FROM PMS

to

MENOPAUSE:

Female Hormones in Context

By Raymond Peat, PhD

FROM PMS

to

MENOPAUSE:

Female Hormones in Context

By Raymond Peat, PhD

From PMS to Menopause: Female Hormones in Context

PART ONE: ESTROGEN IN CONTEXT

1. Estrogen: The Pill--Simply Dangerous 3
2. Estrogen: The Hoax of "Replacement" 10
3. Aging ovaries: Not the eggs 27
4. Menopause and its Causes 37
5. Not the "Female Hormone" 43
6. Just One Problem: Clots 54

PART TWO; PROGESTERONE IN CONTEXT

7. Symptoms that Respond to Progesterone Therapy 60
8. The Origins of Progesterone Therapy 63
9. Antiaging Hormones: Steroids in General 67
10. Youth-Associated Hormones 71
11. Thyroid 76
12. Progesterone's Biological Generality 79
13. Dosage 89
14. An Efficient Oral Therapy 92
15. Transdermal Therapy for PMS 94
16. The Progesterone Deceptions 97

PART THREE: "MYSTERIOUS" DISEASES IN CONTEXT

17. Preserving Tissues: Osteoporosis and the Skin 102
18. Natural Hormones and Arthritis 110
19. The Cervical Cancer Scare and Other Approaches to Cancer 115
20. Warburg's Cancer Theory and Thyroid 117
21. Migraine, Varicose Veins, & Epilepsy 120
22. Nerves 121
23. Alzheimer's Disease 122
24. Eclampsta in the real Organism 124

PART FOUR: SOME PRODUCTS IN CONTEXT

25. Estriol & Phytoestrogens 134
26. Using Sunlight to Enhance Life 144
27. Unsaturated Oils: Toxic and Estrogenic 153
28. The Dangers of Iron: Exacerbated by Estrogen 164
29. Coconut Oil 175

Conclusion 190

Copyright 1997 Raymond Peat, PO Box 5764 Eugene, OR 97405

Introduction

Most of the ideas about health and hormones that are being propagated are fraudulent commercial inventions. In this setting, it is impossible to have any sense of security about the way you are living unless you make the effort to critically examine the claims you hear everywhere.

Occasionally, someone complains that they "don't want to read a lot of technical stuff." (These people prefer to do what "the authorities" tell them. Where would the authorities be without them? I wouldn't want to interfere in their relationships with the authorities, except that the system they sustain is tending to kill everyone.) I have defined some of the technical words, so it shouldn't be necessary to use a dictionary too frequently. Generally, physicians have found my writing more challenging than the average woman does, because my purpose is at odds with the medical culture, and women are realizing that much of the medical culture is at odds with them.

The history of conventional medicine is mainly a history of unscientific and dangerous practices. Medical alternatives were introduced by conscientious workers to avoid the dangers of conventional medicine. But alternative approaches to medicine, especially nutritional therapies, have come to be influenced or even dominated by the same giant industries that control conventional medicine.

Many of the "preventive medicine" and "alternative health" ideas are dangerous--"estrogen replacement therapy," low protein diets, fear of milk, fear of salt, fear of shell-fish, fear of coconut oil, the avoidance of all of the best foods, emphasis on legumes and "complex carbohydrates," supplementation with fish oils and polyunsaturated seed oils, with "complete mineral supplements" (consisting of earth), with minerals "chelated" with toxins such as orotate, glutamate, and aspartate, the use of supplements containing dangerous amounts of iron and manganese, etc.

By putting the idea of eating dirt ("mined in Utah") or pond scum (various algaes) into a very limited context, the advertisers convince people that their product meets a need. Bad ideas don't look so bad, if you can write the presentation without mentioning certain drawbacks.

Good ideas are almost invariably twisted into profit-making schemes. People have come up with the idea that progesterone can be turned into a lucrative product, and--by attaching their products to the

deeply entrenched ideology of "hormone replacement therapy"--they convince people that they should keep using progesterone indefinitely, "to prevent osteoporosis." Many of these marketers advise their customers to avoid milk, and to substitute "plant proteins." (Milk actually helps to prevent and even to cure osteoporosis, because of its optimal content of calcium, protein, progesterone, thyroid, and vitamins.) Big drug companies long ago saw that progesterone wasn't appropriate for their involvement, since "a good drug is one you have to keep taking for the rest of your life."

Progesterone can relieve disabilities with great speed and safety. Since it is a protective substance that stabilizes structures and functions at many levels, it can be useful in almost any situation. It even helps the body regain its ability to produce more progesterone. But if there is a progesterone deficiency, something has caused that deficiency, and it is important to find out what the basic problem is. A diet that is deficient in high quality protein, or that contains natural food toxicants, often is responsible for a progesterone deficiency. If your diet is killing you, supplementing progesterone is of limited value.

For example, a pregnant vegetarian who has produced a long series of children with "attention deficit disorder" wants to use progesterone preventively, without changing her diet; the progesterone would undoubtedly improve the outcome of the pregnancy, but without an adequate diet it is certain that the outcome will not be entirely good. When such people use a "wild yam cream" during pregnancy, they are likely to blame the baby's birth defects on "progesterone," when in fact they were probably not absorbing a measurable amount of progesterone.

If progesterone is used as part of an appropriate physiological program, it isn't necessary to keep using it once it has helped to restore a balanced hormone metabolism.

This book is intended to help you preserve and promote your natural ability to produce an optimal hormonal balance. Since the greatest threat for many people is coming from the medical and nutritional industries, it is necessary to learn enough about the hormones and their physiology to be able to critically reject the impostures that are all around us. A scientific attitude is of great importance, but we must recognize that science has absolutely nothing to do with the "consensus of the authorities." You are less likely to do the wrong thing if you believe that "the authorities are always wrong," because then you will begin to question their assumptions, evaluate their evidence, and examine their reasoning.

PART ONE: ESTROGEN IN CONTEXT

1

ESTROGEN: SIMPLY DANGEROUS

The questions for this chapter came from a 3 day conference in Los Angeles in 1995.

GLOSSARY:

The pituitary gland sits at the base of the brain, where it receives signals from the brain, and secretes hormones that regulate the production of various other hormones and secretions.

Prolactin is a hormone secreted by the pituitary gland during pregnancy, and during stress. It promotes milk production, removes calcium from the bones, and inhibits progesterone formation.

Progesterone is the main female hormone, and is a protective hormone during pregnancy, but it is also important in men since it is a general brain regulating and protective hormone.

DHEA, known as the youth hormone, is very similar to progesterone but is present in both men and women at very high levels. It can be turned into either estrogen or testosterone.

The thymus gland is the main regulator of the immune system. Estrogen causes it to shrink, while progesterone protects it.

Estrogen is a hormone that stimulates cell division (mainly in the breast, uterus, and prostate gland, and in the pituitary gland) and is normally produced in a monthly surge at the time of ovulation and during pregnancy. Women normally have higher levels in their blood than men do.

Q: What are the harmful effects of taking estrogen?

Just naming some of estrogen's effects on the body and mind that have been described in scientific and medical publications will give you at least an indication of the possibilities:

Breast cancer, uterine cancer, ovarian cancer, fibroid tumors, pituitary tumors, lung cancer, liver cancer, bowel cancer, kidney cancer, malignant melanoma, meningioma and other brain cancers, cancers of other organs, osteoarthritis, lupus, rheumatoid arthritis, allergies, porphyria, optic neuritis, epilepsy, depression, suicide, accidents, anxiety, agoraphobia, amnesia, nerve cell damage, low blood pressure, fainting, shock, migraine, varicose veins, irregular heart beat, blood vessel spasms, intestinal spasms, inflammatory bowel disease, gall stones, gall bladder spasms, blood sugar disturbances, hypothyroidism, blood clots, strokes, heart attacks, miscarriage, birth defects, endometriosis, excess hair and loss of hair, skin discoloration, thinning of the skin, water retention and obesity.

About 50 years ago, Hans Selye (known for his discovery of the stress syndrome) gave large doses of individual steroid hormones to rats to study the range of their effects. He had previously analyzed the physiology of the stress reaction, and he observed that estrogen treatment exactly duplicated the shock phase of the stress reaction. This interferes with circulation and energy metabolism, and its physiological purpose is to cause tissue to take up water which stimulates cell division, for example in the uterus to prepare for pregnancy, and in the breasts to prepare for lactation. But none of the physiological functions of estrogen suggests that it could be beneficial in situations other than reproduction--and then only when its "shock" effect is tightly regulated by a well balanced organism--and possibly in wound healing, where its ability to stimulate cell division could be useful.

Q: You mention that estrogen can cause both excess hair and loss of hair. What do you mean?

By suppressing the thyroid and stimulating the pituitary's secretion of prolactin, estrogen can have a variety of complex effects on hair growth; usually, thinning of the hair on the head is a consequence of hypothyroidism. In both men and women, loss of hair from the scalp is associated with low thyroid, but "male pattern baldness" has been held to be produced by a male hormone; but even the male hormones can be turned into estrogen by enzymes in the skin, and experiments show that it

is estrogen which causes the hair follicle to become inactive, while an estrogen-blocker can stimulate the renewal of hair. (R. C. Smart, et al., Proc. Natl. Acad. of Sciences, Oct. 29, 1996.)

By stimulating the adrenal glands, estrogen can increase the production of the "male" hormones that are associated with whiskers and chest hair. [E. C. Ditkoff, et al., "The impact of estrogen on adrenal androgen sensitivity and secretion in polycystic ovary syndrome," J. Clin. Endocrinol. Metab. 80(2), 603-607, 1995.] This usually happens when a progesterone deficiency is combined with an excess of estrogen, as in the polycystic ovary syndrome and sometimes at menopause. In animals, polycystic ovaries are caused by a deficiency of the thyroid hormone, and the same regulatory mechanisms seem to operate in women. The polycystic ovary syndrome is the most common endocrine disorder in women during the reproductive years, and may occur in 10% of them. [A. Dunaif, et al., eds. The Polycystic Ovary Syndrome. Cambridge, MA: Blackwell Scientific; 1992.]

Q: You mentioned that estrogen causes pituitary tumors. If the pituitary is the "master gland," isn't that very serious?

In the early 1970s, researchers at Johns Hopkins studied a group of 300 young women living in their region who had pituitary tumors. Previously, that kind of tumor was very rare, and the researchers suggested that the estrogen in the oral contraceptive was causing this epidemic. Estrogen's ability to produce this kind of tumor is now firmly established. This type of tumor secretes prolactin. Prolactin is a hormone which is known to cause osteoporosis, and which also has a role in breast abnormalities, including cancer. It can suppress the ovaries' ability to make progesterone, and it affects sweat glands and hair follicles. If the tumor is very large, its pressure on the optic nerve can cause visual disturbances.

Normally, by the age of 50, most people have an enlargement of the pituitary, and this is undoubtedly a factor in the menopause and other conditions that occur in aging. A blood test for prolactin will usually show whether a tumor is forming or not. A drug is available that will shrink the tumor and normalize the gland's function.

Q: What are some of the emotional symptoms of excess estrogen?

Estrogen excess can cause suicidal depression, or milder forms of depression and lethargy, as well as irritability, aggressiveness, anxiety, fear of public places, forgetfulness, a feeling of confusion, and a tendency to cry easily. Post-partum depression (following childbirth) is associated with high estrogen and low thyroid, and insomnia is common at that time, and during menopause. Sometimes insomnia is associated with night-time worrying.

Migraine headaches are strongly associated with high estrogen and low thyroid. The traditional view that they are caused by emotions probably came from the observation that migraines are frequently associated with the monthly hormone cycle.

According to German documents [investigated by Jean Jofen of Baruch College, reported at the Fifth World Congress of Jewish Studies in Jerusalem], the Nazis put estrogen in the food at concentration camps, to make the prisoners helpless and unable to organize resistance. They certainly weren't doing it to slow the aging process.

Q: What caused your interest in estrogen?

Between 1950 and the early 1960s I knew three women who used estrogen. One developed an extreme case of rheumatoid arthritis, which got worse with each dose of estrogen, and disappeared when she stopped using it. Another woman had a mental breakdown within an hour of her estrogen injection, and was hospitalized for six months. Her daughter began using the contraceptive pill, and died of a stroke at the age of 28. It was clear to me that estrogen had harmful effects, and that it was being promoted without adequate warnings. Magazine articles described massive testing programs in Puerto Rico and claimed that the women were healthier after using the pills, but in reality the contraceptive Enovid was approved on the basis of only 135 women who were studied for a year or more; three young test subjects died. When I went to graduate school in 1968, I began projects in brain physiology, aging, and cancer, and in each of those areas I found that estrogen was an important factor.

Q: What should I do if I want to stop the pill?

In the case of birth control pills, you can simply stop taking them, with few symptoms of withdrawal, but it is important to be alert to the possibility that your own hormone balance might not spontaneously

return to normal. Some women are unable to get pregnant after using the pill. If your normal cycles don't resume within a few months, it would be useful to have tests done for prolactin, progesterone, and thyroid, since those hormones are modified by estrogen use. And you should be aware that estrogen use increases the risk of birth defects. Since natural progesterone has been found to reduce the incidence of birth defects, it would seem reasonable to be sure that your own progesterone has returned to normal before getting pregnant.

Q: How can I tell if my natural estrogen level is too high?

Only a blood test can tell for sure whether your estrogen is higher than it should be, and it is necessary to measure your progesterone at the same time, since it is best to have five or ten times as much progesterone as estrogen. If your progesterone level is low, even an average estrogen level can cause serious symptoms, because its effects are not balanced and opposed by progesterone.

Generally, people whose temperature (measured by an oral thermometer) is below normal or whose thyroid function is low are likely to have high estrogen and low progesterone. (Low temperature stimulates the ovaries to produce excess estrogen, and retards the liver's ability to excrete it.) A deficiency of protein and B vitamins can make it impossible for your liver to excrete estrogen, leading to a chronically high estrogen level. Excess fat tissue, especially after the age of 40 when progesterone and thyroid may be low, is a major cause of chronically high estrogen levels, and therefore is associated with an increased incidence of breast and uterine cancer.

Estrogen usually causes fat to be deposited on the thighs and hips.

Q: How can I get my natural estrogen level to be lower?

Adequate protein and B vitamins are essential. Vitamin A protects some tissues, such as the breasts, against estrogen's effects, including cancer, and generally offers protection against estrogen by increasing progesterone. Several studies found that vitamin E protects against estrogen's harmful effects. A thyroid supplement can reliably lower estrogen, by increasing the liver's ability to excrete it. Unsaturated oils have a strongly estrogen-promoting action, and should be avoided. Raw carrots can help, by preventing the reabsorption of estrogen which has been secreted into the intestine with the bile. Adequate sunlight helps

to maintain a healthy balance of the hormones. In certain circumstances, natural progesterone can help to reestablish a balance of hormones

Q: Will lowering my estrogen have any harmful effects?

No. Natural estrogen is closely associated with stress, and this "anti-estrogen" program is essentially an antistress program, which is likely to improve many aspects of your health.

Q: What are my options for birth control if I don't take estrogen?

Human fertility, like that of birds, reptiles, fish, and other animals, has declined so steeply during the last 20 years, as a result of the industrial pollutants with harmful estrogen-like effects, that it is very likely that every form of birth control has become more effective than it was found to be in the 1960s and 1970s. This means that even the rhythm method, using temperature or mucous tests to determine the fertile time, should be more effective than it used to be. The barrier methods--condoms, diaphragms, and cervical caps--will tend to be more effective even without the toxic spermicidal drugs that are now normally used with them.

The traditional cervical cap was illegal in the United States for many years. (In fact, contraception was a crime not very long ago. And when I first considered including contraception in a course I taught, I learned that even teaching about it would have been illegal. It was undoubtedly lobbying by the pharmaceutical industry that contributed to the changed legal situation.) When a so-called cervical cap was finally approved for use in this country, it was actually an unworkable, ludicrously designed receptacle for a spermicidal drug, and not actually an effective barrier. The actual cervical cap, if it can be obtained "illegally," is a safe, easy, comfortable and effective means of contraception.

The IUD (intrauterine device) actually works by causing serious hormonal disruptions, blocking the ability to produce progesterone.

Natural progesterone has been added to plastic IUDs, but this doesn't correct the general hormone imbalance that can be produced by the presence of an object in the uterus.

Synthetic hormones which are implanted under the skin increase the risk of cancer, and can cause disfiguring injury at the site of implantation.

Natural progesterone placed in the vagina during intercourse has been very effective in my studies, but is not officially approved.

Progesterone's normal effects include maintenance of pregnancy, and that requires the prevention of additional pregnancies during the course of an established one. Its presence in the vagina during intercourse causes the cells to react as if there were already an established pregnancy. There are various reasons that this method of contraception hasn't been generally accepted; for example, progesterone's very name suggests that it promotes pregnancy, and the bureaucratic mentality sees things in simplistic ways.

Incidentally, I think the evidence is absolutely clear that the estrogen pills are not contraceptives. They don't prevent conception, they prevent implantation of the embryo into the uterus. That is abortion, so the industry had to make up a theory in which the pills could be marketed as a contraceptive, to avoid the religious reaction to the abortion pill. This theoretical gimmick took nearly twenty years to develop.

SUMMARY

There is no valid scientific evidence of its safety in any amounts.

Estrogen's contraceptive action is just one aspect of its general toxic effect.

Estrogen is dangerous, in any amounts, unless it is balanced by an abundance of the natural forms of thyroid, progesterone, and DHEA.

Estrogen is a cumulative toxin, because it causes changes in every system of the body, even when present in normal amounts. These cumulative changes appear to accelerate aging in all tissues.

2

ESTROGEN: THE HOAX OF "REPLACEMENT"

GLOSSARY:

Progesterone is the main female hormone, and is a protective hormone during pregnancy, but it is also important in men since it is a general brain-regulating and protective hormone.

DHEA, known as the youth hormone, is very similar to progesterone but is present in both men and women at very high levels. It can be turned into either estrogen or testosterone.

The thymus gland is the main regulator of the immune system.

Testosterone is the main male hormone, though it is present in females too.

Free radicals are parts of molecules that can react destructively with other molecules to cause damage to cells.

HDL and LDL are often called "good cholesterol" (High Density Lipoproteins) and "bad cholesterol" (Low Density Lipoproteins) because of a slight association between their ratio and heart disease, but in fact the ratio that suggests freedom from heart disease suggests susceptibility to cancer. LDL ("bad") is extremely good because it is used as the source for producing progesterone and DHEA.

Q: You point out the dangers of estrogen, but don't women need to replace it at menopause?

"Replacement" is a trick word in this context. At a European conference, a researcher asked "why do you Americans use the word 'replacement,' when you are administering doses that give them 15 times more estrogen than normal young women have naturally?" Rather than bringing the blood level of estrogen up to normal, most physicians ignore the amount of estrogen already present in the blood, and give a dose of

estrogen sufficient to suppress the pituitary hormones, FSH and LH, which are sometimes called "the menopause hormones."

But the menopausal excess of those pituitary hormones is caused by estrogen's chronic damage to the nerve cells that regulate the pituitary, which causes the nerves to become insensitive to normal stimulation by estrogen.

Cholesterol is turned into hormones such as progesterone in the brain and the adrenal glands, as well as in the ovaries and testicles, but estrogen can be produced in practically every part of the body. For example, even when the ovaries are removed, hormones from the adrenal glands can be turned into estrogen in fat cells. In general, the fatter a person is, the higher their estrogen levels are. This is why the risk of cancer increases in proportion to obesity.

The stimulating effect some women experience when they are given large, unphysiological doses of estrogen seems to be produced partly by an effect of estrogen that resembles stimulation by cocaine. In a variety of ways, estrogen is a powerful brain excitant: it can provoke epileptic seizures, and it increases the effects of some of the excitatory substances and processes that contribute to brain aging.

Q: How safe is it for a woman to take estrogen?

It simply isn't safe to take estrogen. Safety implies that adequate studies have been performed, and have found that the treatment has done no harm. The first such large scale study to examine the general effects of estrogen replacement is just beginning. Many studies which looked for particular effects in humans have already found harm, and the huge amount of research that has been done on animals strongly indicates that the over-all effects of estrogen will be found to be harmful.

During the 20th century, animal studies have revealed almost an infinite variety of harmful effects of estrogen. Cancer, blood clots, miscarriage, shock-like effects, and accelerated aging are among its longest-established toxic effects. Some medical publications have claimed that estrogen-treated women live longer than untreated women, but as Dr. Elizabeth Barrett-Connor (UCSD) has observed, the women who received estrogen were healthier before the study began than the women who didn't receive estrogen, and in such a biased situation no meaningful conclusion is possible, except that some women can survive treatment with estrogen. There are many scientifically sound studies that show estrogen treatment to be seriously harmful to women. Even some of

estrogen's less deadly effects, such as memory impairment and water retention, should be taken more seriously.

Q: How safe is estrogen in very low doses?

It's not safe even in low doses.

"Low estrogen" birth control pills contain about 30 micrograms of estrogen, and since this amount prevents pregnancy, it is significantly "large" in physiological terms. It is low only by reference to earlier pills.

Even young women have had strokes caused by the estrogen in birth control pills, and tumors of the pituitary and liver have been linked to use of the pill, as have cancer, heart disease, inflammatory bowel disease, suicides, and accidental death. Since many environmental pollutants (DDT, phenolic compounds, smoke and dioxins, for example) act like estrogen, it is increasingly difficult to distinguish the effects of medical estrogens from the general effects of pollution, but the higher background level of estrogenic stimulation suggests that more and more people will be injured by the additional burden of "low dose" estrogen treatments. (Skin patches for menopause treatment are intended to deliver 50 or 100 micrograms of the powerful natural estrogen, estradiol, per day, vaginal creams deliver similar amounts (probably causing higher blood concentrations at times, because of the greater permeability of vaginal membranes), and the suggested oral dose of estradiol for menopause symptoms is 1 or 2 mg., that is, 1000 or 2000 micrograms per day. Tablets of conjugated estrogen for oral use range from 300 micrograms to 2,500 micrograms. As a vaginal cream, the applied dosage suggested is 1,250 or 2,500 micrograms per day for the conjugated estrogen, somewhat lower than the suggested amount of estradiol cream.)

Q: Why would the medical establishment prescribe estrogen if it's not safe?

Hundreds of millions of dollars of annual profits from estrogen products allow the drug companies to subsidize medical conferences, medical research, medical journals, and medical schools. The information physicians receive is heavily biased in favor of estrogen treatment by that funding. Physicians are not regularly taught in medical school or in continuing education courses, that they should measure the amount of estrogen in the blood before they prescribe a treatment to "replace" it, and the amount commonly prescribed has no meaningful relationship to

the amount which is normal in young women. Many women have told me that their doctors have measured their estrogen level, but when they look at their medical records they often find that only the pituitary hormones or the vaginal cells have been examined.

Q: Doesn't taking estrogen prevent aging and increase energy?

Because of the claims that estrogen protects the skin against aging, investigators have tested its effects when rubbed onto guinea pigs (Pliske, 1953), or injected into rats (Hooker and Pfeiffer, 1943). It caused hair loss and thinning of skin in the rats, and in guinea pigs it caused degeneration and vacuolization of connective tissue. Animal experiments show clearly that estrogen accelerates the aging of connective tissues, and it causes the accumulation of "age pigment."

When a rat is treated with estrogen, it is likely to run 30 miles a day, because of the brain excitation it causes. Some women like this sensation of "energy," but biochemically, the stimulation isn't unlike that received from cocaine, and accordingly the estrogen-induced excitation seems to be addictive. Cocaine doesn't have some of estrogen's side effects. Estrogen tends to deprive all tissues of an adequate supply of oxygen, so the "energy" it provides isn't protective in the way that a good reserve of biological energy is, and in fact it activates brain pathways that involve potentially deadly over-excitation, which are responsible for the aging and death of brain cells.

Q: Why do so many women I know look and feel better when they take estrogen?

Cows and other animals that have been given estrogen treatments to make them put on extra weight, are fat and waterlogged, but none of their functional systems are improved. When a woman's skin is aging and slack, it becomes tighter and smoother if she gains weight, even if the weight consists of fat and retained water. But the skin itself becomes thinner, less elastic, and "older" in several structural and functional ways when it is treated with estrogen.

Estrogen, as discussed above, can act as a stimulant, and give an increased sense of energy. Estrogen can be metabolized into a form which promotes the actions of the catecholamines, such as adrenalin. In this form, estrogen produces toxic free radicals, which contribute to aging and cancer.

In those senses--tightening the aging skin by causing water retention and obesity, and acting as a stimulant--estrogen can make you "look better" and "feel better." But personality studies show that women who trust their physicians more than they trust themselves are the ones who are likely to use estrogen. What they say they feel tends to be what their physicians have told them they should feel.

Q: Doesn't estrogen prevent osteoporosis?

No. It is said that estrogen slows the rate of bone loss, while progesterone, thyroid, and DHEA actually shift bone metabolism into the growth phase. (Around the time of menopause, there is a steep decline in the levels of these three protective hormones.) But there are serious reasons for believing that estrogen is a factor in causing bone loss. Young women have thinner bones than men of the same age, because even at a young age estrogen is acting to inhibit bone growth. (Men's bones are 50% bigger.) Prolactin, a pituitary hormone which is increased by estrogen, has a powerful bone-weakening effect and it is often produced in excess around menopause. Cortisone, another bone-weakening hormone, also tends to be increased by estrogen. The thyroid hormone, which fundamentally supports the bone-building process, is inhibited by estrogen. And progesterone, which has a bone-protecting and bone-building effect, is inhibited by these estrogen-induced hormonal changes. When bone loss begins at the onset of menopause, it is progesterone (which normally keeps estrogen in balance) which has suddenly decreased, leaving estrogen undiminished and unopposed, usually for years, during which the worst symptoms of menopause occur.

In egg-laying chickens, estrogen promotes the storage of calcium, largely in the soft interior of bones, but if combined with a high calcium intake, extra estrogen can be toxic. To the extent that estrogen does increase the mineral content of bone, it seems to be in the spongy cancellous bone around the marrow, rather than in the strong cortical bone. In the complexly organized hormonal environment of pregnancy, estrogen's ability to stimulate the retention of iron and calcium fits into the whole scheme, in which the growing baby is consuming those substances. Poisoning by cyanide, or oxygen deprivation, can increase the retention of calcium by tissue, and since an immediate effect of estrogen is to decrease the oxygenation of tissue, I see estrogen's effect on calcium metabolism as analogous to its effect on iron: In stress,

organisms absorb calcium and iron. In dying cells, both calcium and iron tend to be deposited together. Estrogen has its place in normal growth and development, but the people who advocate its use as a supplement seem to have no respect for the complexity of its relation to the developing organism.

In young animals, estrogen retards the growth of cartilage. Physicians sometimes give estrogen to tall children, when their parents want their growth to stop, because it does stop bone growth.

Estrogen is not an anabolic hormone, like testosterone, which builds up bone and muscle. In fact, it strongly opposes the effects of those hormones. In the polycystic ovary syndrome, an excess of estrogen stimulates the adrenal glands to produce a large amount of the androgenic steroids, probably to balance estrogen in the way progesterone does when the ovaries are functioning properly. These anabolic/androgenic hormones apparently have some of the good effects of progesterone, such as reducing the incidence of cancer, but many women are disturbed by the increased growth of body and facial hair; facial features also tend to be masculinized. In France, progesterone lotions have been in use for several years for reversing some of these effects of the adrenal hormones, and for balancing estrogen.

Considering this sort of information, it is very unfortunate for women that the osteoporosis problem is so often seen simply as an opportunity for prescribing estrogen. In some countries, old women don't have a problem with osteoporosis. Shouldn't physicians pay more attention to emulating the factors that prevent osteoporosis, instead of thinking that it is a pharmacological problem?

Studies of both animals and humans show that estrogen contributes to a variety of inflammatory degenerative diseases, and one condition known to be aggravated by estrogen is osteoarthritis. Osteoarthritis is sometimes referred to as a matter of "wear" of the joints, but estrogen's contribution seems to be that it structurally weakens the joint tissues, after binding to estrogen-sensitive receptors. This research should be kept in mind when listening to the claims about its "protecting the bones." Other studies have implicated estrogen in other types of arthritis.

Q: What about taking estrogen to avoid Alzheimer's disease and heart attacks?

Several years ago it was noticed that estrogen treatment caused changes in the types and amounts of fat carried in the blood. Ordinarily, unexpected changes caused by drugs are treated as abnormalities, and bring the drug into question. But with estrogen, the situation is different: Recently, a reviewer noted that estrogen alters the triglyceride (simple fat) levels in the blood, but dismissed the change as "probably benign." In the case of cholesterol, the abnormality was interpreted as a virtue. Estrogen increased the ratio of HDL (high density lipoprotein--"good"--cholesterol) to LDL (low density lipoprotein--"bad"--cholesterol). In other situations, a high ratio of HDL to LDL has been found to be associated with a lower incidence of heart attacks (but a higher incidence of cancer), and this single trait has been considered alone, out of context, to allow many people to claim that estrogen "protects against heart attacks," since it shifts that indicator in the direction associated with fewer heart attacks. But estrogen also does many things that are more directly associated with heart attacks: It increases the tendency to form blood clots, and it increases the tendency of blood vessels to go into spasm during stress (synergizing with adrenalin). When men were given estrogen following a heart attack, it was found to increase--rather than decrease--the risk of another heart attack.

In the famous Framingham study, it was found that post-menopausal estrogen use increased heart attacks by 50% and increased strokes by 100%. "Estrogen's heart protective effect" is a clear example of taking one feature (the cancer-associated HDL/LDL ratio) out of context for the purposes of advertising a product. It is a good idea to read the literature that comes with estrogen prescription products, because even though it is printed by the pharmaceutical company, the law requires that some truthful warning information must be provided.

It is known that cancer (and other degenerative diseases) take a long time to develop, often more than 20 years after the crucial damage was done. Many studies have been able to find that estrogen has no harmful effect by stopping the study at an age at which no damage would be expected to show.

In 1993, a study in California found that women who took estrogen were less likely to develop Alzheimer's disease. The first study was done in a little town where I had done some lectures and consultations, and I was aware that a local doctor was giving his patients natural progesterone whenever he prescribed estrogen, and that he usually gave estrogen only when they specifically asked for it. I suspect that the

women who chose to use estrogen were (as in other studies) more affluent and healthier, and that many of them were at the same time taking natural progesterone.

Another more recent study showed that women who take estrogen are not less likely to develop Alzheimer's disease, but were more highly educated than those who don't use estrogen. Several studies have found that poorly educated people are much more likely to be diagnosed with Alzheimer's disease, because of the way the mental tests are designed and interpreted. These relationships show how it is possible to get a mistaken impression of the effects of estrogen treatment.

Since it is harder to do an accurate study of humans than of animals, we should examine the effects of estrogen on the brains of animals much more carefully before making any more claims about its "protective" effects. We should remember that it was claimed to prevent miscarriages (it actually causes them), to prevent skin aging (it accelerates it), to delay menopause (in animals, it accelerates the onset of sterility and the loss of cyclic pituitary function), and to prevent heart attacks in men (it caused them). As far as the brain is concerned, estrogen is known to "erase" memories, to induce seizures, to cause the exhaustion or death of particular types of nerve cell, and to be very toxic to the developing fetal brain, retarding its growth. The adrenalin-like derivative of estrogen which is responsible for much of its brain-stimulating action is known to produce toxic free radicals. Free radicals are considered to play an important role in the development of both Alzheimer's disease and heart disease.

Q: Do you mean estrogen might accelerate brain aging?

In animal studies, it accelerates age-related changes in every organ examined. In P. M. Wise's studies, it appeared to exhaust and kill specific brain cells that are involved in fertility. Recent studies of brain physiology show that estrogen and cortisol both promote the "excitotoxic" processes, which are increasingly believed to be implicated in the processes of brain aging and degeneration.

Since excess iron is now thought (as discussed in the chapter on iron) to contribute to cancer and heart disease, and is a factor in brain degeneration, and since iron assimilation is promoted by estrogen, I would expect there to be an intensification of the toxic effects of dietary iron supplementation by estrogen treatment. For example, both iron and estrogen can destabilize liver protein synthesis, they are both involved in

the formation of "age pigment," they both seem to facilitate epileptic seizures, and so on.

Menstruation, I suspect, is protective (by causing some iron loss), and estrogen (by promoting iron retention), harmful.

The incidence of Azheimer's disease is higher in women than in men [A. F. Jorm, 1990; W. A. Rocca, et al., 1991], osteoporosis is mainly a disease of American and European women, and men have more heart attacks when they are given estrogen. According to the Framingham study, women who use estrogen have more heart attacks and strokes than those who don't. Considering those simple facts, one has to wonder how the estrogen promoters came up with the theory that estrogen is "protective" against heart disease, Alzheimer's disease, and osteoporosis.

Q: My doctor said estrogen is safe if I take it with "progesterone" or progestin or testosterone.

Physicians often confuse the synthetic progestins with natural progesterone. The brand of medroxyprogesterone acetate called Provera is often mistakenly called progesterone. Each steroid hormone has a range of biological effects, and generally the synthetic progestins contain some very powerful estrogen-like or testosterone-like effects. Natural progesterone's effects on the uterus can be achieved to some extent by some of the synthetic hormones, but the natural substance also has a powerful and pervasive balancing effect on other hormones, and serves as the material out of which other natural hormones can be formed. The synthetic progestins lack that balancing effect, and can't be transformed biologically into any of the other natural hormones.

The synthetic progestins can protect the uterus from the carcinogenic effect of estrogen. Even testosterone's anti-estrogen action seems to protect the uterus and the breast from estrogen's effects. But the famous studies on female beagles showed that a commonly used synthetic progestin can cause breast cancer, and similar results have been seen with other synthetics. One of progesterone's most important effects is its protection of the brain's structure and function; the use of a synthetic substitute for it often causes nervous and emotional symptoms, and I think it is reasonable to be concerned that the synthetic may have harmful long-range effects on the brain that haven't been discovered yet.

Adding testosterone to estrogen treatment reduces some of the risks of estrogen treatment, and it definitely improves bone metabolism. Testosterone is a powerful sexual stimulant, and this has probably

increased the popularity of the treatment, but many women dislike the growth of whiskers that testosterone stimulates. [Estrogen itself can sometimes stimulate the growth of whiskers, by over-stimulating the adrenal glands. E. C. Ditkoff, et al., "The impact of estrogen on adrenal androgen sensitivity and secretion in polycystic ovary syndrome," J. Clin. Endocrinol. Metab. 80(2), 603-607, 1995.] Both testosterone and estrogen cause the thymus gland to shrink, with serious consequences for immunity, and they also seem to have some similar toxic effects on the brain.

If estrogen is not balanced by hormones such as progesterone, DHEA, pregnenolone, and testosterone, even a very small amount of the substance has a very large effect on the body. Even when the ovaries have been removed, the body's fat tissues can produce significant quantities of estrogen. Various stresses and injuries can cause the body to produce more estrogen. When large amounts of estrogen are given, the body is unable to produce enough of the other hormones to balance it, and these other hormones fail at an earlier age than estrogen production does. "Ovarian failure" always involves a progesterone deficiency, but it doesn't necessarily mean that there is an estrogen deficiency.

Natural progesterone is a cheap material which is effective when taken orally dissolved (not just packed) in oil, but many physicians are confused about it, because the FDA lists only the injectable form (which is in a toxic solvent) as the "approved" form. Natural progesterone, when not in an injectable form, doesn't need the FDA's approval, because it is a natural hormone which was in use before the FDA law was passed.

To be effective, it has to be fully dissolved and not visible as a white powder. This is why some studies have claimed that it is not effective, or is effective only when administered in very large doses.

Q: What about estriol and other estrogen choices, such as phytoestrogens (estrogens derived from plants such as soybeans)?

Estriol is a slightly weaker variant of the stronger natural estradiol. It is more water soluble than estradiol, so it is slightly easier to excrete in the urine. When it is used as a drug, the body can change it into the more active estradiol.

The phytoestrogens, or plant-derived estrogens, have been promoted recently as safer alternatives for therapeutic use. In the sense that these weaker estrogens can modify the actions of strong estrogens, they might be protective in certain circumstances involving excess

estrogen, but this protection is more theoretical than practical, and the harm they can do is real. Sheep farmers learned long ago that the phytoestrogens in clover can cause miscarriages, animal studies show they cause genital deformities, and recent tests are suggesting that they are, like other estrogens, carcinogenic. This is similar to the situation with Tamoxifen, which is an anti-estrogen used to treat breast cancer. It, in itself, is carcinogenic. (See my discussion of estriol and other "weak" estrogens in section 4.)

Q: Doesn't everyone have the right to decide what is best for them? What if they feel estrogen is working for them and eliminates symptoms?

That is reasonable, if you have access to the best information on the beneficial and harmful effects of the treatment. This book is to help you to decide whether you have the information you need on questions of this sort. Many people have felt that they understood a treatment, and benefitted from it, but later learned that it had seriously harmed them. For example, many people were given large doses of X-rays to treat their acne or ringworm or sinus inflammation or "enlarged thymus gland," with their physicians' assurance that it was the safe and effective and universally accepted treatment, only to discover that the treatment caused cancer or brain damage or deformity or loss of immunity. Many people, including physicians, do not realize that there is a very large and persuasive scientific literature that indicates that estrogen is neither safe nor effective for the various uses which are currently advertised.

Q: What are the pros and cons of other treatment regimes if I go off estrogen?

Many physicians prescribe clonidine patches to prevent hot flashes in women who don't want to use estrogen. Clonidine is a drug that blocks adrenalin. Since hot flashes can be caused by excess cortisone, and adrenalin triggers the release of cortisone, this procedure seems to have a logical foundation. Cortisone excess causes osteoporosis, so clonidine could protect the bones while preventing hot flashes.

Natural progesterone strengthens the bones by blocking cortisone and prolactin, it normalizes thyroid and energy metabolism and thereby helps with insomnia, it prevents the growth of excess facial hair, steadies the emotions, and sometimes even helps to control hot flashes.

Natural thyroid supplements can help to avoid weight gain, depression, and hot flashes; this will be discussed in the chapter on thyroid. The claims that thyroid contributes to osteoporosis are not true, according to the relevant human and animal studies (for example, Franklyn, 1994), and that myth was based on a few unscientific reports.

There is a drug which is sometimes more powerful than thyroid and progesterone in correcting abnormal pituitary function, and this has been used to relieve some of the symptoms of menopause, including osteoporosis.

The diet should support optimal functioning of the thyroid and other glands, as discussed in other chapters.

Q: How do I get off estrogen?

Keeping estrogen's stimulating action in mind, women who want to stop using estrogen prescribed "for menopause" usually find that they can withdraw from it by decreasing the dose gradually over a period of two or three months, while using some harmless stimulants such as tea or coffee as needed to smooth the process of withdrawal.

SUMMARY

Estrogen can cause breast cancer, heart disease, strokes, accelerated aging, and many other serious problems.

There is no valid scientific evidence of its safety in any amounts.

Estrogen is dangerous, in any amounts, unless it is balanced by an abundance of the natural forms of thyroid, progesterone, and DHEA.

Estrogen can be produced in practically every part of the body, especially in fat tissue.

Estrogen's only clearly established useful functions are to prepare for reproduction by stimulating growth of the uterus, the breasts, and the pituitary gland, and to influence behavior during reproduction. Even in these specialized functions, it

has an absolute requirement for a complex and precise balance of other hormones.

The body's normal defenses against estrogen fail with aging, causing many symptoms associated with menopause.

REFERENCES

1. Astedt, B., "Low fibrinolytic activity of veins during treatment with ethinyl oestradiol." Acta Obstet. Gynecol. Scand. 50, 279-83, 1971.
2. Aurousseau, M. H., et al., "Risk of thromboembolism in relation to an in vitro fertilization programme: Three case reports," Hum. Reprod. 10(1), 94-97, 1995.
3. Ball, P., R. Knuppen and H. Breuer, "Interactions between estrogens and catechol amines: Purification and properties of a catechol-O-methyl-transferase from human liver," Research on Steroids (Rome) 5, 377-383, 1973. This study shows that estrogen can block the liver's ability to eliminate adrenalin; a similar effect has been observed in the brain's enzyme systems, which accounts for estrogen's amphetamine-like or cocaine-like action on the brain.
4. Ball, J., et al., "Maternal and fetal sequelae of anticoagulation during pregnancy," Am. J. Med. 122, 1980,
5. Barrett-Connor, E., "Heart disease in women," Fertility and Sterility 62(6, suppl 2), S127-S132, 1994. "No studies have shown that" estrogen "is protective."
6. Baum, J. K., "Liver tumors and oral contraceptives," J. A. M. A. 232, 1329, 1975.
7. Bauer, D. C., et al., "Skin thickness, estrogen use, and bone mass in older women," Menopause 1(3), 131-136, 1994
8. Beller, F.K. and Ebert, C. "Effects of oral contraceptives on blood coagulation. A review," Obstet. Gynecol. Surv. 40, 425, 1985.
9. Beral, V., "Cardiovascular disease mortality trends and oral contraceptive use in young women," Lancet 2, 1047-1051, 1976.
10. Bickerstaff, E. R., Neurological Complications of Oral Contraceptives, Oxford, Clarendon Press, 1975.
11. Blair, V, "Breast cancer and estrogen therapy," JAMA 272(13) 1004, 1994.
12. Boccuzzi, G., et al., "5-en-androsterone-3 beta,17 beta-diol inhibits the growth of MCF-7 breast cancer cells when oestrogen receptors are blocked by oestradiol," Br. J. Cancer 70(6), 1035-1039, 1994.
13. Bole, G. G., et al., "Rheumatic symptoms and serological abnormalities induced by oral contraception," Lancet 1, 323, 1969.
14. Bonnar, J., et al., "Coagulation system changes in postmenopausal women receiving oestrogen preparations," Postgrad. Med. J. 52, 30, 1976.
15. Bonnar, J., "Venous thromboembolism and pregnancy." in Rec. Advs. in Obst. and Gynecology, J. Stallworth and G. Bourne, Eds. Churchill Livingstone, Edinburgh, 1979, 173.
16. Bonnar, J., "Coagulation effects of oral contraception." Am. J. Obstet. Gynecol., 1042, 1987.
17. Boston Collaborative Drug Surveillance Program: Surgically confirmed gallbladder disease, venous thromboembolism, and breast tumors in relation to menopausal oestrogen therapy, N. Engl. J. Med. 290, 15, 1974.
18. Bottiger, L.E. et al., "Oral contraceptives and thromboembolic disease: effect of lowering oestrogen content," Lancet 1, 1097, 1981.

19. Boyko, E. J., et al., "Increased risk of inflammatory bowel disease associated with oral contraceptive use." Am. J. Epidemiol. 140, 268-78, 1994.
20. Castelobranco, C., et al., "Antagonism of oestrogen-induced prolactin release by medroxyprogesterone acetate," Maturitas 20(2-3), 145-150, 1994.
21. Christiansen, C., "The different routes of administration and the effect of hormone replacement therapy on osteoporosis," Fertil. Steril. 62(6 Suppl. 2) S152-S156, 1994.
22. Collaborative Group for the Study of Stroke in Young Women, "Oral contraceptives and stroke in young women," J. A. M. A. 231, 718-722, 1975.
23. Coronary Drug Research Group, "The coronary drug project: initial findings leading to modifications of its research protocol," J. A. M. A. 214, 1303-1313. 1976.
24. Cotton, P. B. and M. L. Thomas, "Ischemic colitis and the contraceptive pill," British Medical J. 3, 27-28, 1971.
25. De Swiet. M., "Thromboembolism," in Med. Disorders in Obstetric Practice, M. De Swiet, Ed., Blackwell Scientific, Oxford, 1984, 95.
26. Ditkoff, E. C., et al., "The impact of estrogen on adrenal androgen sensitivity and secretion in polycystic ovary syndrome," J. Clin. Endocrinol. Metab. 80(2), 603-607, 1995.
27. Djerassi, C., "The making of the pill," Science 84: 127-129, 1984.
28. Dodds, E. C., et al., "Interruption of early pregnancy by means of orally active oestrogens," British Medical Journal 2, 557, 1938. This early study, and many later ones (e.g., A. L. Soderwall's) clearly showed that estrogen induced abortions. The fear of a religious boycott delayed the introduction of "oral contraceptives" for many years. The new marketing program presented the estrogen pill as an inhibitor of ovulation, though the evidence has remained clear that estrogen will induce abortion at any stage of gestation, and the stage of implantation of the early embryo is the most sensitive to its effects.
29. Dinbar, F. and M. E. Platts, "Intracranial venous thrombosis complicating oral contraception," Canadian Med. Assoc. J. 111, 545, 1974.
30. Dolan. M., "New research links the pill and breast cancer," Synapse (UCSF Medical School), Nov. 13, 1975.
31. Dubois. E. L., et al., "L.E. cells after oral contraceptives," Lancet 2, 679, 1968.
32. Dunaif, A., et al., eds. The Polycystic Ovary Syndrome. Cambridge, MA: Blackwell Scientific: 1992.
33. Duval, D., S. Durant, and F. Homo-DeLarche, "Non-genomic effects of steroids," Biochem. Biophys. Acta 737, 409-42, 1983 (pg. 426).
34. K. Eguchi, et al., "In vivo effect of cabergoline, a dopamine agonist, on estrogen-induced rat pituitary tumors," Endocr. J. 42(2), 153-161, 1995.
35. Ellerbroek, W. C., "Oral contraceptives and malignant melanoma," J.A.M.A. 206, 649-650, 1968.
36. Falliers, C. J., "Oral contraceptives and allergy," Lancet 2, 515, 1974.
37. Family Practice News 22(1), pp. 3, 34, 1992 (about E. Barrett-Connor).
38. Fasal, E. and R. S. Paffenbarger, "Oral contraceptives as related to cancer and benign lesions of the breast," J. Natl. Cancer Inst. 55, 4, 1975.
39. Forgie, M. L. and J. Stewart, "Effect of prepubertal ovariectomy on amphetamine-induced locomotor activity in adult female rats," Horm. Behav. 28(3), 241-260, 1994.
40. Forman, D., et al., "Cancer of the liver and oral contraceptives," Brit. Med. J. 292, 1357-1361, 1986.
41. Franklyn, J., et al., "Bone mineral density in thyroxine treated females with or without a previous history of thyrotoxicosis," Clin. Endocrinol. 41(4), 425-432, 1994.
42. Frye, C. A., "Estrus-associated decrements in a water maze task are limited to acquisition," Physiol. Behav. 57(1), 5-14, 1995.
43. Gerstman, B. B., et al., "Oral contraceptive estrogen dose and the risk of deep venous thromboembolic disease," Amer. J. Epidemiology 133, 32-36, 1991.

44. Gill, G. J., "Rheumatic complaints of women using anti-ovulatory drugs," J. of Chronic Disease 21, 435, 1968.
45. Goldzieher, J. W., "Are low-dose oral contraceptives safer and better?" Am. J. Obstet. Gynecol. 171(3), 587-590, 1994.
46. Goodrich, S. M. and J. E. Wood, "Effect of estradiol 17b on peripheral venous blood flow," American Journal of Obstetrics and Gynecology 96, 407, 1966.
47. Haarbo, J., "Impact of hormone replacement therapy on serum lipids, lipoproteins, body composition, and atherosclerosis," Dan. Med. Bull. 41(4), 412-422, 1994.
48. Hellgren, M., "Thromboembolism and pregnancy," Thesis, Karolinska Institute, Stockholm, 1981.
49. Hellgren, M. and Blomback, M., "Studies on blood coagulation and fibrinolysis in pregnancy during delivery and in the puerperium," Gynecol. Obstet. Invest. 12, 141, 1981.
50. Henderson, S. R., et al., "Antepartum pulmonary embolism," Am. J. Obstet. Gynecol. 1162, 176. 1971.
51. Ho, S. M. and D. Roy, "Sex hormone-induced nuclear DNA damage and lipid peroxidation in the dorsolateral prostates of Noble rats," Cancer Lett. 84(2), 155-162, 1994.
52. Hulka, B. S., "Links between hormone replacement therapy and neoplasia," Fertil. Steril. 62(6 Supple. 2), S168-S175, 1994.
53. Inman, W.H.W., et al., "Thromboembolic disease and the steroidal content of oral contraceptives. A report to the committee on safety of Drugs," Br. Med. J. 2, 203, 1970.
54. Irey, N. S., et al., "Vascular lesions in women taking oral contraceptives," Arch. Pathol., 1, 1970.
55. Irey, N.S. and Norris, H.J., "Intimal vascular lesions associated with female reproductive steroids," Arch. Pathol. 96, 227, 1973.
56. Janerich, D. T., et al., "Oral contraceptives and birth defects," Am. J. Epidemiology 112, 73-79, 1980.
57. Jorm, A. F., "The epidemiology of Alzheimer's disease and related disorders," London, England, Chapman and Hall, 1990.
58. Kane, F. J., "Psychosis associated with the use of oral contraceptive agents," Southern Medical Journal 62, 190-192, 1965.
59. Kaniel, D. G., "Puerperal thromboembolism and suppression of lactation," Lancet 2, 287, 1967.
60. Kaufman, A. Y., "An oral contraceptive as an etiologic factor in producing hyperplastic gingivitis and a neoplasm of the pregnancy tumor type," Oral Surgery 28, 666-670, 1969.
61. Larosa, J. C., "Metabolic effects of estrogens and progestins," Fertil. Steril. 62(6 Suppl. 2), S140-S146, 1994.
62. Lee, N. C., et al., "Estrogen therapy and the risk of breast, ovary and endometrial cancer," in Aging, Reproduction, and the Climacteric," L. Mastroianni, Jr., and C. A. Paulsen, editors, Plenum, N.Y. & London, 1986. To the extent that oral contraceptives suppress the pituitary gonadotropic hormones, the ovary is protected from the stimulation that can produce cancer. However, the estrogen used to treat menopause doubles the risk of ovarian cancer after ten years. If the estrogen was used for more than 6 years, the risk is tripled.
63. Lidegaard, et al., "On cerebral thromboembolia," Br. Med. J. 306, 956-63, 1993.
64. Liehr, J. G., et al., "Estrogen-induced endogenous DNA adduction: Possible mechanism of hormonal cancer," Proc. Natl. Acad. Sci. USA 83, 5301-5305, 1986.
65. Lipschutz, Alexander, Steroid Hormones and Tumors, Williams and Wilkins Company, Baltimore, 1950.
66. Mann, J. I., et al., "Myocardial infarction in young women with special reference to oral contraceptive practice," British Medical J. 2, 241-245, 1975.
67. Meade, T. W., "Haemostatic lipid and blood pressure profiles of women on oral contraceptives containing 50 mcg or 30 mcg oestrogen," Lancet 1, 948, 1977.

68. Nencioni, T., and F. Polvani, Calcitonin, p. 297-305, A. Pecile, editor, Elsevier, N.Y.. 1985.
69. Metka, M., et al., "The role of prolactin in the menopause," Maturitas 20(2-3), 151-154, 1994.
70. L. A. Norris and J. Bonnar. "Effect of oestrogen dose on whole blood platelet activation i women taking new low dose oral contraceptives." Thromb. Haemost. 72(6), 926-930, 1994.
71. Notelovits, M., "Oral contraception and coagulation," Clin. Obstet. Gynecol. 28, 73, 1985.
72. T. Ogawa, et al., "Role of reactive oxygen in synthetic estrogen induction of hepatocellular carcinomas in rats and preventive effect of vitamins," Carcinogenesis 16(4), 831-836, 1995. Oral contraceptive-induced liver cancers in rats show estrogens to be both cancer initiators and promoters.
73. Papa, C. M., and A. M. Kligman, chapter XI in Advances in the Biology of Skin, vol. VI. Aging, ed. by W. Montagna, Pergamon Press, N.Y., 1965.
74. Peat, R. F., “Age-related oxidative changes in the hamster uterus,” biology department dissertation, University of Oregon, 1972.
75. Pike, M. C. et al., "Breast cancer in young women and use of oral contraceptives: Possible modifying effect of formulation and age at use," Lancet 2, 926-929, 1983.
76. Pike, M. C. and D. V. Spicer, "The chemoprevention of breast cancer by reducing sex steroid exposure--perspectives from epidemiology." J. Cell. Biochem. Suppl. 17G, 26-36, 1993.
77. Piroli, G., et al.. "Biochemical parameters in the anterior pituitary during the course of tumorigenesis induced by diethylstilbestrol treatment," J. Steroid Biochem. Mol. Biol. 51(3-4), 183-189, 1994.
78. Pollard, Irina, A Guide to Reproduction, Cambridge Univ. Press, 1994: page 219. "Women on steroid replacement therapy may have many times the amount of oestrogen in their circulation than they had before the menopause."
79. Prior, J. C., et al., "Progesterone as a bone-trophic hormone," Endocrine Reviews 11, 386-398, 1990.
80. L. V. Rao, et al., "Effects of GnRh antagonist on lymphocyte subpopulations in primary and secondary lymphoid tissues of female mice," Am. J. Reprod. Immunol. 32(3), 238-247, 1994.
81. Rocca, W. A., et al, "Frequency and distribution of Alzheimer's disease in Europe: A collaborative study of 1980-1990 prevalence findings," Ann. Neurol. 30, 381-390, 1991.
82. C. Rodriguez, et al., "Estrogen replacement therapy and fatal ovarian cancer," Am. J. Epidemiol. 141(9), 828-835, 1995.
83. Rookus, M. A. and F. E. Vanleeuwen, "Oral contraceptives and risk of breast cancer in women aged 20-54 years," Lancet 344(8926), 844-851, 1994.
84. Rubin, M., et al., "9-cis-retinoic acid inhibits growth of breast cancer cells and down-regulates estrogen receptor RNA and protein," Cancer Research 54(24), 6549-56, 1994.
85. Sabra, A. and Bonnar, J., "Haemostatic system changes induced by 50 mcg and 30 mcg estrogen/progestagen oral contraceptives." J. Reprod. Med. 28, 85, 1983.
86. Schlechte, J. A., et al., (prolactin and osteoporosis), J. Clin. Endocrinol. Metab. 56. 1120-1123, 1983.
87. Seaman, B., and G. Seaman, Women and the Crisis in Sex Hormones, Rawson Associates, N.Y., 1977.
88. Shapiro, S., "Oral contraceptives--a time to take stock," N. Engl. J. Med. 315, 450, 1986.
89. Simpkins, J. W., et al., "The potential role for estrogen replacement therapy in the treatment of the cognitive decline and neurodegeneration associated with Alzheimer's disease," Neurobiol. Aging 15 (Suppl. 2), S195-S197, 1994.
90. Stadel, B.V.., "Oral contraceptives and cardiovascular disease," N. Engl. J. Med. 305, 612, 1981.

91. K. Suzuki, et al.. "Synergistic effects of' estrogen with androgen on the prostate," Prostate 25(4), 169-176, 1994.
92. "The pill and myocardial infarction." Medical World News, Aug. 25, 1975.
93. R. D. Thomas and D. Roy, "Mitochondrial enzyme-catalyzed oxidation and reduction reactions of stilbene estrogen," Carcinogenesis 16(4), 891-895, 1995. Shows estrogens can damage mitochondria by causing DNA damage.
94. Thorogood, M., "The epidemiology of cardiovascular disease in relation to the estrogen dose of oral contraceptives: A historical perspective," Adv. Contracep. 7(Suppl. 3), 11-21, 1991.
95. Tyson, J. E., et al., "Neuroendocrine dysfunction in galactorrhea-amenorrhea after oral contraceptive use," Obstetrics and Gynecology 46, 1-11, 1975.
96. Ullery, J. C., "Thromboembolic disease complicating pregnancy and the puerperium," Am. J. Obstet. Gynecol. 68, 1243, 1954.
97. Ursin, G., et al., "Oral contraceptive use and adenocarcinoma of cervix." Lancet 344, 8934, 1994. Ever used o.c., doubled incidence; over 12 years, 4.4 times greater.
98. Vessey, M. P. and R. Doll, "Investigation of relation between use of oral contraceptives and thromboembolic disease," Brit. Med. J. 2, 199-205, 1968.
99. von Kaulla, F., et al., "Conjugated oestrogens and hypercoagulability," Am. J. Obstet. Gynecol. 122, 688, 1975.
100. von Kaulla, E. and von Kaulla, K. N., "Oral contraceptives and low antithrombin III activity," Lancet 1, 36, 1970.
101. Wehling, M. "Nongenomic actions of steroid hormones," Trends Endocrinol. Metab. S(8), 347-353, 1994.
102. Weiner, C. P., "Diagnosis and management of thromboembolic discase during pregnancy," Clin. Obstet. Gynecol. 28, 107, 1985.
103. Wilson, P. W. F., et al., "Postmenopausal estrogen use, cigarette smoking, and cardiovascular morbidity in women over 50." New England J. of Medicine 313(17), 1038-43, 1985. (Framingham study, 50% greater risk with estrogen use.)
104. Wise, P.M., "Influence of estrogen on aging of the central nervous system: Its role in declining female reproductive function," in Menopause: Evaluation, Treatment, and Health Concerns, pages 53-70, 1989.
105. Wise, P.M., et al., "Neuroendocrine influences on aging of the female reproductive system," Frontiers in Neuroendocrinology 12, 323-356, 1991.
106. Wessler, S., et al., "Estrogen-containing oral contraceptive agents: a basis for their thrombogenicity," J. A. M. A. 236, 2179-2182, 1976.
107. Woods, J. W., "Oral contraceptives and hypertension," Lancet 2, 653-654, 1967.
108. Wynn, R. M., Obstetrics and Gynecology: the Clinical Core, Lea & Febiger, Philadelphia, 1982.
109. Vandenbrouck, Y., et al., "The modulation of apolipoprotein E gene expression by 3,3-5-triiodothyronine in HepG(2) cells occurs at transcriptional and post-transcriptional levels," Eur. J. Biochem. 224(2), 463-471, 1994.
110. Xu, X. M. and M. L. Thomas, "Estrogen receptor-mediated direct stimulation of colon cancer cell growth in vitro," Molecular and Cellular Endocrinology 105(2), 197-201, 1994.
111. Yearbook of Endocrinology 1984, page 273: "Consider. if hyperprolactinemia leads to osteopenia, and the administration of estrogens to postmenopausal women leads to hyperprolactinemia.

3

AGING OVARIES: NOT THE EGGS

A few months ago public television ran a long program on the menopause, in which a rather glamorous woman physician said some shockingly ignorant things about the ovaries and menopause. I went to some book shops, to see what she might have been reading, or hearing in conversations.

One writer thought it would be nice to change the name of the menopause to "the pause." Another said it is too judgmental to say that the ovaries "fail" at menopause, and that they are really just maturing. Those concerns with terminological politeness remind me of Woody Allen's remark about death--that it is nature's way of telling us to slow down.

All of these current paperback books about menopause subscribe to the same doctrine about reproductive aging. Uniformity of opinion creates an environment in which publishers who want to sell a lot of books feel that they have to publish things that don't disturb the reading public. Books about menopause become books about an attitude toward menopause.

Even people who like to say that the ovaries "don't fail" at menopause describe a theory in which menopause and its consequences are the result of the disappearance of eggs from the ovary. That theory is so simple it can be described in three short sentences, none of which is true: (1) the ovary runs out of eggs; (2) ovulation produces hormones, so you can tell when ovulation stops because the ovaries stop producing hormones; (3) menstruation stops because ovulation has stopped. Those principles are surrounded by various corollaries. "Estrogen is the female hormone." "Estrogen deficiency accelerates aging." "Treatment with estrogen makes you more feminine." "Progesterone deficiency is the result of anovulatory cycles."

Many experimenters have demonstrated that old animals that have become infertile keep producing eggs. Several experimenters (e.g., R. R. Maurer and R. H. Foote,' 1971, "Maternal ageing and embryonic mortality in the rabbit," J. Reprod. Fert. 25, 329-341) have removed eggs from the ovaries of old animals, and transplanted the fertilized eggs into young animals, where the embryos were able to implant and develop normally.

I found that old animals had too little oxygen in their uterus to keep the embryo alive at the time it would normally be ready to implant itself in the uterus. Giving estrogen to a young animal causes a similar lack of oxygen in the uterus, and prevents implantation of the embryo.

At the time old animals would normally have become infertile, they remain fertile if they are given a supplement of vitamin E and progesterone. It is now established that aging animals, at the time they become infertile, are deficient in progesterone, but still produce estrogen. Even in young individuals, when stress occurs around the time of ovulation, interference with progesterone production will prevent implantation. If progesterone becomes deficient after the embryo has become implanted, miscarriage occurs.

Estrogen, acting alone or with insufficient progesterone, causes spasms in the spiral arteries that provide oxygen and nutrients to the endometrium. This seems to be the basis for menstruation, and is also believed to be a factor in miscarriage.

About 30 years ago, researchers began to understand that reproductive aging was not caused by the lack of eggs, and the aged uterus was able to support pregnancy if it had the right hormonal support. Interest turned to the brain cells in the hypothalamus which regulate the pituitary. G. H. Zeilmaker ("Effects of prolonged feeding of an ovulation inhibitor (Lyndiol) on ageing of the hypothalamic-ovarian axis and pituitary gland tumorigenesis in rats," J. Endocrin. 43, xxi, 1969)[2] was one of the first to suggest that ovarian hormones caused the brain to age. More recently, P.M. Wise[3],[4] has clearly demonstrated that estrogen exhausts the cells which inhibit the pituitary gonadotropins, with the result that even abnormally high levels of estrogen are unable to turn off the pituitary secretion of the hormones that drive the ovary. Estrogen itself can impair the ovary's ability to produce progesterone, but the continuously high secretion of gonadotropins disturbs the ovary, the adrenals, and (according to recent observations) even the uterus.

Stress, especially when augmented by estrogen, leads to injury, exhaustion, and aging. The uterus and ovaries participate in the response to stress, but (as Zeilmaker and Wise have shown) the brain proves to be more directly involved in menopause than the ovaries or uterus. Coordination turns out to be crucial for complex processes such as ovulation, fertilization, and implantation. The destruction of the nerve cells that regulate the pituitary makes coordination impossible.

The issue of "running out of eggs" can be settled simply by demonstrating the presence of viable eggs at the time reproductive ability

has ended. In the 1940s, menopause was "explained" in terms of an estrogen deficiency, without a basis in fact, and now an "egg deficiency" is combined with the "estrogen deficiency," compounding the confusion. Facts aren't everything in science;* it is necessary to look at the context from which these ideas develop.

Two of America's most productive researchers in reproductive physiology, Edgar Allen and Herbert M. Evans, made observations that they believed showed that the germinal epithelium of the ovary goes through a cycle of cell proliferation that produces a new generation of oocytes during each menstrual cycle. It is recognized that new egg cells appear in the ovaries of adult prosimian primates, and at puberty in cats and pigs. Observations of newly developed egg cells have been reported in some other species. But the dominant view prefers to see the number of egg cells declining from birth, or earlier, with absolutely no new egg cells being formed later.

During gestation and infancy, the gonadotropins are very high. These hormones decline during childhood, during the time that the number of egg cells is so visibly declining. The high level of the gonadotropins during infancy hasn't been explained, but it is reasonable to suppose that it has something to do with the development of the ovaries, since a "developmental" function can be demonstrated for the gonadotropins in the ovaries and testes of older animals.

The number of brain cells peaks a few months before birth, just as the number of egg cells does. Many people have argued that this somehow means that brain cells are incapable of dividing after infancy, though there is no factual basis for making that argument, and in fact adult brain cells are now known to be able to divide. (That is true of heart cells, too.)

In a variety of tissues, it can be shown that the presence of mature cells inhibits the division of other cells. If part of the liver is removed, the remaining cells divide to replace the lost tissue. If the skin is cut, cells divide to help fill in the defect. If there is an adequate number of egg cells, this principle suggests that there is no need to produce more. There is a treatment for polycystic ovaries called "wedge resection." This can reduce the production of masculinizing hormones. By analogy with other tissues, it seems likely that the removal of a mass of malfunctioning tissue leads to the growth and development of new cells which function the way a new ovary would. Regeneration seems to be a capacity of every tissue, given the right environment. If the ovary were studied after such treatment, I suspect that "new eggs" would be found. (But even in the

seemingly simple process of healing a wound in the skin, there is still disagreement as to the relative contribution made by local cell division, and the invasion of the region by structural cells from elsewhere in the body. The appearance of a cell can be misleading; histology is often a matter of making educated guesses. For example, white blood cells can look like epithelial cells.)

Although the question of whether all the woman's eggs are in existence at or before birth doesn't logically have anything to do with the other question, whether there are still eggs in the ovary at menopause, there is a reason that people connect them. This has to do with the idea of a "germ line" as distinct from the "somatic cells." The eggs are "from the germ line," all the rest of the body (and much of the ovary) is a different sort of stuff. The "germ line" has the special property of immortality and it is "isolated" and independent. The body is susceptible to being modified by the environment, and is mortal. These are the traditional formulations of the idea, and the people who learn their orientation from textbooks are not necessarily conscious of how the ideas fit together. For biologists of my professors' generation, these ideas seemed to be a sacred core of biology, but with their death, maybe biology can be liberated

August Weismann, working at the end of the last century and the beginning of the 20th century, created the basic ideology of genetics, to combat the idea of the inheritance of acquired characteristics, which had been supported by Darwin and others. He argued that the hereditary substance, or germ plasm, was derived only from preexisting germ plasm, and couldn't be formed anew, or modified by the environment. It created every part of the perishable body, by a process in which traits were segregated, so that the germ plasm contained the full complement of hereditary material, and each part of the body contained only the limited fraction needed for its characteristics. Thus, the body was inferior created material, while the germ line was the immortal creative stuff. Since the body adapts in response to the environment, it had seemed that these changes would be passed on to descendants, until Weismann's argument showed that it was only the perishable, dead-end body lacking the hereditary principle which was adapting. The germ line was somehow isolated from the body and from the environment.

Weismann's theoretical germ line became identified with the chromosomes and the genes. His theory was shown to be simply wrong, in that each type of cell in the body contains a full complement of chromosomes and genetic information. Although his facts were wrong,

his ideology became deeply embedded in the culture of genetics. To keep the idea that the "germ line" is somehow something distinct from the body required a special effort, once the chromosomes were seen to be identical in every part of the body. Weisman's whole point in his "germ line" idea was to show an absolute distinction between the body and the hereditary substance. If his ideology that had been built to deny the inheritance of acquired characteristics were to be saved, the isolated germ line would have to be found elsewhere than in the chromosomes.

The idea of "germ line (or Keimbahn) determinants" now took over, and was believed to be something in a certain spot in the egg. As the egg divided, into cells that look very much like each other, the cells which came from that part of the egg represented the germ line. As the embryo developed, the region that seemed to be traceable back to that part of the egg, represented the germ line. As the gonad began to grow, cells from the region representing the germ line were thought to travel over and invade the gonad, where they multiplied into vast numbers, but always remained the same isolated strain of germ cells with their "separate" history that could be traced back to the determinants in the special place in the egg. During the early days of embryonic development, these immigrant cells looked exactly like their neighbors which were somatic cell sprouts from the embryonic kidney region.

If it weren't for the ideology of absolute isolation of the hereditary substance, an embryologist might have suggested that cells or material of one part of the embryo induced a specialized, differentiated state in some cells that happened to be suitably located. If the cells derived from that certain part of the egg didn't carry unique genetic material--and they didn't--then what they carried with them was an incipient state of differentiation. Why the big deal about that particular history of differentiation? It was because the ideology that motivated Weismann was still active, and its purpose was to argue that only the "gene" was the creative productive source, and that the body--the "somatic cells"--was the passive product, whose adaptations meant nothing in the long run. This has been called the "central dogma" of genetics, that information flows only from the gene to the cell, and not back from the cell to the gene. That ideology forced geneticists to deny the existence of RNA viruses (including retroviruses such as the HIV-"AIDS" virus), and is still active in blocking research on the prion or scrapie virus, which is a protein. To say it bluntly, many highly respected biologists acted stupidly because they blindly believed in a false ideology.

Incidentally, this ideology was always impossible for horticulturists to accept, since they were in the habit of grafting (cloning) vegetative (somatic) parts of plants, which would then produce flowers and fruits. For them, the "germ" was often a product of the "body." Luther Burbank's work was consistently ridiculed by the academic biologists, who believed his achievements were impossible, that is, fraudulent. Many of Burbank's perceptions have been supported by recent evidence, but they couldn't be accepted by people whose ideology of the germ line/somatic distinction seemed to be contradicted by his work.

Another problem with the doctrine of the germ line was revealed when embryologists separated the embryo at a very early stage into two groups of cells, and found that each was able to grow into a complete animal. The idea of the germ line predicts that one member of the pair of twins could get the ability to reproduce while the other would be sterile. Some important ideas can survive their disproof.

It is exactly the same academic ideology of the priority of the germ line which blames the whole complex process of reproductive aging on the mechanical process of an "ovary running out of eggs." The ovary doesn't run out of eggs, and running out of eggs would have no great consequences if it did happen, because the main events in ovulation are produced by cells other than the eggs. But the ideology says that the "germ line" controls everything, and the eggs are the germ line. In other words, genes control the organism, and eggs control the woman.

After I had written the preceding paragraphs, Ian Wilmut's success in cloning a sheep from an adult's cell was announced. Those who still argued for Weismann's genetic interpretation of the germ line wiil probably stop talking about it, but generally, the "germ line" advocates will keep their doctrine (as empty as it is) by acknowledging the role of the cytoplasm in differentiation. The cytoplasm of the egg is constructed with the assistance of the surrounding cells of the ovary, so the important questions regarding the production of eggs will no longer be quite so obstructed by the ideology of the "germ line."

Another idea about aging of the ovary was that "old eggs" contained "old DNA," and so were defective. This was just a derivative of the idea that aging was a genetic phenomenon, and it appears that Wilmut's cloning experiment will make that argument extremely difficult to sustain. According to two variants of this theory ("Hayflick's limit," and "telomere depletion"), the cells of an adult had exhausted their "quota" of cell divisions, and so wouldn't be able to undergo enough

divisions to multiply into a new animal. The end of a dogma was mildly recognized by Professor Franklin Stahl's comment, "One often had reason to imagine that DNA suffered from irreversible changes during development." One could have imagined many things, if dogmas such as Weismann's hadn't obstructed biology for a century.

I think it will be instructive to consider the three steroid secreting glands--ovaries, testes, and adrenals--together, to see what they might have in common. In the testis, it is generally believed that pituitary gonadotropins regulate steroid synthesis and gametogenesis. In the ovaries, the gonadotropins also regulate the production of steroids, and--to some extent--the production of eggs, if not the whole gametogenic process. In the adrenal, ACTH governs the production of cortisol and sex steroids, and the transformation of the glomerulosa cell type into the other types, which secrete those hormones.

The outer layer of cells in the adrenals can form the other two cell types, and since stress-ACTH converts them to the other types, new ones must be formed. If the inner layers are removed, the whole adrenal cortex can regenerate from the outer layer. Obviously, if stress causes cells to multiply and differentiate, cells are disappearing from the inner layers.

When I was in graduate school, immunologists were aware that new cells were continually appearing in the thymus gland, but the gland didn't get bigger, and there was no visible trace of dying cells. At that time, it was considered a major puzzle, but gradually it came to be understood that a special kind of cell dissolution (called apoptosis) was occurring that accounted for the missing cells.

In the testes, apoptosis or cell-dissolution is always occurring, even though sperm cells are being produced and leaving the organ.

In the ovary, "waves" of egg cell degeneration are constantly taking place in young women. Radioactive labelling that has been used to argue that egg cells aren't being replaced seem to show that there is continual cell division in all the other ovarian cells. Interestingly, those researchers didn't seem to be interested in this apparent regeneration of the other parts of the ovary.

Apoptosis always seems to be part of a shaping process of the organ in which it occurs. Regeneration provides new cells, apoptosis recycles the substance of certain fraction of the tissue's cells. We are just starting to notice that various hormones inhibit or promote apoptosis, and so participate in the "shaping" of the organism. In many systems, it

seems that the need for a cell type or function calls it into existence, while idleness makes a cell susceptible to dissolution.

I have been referring to the "pituitary gonadotropins," and deliberately avoided referring to them as LH--luteinizing hormone--and FSH--follicle stimulating hormone--because their names reflect a theory of what they do. In some textbook descriptions of testicular function, for example, it has been said that LH produces testosterone, and that negative feedback from testosterone suppresses LH, while FSH governs the formation of sperms. That description is completely worthless, and probably was largely built up by analogy with their supposedly neatly divided functions in the ovary, reflected in their names. These gonadotropins participate in the development, maintenance, and functioning of the ovaries, and their effects depend on their timing, their balance with each other and with the steroids produced by the ovaries in response to their stimulation, and their actions are modified by many other factors, ovarian, nervous, pituitary, uterine, and immunological. During youth, the system functions in a coordinated way, with ovulation as a consequence. During aging, the crucial changes appear to be a decreased ability of the ovary and the brain to produce progesterone. Thyroid hormone, cholesterol, vitamin A and efficient cellular respiration are essential factors for synthesizing progesterone. Accumulated iron, unopposed estrogen, and impaired use of cholesterol and oxygen are factors known to contribute to the widespread and variable damage to the system of coordination.

Two things can cause the pituitary to secrete excessive amounts of the gonadotropins: A deficiency of the steroids, and damage to the steroid-sensing nerves that regulate the pituitary. When an ovary is moved (transplanted into the spleen) so that its hormones are destroyed before getting to the brain, there is hypersecretion of gonadotropic hormone,[5],[6],[7] and tumors develop in the ovary. The interpretation, that hypersecretion causes the tumors, is supported by other observations, e.g., that removal of one ovary increases the chance of developing a cancer in the other ovary[8] and that prolonged use of estrogen (known to create the conditions for later hypersecretion of gonadotropin[3],[4]) increases the risk of ovarian cancer after menopause.[9]

Psychologists have noticed that naming an object according to a certain function often limits the way people will be able to use it. This happens in science. If we know one function of a substance, and name it for that function, we will find it harder to think of its other possible roles. Hans Selye argued that steroids, for example, should be named according

to their place of origin, rather than by a single aspect of their function. I think this applies even to the phrases "male hormone" and "female hormone": it's better to think of them in terms of their origin, and not to count on them to promote femininity or masculinity.

A note about "the female hormone." In the absence of the testicular or "male" hormones, animals differentiate as females. Recent evidence indicates that the mechanism by which testosterone masculinizes the brain requires that it be converted (in the brain) into estrogen. In this crucial event, estrogen is functioning as "the male hormone." Over the last 20 years, some types of experiment indicate that estrogen is necessary for the aggression-promoting effect of testosterone.

Progesterone is an anti-androgen, and blocks testosterone's effects. When testosterone is given to newborn or very young rats, it sets up a male pattern of hormone development, but if progesterone is given at the same time, that doesn't happen. Progesterone prevents the differentiation. away from the basic female path into the male specialization. Later in life, a deficiency of progesterone in a woman can again lead to masculinization of some features, such as musculature and facial or body hair. When progesterone is given to men in large doses, it blocks various typically male processes, such as growth of whiskers. In the brain, it has a protective function in both sexes.

Estrogen promotes cell division, and is involved in essentially every tissue, in both males and females. If it is to be called a "female hormone," maybe it also has to be called "a male hormone." It does have to be present for breast development, though it is just one of many factors. In this instance, it is contributing to feminization. In other instances, it seems to contribute to virilization.

At menopause, estrogen excess can promote the production of androgens, in the absence of progesterone, which tends to defeminize the woman. This is often a result of stress, and sometimes is a consequence of hypothyroidism. In situations of this sort, estrogen is seen not to be a feminizing hormone; it is unable to neutralize the male hormones the body produces in response to the estrogen excess.

NOTE AND REFERENCES:

* Since the 1930s, estrogen's toxic potential has become very clear. However, the estrogen industry doesn't want people to understand that estrogen is a shock hormone with pro-aging effects. Histamine mimics estrogen's effects on the uterus,

and antihistamines block estrogen's effects (Szego, 1965, Szego and Davis, 1967). Estrogen mimics the shock reaction. Stress, exercise, and toxins cause a rapid increase in estrogen. Males often have as much estrogen as females, especially when they are tired or sick. Estrogen increases the brain's susceptibility to epileptic seizures. and recent research shows that it (and cortisol) promote the effects of the "excitotoxins," which are increasingly implicated in degenerative brain diseases.

Currently, estrogen marketing emphasizes appearance and the danger of osteoporosis. Evidence occasionally turns up implicating estrogen in thinning of the skin and bones.[10]

REFERENCES

1. R. R. Maurer and R. H. Foote,[1] "Maternal ageing and embryonic mortality in the rabbit," J. Reprod. Fert. 25, 329-341, 1971.

2. G. H. Zeilmaker ("Effects of prolonged feeding of an ovulation inhibitor (Lyndiol) on ageing of the hypothalamic-ovarian axis and pituitary gland tumorigenesis in rats," J. Endocrin. 43, xxi, 1969).

3. Wise, P. M., "Influence of estrogen on aging of the central nervous system: Its role in declining female reproductive function," in Menopause: Evaluation, Treatment, and Health Concerns, pages 53-70, 1989.

4. Wise, P.M., et al., "Neuroendocrine influences on aging of the female reproductive system," Frontiers in Neuroendocrinology 12, 323-356, 1991.

5. M. H. Li and W. U. Gardner, "Experimental Studies on the pathogenesis and histogenesis of ovarian tumors in mice," Cancer Research 7, 549-566, 1947.

6. W. U. Gardner, "Hormonal imbalance in tumorigenesis," Cancer Research 8, 397-411, 1948.

7. M. H. Li and W. U. Gardner, "Further studies on the pathogenesis of ovarian tumors in mice," Cancer Research 9, 532-536, 1949.

8. H. S. Kaplan, "Influence of ovarian function on incidence of radiation-induced ovarian tumors in mice," J. Natl. Cancer Inst., 11, 125-132, 1950.

9. Lee, N. C., et al., "Estrogen therapy and the risk of breast, ovary and endometrial cancer," in Aging, Reproduction, and the Climacteric," L. Mastroianni, Jr., and C. A. Paulsen, editors, Plenum, N.Y. & London, 1986. To the extent that oral contraceptives suppress the pituitary gonadotropic hormones, the ovary is protected from the stimulation that can produce cancer. However, the estrogen used to treat menopause doubles the risk of ovarian cancer after ten years. If the estrogen was used for more than 6 years, the risk is tripled.

10. Bauer, D. C., et al., "Skin thickness, estrogen use and bone mass in older women," Menopause 1(3), 131-136, 1991. "We found no evidence that estrogen preserves skin thickness; indeed, estrogen use is associated with thinner skin." "Our findings further support an association between skin thickness and bone mass." "Skin thickness and bone mass are related, but skin thickness cannot be used to predict bone mass."

4

MENOPAUSE AND ITS CAUSES

When I was in graduate school at the University of Oregon, everyone in our lab was working on the problem of reproductive aging. Previously, people in the lab had established that the ovaries didn't "run out of eggs." There was never really any basis for that ridiculous belief. Many people just said it, the way they said "old eggs" (but never old sperms) were responsible for birth defects, or that "estrogen is the female hormone," a deficiency of which is the cause of menopausal infertility. (Old sperms have been implicated in some birth defects. People who are newly married, for example, were found to have children with fewer birth defects than people of the same age who had been married a long time, suggesting that more frequent intercourse involves fresher sperms.) When ovaries have been treated with x-rays to destroy their ability to ovulate, they have been found to produce more estrogen than before. Ovulation is one thing, and the production of hormones is another thing. You can't determine whether ovulation has occurred by measuring the hormones.

Knowing the large amount of work that has gone into our understanding of the age-related decline in fertility, it is disturbing to see people on television and in popular health books saying that menopause occurs when the "ovaries run out of eggs."

Around 1970, many people were saying that aging was caused by the loss of brain cells. There is a glimmer of truth in that silly idea, just as there would be in saying that "aging is caused by the death of skin cells," making the skin thinner and drier and less elastic. Both the brain and the skin are sources of steroid hormones, and it is possible that the death of skin cells and neurons is one factor in the age-related decline in the "sex steroids." An organism would be an easier thing to understand if cells just did their job for a certain period of time, and then died. A man named Hayflick has given people some publications to cite, when they want to simplify things by saying that aging occurs when cells have used up their quota of 50 divisions, but there are many more studies that clearly show that Hayflick's limit is nothing but a product of the cells' environment. The cell's environment, the signals and substances and energy it receives, is complex, but real progress is being made in understanding the things involved in the aging process. Luckily, the

infinite complexity of the environment is channeled into an understandable array of processes by the cell's systematic ways of responding.

I knew, from talking with L. C. Strong,' that early reproductive maturity was associated with early death; in his strains of cancer-prone mice, he showed that high estrogen was the cause of early puberty, a high cancer incidence, and a relatively short life. D. A. Snowdon, et al., showed that the occurrence of menopause at an early age in women is associated with a greater risk of death from all causes, including strokes and coronary heart disease." (They saw ovarian aging as an indicator of general aging.) P. W. F. Wilson, et al., reported that postmenopausal estrogen use was associated with an increased incidence of heart disease and stroke.[3] P. M. Wise showed that estrogen accelerates aging of the central nervous system, destroying the nerves which regulate the pituitary gonadotropins, and causing ovarian failure and infertility.[4] Many other studies of particular tissues show that estrogen accelerates the rate of aging.

In my work with hamsters, I found that the infertility that developed at middle age was caused by a high rate of oxygen consumption in the uterus, causing the oxygen needed by the developing embryo to be consumed by uterine tissues, and causing suffocation of the embryo. This is the central mechanism by which the estrogen-containing contraceptives work: at any stage of pregnancy, a sufficient dose of estrogen kills the embryo.

Polvani and Nencioni,' among others, found that in women, the onset of menopause (the first missed period, suddenly increased bone loss, nervous symptoms such as depression, insomnia, and flushing) corresponds to the failure to produce progesterone, while estrogen is produced at normal levels. This results in a great functional excess of estrogen, because it is no longer opposed by progesterone. Typically, it takes about four years for the monthly estrogen excess to disappear. They suggested that the bone loss sets in immediately when progesterone fails because cortisol then is able to dominate, causing bone catabolism; progesterone normally protects against cortisol. Other researchers have pointed out that estrogen dominance promotes mitosis of the prolactin-secreting cells of the pituitary, and that prolactin causes osteoporosis; by age 50, most people have some degree of tumefaction of the prolactin-secreting part of the pituitary. But estrogen dominance (or progesterone deficiency) also clearly obstructs thyroid secretion, and thyroid governs the rate of bone metabolism and repair. Correcting the

thyroid and progesterone should take care of the cortisol/prolactin/osteoporosis problem.

P. M. Wise[4] has demonstrated that the "menopausal" pituitary hormones, high levels of LH and FSH, are produced because the regulatory nerves in the hypothalamus have lost their sensitivity to estrogen, not because estrogen is deficient. In fact, he showed that the nerves are desensitized precisely by their cumulative exposure to estrogen. If an animal's ovaries are removed when it is young, the regulatory nerves do not atrophy, and if ovaries are transplanted into these animals at the normally infertile age, they are fertile. But if animals are given larger doses of estrogen during youth, those nerves atrophy prematurely, and they become prematurely infertile.

The mechanism by which estrogen desensitizes and kills brain cells is now recognized as the "excitotoxic" process, in which the excitatory transmitter glutamic acid is allowed to exhaust the nerve cells. (This explains the older observations that glutamic acid, or aspartic acid, or aspartame, can cause brain damage and reproductive failure.) Cortisol also activates the excitotoxic system, in other brain cells, causing stress-induced atrophy of those cells Progesterone and pregnenolone are recognized as inhibitors of this excitotoxic process.

Besides estrogen's promotion of excitotoxic cell death, leading to the failure of the gonadotropin regulatory system, estrogen's stress-mimicking action probably tends to increase the secretion of LH, in ways that can be corrected by supplementing progesterone and thyroid. Since Selye's work, it has been known that estrogen creates the same conditions as occur in the shock phase of the stress reaction. (And shock, in a potential vicious circle, can increase the level of estrogen.') It has recently been demonstrated that estrogen stimulates the adrenal glands, independently of the pituitary's ACTH. This can increase the production of adrenal androgens, leading to hirsutism, and other male traits, including anabolic effects.*

It was established in the 1950s that estrogen "erases" memories in well trained animals. I suppose that acute effect is related to the chronic toxicity that leads to cell death. (In the 1940s, DES was sold to prevent miscarriages, though it was already known that it caused them; then there was the argument that it slowed aging of the skin, despite the Revlon studies at the University of Pennsylvania showing that it accelerates all aspects of skin aging; lately there has been talk of promoting estrogen to improve memory.)

Estrogen's nerve-exciting action is known to lower seizure thresholds; premenstrual epilepsy is probably another acute sign of the neurotoxicity of estrogen.

When fatigue and lethargy are associated with aging, the brain stimulating action of estrogen can make a woman feel that she has more energy. (Large doses given to rats will make them run compulsively; running wheels with odometers have shown that they will run over 30 miles a day from the influence of estrogen.) Estrogen inhibits one of the enzymic routes for inactivating brain amines, and so it has more general effects on the brain than just the glutamate system. This generalized effect on brain amines is more like the effects of cocaine or amphetamine. If that is a woman's basis for wanting to use estrogen, a monoamine oxidase inhibitor would be safer.

The reason for the menopausal progesterone deficiency is a complex of stress-related causes. Free-radicals (for example, from iron in the corpus luteum) interfere with progesterone synthesis, as do prolactin, ACTH, estrogen, cortisol, carotene, and an imbalance of gonadotropins. A deficiency of thyroid, vitamin A, and LDL-cholesterol can also prevent the synthesis of progesterone. Several of the things which cause early puberty and high estrogen, also tend to work against progesterone synthesis. The effect of an intra-uterine irritant is to signal the ovary to suppress progesterone production, to prevent pregnancy while there is a problem in the uterus. The logic by which ACTH suppresses progesterone synthesis is similar, to prevent pregnancy during stress. Since progesterone and pregnenolone protect brain cells against the excitotoxins, anything that chronically lowers the body's progesterone level tends to accelerate the estrogen-induced excitotoxic death of brain cells.

Since progesterone and pregnenolone protect brain cells against the excitotoxins, anything that chronically lowers the body's progesterone level tends to accelerate the estrogen-induced excitotoxic death of brain cells.

Chronic constipation, and anxiety which decreases blood circulation in the intestine, can increase the liver's exposure to endotoxin. Endotoxin (like intense physical activity) causes the estrogen concentration of the blood to rise. Diets that speed intestinal peristalsis might be expected to postpone menopause. Penicillin treatment, probably by lowering endotoxin production, is known to decrease estrogen and cortisone, while increasing progesterone. The same effect can be achieved by eating raw carrots (especially with coconut oil/olive oil

dressing) every day, to reduce the amount of bacterial toxins absorbed, and to help in the excretion of estrogen. Finally, long hours of daylight are known to increase progesterone production, and long hours of darkness are stressful. Annually, our total hours of day and night are the same regardless of latitude, but different ways of living, levels of artificial illumination, etc., have a strong influence on our hormones. In some animal experiments, prolonged exposure to light has delayed some aspects of aging.

General aging contributes to the specific changes that lead to menopause, but the animal experiments show that fertility can be prolonged to a much greater age by preventing excitotoxic exhaustion of the hypothalamic nerves. The question that still needs to be more clearly answered is, to what extent can general aging be prevented or delayed by protecting against the excitotoxins? Minimizing estrogen (and cortisone) with optimal thyroid activity, and maximizing pregnenolone and progesterone to prevent excitotoxic cell fatigue, can be done easily. A diet low in iron and unsaturated fats protects the respiratory apparatus from the damaging effects of excessive excitation, and--since pregnenolone is formed in the mitochondrion--also helps to prevent the loss of these hormones.

REFERENCES

1. L. C. Strong, Biological Aspects of Cancer and Aging, Pergamon Press, 1968.
2. D. A. Snowdon, et al., "Is early natural menopause a biologic marker of health and aging? Am. J. Public Health 79, 709-714, 1989
3. P. W. F. Wilson, et al. [The Framingham Study], N. E. J. M. 313(17), 1038-1043, 1985
4. P. M. Wise, "Influence of estrogen on aging of the central nervous system: Its role in declining female reproductive function," in Menopause: Evaluation, Treatment, and Health Concemis, pages 53-70, 1989.
5. Nencioni, T., and F. Polvani, Calcitonin, p. 297-305, A. Pecile, editor, Elsevier, N.Y., 1985.
6. T. 1. Belova, "Structural damage to the mesencephalic reticular formation induced by immobilization stress," Bull. Exp. Biol. & Med. 108(7), 126030, 1989.
7. F. Fourrier, et al., "Sex steroid hormones in circulatory shock, sepsis syndrome, and septic shock," Cire. Shock 43(4), 171-178, 1994.
8. E. C. Ditkoff, et al., "The impact of estrogen on adrenal androgen sensitivity and secretion in polycystic ovary syndrome," J. Clin. Endocrinol. Metab. 80(2), 603-607, 1995.
9. C. Bain, et al., "Use of postmenopausal hormones and risk of myocardial infarction," Circulation 64, 42-46, 1981.
10. T. L. Bush, et al., "Estrogen use and all-cause mortality: Preliminary results from the Lipid Research Clinics Program follow-up study," JAMA 249, 903-906, 1983.
11. C. Rodriguez, et al., "Estrogen replacement therapy and fatal ovarian cancer," Am. J Epidemiol. 141(9), 828-835, 1995. Long-term use of estrogen replacement therapy is associated with increased death from ovarian cancer.
12. Lee, N. C., et al., "Estrogen therapy and the risk of breast, ovary and endometrial cancer," in Aging, Reproduction, and the Climacteric," L. Mastroianni, Jr., and C. A. Paulsen, editors,

Plenum, N.Y. & London, 1986. To the extent that oral contraceptives suppress the pituitary gonadotropic hormones, the ovary is protected from the stimulation that can produce cancer. However, the estrogen used to treat menopause doubles the risk of ovarian cancer after ten years. If the estrogen was used for more than 6 years, the risk is tripled.

13. M. S. Hunter and K. L. M. Liao, "Intentions to use hormone replacement therapy in a community sample of 45-year-old women," Maturitas 20(1), 13-23, 1994. (Women who expressed an intention to use hormone replacement therapy at menopause reported significantly lower self-esteem, more depressed mood, anxiely, and negative attitudes toward menopause. The also expressed stronger beliefs in their doctors' ability-as opposed to their own--to control their menopause experience.)

14. L. Dennerstein, et al., "Psychological well-being, mid-life and the menopause," Maturitas 20(1), 1-11, 1994.

5

NOT THE "FEMALE HORMONE," BUT THE SHOCK HORMONE

Estrogen, at least when it is not opposed by a very large concentration of progesterone, creates all of the conditions known to be involved in the aging process. These effects of estrogen include interference with oxidative metabolism, formation of lipofuscin (the age-pigment), retention of iron, production of free radicals and lipid peroxides, promotion of excitotoxicity and death of nerve cells, impaired learning ability, increased tendency to form blood clots and to have vascular spasms, increased autoimmunity and atrophy of the thymus, elevated prolactin, atrophy of skin, increased susceptibility to a great variety of cancers, lowered body temperature, lower serum albumin, increased tendency toward edema, and many of the features of shock. In recent years, it has been found to be responsible even for neonatal masculinization and the masculinization of the polycystic ovary syndrome. Although the pharmaceutical industry has often referred to it as "the female hormone," I don't know of any competent scientist who has ever called it that.

Since the 1930s, estrogen's toxic potential has become very clear. However, the estrogen industry doesn't want people to understand what estrogen is, because it is the source of billions of dollars per year for them. Estrogen is a shock hormone with pro-aging effects. In the 1930s and 1940s Loeb, Lipschutz, the Shutes, Selye, L.C. Strong, and others showed that it causes cancer, excessive clotting of the blood, shock, miscarriage, and tissue degeneration, but at the same time, the shills of the drug companies were promoting its use for preventing miscarriages and even for preventing the complications of pregnancy and toxemia it was known to cause.

The diuretic industry complemented the estrogen industry in its assault on pregnancy. creating a myth of pregnancy as a sodium-retention syndrome, when in fact an increased intake of salt is highly protective against the effects of excess estrogen and toxemia of pregnancy. (In hypovolemic shock, even a hypertonic salt solution is known to be therapeutic, and hypovolemia with hypoalbuminemia was clearly recognized as a feature of eclampsia). Thousands of well-meaning teachers and physicians helped to spread and perpetuate the fraudulent

ideas originating with the corrupt pharmaceutical industry. (The U.S. Dept. of Justice and FBI found fraud in connection with research on diuretics, but it didn't affect the FDA's approval.) After Tom Brewer's work (which built on R. Ross' and M. B. Strauss's 1935 work, and many other studies in the 1940s and 1950s), the FDA's continued approval of those drugs could only be characterized as malfeasance. (In 1834, J. Lever recognized that malnutrition and restricted salt intake could cause eclampsia. "Cases of puerperal convulsions," Guy's Hospital Reports vol. 1, series 2, 495-517, 1843.) By 1950, there was sufficient knowledge available for controlling this disease of estrogen-excess, but the mere concept of too much estrogen was anathema to the industry-agency conspirators. This is a disturbing issue, because even in 1996, prestigious professors of medicine (NPR's "Science Friday") are pretending that toxemia and eclampsia are mysterious.

Histamine mimics estrogen's effects on the uterus, and antihistamines block estrogen's effects (Szego, 1965, Szego and Davis, 1967). Estrogen mimics the shock reaction. Stress, exercise, and toxins cause a rapid increase in estrogen. Males often have as much estrogen as females, especially when they are tired or sick. Estrogen increases the brain's susceptibility to epileptic seizures, and recent research shows that it (and cortisol) promote the effects of the "excitotoxins," which are increasingly implicated in degenerative brain diseases.

Just after Szego's work was published, I suggested that antihistamines might be used to resist some of estrogen's toxic effects, including cancer. A few people tried the idea, with some benefit, but the basic idea of a physiological counterforce is opposed by the ideology of "specific chemotherapy," in cancer, epilepsy, arthritis, infertility, osteoporosis, immunodeficiency, Alzheimer's disease, etc.

The pooling of blood in veins, a basic feature of shock, has recently become another of estrogen's "protective" features for the circulatory system--the reasoning seems to be that reduced circulation of blood makes life easier for the circulatory system. The relevant contexts, though, are the contribution this makes to the formation of blood clots, and the quality of oxygenation of all tissues.

Besides causing stress, estrogen levels are increased by stress. For example, a male runner's estrogen is often doubled after a race. Men and women who are hospitalized for serious sickness typically have greatly increased estrogen levels. Estrogen's role in terminal illness, a vicious circle in which stress decreases the person's ability to tolerate stress, is seldom appreciated. Circulatory collapse, multi-organ failure,

intravascular coagulation (and the consequent depletion of fibrinogen, leading to internal bleeding) are so commonly seen in the people who die in hospitals that it would seem scandalous to suspect that estrogen could be a major contributing factor. The willingness to cover up estrogen's involvement in strokes was evident in a recent newspaper report in which a woman won a large financial settlement after her husband died from a series of strokes, caused by a pharmacy's mistakenly giving him "a female sex hormone." The mass media seem to have a "speak no evil about estrogen" policy.

Estrogen marketing involves manipulation of the mass media and the medical media. Currently, there is emphasis on appearance, heart disease, and the danger of osteoporosis. Undesirable evidence is simply ignored. I have never met a physician who had considered that estrogen might contribute to thinning of the skin and bones. Why are women's skeletons lighter than men's? This issue is sometimes noted in a tangential way (for example, see the discussions of osteoporosis and prolactin, and of prolactin and estrogen, in the Yearbook of Endocrinology, in the 1980s), but the relevant information is ignored by the influential media.

Estrogen's brain-toxic effects have been known since the 1950s, or earlier. Text-books in the 1960s discussed experiments in which either estrogen or insulin stopped growth of the fetus's brain, and also in the 1960s experiments were showing that progesterone fosters brain growth and intelligence. Zamenhoff's work showed that the prenatal abundance of glucose is a central factor in brain growth. Since estrogen and insulin lower blood sugar, and progesterone and thyroid sustain it, Zamenhoff's work showed that the level of glucose was a common factor in many of the previous experiments, though other factors, including blood volume and body temperature, are also important. The epidemiological evidence is clear that women with toxemia of pregnancy, which involves inadequate delivery of glucose to the fetus, have babies with subnormal intelligence. Among obstetricians, it used to be common knowledge (before insulin treatment became common) that diabetic women were likely to have intellectually precocious children. As the work of Shanklin, Hodin, and the Brewers shows, there is a large group of Americans with neurological damage resulting from their mothers' treatment during pregnancy.

While I was studying the effects of light on health, many of the women with the pre- or peri-menstrual syndrome told me that they had few symptoms during the summer months, so I began in the 1960s to examine the role of progesterone in health, because its synthesis is

promoted by long days. I saw that many of the sicknesses that mainly affect women had often been described as the consequence of an excess of estrogen. When animal experiments support the clinical reports and epidemiological evidence, as they do in the case of the "estrogen sicknesses," the goal of research becomes understanding the mechanisms involved, and discovering the safest way to avoid or to correct the problem. In the period between 1940 and 1960, thyroid, progesterone, and vitamins E and A had often been described as antiestrogenic substances, and some of this information persists in classical textbooks, in spite of the efforts of the drug industry to suppress the facts by giving their financial support to journals and symposia which exclude research which uses the concept of excess estrogen. For example, Goodman and Gilman's text on pharmacology discusses the ability of estrogen to make animals susceptible to seizures, and progesterone's opposing effect. One might suppose that the fact that all of the "official" approved drugs for treating epilepsy are teratogens should have been mentioned at that point, so that it would be brought to the attention of physicians that they had the option of using natural hormones to prevent seizures during pregancy, instead of making women choose between having a baby with birth defects, or having seizures during pregnancy. But that is not how the subject of epilepsy is presented to medical students.

It turns out that the meaning of "excess estrogen" has to be interpreted in relation to the balance of estrogen (and the multitude of factors which mimic estrogen's effects) with all of the antiestrogen factors. I have concentrated on thyroid, progesterone, and red light as the most important factors that protect against estrogen, and these all turn out to be protective against stress, shock, ionizing radiation, free radicals, lipid peroxidation, thymic atrophy, osteoporosis, arthritis, scleroderma, apoptotic cell death, and other problems that are involved in tissue degeneration or aging.

A Better Name is Needed

If animals grow up with female traits simply because testosterone is lacking, what can a "female hormone" be? If too much estrogen can make women grow whiskers, what should estrogen be called?

If we named hormones according to their place of origin, as Selye suggested, we could call estrogen folliculin (as Selye did, because it is produced abundantly in the ovarian follicle), or adipin, because it is

sometimes produced in fat cells. But it can be produced by many cells when they are under stress, and it seems to be normal for some to be produced in the testicle. (I have heard that stallions produce more estrogen than mares, though I haven't read the studies.)

If estrogen is produced by so many different cell types, could it be named according to its effects? Selye objected to that approach to naming hormones, because every hormone has a variety of functions. Nearly every type of tissue in the body contains the proteins that are called "estrogen receptors," though the receptors are not the only way estrogen affects cells. For example, it reacts with some common enzymes in cycles which produce free radicals.

I studied many different systems, trying to characterize estrogen's functions in a general way. In every system that I examined, estrogen seemed to "waste oxygen," resulting in a tendency for the tissue to be de-energized. Recent studies have used estrogen's ability to lower the cell's "energy charge" to study its ability to promote tumor growth: It lowers the energy charge in cells when it is stimulating their growth.

My results, in which estrogen interfered with respiration, made me think of Warburg's description of cancer metabolism. He saw cancer's "respiratory defect" as depriving it of the energy it needed to function as a useful tissue, leaving it only the primitive function of growth. I considered many ways in which estrogen might be a cancer hormone, including its promotion of the oxygen-wasting age pigment, and its stimulation of porphyrin metabolism, since some researchers had seen an association between cancer and porphyrins. At that time, it wasn't known that the breakdown of the porphyrin, heme, produced carbon monoxide.

But beyond the possibility that estrogen was deeply involved in the nature of cancer, I felt that its biological role had to do with its interference with oxidative metabolism. Selye had characterized estrogen's effect as "like the shock phase of the stress reaction." Estrogen does act in conjunction with histamine, and histamine alone tends to cause circulatory collapse by allowing fluid to leak out of blood vessels. Lack of oxygen probably relates more generally to the shock reaction than does histamine

The reduction of cellular energy is probably estrogen's central action, and in Warburg's scheme, this would be the way to turn on cell division and growth. In the absence of oxygen, cells take up water, and when water-logged (even from being placed in a hypotonic fluid), they begin to divide.

Since some pituitary hormones (including prolactin, ACTH, and the gonadotropins) cause cell division in their "target organs," I suspect that they function much the way estrogen does, except that they have different affinities and so act on different types of cell.

The thyroid hormone is opposed to estrogen in many ways, promoting the delivery of oxygen to tissues, reducing tissue edema, etc. It is also antagonistic to some of the pituitary hormones, especially prolactin. In bones, prolactin causes osteoporosis, estrogen blocks bone forming processes as well as bone destroying processes, while thyroid increases bone turnover, activating both formation and removal. I'm not sure how far this generalization can be applied, but it seems that some hormones can be understood largely in terms of their pro-energy or anti-energy functions. Estrogen turns on a primitive type of growth by lowering cellular energy and function. Thyroid turns on cellular energy and function, and controls the rate of cell growth.

Some mysteries, such as the high levels of gonadotropins during infancy, might be explained by this principle: Their primary function is to regulate energy and growth. After prolonged stress or in old age, their hypersecretion would tend to cause tumors, or to de-energize cells further, causing atrophy.

Note: Although the so-called regulatory agencies have served the giant drug corporations well, by suppressing their competition and approving the most profitable drugs, in exchange for lucrative drug industry jobs offered to the officials* who do their jobs satisfactorily, the current trend in the US is to remove all constraints from the powerful corporations. Vice President Quail, with major family interests in the drug business, was put in charge of a commission to make it even easier for businesses to avoid the regulations, and similar favors are being done for the timber industry, the mass media, the banks, and the insurance industry.

New channels must be found to inform the public about the threats to their health. Even the "health food" industry is dominated by the giant corporations, so their publications don't present the alternative that used to exist, thirty years ago, in a few magazines like Prevention.

* The revolving-door between the agency and the industry--the delayed bribe--applies only for the well qualified officials. The basic function of allowing industry to do what it wants is also served by staffing the agency at lower levels with ridiculously unqualified people. The technical "training" given to people who lack any formal background in the field

apparently consists mainly of teaching them to scoff at evidence because it was published in a British or French or German or Japanese or Russian or Italian scientific journal, or because it hasn't been discussed recently in an American journal. And at all levels, the institutional principle is that if a drug doesn't cause cancer or Azheimer's disease within five years, then it is proven to be safe. At the highest level, when the agency is presented with clear evidence of fraud or malfeasance, the final response is that the agency doesn't handle complaints by individuals. I have been forced to believe that something more than incompetency is involved when officials refuse to say in writing things they have told me orally, and when they make misstatements in writing, or make deletions from documents provided under the Freedom of Information Act. And these are the guys that "work for us."

REFERENCES

I. M. C. Diamond, Enriching Heredity: The Importance of the Environment on the Anatomy of the Brain. Free Press, NY, 1988

2. S. Shanklin and J.Hodin, Maternal Nutrition and Child Health, 1976, and Gail and Tom Brewer, What Every Pregnant Woman Should Know, Random House, 1977.

3. R. R. Maurer and R. H. Foote, "Maternal ageing and embryonic mortality in the rabbit," J. Reprod. Fert. 25, 329-341, 1971.

4. G. H. Zeilmaker, "Effects of prolonged feeding of an ovulation inhibitor (Lyndiol) on ageing of the hypothalamic-ovarian axis and pituitary gland tumorigenesis in rats," J. Endocrin. 43, xxi,

1969).

5. Wise, P. M., "Influence of estrogen on aging of the central nervous system: Its role in declining female reproductive function." in Menopause: Evaluation, Treatment, and Health Concerns, pages 53-70, 1989.

6. Wise, P.M.. etal. "Neuroendocrine influences on aging of the female reproductive system," Frontiers in Neuroendocrinology 12, 323-356, 1991.

7. M. H. Li and W. U. Gardner, "Experimental Studies on the pathogenesis and histogenesis of ovarian tumors in mice," Cancer Research 7, 549-566, 1947.

8. W. U, Gardner, "Honnonal imbalance in tumorigenesis," Cancer Research 8, 397-411, 1948.

9. M. H. Li and W. U. Gardner, "Further studies on the pathogenesis of ovarian tumors in mice." Cancer Research 9, 532-536, 1949.

10. H. S. Kaplan, "Influence of ovarian function on incidence of radiation-induced ovarian tumors in mice," J. Natl. Cancer Inst., 11, 125-132, 1950.

11. Lee, N. C., et al., "Estrogen therapy and the risk of breast, ovary and endometrial cancer," in Aging. Reproduction, and the Climacteric," L. Mastroianni, Jr., and C. A. Paulsen, editors, Plenum. N.Y. & London, 1986. To the extent that oral contraceptives suppress the pituitary gonadotropic hormones, the ovary is protected from the stimulation that can produce cancer. However. the estrogen used to treat menopause doubles the risk of ovarian cancer after ten years. If the estrogen was used for more than 6 years, the risk is tripled

12. Bauer. D). C., et al., "Skin thickness, estrogen use and bone mass in older women," Menopause 1(3), 131-136. 1991. "We found no evidence that estrogen preserves skin thickness: indeed, estrogen use is associated with thinner skin." "Our findings further support

an association between skin thickness and bone mass." "Skin thickness and bone mass are related, but skin thickness cannot be used to predict bone mass."
13. L. C. Strong, Biological Aspects of Cancer and Aging, Pergamon Press, 1968. [Also see D. T. Janerich, et al., "Maternal pattern of reproduction and risk of breast cancer in daughters: Results from the Utah population data base," J. Nat. Cancer Inst. 86(21), 1634-1639, 1994. "Several studies have found that daughters born to older mothers have an elevated risk of breast cancer, and an endocrine hypothesis, among others, has been developed to explain these findings."]
14. D. A. Snowdon, et al., "Is early natural menopause a biologic marker of health and aging? Am. J. Public Health 79, 709-714, 1989.
15. P. W. F. Wilson, et al. [The Framingham Study], N. E. J. M. 313(17), 1038-1043, 1985.
16. Nencioni, T., and F. Polvani, Calcitonin, p. 297-305, A. Pecile, editor, Elsevier, N.Y., 1985.
17. T. I. Belova, "Structural damage to the mesencephalic reticular formation induced by immobilization stress," Bull. Exp. Biol. & Med. 108(7), 126030, 1989.
18. F. Fourrier, et al., "Sex steroid hormones in circulatory shock, sepsis syndrome, and septic shock," Circ. Shock 43(4), 171-178, 1994.
19. E. C. Ditkoff, et al., "The impact of estrogen on adrenal androgen sensitivity and secretion in polycystic ovary syndrome," J. Clin. Endocrinol. Metab. 80(2), 603-607, 1995.
20. C. Bain, et al., "Use of postmenopausal hormones and risk of myocardial infarction," Circulation 64, 42-46, 1981.
21. T. L. Bush, et al., "Estrogen use and all-cause mortality: Preliminary results from the Lipid Research Clinics Program follow-up study," JAMA 249, 903-906, 1983.
22. M. S. Hunter and K. L. M. Liao, "Intentions to use hormone replacement therapy in a community sample of 45-year-old women," Maturitas 20(1), 13-23, 1994. (Women who expressed an intention to use hormone replacement therapy at menopause reported significantly lower self-esteem, more depressed mood, anxiety, and negative attitudes toward menopause. The also expressed stronger beliefs in their doctors' ability--as opposed to their own--to control their menopause experience.)
23. L. Dennerstein, et al., "Psychological well-being, mid-life and the menopause," Maturitas 20(1), 1-11, 1994.
24. H. Kaunitz and C. A. Slanetz, and W. B. Atkinson, "Estrogen response and pigmentation of the uterus in vitamin E-deficient rat," Proc. Soc. Exp. Biol. Med. 70, 302-304, 1948
25. S. W. Brown, et al., "Effect of continuous radiation on reproductive capacity," page 103 in Effects of Ionizing Radiation on the Reproductive System, Carlson and Gassner, editors, MacMillan, N.Y., 1964.
26. D. L. Ingram and A. M. Mandl, "The hypophysial control of the x-ray sterilized ovary," J. Endocrin. 17, 1-12, 1958. [Also see Mandl and Zuckerman, 1956, who found that radiation produces vaginal cornification, the classical test for estrogenic activity.]
27. Winfried G. Rossmanith, "Gonadotropin secretion during aging in women: Review article," Exp. Gerontology 30(3/4) 369-381, 1995. "...major functional derangements, primarily at a hypothalamic rather than a pituitary site, have been determined as concomitants of aging in women."-" ...aging may impair the negative feedback sensitivity to ovarian sex steroids...." Hormonal changes at menopause "may represent the sum of functional aberrations that were initiated much earlier in life...." "...prolonged estrogen exposure facilitates the loss of hypothalamic neurons..."
28. J. R. Brawer, et al., "Ovary-dependent degeneration in the hypothalamic arcuate nucleus," Endocrinology 107, 274-279, 1980.
29. J. Herbert and S. Zuckerman, "Ovarian stimulation from cerebral lesion in ferrets," J. Endocrinology 17(4), 433-443, 1958.
30. G. C. Desjardins, "Estrogen-induced hypothalamic beta-endorphin neuron loss: A possible model of hypothalamic aging," Exp. Gerontology 30(3/4), 253-267, 1995. "This loss of opioid neurons is prevented by treatment with antioxidants indicating that it results from

estradiol-induced formation of free radicals." "...this beta-endorphin cell loss is followed by a compensatory upregulation of mu opioid receptors in the vicinity of LHRH cell bodies." Resulting supersensitivity of the cells results "in chronic opioid suppression of the pattern of LHRH release, and subsequently that of LH." The neurotoxic effects of estradiol cause a "cascade of neuroendocrine aberrations resulting in anovulatory acyclicity." Treatment with an opiod antagonist "reversed the cystic morphology of ovaries and restored normal ovarian cycles" in estrogen-treated rats.

31. G. B. Melis, et al., "Evidence that estrogens inhibit LH secretion through opioids in postmenopausal women using naloxone," Neuroendocrinology 39, 60-63, 1984.

32. H. J. Sipe, et al., "The metabolism of 17 beta-estradiol by lactoperoxidase: A possible source of oxidative stress in breast cancer," Carcinogenesis 15(11), 2637-2643, 1994. ".molecular oxygen is consumed by a sequence of reactions initiated by the glutathione thiyl radical. ...the estradiol phenoxyl radical abstracts hydrogen from...NADH to generate the NAD radical." ".the futile metabolism of micromolar quantities of estradiol catalyzes the oxidation of much greater concentrations of biochemical reducing cofactors, such as glutathione and NADH, with hydrogen peroxide produced as a consequence."

33. S. Santagati, et al., "Estrogen receptor is expressed in different types of glial cells in culture," J. Neurochem. 63(6), 2058-2064, 1994. "...in all three types of glial cell analyzed in almost equal amounts..."

34. D. X. Liu and L. P. Li, "Prostaglandin F-2 alpha rises in response to hydroxyl radical generated in vivo," Free Radical Biol. Med, 18(3), 571-576, 1995. "Free radicals and some free fatty acids, such as arachidonic acid metabolites...may form a feedback loop in which generation of one type leads to formation of the other." "Prostaglandin F-2 alpha dramatically increased in response to hydroxyl radical generation..."

35. J. Owens and P. A. Schwartzkroin, "Suppression of evoked IPSPs by arachidonic acid and prostaglandin F-2 alpha," Brain Res. 691(1-2), 223-228, 1995. "These findings suggest that high levels of AA and its metabolites may bias neurons towards excitation." [Estrogen appears to support this excitatory system at every level, while prostaglandin F2 alpha alters steroid balance, by suppressing progesterone synthesis.]

36. E. A. Quail and G. C. T. Yeoh, "The effect of tron status on glyceraldehyde 3-phosphate dehydrogenase expression in rat liver," FEBS Lett. 359(2-3), 126-128, 1995. "...the overexpression of GAPDH mRNA in iron deficiency is probably due to increased message stability." [This is one of the points discussed by Henics. Estrogen, which increases iron retention, also modifies mRNA stability.]

37. J. G. Liehr, et al., "4-hydroxylation of estradiol by human uterine myometrium and myoma microsomes: Implications for the mechanism of uterine tumorigenesis," Proc Natl Acad Sci **USA 92(20), 9220-9224, 1995. ".** ... elicits biological activities distinct from estradiol, most notably an oxidant stress response induced by free radicals generated by metabolic redox cycling reactions."

38. J. G. Liehr and D. Roy, "Free radical generation by redox cycling of estrogens," Free Rad. Biol. Med. 8, 415-423, 1990.

39. P. Aschheim, "Resultats fournis par la greffe heterochrone des ovaires dan J'etude de la regulation hypothalamo-hypophyso-ovarienne de la ratte senile," Gerontologia 10, 65-75, 1964/65. "Our last experiment, grafting ovaries...into senile rats which had been castrated (ovariectomized) when young, and its result, the appearance of estrous cycles, seems explicable by this hypothesis. Everything happens as if the long absence of ovarian hormones... had kept the cells of the hypothalamus in the state of youth. It's as if the messages of the circulating steroids fatigued the hypothalamic memory." "What are the factors that cause this diminution of the hypothalamic sensitivity...? Kennedy incriminates a decrease in the cellular metabolism in general...."

IO. P. Ascheim. "Aging in the hypothalanic-hypephyseal-ovarian axis in the rat." pp. 376-418 i: A. V. Vveritt and ! A Burgess, editors, Iispothalamus. Pituitary and Aging. C. C. Thomas. Springfield, 1976.

H. C. A. brve and J. D. Sturgis. "Neurosteroids affect spatial reference, working, and long-term memory of female rats," Neurobiol. I.carn. Memors 6-k(1). 83-96. 1995. (female rats take longer to acquire a spatial task during behavioral estrus | (CA Fryc. boston univ.. dept biol, behavioral neurosci lab, boston 02215) "Estrus-associated decrements in a water maze task are limited to acquisition." Physiol. Behay. 37(1). 5-14. 1995.

t2. Ho. S. M. and D. Ros. "Sex hormone-induced nuclear DNA damage and lipid peroxidation in the dorsolateral prostates of Noble rats," Cancer Lett. 84(2), 155-162, 1994.

43. C. A. Kristensen, et al., "Effect of estrogen withdrawal on energy-rich phosphates and prediction of estrogen dependence monitored by in vivo P'-31 magnetic resonance spectroscopy! of four human breast cancer venografts." Cancer Research 55(8), 1661-1669. 1995.

44. C. E. Finch. "The evolution of' ovarian oocyte decline with aging and possible relationships to Down Syndrome and Alzheimer's Disease." Exp. (Geront. 29(6), p. 299. 199

t5. B.T. %hu. et al.. "Conversion of estrone to 2- and 4-hydroxyestrone by hamster kidney and liver microsomes: Impheation for the mechanism of estrogen-induced carcinogenesis," Endocrinology 135(5), 1772-1779, 1994.

46. I. A. Marr. et al.. "The effects of bromocriptine and prolactin on porphyrin biosynthesis in the Harderian gland of the male hamster. Mesocricetus auratus." J. of Comp. Physiology B--Brochemical Systemic and Environmental Physiology 164(7). 524-529, 1995.

47. C. R. Barb. et al.. "Opioid modulation of gonadotropin releasing hormone release from the hypothalamic preoptic area in the pig." Domest. Anim. Endocrinol. 11(4). 375-382. 1994.

48. N. Nilsson and H. Carlsten, "Estrogen induces suppression of natural killer cell cytotoxicity and augmentation of polyclonal B cell activation." Cell. Immunol. 158(1), 131-139, 1994.

49. X. L. Han and 1. G. Liehr, "8-Hsdrovilation of guanine bases in kidney and liver DNA of hamsters treated with estradiol: Role of free radicals in estrogen-induced carcinogenesis," Cancer Res. 5(21), 5515-517, 1994.

50. B. T. Zhu, et al., "Conversion of estrone to 2- and 4-hydroxyestrone by hamster kidney and liver microsomes: Implications for the mechanism of estrogen-induced carcinogenesis," Endocrinology 135(5). 1772-1779. 1994.

51. Desjardin. G. C.. et al.. "Estrogen-induced hypothalamic beta-endorphin neuron loss: A possible model of hypothalamic aging."]Exp. Gerontology 30(3/4), 253-267, 1995.

52. W. G. Rossmanith. "Gonadotropin secretion during aging in women: Review article," Exp. Gerontology 30(3/4), 369-381, 1995.

53. Wise. P'. M., "Alerations in the proestrous pattern of median eminence LHRIT, serum, L.H, FSII. estradiol and progesterone concentratons in middle-aged rats," Life Sei. 31, 165-173, 1982

54. Simard, M., et al., "An intractable ovary-dependent impairment in the hypothalamo-pituitary axis of the estradiol-valerate induced polycystic ovarian condition in the rat." Biol. Reprod. 36, 1229-1237, 1987.

55. E. W. Hahn and W. F. Ward, "The incidence of mating in x-irradiated female rats," J. Reprod. Fert. 20, 151-154, 1961, and Ward and Hahn. Rad. Res. 33, 574, 1967. progesterone anti-radiation (Hahn?): Valent and Hahn. ISRB 20(3). 259-267, 1971. "In general, irradiater females experience a period of fairly regular oestrous cycles, followed by a reduction o cessation of cycling...." " "Oestrous cycle depression is characterized by prolongation of vagina comification, leading to constant cornification and finally permanent di-oestrus..." "Exposur of rats during metoestrus to 50 to 200 R X-rays has been found to induce typical signs o psycthic oestrus--increased activity.lordosis, car quivering-in 49% of the animals...

56. R. Bischoff, et al.. "The influence of irradiation of the ovaries upon estrus and neoplasti development in the Marsh-Buffalo mice." Radiology 43, 55, 1944..

57. S. H. Geist, et al., "Vaginal estrus in irradiated mice." Endocrinology 29, 59, 1941.

58. W.G. Salte and J. T. Bradbury, "Ovarian function and histology after x-ray irradiation on albino rats," Endocrinology 70, 1, 1962.
59. D. L. Ingram and A. M. Mandl, "The hypophysial control of the x-ray sterilized ovary:" J. Endocrin. 17, 1-12, 1958. "This finding indicates that in the absence of the pituitary, the X-irradiated ovary can produce more oestrogen than a non-irradiated ovary, or that the oestrogen it produces is biologically more active."
60. Mandl and Zuckerman, 1956: "After the exposure of their ovaries to sterilizing doses of x-rays, adult rats experience a phase of vaginal cornification which begins within 40 days and lasts up to 14 weeks." ™ '..in fourteen of the fifteen litter-pairs (one animal irradiated: one control) killed at intervals of 5-70 days after hypophysectomy, the uterus was heavier in the irradiated animal...." "(It is of interest that the one control animal whose uterus was the heavier of the litter-pair was later found to have a mild degree of glandular hyperplasia.)
61. C. A. Frye and J. D. Sturgis, "Neurosteroids affect spatial reference, working, and long-term memory of female rats," Neurobiol. Lear. Memory 64(1), 83-96, 1995. [Female rats take longer to acquire a spatial task during behavioral estrus.] and (C. A. Frye, Boston Univ. Dept. Biol., Behavioral Neurosci. Lab, Boston 02215) "Estrus-asociated decrements in a water maze task are limited to acquisition," Physiol. Behav. 57(1), 5-14, 1995.

6

JUST ONE PROBLEM: CLOTS

A stage magician can produce surprising illusions by directing the audience's attention to where something is not happening, or to a distracting gesture. The billion-dollar estrogen industry has learned the trick of directing the public's attention to where some plausible benefit might be expected, and of politely ignoring the areas where death and destruction are in fact being produced.

Interestingly, another billion-dollar industry--the edible oil industry--is using the same prestidigitation to profitably misinform the public. Decades ago, unsaturated oils were found to lower cholesterol. However, studies showed that adding the polyunsaturated oils to the diet didn't prevent death from heart disease, but that it did increase cancer deaths. There were also warnings that the oils could cause problems with blood clotting. There was silence from the industry, the government, and the medical profession in response to the bad news.

When evidence of an association between blood lipids and heart disease was found, the blood tests, rather than actual health, became the focus of publicity. A high ratio of HDL (High density lipoprotein) to LDL (low density lipoprotein) came to be identified with "health," because of its association with lower risk of heart disease, although it was also an indicator of a risk of death from cancer. By ignoring everything but heart disease, it could be argued that "If high HDL. equals health, and estrogen and PUFA (polyunsaturated fatty acids) cause HDL to increase, then these things promote health."

Concerning estrogen, similarly twisted reasoning led to its trial in the 1960s to prevent heart attacks in men, but the experiment was stopped when the rate of heart attacks increased sharply.

Focus on the positive. Ignore the HDL-cancer association. Ignore the association of estrogen with thrombosis, embolism, stroke, edema, obesity, depression, myocardial infarction, eclampsia, epilepsy, brain damage, and immunodeficiency. Ignore the implications of thyroid suppression.

In her comedy routine, Judy Tenuto describes a most implausible situation, and then belligerently pleads: "It could happen; it could happen."

The ignorance or mendacity which allows experts to plead the importance of one possible benefit, in the face of clear evidence of a

multitude of serious dangers, defies any sort of conventional scientific response.

The recent corruption scandal involving the FDA's generic drug division might come to mind when I suggest that Tenuto's satire illuminates the attitude of the FDA (and the medical industry), but |I believe the indictments are part of the prestidigitation.

Marvin Seife, who was head of the generic drug division, was indicted for perjury. The indicated intent of Congress had been to support generic drugs to break the monopoly of the biggest drug companies, but for the last six years there has been an intense campaign by the monopolies to keep generic drugs off the market, and Seife's indictment must be evaluated in this context.

Earlier, an FDA official who was too friendly toward DMSO and its developer, Dr. Jacob, was exposed for accepting a loan from the doctor. While keeping new entrepreneurs from intruding into the fabulously lucrative drug business, those little prosecutions allow the public to believe that the government is policing itself. (If your corporation could expect an additional $4,000,000,000 in profits in the next 10 years, but only if a few men would narrow the scope of their judgment, how do you suppose you could encourage those few men to go in the right direction?)

Forty five years ago the Shutes found that estrogen promotes the clotting of blood. At the same time, Knisely was studying the phenomenon of blood sludging, which occurs under many types of stress. At that time it was recognized that there is an equilibrium between clot formation and clot removal (fibrinolysis). Vitamin E and magnesium and some substances produced by the body shift the balance away from clots. Estrogen, calcium, altered water content and blood volume, and sluggish flow of blood encourage the formation of clots. Some contemporary articles acknowledge that estrogen can cause thrombophlebitis or thromboembolism and can exacerbate gallbladder and liver disease and breast cancer, but these warnings are subordinated to praising the benefits of estrogen replacement therapy. (Valery Miller, Veronica Ravnikar, and Chrystie Timmons, "ERT: Weighing the risks and benefits," Patient C'are, 30-58, June 15, 1990.)

Some quotations from the ERT article by Miller, ef al., illustrate current medical attitudes:

"Although the reasons for its apparent protective effect on the heart are not fully understood, oral estrogen does decrease low-density lipoprotein cholesterol and increase high-density lipoprotein cholesterol." "Although no prospective study has yet shown that estrogen protects against cardiovascular disease, other studies show that women who use estrogen or who have ever used estrogen have a reduced risk of heart disease. The only study that has not confirmed these results is the Framingham Heart Study, which contained smaller numbers of older women and classified chest pain--a notoriously poor identifier of heart disease in women--as a cardiovascular end point" (p. 47).

The prospective long-term Framingham study noted above used to be highly praised as a source of reliable information on heart disease. In contrast, some of the studies that are praised in prestigious journals are wildly unscientific. For example, the heart disease in Marin County women receiving estrogen has been compared with that of women in the East Bay not getting estrogen. Marin County is a rich residential area, which is swept by ocean breezes, while across the bay there are more working class people (and working class men are known to have nearly 50% more heart disease than white collar workers), and the wind from one direction blows smoke from a concentration of industries and refineries, from another direction it carries the pollution from San Francisco's traffic, and from another direction it brings the agricultural poisons of the Salinas area.

If enough women die from strokes, pulmonary embolisms, accidents, suicide, cancer, and loss of immunity caused by estrogen excess, it is possible that some competent study will eventually show that estrogen treatment reduces the mortality from heart attacks, but this is not likely.

It is the estrogen in oral contraceptives which correlates with their effects on the clotting system. In the last 20 years there has been general agreement that increased risk of cardiovascular disease, rather than cancer or immunodeficiency or depression, is the most important concern about the effects of oral contraceptives.[1-11]

There are many ways that estrogen can contribute to a hypercoagulable state (leading to cardiovascular disease). Some of these involve altered liver function, including disturbed production or metabolism of 8 different coagulation controlling factors.[12],[13] Since estrogen can stimulate endothelial proliferation (often cited as crucial in heart disease) and reduces the rate of venous flow,[14],[15] it is necessary to

consider the whole complex circulatory system, and not just the clotting factors.

The thyroid and other hormones such as insulin and adrenalin are influenced by estrogen, and must be taken into account. Although I'm not sure what clinical perceptions led the Shutes to study estrogen's affect on clotting, pregnancy and lactation are notoriously associated with hypercoagulability (eclampsia and thromboembolism, for example) produced by the body's high estrogen production at those times. •2 The very high doses of estrogen that were once used to suppress lactation were found to produce clotting problems.[24] Postmenopausal use of estrogen causes changes in coagulability.[13],[25],[26]

In the mid-1970's when I pointed out that menopause resembles Cushing's syndrome," I hadn't investigated that disease of cortisol-excess enough to know the full extent of the parallel: For example, hot flushes. night sweats, and insomnia, such common menopausal symptoms, are also common symptoms in Cushing's syndrome. Estrogen's tendency to increase cortisol production should be considered in connection with the brain-aging effects of both estrogen and cortisol[28],[29]

Both estrogen and cortisol weaken the structural components of tissue, and the bruising which is so commonly associated with the premenstrual syndrome seems to involve the unopposed action of both of these hormones. The women who often have bruised thighs in their twenties are later susceptible to hemorrhages into the white part of the eye, and still later to bleeding into the brain, presumably because there is a hierarchy of protection against the tissue-weakening effects of those hormones, with the brain being the last to lose its resistance.

For example, the brain content of progesterone, pregnenolone and DHEA is normally 20 or 30 times higher than the serum concentration, and these hormones are protective against both estrogen and cortisone.

As far as I know, it is possible to have fragile blood vessels at the same time as an excessive tendency to clot, though when the vessels break the extent of the bleeding will be smaller in the hypercoagulable state. The observation that low cholesteral is associated with increased risk of hemorrhagic stroke[30] suggests that the age-related decline in progesterone, pregnenolone, and DHEA occurs earlier when there is a low level of the precursor substance, cholesterol.

Clotting too easily is just one of the problems that can be caused by an excess of estrogen, and I don't mean to give it too much emphasis. since I consider its toxic effects on the brain, and its acceleration of brain aging to be its worst effects--though its cancer inducing

effects on the uterus, the breast, the lung, the bowel and liver, and brain, are certainly serious. But at present, estrogen's cardiovascular toxicity is probably the aspect that people need to be reminded of.

The effects of estrogen on calcium metabolism--stimulating cells to take up an excess of calcium--have been known for a very long time, but accumulating knowledge shows that this excess calcium is a very important aspect of estrogen's contribution to blood clotting, heart necrosis, and tissue aging, especially brain aging. Magnesium, which is absorbed under the influence of thyroid hormone, is one of our basic defenses against the toxic effects of calcium.

REFERENCES

1. Sas, Geza, "The Biology of Antithrombins," CRC Press, Boca Raton, 1990.
2. Inman, W. H. W., et al., "Thromboembolic disease and the steroidal content of oral contraceptives. A report to the committee on Safety of Drugs," Br. Med. J. 2, 203, 1970.
3. Shapiro, S., "Oral contraceptives -- a time to take stock," N. Engl. J. Med. 315, 450, 1986.
4. Stadel, B. V., "Oral contraceptives and cardiovascular disease," N. Engl. .J. Med. 305, 612, 1981.
5. Meade, T.W., et al., "Iaemostatic lipid and blood pressure profiles of women on oral contraceptives containing 50 ug or 30 ug oestrogen," Lancet 2, 948, 1977.
6. Sabra, A. and Bonnar, J., "Haemostatic system changes induced by 50 ug and 30 ug estrogen/progestagen oral contraceptives," J. Reprod Med. 28, 85, 1983
7. Beller, F.K. and Ebert, C. "Effects of oral contraceptives on blood coagulation. A review," Obstet. Gynecol. Surv. 40, 425, 1985.
8. Notelovits, M., "Oral contraception and coagulation, Clin. Obstet. Gyncol. 28, 73, 1985.
9. Botuger, L. E. et al., "Oral contraceptives and thromboembolic disease: effect of lowering oestrogen content," Lancet 1, 1097, 1981.
10. Bonnar, J. "Coagulation effects of oral contraception," Am. J. Ostet. Gynecol. 157, 1042, 1987
11. von Kaulla, I. and von Kaulla, K.N. "Oral contraceptives and low antithrombin Ill activity," Lancet 1, 36, 1970.
12. Bonnar, J. et al., "Coagulation system changes in postmenopausal women receiving oestrogen preparations," Postgrad. Med. J. 52, 30, 1976.
13. von Kaulla, F., et al., "Conjugated oestrogens and hypercoagulability," Am. J. Obstet. Gynecol. 122, 688, 1975.
14. frey, N.S. et al., "Vascular lesions in women taking oral contraceptives," Arch. Pathol. 89, 1, 1970.
15. Irey, N.S. and Norris, H.J., "Intimal vascular lesions associated with female reproductive steroids," Arch. Pathol. 96, 227, 1973
16. Ullery, J.C_., "Thromboembolic disease complicating pregnancy and the puerperium," Am. J. Obstet. (iynecol. 68%, 1243, 1954
17. Henderson, S.R. et al., "Antepartum pulmonary embolism," Am. J. Obstet. Gynecol. 1162, 276, 1971.
18. Bonnar, J., "Venous thromboembolism and pregnancy," in Rec. Adv. in Obst. and Gynecology, J. Stallworth and G. Bourne, Eds. Churchill Livingstone, Edinburgh, 1979, 173.
19. Hellgren, M. and Blomback, M. "Studies on blood coagulation and fibrinolysis in pregnancy during delivery and in the puerperium," Gynecol. Obstet. Invest. 12, 141; 1981.

20. Hall, J. et al., "Maternal and fetal sequelae of anticoagulation during pregnancy," Am. J. Med. 68, 122, 1980.
21. Weiner, C. P., "Diagnosis and management of thromboembolic disease during pregnancy," Clin. Obstet: Gynecol. 28, 107, 1985.
22. De Swiet, M. "Thromboembolism," in Med. Disorders in Obstetric Practice, M. De Swiet, Ed., Blackwell Scientific, Oxford, 1984, 95.
23. Hellgren, M.., Thromboembolism and pregnancy, Thesis, Karolinska Institute, Stockholm, 1981.
24. Kaniel, D.G. et al., "Puerperal thromboembolism and suppression of lactation," Lancet 2, 287, 1967.
25. Boston Collaborative Drug Surveillance Program: Surgically confirmed gallbladder disease, venous thromboembolism, and breast tumors in relation to menopausal oestrogen therapy, N. Engl. .J. Med.290, 15, 1974.
26. Bonnar, J. et al., "Coagulation system changes in postmenopausal women receiving oestrogen preparations," Postgrad. Med. J. 52, 30, 1976.
27. Peat, R. Nutrition for Women, 3rd edition 1980, Blake College, Eugene, Oregon.
28. Belova, T. I., "Structural damage to the mesencephalic reticular formation induced by immobilization stress," Bull. Exp. Biol. and Med. 108(7), 1026-30, 1989
29. Wise, P. W., "Influence of estrogen on aging of the central nervous system: its role in declining female reproductive function," in Menopause: Evaluation, Treatment, and Health Concerns, pages 53-70, 1989.
30. Shimamoto, T., et al., Circulation, March, 1959.

7

A LIST OF SIGNS AND SYMPTOMS THAT RESPOND TO PROGESTERONE THERAPY

Many people found the list of signs and symptoms in the first edition of this book either useful or interesting; at least it is an emphatic way of pointing out that progesterone has so many functions it can't be considered to be just a "reproductive hormone." Since I now understand better the biological meaning of these signs, I want to emphasize more strongly the importance of normalizing nutrition, thyroid function, light exposure, and bowel action in correcting the problems behind these signs and symptoms. It is really a kind of index of physiological disorders, and it happens that progesterone is a major tool for physiological adaptation.

Abdominal bloating
Accident proneness
Acne (cyclic)
Aggressiveness
Alcoholic or drug addiction
Allergic rhinitis
Appetite disturbance
Arthritis'
Asthma, especially in adolescence & menopause
Bleeding gums
Breast symptoms[2]
Bruising spontaneously
Capillary fragility
Carpal tunnel syndrome
Cold hands & feet
Colitis, regional enteritis
Conjunctival or retinal hemorrhage
Constipation, colicky pain
Depression
Diabetic vascular problems
Edema
Endometriosis, cervical dysplasia
Epilepsy, vertigo
Facial hair
Facial pallor, puffiness, darkening under the eyes
Fainting
Fatigue, lethargy
Fibroids
Fluctuations in weight
Formication (crawling sensation on the skin)
Gall bladder symptoms
Glaucoma (high eye pressure)
Goiter
Headache, eye pain, flashes of light, photophobia

Heart murmur
High blood pressure
Hypoglycemia
Hysteria (many emotional symptoms)
Infertility
Inflammatory and "fibrous" disease
Inner ear dizziness
Insomnia
Irritability
Low blood pressure
Lethargy and clumsiness
Menopause
Mittelschmerz[3]
Migraine
Nymphomania, loss of libido
Optic neuritis
Panic, weepiness, night-worry
Palpitations or paroxysmal tachycardia
Paraesthesias
Pituitary abnormalities
Porphyria
Sciatica
Skin disorders: facial pigmentation, erythema, urticaria
Stroke symptoms
Sweat glands: fewer functional
Toxemia of pregnancy.
Urinary frequency, etc.
Varicose veins, tired leg
Vascular abnormalities: flushing, capillary fragility, clotting, kidney underfunction, varicosities.

1. Antibodies to joint material are found after even a mechanical or thermal injury to the joint; twisting cartilage makes it antigenic; autoimmune disease is probably nothing very special, and estrogen is now known to be responsible for many forms of it, including osteoarthritis. "Rheumatism" is an early sign of stress damage to joints. See H. Selye's publications on arthritis and scleroderma.
2. See Annales d'Endocrinologie 37, p. 309; Cancer 33, p. 1506; Ann. N. Y. Acad. Sci., 1977. Progesterone deficiency predisposes to cancer.
3. Cramping at ovulation, often mistaken for appendicitis: in a 1962 study, 62% of all appendices removed from girls ages 11-20 were normal.

REFERENCES

1. Katharina Dalton, The Premenstrual Syndrome and Progesterone Therapy, Year Book Medical Publishers, Inc., ('Chicago, 1977.
2. Ashley Montagu, Human Heredity, New American ibrary, New York. 1963.

3. R. F. Peat and A. L. Soderwall, "Estrogen stimulated pathway changes," Physiological Chemistry and Physics, 4(3), 295, 1972.
4. K. F. Peat. "A biophysical approach to altered consciousness," J. of Orthomolecular Psychiatry, September, 1975.
S. S. Rose. "Environmental effects on brain and behavior," chapter in Race and Intelligence, edited by Richardson and Spears, Penguin Books, Baltimore, 1972
6. A. E. Needham, The Growth Process in Animals, Van Nostrand, Princeton, N. J. 1964.
7. Max Reiss, Psychoendocrinology, Grune and Stratton, New York, 1958.

8

ORIGINS OF PROGESTERONE THERAPY

By the beginning of the 20th century, the idea of extracting regulatory substances from animal tissues was coming into general acceptance in Western medicine. J. A. Lebreton, in Paris, was one of the first to argue for the therapeutic use of an extract of the corpus luteum. Around 1904, C. F. Burnam, of Baltimore, began using corpus luteum of the sow, administered orally, to treat the nervous symptoms associated with menopause or with the menstrual cycle, and also to treat functional amenorrhea, obesity, sterility, and habitual miscarriage. (1912 edition of New and Nonofficial Remedies, and J.A.M.A., Aug. 31, 1919, lix, p. 698.) By the 1920s, tablets of desiccated corpus luteum were generally available, and the daily dosage recommended (representing 6 to 18 grams of fresh tissue) contained a very substantial quantity of progesterone.

The chemical structure of pure crystalline progesterone was determined in 1934 (by Butenandt), and within 2 years many publications were reporting the beneficial effects of injections of the purified material. By 1935, animal research was confirming that the therapeutic work previously done with the crude extract had been on the right track. Although the early research showed that progesterone was very beneficial in threatened miscarriage, arthritis, infertility, cancer and functional diseases of the nervous system, interest in this generic, public-domain material faded as the pharmaceutical industry found methods for converting it into proprietary synthetic glucocorticoids, estrogens, and progestins.

Animals are generally more sensitive to progesterone than humans are, and in animals no toxic level has been found, except that in the highest doses it is anesthetic. In humans, even this effect has never been reported in the medical literature, and it is clearly anti-toxic in nature. Besides preventing acute poisoning of many kinds, it also reduces the incidence of birth defects and cancer.

Progesterone, the Protective Substance of Youth

In 1971, I discovered that vitamin E and progesterone work together to sustain efficient production and use of biological energy. (1)

In the mid-1970s, I found that progesterone is the most powerful order-preserving substance (anti-chaotropic) on the cellular level, and that this explains its range of protective actions, from anti-toxic to anti-stress. (2,3)

Around 1980, I discovered that vitamin E, with its crucial effect on the mitochondrial respiratory enzymes, is a uniquely powerful, stable, and biologically compatible solvent for progesterone.(4) Their intimate association at certain cellular sites requires mutual solubility. This property of mutual affinity extends to all biological areas, meaning that the solution of progesterone in vitamin E can be administered with exceptional efficiency by application to the skin or other membranes, or by ingestion, where normal digestive processes convert it into chylomicrons and distribute it to all tissues, allowing it to escape the tendency of the liver to convert it rapidly to an excretory form, as occurs when progesterone is administered in other forms.

Because of its profound biological compatibility, the progesterone-vitamin E solution permits otherwise impossibly high doses to be given, increasing by as much as 2,000% progesterone's already dramatic effects in a wide range of major biological problems, including epilepsy, habitual miscarriages, auto-immune diseases, and cancer of the uterus, breast, and kidney.

Some Aspects of Basic Progesterone Research

By 1945, Hans Selye had demonstrated that progesterone in itself has the full spectrum of regulatory and anti-stress functions of the adrenal steroids. A little later, Albert Szent-Gyorgyi showed that progesterone is able to regulate the heart, in a manner similar to digitalis. In the 1970s, I demonstrated that it acts similarly on vascular smooth muscle, regulating its tone and preventing venous pooling of blood, and maintaining normal filling of the heart, opposing shock. The immediate improvement in circulation can have dramatic effects, which include restoration of kidney function, elimination of fluid from the lungs, restoration of sensation in the feet, and healing of gangrenous toes. It restores normal tone to other smooth muscles, including the gall bladder, urinary bladder, intestine, sphincters, and uterus.

Progesterone's ability to regulate thresholds of cellular excitation operates in nerves, as well as in smooth and cardiac muscle. It sensitizes

nerves that regulate respiration, and has been used to treat infant apnea, sleep apnea in adults, and polycythemia vera in men.

In cases of specific progesterone deficiency in men, small doses can cure impotence. It has been used effectively to treat benign prostatic enlargement.

It normalizes fluid pressure, as in bursitis and glaucoma treatment. This effect on tissue fluid content is probably involved in its ability to improve oxygenation in emphysematous lungs, and to normalize swollen cartilage.

It restores many of the functions of aged skin, and is the normal defense against calcium loss from bones. It is one of the few essential requirements, besides nutrients, for nerve (brain) cell growth and survival. In young people of both sexes, the brain contains more progesterone than other organs do.

It is reasonable that progesterone, the dominant hormone in pregnancy, should have a full range of protective functions to protect the vulnerable organism during its intra-uterine life.

Practical Issues

A typical dose of progesterone/vitamin E, 20mg./day for 10 consecutive days, costs about $1.00 per month, at the present retail price. Pharmacists have the authority to compound drugs as they choose, just as physicians can prescribe the formulation they prefer. (And beyond that principle, is the fact natural hormones have never been legally even prescription drugs. Even potentially deadly injectable insulin is available everywhere without a prescription. The FDA acknowledged that they had erroneously been listing insulin as a prescription drug, when it wasn't. Federal law prohibits labeling a non-prescription drug as a prescription drug. When I asked for a copy of their policy discussions regarding natural hormones, they claimed the records were "old," and unavailable, then they said that those policy discussions were done elsewhere, so they couldn't get access to the record. It's a touchy subject; the Freedom of Information office claimed they couldn't find those old documents, and some related things they sent me were incomplete, with no explanation for the missing pages.)

Neither progesterone nor vitamin E has any toxicity when used orally. Under federal law, a prescription is needed for a dosage form of a drug that is potentially harmful. The very dangerous injectable insulin is always sold without need for a prescription, because something overrides the principle of danger, presumably that its use is conceived as akin to

nutrition, providing an essential natural substance to restore a natural function of the body. By analogy with insulin, the infinitely less dangerous progesterone should not require a prescription. The most useful terms for regulatory obfuscation are "Approved New Drug," and "not an approved drug." Most legal drugs under the 1938 FDA law have not been under the special category of "Approved New Drugs." but that is a subject the regulators just won't talk about. They talk about what they control, and hope people will assume they control everything.

Economic Questions and Pharmaceutical Efficacy

Because of its absorption by a natural digestive route which distributes it to all of the tissues, progesterone dissolved in vitamin E is almost 100% absorbed when taken orally. Less than 1% is absorbed from some types of suppositories, and less than 5% absorption is typical. Taken orally as a micronized powder, pharmaceutical efficiency is only slightly better.

Most of the valid human research before 1981 used intramuscular injections of progesterone dissolved in vegetable oil and benzyl alcohol. Benzyl alcohol has a high affinity for water, and in contact with the tissue fluid, it leaves the mixture, causing progesterone crystals to form, since vegetable oil is a poor solvent for progesterone. Therapeutic blood levels of progesterone can be achieved by intramuscular injections, but at the cost of leaving toxic debris at the site of injection. Benzyl alcohol is a powerful neuro-toxin, but its harm is reduced by progesterone's anti-toxic action. The cost of the injectable progesterone, and especially of the injection itself, has been the main factor preventing wider acceptance of this form of progesterone in the United States, since the solvent's toxicity has never been discussed officially.

The chemistry for converting crude diosgenin into pregnenolone, and for converting pregnenolone into progesterone, is simple enough that it can be done with little capital, at the site of production of the raw material.

REFERENCES

1. R. Peat, dissertation, Biology Department, University of Oregon, 1972.
2. R. Peat and A. L. Soderwall, Cold-inactivated Enzymes, Physiological Chem. and Physics, 1971 and 1972.
3. R. Peat, A biophysical approach to altered consciousness, Jour. of Orthomolecular Psychiatry, 1975.
4. R. Peat, U.S. Patent No. 4,432,437, 1984.

9

ANTI-AGING HORMONES: STEROIDS, IN GENERAL

This type of molecule might be the most common carbon compound in the universe. It is made by single celled organisms, by plants, and by animals, and has many kinds of function. The steroid hormones are involved in all aspects of animal physiology, and overlap with control functions of the nervous system, peptide hormones, metabolites, prostaglandins, cyclic nucleotides, etc. (I suspect that their ubiquity reflects a special kind of physical influence on biological water.) Sometimes people speak of "steroids" when they mean glucocorticoids such as cortisol or a synthetic like dexamethasone, or, among athletes, when they mean anabolic steroids or synthetic androgens; and so it is common to associate "steroids" with harmful side effects. Oddly, many people who are afraid of toxic steroids fail to realize that estrogen is a steroid, and is the most toxic steroid normally found in animals. All foods contain steroids and sterols (a major type, containing an alcohol group and a side-chain) some of which are beneficial and some of which are toxic or allergenic.

In animals, cholesterol is the basic sterol molecule, which is massively converted into other substances, including the steroid hormones. (In plants, cholesterol in very small amounts appears to serve as a hormone.) Thyroid hormone and vitamin A are required for this conversion. The first step occurs in the energy-producing mitochondrion, where cholesterol loses its side-chain and is slightly oxidized, producing pregnenolone. Being less fat soluble than cholesterol, pregnenolone leaves the mitochondrion, so it tends not to inhibit its own synthesis.

Rather, it seems to stimulate its own synthesis, though this isn't as clearly established as in the case of progesterone. Depending on the tissue, pregnenolone will be converted by enzymes in the cytoplasm into either progesterone or DHEA (dehydroepiandrosterone). The fact that progesterone (and probably pregnenolone) stimulates its own synthesis means that taking it does not suppress the body's ability to synthesize it, as happens with cortisol. Sometimes, one dose or a few doses can restore the body's ability to produce enough of its own.

Progesterone also allows the thyroid gland to secrete its hormones, especially when the thyroid function has been inhibited by

estrogen. Since the thyroid hormone is needed to produce progesterone, a supplement of either tends to normalize both thyroid and progesterone production.

Progesterone and DHEA are the precursors for the other more specialized steroid hormones, including cortisol, aldosterone (sodium-retaining hormone), estrogen, and testosterone. The formation of these other hormones is tightly regulated, so that taking the precursor will correct a deficiency of a specialized hormone, but will not create an excess. At least in the case of progesterone, an excess tends to balance or neutralize an excess of the specialized hormone, so it has been described as having anti-androgenic, anti-estrogen, anti-aldosterone, and anti-cortisol functions.

Many steroids have a protective ("catatoxic") action against a wide variety of poisons. Some of the quick effects (e.g., within 10 minutes) of progesterone and pregnenolone probably represent a catatoxic action, as well as a neutralizing or balancing of excessive estrogen or cortisol. Improved metabolic efficiency, sparing oxygen and glucose, will have a quick effect in reducing edema.

During pregnancy, very large amounts of progesterone are made. It protects and stabilizes practically all functions of both the mother and the fetus. Progesterone, glucose and the thyroid hormones powerfully influence the brain development and intelligence of the baby, probably by influencing both the number and the size of brain cells, and the quality of their functioning.

Part of progesterone's protective effect is a result of its quieting effect on cells. For example, it tends to prevent seizure activity in brain cells. During childbirth, its normal function is to act as an anesthetic. When the level of estrogen is too high, progesterone can't achieve this effect. In a non-pregnant person, it is important to determine the minimum effective dose by taking only a few drops at a time, and repeating this small dose about every 20 minutes until symptoms have been controlled. Otherwise, serious "drunkenness" can be produced, with loss of coordination, and even unconsciousness.

The only solvent for progesterone which isn't toxic and which will dissolve an effective quantity, is vitamin E. In this form, it can be absorbed through the skin or other membranes, or can be taken orally. Taken orally, it is absorbed as chylomicrons, going into the general circulation (as vitamin E does), instead of to the liver where it would be prepared for excretion. In this form, therefore, it is fully and quickly available to all tissues. It is approximately 20 times more powerful in its

action than other preparations, so it is important to use it in physiological quantities, rather than in the huge doses commonly given rectally or by injection. Ten or 20 mg. is often an effective dose, though people with low thyroid or high estrogen sometimes use 50 to 100 mg. per day. In the customary 10% solution, one drop contains about 3 mg. progesterone, and 1 ml. (1/4 tsp.) contains 100 mg. The first dose should never be more than 15 mg.

Pregnenolone, taken orally, does nothing noticeable to a healthy animal or person, but if the stress-related hormones are elevated, they return to normal when pregnenolone is taken. The brain contains much more pregnenolone, DHEA, and progesterone than do other organs or the blood, and these levels decrease progressively with age. Older people are more likely to feel an effect from pregnenolone, than are young people. A tenth of a gram is a reasonable first dose, though some people seem to need as much as 1 gram per day, possibly because of poor absorption. (The amount produced daily in a healthy young adult is roughly 30 mg.)

Normalizing the stress hormones with pregnenolone often seems to have the effect of correcting the function of the thyroid gland, probably because it is suppressed by stress. Since pregnenolone is the precursor for progesterone and DHEA (and all the other steroid hormones), it often has the same effects as progesterone or DHEA, and it has the advantage that it allows the body to produce just an optimum amount of those hormones. In very old people, or people with special enzyme deficiencies, it might be necessary to supplement all three to achieve their normal physiological concentration in the tissues.

Pregnenolone and progesterone are known to protect nerves against the damaging effects of the "excitotoxins," which activate nerve cells to the point of cumulative injury during stress and fatigue. The need for pregnenolone is probably what is described as "agitated depression," in which the person feels unable to cope with ordinary life, and when the body is unable to produce enough pregnenolone, the nervous-physiological distress leads to increased production of cortisol. The clinical depression, which so typically involves elevated cortisol production, is probably primarily a pregnenolone deficiency. The active fraction of the thyroid hormone, triiodothyronine, or liothyronine (T_3), is essential for the conversion of cholesterol to pregnenolone, as is the retinol form of vitamin A. Butyric acid is known to facilitate the entry of T, into the mitochondrion.

Since progesterone and pregnenolone protect against the excitotoxins which damage neurons, and estrogen and cortisol promote excitotoxic damage, it seems reasonable to see this opposition as relating to their known physiological actions. For example, estrogen damages memory, and pregnenolone restores memory in old animals. Although the excitotoxins might not be involved in other organs, I suspect that something analogous (possibly the cyclic nucleotide ratio) is involved in the opposite effects of these substances on, for example, the thymus, vascular tone, and liver function.

10

YOUTH ASSOCIATED HORMONES

PROGESTERONE

Sixty years ago, progesterone was found to be the main hormone produced by the ovaries. Since it was necessary for fertility and for maintaining a healthy pregnancy, it was called the "pro-gestational hormone," and its name sometimes leads people to think that it isn't needed when you don't want to get pregnant. In fact, it is the most protective hormone the body produces, and the large amounts that are produced during pregnancy result from the developing baby's need for protection from the stressful environment. Normally, the brain contains a very high concentration of progesterone, reflecting its protective function for that most important organ. The thymus gland, the key organ of our immune system, is also profoundly dependent on progesterone.

In experiments, progesterone was found to be the basic hormone of adaptation and of resistance to stress. The adrenal glands use it to produce their anti-stress hormones, and when there is enough progesterone, they don't have to produce the potentially harmful cortisone. In a progesterone deficiency, we produce too much cortisone, and excessive cortisone causes osteoporosis, aging of the skin, damage to brain cells, and the accumulation of fat, especially on the back and abdomen.

Experiments have shown that progesterone relieves anxiety, improves memory, protects brain cells, and even prevents epileptic seizures. It promotes respiration, and has been used to correct emphysema. In the circulatory system, it prevents bulging veins by increasing the tone of blood vessels, and improves the efficiency of the heart. It reverses many of the signs of aging in the skin, and promotes healthy bone growth. It can relieve many types of arthritis, and helps a variety of immunological problems.

If progesterone is taken dissolved in vitamin E, it is absorbed very efficiently, and distributed quickly to all of the tissues. If a woman has ovaries, progesterone helps them to produce both progesterone and estrogen as needed, and also helps to restore normal functioning of the thyroid and other glands. If her ovaries have been removed, progesterone should be taken consistently to replace the lost supply. A progesterone deficiency has often been associated with increased susceptibility to cancer, and progesterone has been used to treat some types of cancer.

It is important to emphasize that progesterone is not just the hormone of pregnancy. To use it only "to protect the uterus" would be like telling a man he doesn't need testosterone if he doesn't plan to father children, except that progesterone is of far greater and more basic significance than testosterone. While men do naturally produce progesterone, and can sometimes benefit from using it, it is not a male hormone. Some people get that impression, because some physicians recommend combining estrogen with either testosterone or progesterone, to protect against some of estrogen's side effects, but progesterone is the body's natural complement to estrogen. Used alone, progesterone often makes it unnecessary to use estrogen for hot flashes or insomnia, or other symptoms of menopause.

When dissolved in vitamin E, progesterone begins entering the blood stream almost as soon as it contacts any membrane, such as the lips, tongue, gums, or palate, but when it is swallowed, it continues to be absorbed as part of the digestive process. When taken with food, its absorption occurs at the same rate as the digestion and absorption of the food.

PREGNENOLONE

Pregnenolone, which is the raw material for producing many of the hormones of stress and adaptation, was known as early as 1934, but for several years it was considered to be an "inert" substance. A reason for this belief is that it was first tested on healthy young animals. Since these animals were already producing large amounts of pregnenolone (in the brain, adrenal glands, and gonads), additional pregnenolone had no effect.

In the 1940s, pregnenolone was tested in people who were sick or under stress, and it was found to have a wide range of beneficial actions, but the drug industry never had much interest in it. Its very generality made it seem unlike a drug, and its natural occurrence made it impossible to patent. Thus, many synthetic variants, each with a more specialized action and some serious side effects, came to be patented and promoted for use in treating specific conditions. The drug companies created an atmosphere in which many people felt that each disease should have a drug, and each drug, a disease. The side effects of some of those synthetic hormones were so awful that many people came to fear them. For example, synthetic varieties of "cortisone" can destroy immunity, and

can cause osteoporosis, diabetes, and rapid aging, with loss of pigment in the skin and hair, and extreme thinning of the skin.

Natural pregnenolone is present in young people of both sexes at a very high concentration, and one reason for the large amount produced in youth is that it is one of our basic defenses against the harmful side effects that an imbalance of even our natural hormones can produce. In excess, natural cortisone or estrogen can be dangerous, but when there is an abundance of pregnenolone, their side effects are prevented or minimized.

In a healthy young person or animal, taking even a large dose of pregnenolone has no hormone-like or drug-like action at all. It is unique in this way. But if the animal or person is under stress, and producing more cortisone than usual, taking pregnenolone causes the cortisone to come down to the normal level. After the age of 40 or 45, it seems that everyone lives in a state of continuous "stress," just as a normal part of aging. This coincides with the body's decreased ability to produce an abundance of pregnenolone.

When aging rats are given a supplement of pregnenolone, it immediately improves their memory and general performance. Human studies, as carly as the 1940s, have also demonstrated improved performance of ordinary tasks. It is now known that pregnenolone is one of the major hormones in the brain. It is produced by certain brain cells, as well as being absorbed into the brain from the blood. It protects brain cells from injury caused by fatigue, and an adequate amount has a calming effect on the emotions, which is part of the reason that it protects us from the stress response that leads to an excessive production of cortisone. People feel a mood of resilience and an ability to confront challenges.

Many people have noticed that pregnenolone has a "face-lifting" action. This effect seems to be produced by improved circulation to the skin, and by an actual contraction of some muscle-like cells in the skin. A similar effect can improve joint mobility in arthritis, tissue elasticity in the lungs, and even eyesight. Many studies have shown it to be protective of "fibrous tissues" in general, and in this connection it was proven to prevent the tumors that can be caused by estrogen.

Pregnenolone is largely converted into two other "youth-associated" protective hormones, progesterone and DHEA. At the age of 30, both men and women produce roughly 30 to 50 mg. of pregnenolone daily. When taken orally, even in the powdered form, it is absorbed fairly well. One dose of approximately 300 mg (the size of an aspirin tablet) keeps acting for about a week. as absorption continues

along the intestine, and as it is "recycled" in the body. Part of this long lasting effect is because it improves the body's ability to produce its own pregnenolone. It tends to improve function of the thyroid and other glands, and this "normalizing" effect on the other glands helps to account for its wide range of beneficial effects.

DHEA: ANOTHER YOUTH-ASSOCIATED HORMONE

DHEA (dehydroepiandrosterone) has a technical-sounding name because it has never been identified with a single dominant function, in spite of its abundance in the body. Many researchers still think of it as a substance produced by the adrenal glands, but experiments show that animals without adrenals are able to produce it in normal amounts. Much of it is formed in the brain (from pregnenolone), but it is probably produced in other organs, including the skin. The brain contains a much higher concentration of DHEA than the blood does.

In old age, we produce only about 5% as much as we do in youth. This is about the same decrease that occurs with progesterone and pregnenolone. The other hormones (for example, cortisone) do not decrease so much; as a result, our balance shifts continually during aging toward dominance by hormones such as cortisone, which use up more and more body substance, without rebuilding it. Protection against the toxic actions of these specialized hormones is a major function of DHEA and the other youth-associated hormones.

For example, starvation, aging, and stress cause the skin to become thin and fragile. An excess of cortisone--whether it is from medical treatment, or from stress, aging, or malnutrition--does the same thing. Material from the skin is dissolved to provide nutrition for the more essential organs. Other organs, such as the muscles and bones, dissolve more slowly, but just as destructively, under the continued influence of cortisone. DHEA blocks these destructive effects of cortisone, and actively restores the normal growth and repair processes to those organs, strengthening the skin and bones and other organs. Stimulation of bone-growth by DHEA has been demonstrated in vitro (in laboratory tests), and it has been used to relieve many symptoms caused by osteoporosis and arthritis, even when applied topically in an oily solution.

Estrogen is known to produce a great variety of immunological defects, and DHEA, apparently by its balancing and restorative actions, is

able to correct some of those immunological defects, including some "autoimmune" diseases.

It is established that DHEA protects against cancer, but it isn't yet understood how it does this. It appears to protect against the toxic cancer-producing effects of excess estrogen, but its anti-cancer properties probably involve many other functions.

Diabetes can be produced experimentally by certain poisons which kill the insulin-producing cells in the pancreas. Rabbits were experimentally made diabetic, and when treated with DHEA their diabetes was cured. It was found that the insulin-producing cells had regenerated. Many people with diabetes have used brewer's yeast and DHEA to improve their sugar metabolism. In diabetes, very little sugar enters the cells, so fatigue is a problem. DHEA stimulates cells to absorb sugar and to burn it, so it increases our general energy level and helps to prevent obesity.

Young people produce about 12 to 15 milligrams of DHEA per day, and that amount decreases by about 2 mg. per day for every decade after the age of 30. This is one of the reasons that young people eat more without getting fat, and tolerate cold weather better: DHEA, like the thyroid hormone, increases our heat production and ability to burn calories. At the age of 50, about 4 mg. of DHEA per day will usually restore the level of DHEA in the blood to a youthful level. It is important to avoid taking more than needed, since some people (especially if they are deficient in progesterone, pregnenolone, or thyroid) can turn the excess into estrogen or testosterone, and large amounts of those sex hormones can disturb the function of the thymus gland and the liver.

11

THYROID

Measuring the amount of thyroid in the blood isn't a good way to evaluate adequacy of thyroid function, since the response of tissues to the hormone can be suppressed (for example, by unsaturated fats).

In the 1930s accurate diagnosis was made by evaluating a variety of indications, including basal oxygen consumption, serum cholesterol level, pulse rate, temperature, carotenemia, bowel function, and quality of hair and skin. A good estimate can be made using only the temperature and pulse rate. (Pulse rate should be thought of as an indicator of the rate of blood circulation, meaning that the strength of the pulse should increase with the rate; a rapid but weak, shock-like pulse gives useful information, but has a different meaning.)

Oral or armpit temperature, in the morning before getting out of bed, should be around 98 degrees F, and it should rise to 98.6° by mid-morning. This is not valid if you sleep under an electric blanket, or if the weather is hot and humid. A person who is hypothyroid produces heat at a low rate, but doesn't lose it at the normal rate, since there is less sweating, and the skin is relatively cool. Many hypothyroid people compensate with high adrenalin production (sometimes 40 times higher than normal), and this tends to keep the skin cool, especially on the hands, feet, and nose. The high adrenalin is the consequence of low blood glucose, so a feeding of carbohydrate, such as a glass of orange juice, will sometimes lower the pulse rate momentarily. Since thyroid is essential for producing progesterone, and progesterone is "thermogenic" in the sense of setting the temperature control system higher, the body sometimes maintains a subnormal temperature even in warm weather, Healthy populations have an average resting pulse rate of about 85 per minute. Especially in hot weather it is useful to consider both temperature and pulse rate.

The Achilles tendon reflex is another quick way to estimate thyroid function. This reflex is used because of the insignificant weight of the toes in relation to contraction of the gastrocnemius muscle. The T (repolarization) wave on the electrocardiogram is a similar indicator of the rate of energy production. Thumping the Achilles tendon causes the muscle to contract (unless it is already in a semi-contracted state, which isn't uncommon). The contraction consumes energy, and the muscle can't relax until enough energy has been produced to restore the threshold and

the readiness for a new contraction. (Creatinine levels are a vague indicator of the activity of this system, and are often a little low in hypothyroidism.)

If energy production is efficient, relaxation is faster than the passive return motion of the foot, so the foot swings freely back to its original position, and over-shoots slightly, causing a slight swinging action. In hypo- thyroidism, the foot returns as if controlled by a pneumatic door-closer, and settles slowly and precisely into its relaxed position, sometimes with a hesitating, intermittent motion. This slow replenishment of energy, and slow relaxation, can cause muscles to cramp easily. The aching leg muscles of children at the end of an active day are often a sign of hypothyroidism, and sometimes the gastrocnemius muscle become very swollen and hypertrophied in hypothyroid children. The same process, of slow energy regeneration, can cause rhythm disturbance in the heart, and often causes insomnia and restless sleep.

The thyroid gland secretes about 3 parts of thyroxin to one part of triiodothyronine, and this allows the liver to regulate thyroid function, by converting more of the T, to the active T, when there is an abundance of energy. Glucose is essential for the conversion, so during fasting there is a sharp decrease in metabolic rate, and in experiments, 200 or 300 calories of carbohydrates can be added to the diet without causing fat storage.

When the liver is the main cause of hypothyroidism, your temperature (and especially the temperature of your nose, hands and feet) will fall when you are hungry, and will rise when you eat carbohydrates. If a hypothyroid person has a very slow pulse, and feels lethargic, it seems that there is little adrenalin; in this case, a feeding of carbohydrate is likely to increase both the pulse rate and the temperature, as the liver is permitted to form the active T, hormone.

Women often have above-average thyroxin, with symptoms of hypothyroidism. This is apparently because it isn't being converted to the active form (T,). Before using a Cytomel (T,) supplement, it might be possible to solve the problem with diet alone. A piece of fruit or a glass of juice or milk between meals, and adequate animal protein (or potato protein) in the diet is sometimes enough to allow the liver to produce the hormone. If Cytomel is used, it is efficient to approximate the physiological rate of T, formation, by nibbling one (10 or 15 meg.) tablet during the day. When a large amount is taken at one time, the liver is likely to convert much of it to the inactive reverse-T, form, in a normal defensive response.

Women normally have less active livers than men do. Estrogen can have a directly toxic effect on the liver, but the normal reason for the difference is probably that temperature and thyroid function strongly influence the liver, and are generally lower in women than in men. Estrogen inhibits the secretion of hormone by the thyroid gland itself, probably by inhibiting the proteolytic enzyme which dissolves the colloid. Progesterone has the opposite effect, promoting the release of the hormones from the gland. At puberty, in pregnancy, and at menopause, the thyroid gland often enlarges, probably as a result of estrogen dominance.

Thyroid function stimulates the liver to inactivate estrogen for secretion, so estrogen dominance can create a vicious circle, in which excess estrogen (or deficient progesterone) blocks thyroid secretion, causing the liver to allow estrogen to accumulate to even higher levels. Progesterone (even one dose, in some cases) can break the cycle. However, if the gland is very big, the person can experience a few months of hyperthyroidism, as the gland returns to normal. It is better to allow the enlarged gland to shrink more slowly by using a thyroid supplement. If an enlarged gland does begin to secrete too much thyroid hormone, it can be controlled with tablets of propylthiouracil, or even with raw cabbage or cabbage juice, and cysteine-rich meats, including liver.

Besides fasting, or chronic protein deficiency, the common causes of hypothyroidism are excessive stress or "aerobic" (i.e., anaerobic) exercise, and diets containing beans, lentils, nuts, unsaturated fats (including carotene), and undercooked broccoli, cauliflower, cabbage, or mustard greens. Many health conscious people become hypothyroid with a synergistic program of undercooked vegetables, legumes instead of animal proteins, oils instead of butter, carotene instead of vitamin A, and breathless exercise instead of a stimulating life.

A good diet, plus a supplement of either thyroid or progesterone, can often break the cycle of hormonal imbalance.

If a person has at least a normal level of cholesterol, it is very likely that a progesterone deficiency can be corrected by normalizing the thyroid function, since thyroid, vitamin A, and cholesterol are the main factors in the synthesis of progesterone. If the problem is that the ratio of estrogen to progesterone is too high, though progesterone might itself be at a reasonable level, thyroid becomes crucial, to bring the estrogen level down to normal. In hypothyroidism there is a tendency to develop cystic ovaries, and low thyroid function normally leads to estrogen dominance, even if the ovaries seem normal.

12

PROGESTERONE'S BIOLOGICAL GENERALITY

1. Intrinsic general properties.

All of the steroid functions, except those of estrogen and testosterone, are included, though weakly, in the progesterone molecule itself. These include lysosome stabilization, salt regulation, blood sugar elevation, and anesthesia (or, in physiological amounts, modulation of nerve functions). It is unusual among the steroids in promoting enlargement, rather than atrophy, of the thymus gland. Progesterone, like testosterone is anti-estrogenic.

A weak hormone activity in the absence of the stronger hormone will act as a substitute, but in the presence of the stronger hormone will weaken the strong hormone's effect by competition or "dilution" at the point of action, and possibly by suppressing the trophic pituitary agent which regulates synthesis. By thus opposing both deficiencies and excesses, such a hormone will tend to protect against pathological extremes. There is, for example, supposed to be competition between progesterone and aldosterone for the "aldosterone receptors" which cause water retention by the kidneys, so that in many situations, progesterone will relieve edema; but when the adrenal cortex is removed or fails to function (as in Addison's disease), progesterone will promote relatively normal retention of sodium and water, keeping the individual alive as long as large doses are given regularly.

Some hormones which are both progestins and anti-testosterones seem to work both at the tissue "receptor" level, and at the pituitary level. Though progesterone itself will suppress menopausal pituitary gonadotrophins, and (my observations) reduces excessive facial hair, it has not been found to have anti-testosterone effects in men when used in low doses, and in appropriate doses it can improve sexual functions in some impotent men who are deficient in progesterone. Pregnenolone (produced from cholesterol in the mitochondria), which is the precursor to progesterone and other steroids, has been used successfully to restore fertility (sperm count and motility, and, according to the wives--libido) in men.

All of the natural steroids have functions that overlap to some extent--e.g., testosterone has some progestational function--but progesterone's generality is the most remarkable.

2. Steroid precursor function.

The second aspect of progesterone's biological generality, besides its intrinsic hormonal activity, is its role as precursor for all of the other steroid hormones (see chart). When consumed in food (e.g., butter, brains, milk, ovaries--some cultures eat pork ovaries, many eat sea-urchin ovaries), it, like cholesterol, only more efficiently, enters the cycle of steroid synthesis near the beginning, so that it is a raw material, allowing normal amounts of the other hormones to be produced. This aspect of progesterone distinguishes it most strongly from the other progestins (e.g., medroxyprogesterone), which have had atoms introduced at unusual positions to inhibit metabolism and prolong activity (as well as to create a patentable and thus highly profitable substance). When we eat protein, we support the production of all the peptide hormones, likewise, natural progesterone (and pregnenolone, which is also found in brains, endocrine glands, and probably skin) serves to allow the body to produce an appropriate and balanced amount of all the other steroid hormones.

3. Anti-estrogen functions.

A third aspect of progesterone's generality is a little less clear than its intrinsic generality and its function as a general steroid precursor, because this third form has to do with its overall antagonism to estrogen, and gains significance only to the extent that we see estrogen as having a very broad physiological role--for males as well as for females. I will just mention some of the many effects of estrogen, and some reasons for its ubiquity.

Estrogen causes water retention, even when dietary salt is restricted; hyposmotic blood has been observed under estrogen influence.
Estrogen causes "erasure" of memory, as does prolactin, which is formed under the influence of estrogen.
Estrogen promotes the formation of prolactin, which normally increases with aging and stress, and which is a known contributor to osteoporosis.

Estrogen causes hypoxia at many levels--pulmonary diffusion, intracellular metabolism, and various points between.

Estrogen synergizes with insulin, lowering blood sugar, promoting fat synthesis.

Estrogen opposes actions of thyroxin, elevates the bound proportion, and blocks its secretion from the gland.

Estrogen causes reproductive aging, by exhausting neurons which regulate the pituitary.

Estrogen contributes to the risk of miscarriage and infertility.

Estrogen retards prenatal brain growth.

Estrogen promotes histamine release.

Estrogen shifts the balance of prostaglandins and cyclic nucleotides, important cellular regulators.

Estrogen and its metabolites are carcinogenic, in every sense of the word.

Estrogen promotes development of fibroids and many other kinds of tumor, including pituitary prolactin-secreting tumor.

Estrogen promotes blood clotting and increases embolism incidence.

Estrogen synergizes with adrenaline in causing vascular spasm.

Estrogen alters blood lipids and promotes gall bladder disease.

Estrogen accelerates the aging of collagen.

Estrogen mimics the shock phase of the stress reaction.

Estrogen is produced by many tissues--possibly by every tissue under certain circumstances. Stress hormones promote liver synthesis of estrogen.

Estrogen lowers the seizure threshold of nerve cells, increasing susceptibility to epileptic convulsions.

Estrogen shrinks the thymus, and contributes to many auto-immune conditions and tissue alterations including osteoarthritis.

Men and women, especially as they age, are susceptible to liver damage from toxins which can cause elevated estrogen levels by interfering with metabolism and excretion.

Malnutrition can cause signs of high estrogen.

Various physical factors, including ionizing radiation, mimic estrogen actions.

Many environmental pollutants--phenolic compounds, dioxins, PCBs, polycyclic hydrocarbons, chlorinated hydrocarbons, DDT, etc.--are estrogenic.

Estrogen promotes the retention of iron, which accumulates with aging and promotes the free-radical damage caused by stress.

In relating progesterone's effects to those of estrogen, we should avoid being misled by the opinions expressed in many textbooks, describing symptoms of the luteal phase of the menstrual cycle as symptoms "caused by progesterone." For example, many medical books promote the erroneous idea that progesterone causes edema, because edema often occurs during the luteal phase of the cycle, which is too often conceptualized as "the progesterone dominance phase." Actually, this is the time when the estrogen/progesterone ratio frequently reaches its pathological height, for four common reasons:

1. failure to eliminate estrogen;
2. failure to produce enough progesterone;
3. overproduction of estrogen;
4. excessive metabolism of progesterone.

Failure of the liver to metabolize or detoxify estrogen is equivalent to the older idea of an "elevated kidney threshold for estrogen," which was proposed as the cause of the "pre-menstrual syndrome." Probably the main reason for liver sluggishness (apart from the direct action of estrogen itself, discussed in liver monographs, and often noticed in the post-ovulatory increase of susceptibility to intoxication by alcohol or other chemicals) is low thyroid, which itself is related to estrogen--about five times more women have thyroid abnormalities than men. Protein deficiency has been shown to cause the liver to fail to detoxify estrogen.[2]

Thyroid therapy normally increases assimilation of nutrients and stimulates synthesis of steroids though it lowers estrogen by promoting its metabolism in the liver. However, it increases metabolic activity systemically and can exacerbate a nutritional deficiency or a failure of steroidogenic tissue, so thyroid therapy should always be accompanied by nutritional optimization, and sometimes should be used with a steroid, preferably progesterone, to promote adrenal and other glandular function. Thyroid hormone is one of the essential factors for the conversion of cholesterol to progesterone. Progesterone promotes its own synthesis, and provides stability during adaptation.

Failure of the corpus luteum to produce adequate quantities of progesterone has been observed under various circumstances. A lack of vitamin A, and reduced circulation resulting from the prostaglandin F (resulting from estrogen action, or from uterine irritation) have been proposed as causes of luteal failure.[3] There is no doubt that vitamin A is

essential for the conversion of cholesterol to progesterone; its action can be competitively blocked by an excess of carotene. Luteolysis has been demonstrated to result from uterine irritation by a foreign object.[4] A uterine infection probably would have the same effect. (Penicillin has been found to relieve PMS, but the mechanism by which it increases progesterone and decreases estrogen and cortisone isn't clear, and probably involves endotoxin and the liver.) The IUD often causes the same kind of symptoms as the oral contraceptive pill--obesity, depression, etc., and this seems to be the result of progesterone deficiency from luteolysis. An excess of prolactin, which is now recognized as a sequel to use of the estrogen contraceptive pill (estrogen induces mitoses in the prolactin secreting pituitary cells) has been found to block progesterone synthesis. (Incidentally, Korenchevsky demonstrated 50 years ago that progesterone would cause regression of the estrogen-induced pituitary tumor.) Logically, since it isn't desirable to get pregnant during stress, the stress hormones ACTH and cortisone inhibit progesterone production. Lack of sunlight, short photoperiod, or staying indoors can probably contribute to a progesterone deficiency, since both progesterone and testosterone synthesis (the latter in men) are increased in summer.

Excessive production of estrogen can result from a large mass of adipose tissue, or from a sick liver.[5] Olfactory stimuli seem to increase estrogen production in female mice, sufficient to induce spontaneous abortion; pheromonal activation of estrogen synthesis in humans might be another possible cause of estrogen excess.[6] Stress is probably a common cause of elevated estrogen especially when it is prolonged enough to cause significant protein loss. Stress also stimulates liver estrogen synthesis.[7]

Excessive metabolism of progesterone, e.g., by its conversion to cortisol and other anti-stress hormones, can probably explain the increasingly common observations of "athlete's amenorrhea" and the development of excess facial hair in some women working under pressure (the alternate hormonal disturbance in stress appears to result in obesity).[8] Besides losing the effects of progesterone on the endometrium, pituitary gonadotrophins would be increased, and would drive various synthetic pathways at a higher rate, shifting the ratio of progesterone to other hormones, but I do not think the ovaries have been studied very much during ordinary stress. (In the stress of ionizing radiation, the ovaries produce excessive estrogen; with the stress of high levels of gonadotrophins, they tend to be cancerized.) While large doses of progesterone have been shown to have anti-stress effects without harming

the adrenals (and probably protecting them, by lowering the demand for adrenal hormones), large doses of estrogen were found to destroy certain areas of the adrenal cortex,' possibly in a reaction similar to luteolysis by estrogen.

4. Effects on development.

The three aspects of progesterone's biological generality discussed above disregard the time dimension, i.e., the effect of progesterone on the developing organism, which is, according to popular belief (deriving largely from its name), its only role. All of the points discussed above are relevant to the developing organism. For example, the fetus is highly dependent on glucose for growth--especially brain growth--and the oxygen supply and maternal metabolism both affect the glucose supply.

Animal studies have shown that an excess of estrogen, late in the gestation period, like oxygen deprivation and insulin-induced hypoglycemia, can cause brain damage, in the form of reduced cell number and brain weight. Stress during pregnancy can produce (apparently hormonal) defects in the offspring.[10] L. C. Strong showed transgenerational effects, apparently acting through hormone balance, in his cancer-prone (high-estrogen) mice which were treated with a liver extract (personal communication). Many older studies showed transgenerational effects which I believe can be traced to gestational hormonal modification, affecting metabolism at a variety of levels, including the liver. For example, feeding thymus to rats for several generations caused each generation to be more precocious development. The known transgenerational influences of starvation (Zamenhoff, et al.,[11] with rats, and more recently--1978--in human studies) are similar to the first generation effects of estrogen or hypoglycemia. I suspect that these effects are part of a general system of physiologically adjusting the metabolism of offspring to the availability of nutrients.

One of the physiological effects of progesterone is its support of the thymus (opposing the effects of glucocorticoids and sex steroids). In animal experiments (dog and rat), results so far indicate that the same types of precocity are induced by progesterone in these animals as were reported for thymus feeding.[12] Dalton's (and others') studies in humans show the same generalized precocity, except that in humans the intellectual precocity is the most noticeable. Rat studies show that increased prenatal exposure to progesterone increases rats' learning ability and the thickness of their cerebral cortex, but the scientific community's

lack of interest in these studies has been great. The owner of an afghan dog which gestated with extra progesterone commented that the dog had learned to retrieve a stick by watching another dog, while "normal" afghans dislike learning anything, especially retrieving (though they have a remarkable geographic memory).

Since the brain is dependent on glucose for its growth, the ability of progesterone to promote maternal fat metabolism and to spare glucose (elevating blood glucose) for fetal use is a logical part of its role as a gestational hormone. Other pregnancy hormones, including "placental lactogen," also promote elevation of blood glucose.

I propose that there is a "developmental trajectory" (analogous to a ballistic trajectory) which is set by the availability of biological energy during gestation, and that we could, by measuring brain weight and the ratio of brain weight to body weight during gestation, predict (given stable post-natal conditions for growth) such things as the ages at puberty, full growth, and approximate lifespan. Good prenatal conditions would increase the rate of development (IQ, etc.), but would delay maturity, allowing achievement of a higher level of development by the rapid and prolonged development of higher abilities, Bright people develop faster than dull people, but bright monkeys, at first, develop even faster (see chart). Our species characteristics would include setting the angle of our developmental trajectory, but the availability of biological energy during gestation determines the rate of ascent and the "altitude" achieved, as the explosive charge determines velocity and altitude of a ballistic trajectory. The effect of nutrition on brain size is known, as are the relationships between relative brain weight and life-span[13] and between rate of sexual development and life-span (Strong, and others), so what I am suggesting is simply that the amount of energy early in life might organize in an orderly way the timing of, and quality of, development throughout the rest of one's life.

A "Medical News" item in a 1976 issue of the J.A.M.A.' reports a study showing that progesterone probably plays a critical role in preventing rejection of the fetus by the mother. In reviewing the scientific and medical literature, I have found no side effects attributed to natural progesterone, except for sometimes altering the menstrual rhythm temporarily. Its use before and during pregnancy is associated with a reduced incidence of birth defects. (Since all of the drugs used to treat epilepsy are known to cause birth defects, it would certainly seem reasonable to take advantage of progesterone's anti-seizure effect, especially during pregnancy. It wouldn't be hard to ascribe liability for

the prenatal injury of thousands of people, to the pharmaceutical industry and regulatory agencies, who seem to conspire to keep this information away from the medical profession.) Some publications fail to distinguish between natural progesterone and the frequently harmful synthetic progestins.

Some recent animal studies are showing that prenatal progesterone increased body size, but even more, it increased brain size, for an improved brain/body ratio. First, it was established that good prenatal nutrition produced big, healthy babies with big heads, high intelligence, and good disposition. Then, experiments with rats showed that prenatal treatment with prolactin, which stimulates progesterone synthesis in that species (but blocks it in humans) produced large brained, intelligent animals (95th percentile for brain size and intelligence). It has since been established that a large brain is associated with a long life span.

Prenatal stress produces many minor physical "stigmata," and these have been shown to be associated with hyperactivity. Excess estrogen (and other toxins, and associated deficiencies) reduces brain size and damages behavior. (In animals, the effects of prenatal stress can be passed on to the third generation.)

Progesterone opposes estrogen, and promotes prenatal nutrition. Dalton's studies of babies whose mothers received natural progesterone showed greatly improved intelligence.[15] Another researcher, deliberately attempting to improve intelligence (Dalton simply intended to treat PMS and toxemia of pregnancy) claims "his" babies have a 200 IQ. Other investigators find that progesterone babies have strong, serene, independent characters.

There is increasing recognition that prenatal conditions, whether good or bad, can be passed on to at least one subsequent generation. A reduced ability to produce progesterone is probably often a consequence of prenatal stress, which can lead to pregnancy difficulties, and another stress-injured generation. I feel that progesterone can reverse the trend toward more hyperactive and brain damaged children, and that it can make a great contribution to the mental and physical health of future generations.

5. Progesterone and magnesium.

In considering the general biological effects of progesterone, it is interesting to compare some of its functions with those of the magnesium ion, and to contrast them with the effects of calcium and estrogen.[16]

Uptake of magnesium is promoted by thyroid, and progesterone promotes thyroid function, while tending to block the stress-induced loss of magnesium. Estrogen increases the uptake of calcium.

Blood clotting (especially excessive): promoted by estrogen and calcium, restrained by magnesium and progesterone.

Blood sugar: depressed by estrogen and calcium, sustained by progesterone and magnesium.

Kidney function, diuresis: promoted by magnesium and progesterone, decreased by estrogen; excess calcium appears to damage kidneys.

Histamine release: decreased by progesterone and magnesium, increased by estrogen, and calcium probably facilitates it.

Phagocytosis and other immune functions: increased by magnesium and progesterone, decreased by estrogen; calcium is involved in triggering thymocyte death.

Glucagon: magnesium promotes, calcium inhibits.

Insulin: magnesium and progesterone restrain its secretion, calcium and estrogen promote it.

Vascular spasms: decreased by progesterone and magnesium, promoted by estrogen and calcium.

Vascular tone: stabilized by progesterone and magnesium, often decreased by estrogen, possibly acting through histamine, leading to the tendency of blood to pool in the legs. Estrogen is believed to contribute to varicose veins.

Nerve stabilization or anesthesia: magnesium and progesterone are anesthetic in very large amounis and are protective inhibitors in physiological amounts. Calcium cpposes the anesthetic effect of magnesium, and is always involved in toxic or excitotoxic cell death. Estrogen even in physiological amounts is nerve-exciting, and eventually contributes to the excitotoxic death of brain cells.

Hans Selye demonstrated that calcification of various tissues (kidneys, blood vessels, and skin, for example) could be produced by interactions of stress and hormones. Selye and his associates, and F. Z. Meerson's group in Russia, have demonstrated numerous toxic interactions of iron, calcium, and unsaturated fats. Magnesium, vitamin E, thyroid, and progesterone tend to protect against those toxic effects.

REFERENCES

1. Katharina Dalton, The Premenstrual Syndrome and Progesterone Therapy, Year Book Medical Publishers, Inc., Chicago, 1977.
2. Alexander Lipschutz, Steroid Hormones and Tumors, Williams and Wilkins Company, Baltimore, 1950.
3. Constance Martin, Texthook of Endocrine Physiology, Oxford University Press, 1976.
4. S. N. Chatterjee, et al., "Effect of intrauterine contraceptive suture on corpora lutea of Guinea pigs," Indian Journal of Experimental Biology 9: 105, 1971.
5. J. M. Grodin, et al., "Origin of estrogen in the menopause," J. of Clinical Endocrinology and Metabolism 36(2): 205-214, 1973.
6. C. D. Turner and J: T. Bagnara, General Endocrinology, Saunders Publishing Co., 1971.
7. C. Martin, op. cit. page 58.
8. Mother Jones Magazine, 1978.
9. D. J. Kimeldorf and A. L.. Soderwall, "Changes in the adrenal cortical zones by ovarian hormones," Endocrinology 41(1): 21-26.
10. L. R. Herrenkohl, Psychology Department, Temple University.
11. S. Z.amenhoff, et al., "DNA (cell number) and protein in neonatal rat brain: alteration by timing of maternal dietary protein restriction," J. of Nutrition 101: 1265-1270, 1971.
12. Ciba Foundation Symposium, The Thymus, Experimental and Clinical Studies, Melbourne, 1975.
13. G. A. Sacher, "Molecular versus systemic theories on the genesis of aging," Experimental Gerontology 3: 265, 1968.
14. J. of the Amer. Medical Assoc. 236(8): 905, August 23, 1976.
15. K. Dalton, op. cit., chapter XVII.
16. Hans Selye, Encyclopedia of Endocrinology vols. 1-4, Franks Publishing Co., Montreal, 1943.
17. R. Peat, Nutrition for Women, Blake College, Eugene, Oregon, 1978.

13

DOSAGE OF PROGESTERONE

Since progesterone has none of the harmful side effects of other hormones (except for alteration of the menstrual cycle if it is taken at the wrong time of month), the basic procedure should be to use it in sufficient quantity to make the symptoms disappear, and to time its use so that menstrual cycles are not disrupted. This normally means using it only between ovulation and menstruation unless symptoms are sufficiently serious that a missed period is not important. The basic idea of giving enough to stop the symptoms can be refined by some information on a few of the factors that condition the need for progesterone.

If a person has an enlarged thyroid gland, progesterone promotes secretion and unloading of the stored "colloid," and can bring on a temporary hyperthyroid state. This is a corrective process, and in itself isn't harmful. A thyroid supplement should be used to shrink the goiter before progesterone is given. Normal amounts of progesterone facilitate thyroid secretion, while a deficiency, with unopposed estrogen, causes the thyroid to enlarge. The production of euphoria has been mentioned as a side effect, but I think euphoria is simply an indication of a good physiological state. Very large doses that are given in vitamin E solution, allowing complete absorption, can reach the level that is sometimes achieved late in pregnancy, producing both euphoria and a degree of anesthesia. To avoid unexpected anesthesia, the correct dose should be determined by taking about 10 mg. at a time, allowing it to spread into the membranes of the mouth, and repeating the dose after 10 minutes until the symptoms are controlled.

An excessive estrogen/progesterone ratio is more generally involved in producing or aggravating symptoms than either a simple excess of estrogen or a deficiency of progesterone, but even this ratio is conditioned by other factors, including age, diet, other steroids, thyroid, and other hormones. The relative estrogen excess seems to act by producing tissue hypoxia (as reported in my dissertation, University of Oregon, 1972), and this is the result of changes induced by estrogen in alveolar diffusion, peripheral vascular changes, and intracellular oxygen wastage.

Hypoxia in turn produces edema (as can be observed in the cornea when it is deprived of oxygen, as by a contact lens) and hypoglycemia (e.g., diminished ATP acts like insulin), because glycolysis must increase

greatly for even a small deficiency of oxygen. Elevated blood lactic acid is one sign of tissue hypoxia. Edema, hypoglycemia, and lactic acidemia can also be produced by other "respiratory" defects, including hypothyroidism, in which the tissue does not use enough oxygen. In hypoxia, the skin will be bluer (in thin places, such as around the eyes), than when low oxygen consumption is the main problem. Low thyroid is one cause of excess estrogen, and when high estrogen is combined with low thyroid, the skin looks relatively bloodless.

Symptoms in cycling women are most common around ovulation and in the premenstrual week, when the estrogen/progesterone ratio is normally highest. At puberty, in the early twenties and in the late thirties and menopause are the ages when the ratio is most often disturbed--and these are also the ages when thyroid disorders are commonest in women.

The individual who suffers from one aspect of the progesterone (and/or thyroid) deficiency will tend to develop other problems at different times. With cyclic depressions or migraine headaches at age 22, there will possibly be breast disease later, and often there will be problems with pregnancy. These people with a history of severe symptoms are the ones most likely to have severe problems around menopause. Prenatal exposure to poorly balanced hormones seems to predispose the child to later hormone problems.

Excess stress (which can block progesterone synthesis and elevate estrogen) may bring on symptoms in someone who never had them. Spending a summer in Alaska, with an unusually long day, may relieve the symptoms of a chronic sufferer. Dark cloudy winters in England or the Pacific Northwest are powerful stressors, and cause lower production of progesterone in women, and testosterone in men. Toxins can produce similar symptoms, as can nutritional deficiencies. A very common cause of an estrogen excess is a dietary protein deficiency--the liver simply cannot detoxify estrogen when it is under-nourished.

With a diet high in protein (e.g., 70-100 grams per day, including eggs) and vitamin A (not carotene), I have found that the dose of progesterone can be reduced each month. Using thyroid will usually reduce the amount of progesterone needed. Occasionally, a woman won't feel any effect even from 100 mg. of progesterone; I think this indicates that they need to use thyroid and diet, to normalize their estrogen, prolactin, and cortisol.

Progesterone stimulates the ovaries and adrenals to produce progesterone, and it also activates the thyroid, so one dose can sometimes have prolonged effects. It shouldn't be necessary to keep using

progesterone indefinitely, unless the ovaries have been removed. In slender post-menopausal women, 10 mg. per day is usually enough to prevent progesterone deficiency symptoms.

In a 10% solution of progesterone in vitamin E, one drop contains about three milligrams of progesterone. Normally, the body produces 10 to 20 milligrams per day. A dose of 3 or 4 drops usually brings the blood levels up to the normal range, but this dose can be repeated several times during the day if it is needed to control symptoms.

For general purposes, it is most economical and effective to take progesterone dissolved in vitamin E orally, for example taking a few drops on the lips and tongue, or rubbing it into the gums. (It is good for the general health of the gums.) These membranes are very thin, and the progesterone quickly enters the blood. When it is swallowed, the vitamin E allows it to be absorbed through the walls of the stomach and intestine, and it can be assimilated along with food, in the chylomicrons, permitting it to circulate in the blood to all of the organs before being processed by the liver. These droplets are smaller than red blood cells, and some physicians seem to forget that red blood cells pass freely through the liver.

For the topical treatment of sun damaged skin, or acne, wrinkles, etc., the oil can be applied directly to the affected area.

For topical treatment of arthritis, osteoporosis, tendinitis, bursitis, or varicose veins, to speed absorption it is best to apply a few drops of olive oil to the area, and then to rub the progesterone-vitamin E solution into and around the affected area. Some of the progesterone will be absorbed systemically, but the highest concentration is sustained in the local area, helping to correct the problem locally.

REFERENCES

1. Katharina Dalton, Premenstrual Syndrome and Progesterone Therapy, Year Book Medical Publishers, Inc., Chicago, 1977.
2. Alexander Lipschutz, Steroid Hormones and Tumors, Williams and Wilkens Company, Baltimore, 1950.
3. R. F. Peat, Nutrition for Women, International College, 1992.
4. R. F. Peat, Age Related Oxidative Changes in the Hamster Uterus, University of Oregon thesis, Eugene, Oregon, 1972.

14

AN EFFICIENT ORAL THERAPY

As early as 1912, Armour & Co. sold desiccated corpus luteum for use in cases of ovarian failure, and said that it prevented "nervous symptoms accompanying" menstrual abnormalities.' It was also used to treat obesity and other physical conditions sometimes associated with "ovarian deficiency."

In early reports on the use of synthetic progestins, they were praised as being active when taken orally, unlike natural progesterone, which was said to be "destroyed in the stomach." Although I have looked carefully, I have never found the study which demonstrated that progesterone was inactive when taken orally. No source was cited for the claim. I am convinced that the idea was invented by the promoters of the patented new compounds. The most "popular" (i.e., profitable) of the synthetic "progestins," medroxyprogesterone acetate, is not a progestagen, causes cancer, impairs circulation to the heart, causes birth defects, and suppresses the production of progesterone. I feel that the involvement of the various government agencies in the promotion of this poison, and the suppression of information about natural progesterone, has been conspiratorial and deliberately criminal, and those involved should be identified as criminals.

When fats are eaten, they are almost 100% absorbed by the small intestine. They break up in the intestine into microscopic droplets, called chylomicrons, and reach the general circulation in that form. If progesterone is perfectly dissolved in oil, it is absorbed in that way, and is not immediately exposed to enzymes in the wall of the intestine or in the liver. People often speak of "avoiding the liver on the first pass," but in fact chylomicrons pass through the liver many times before they are destroyed; after an hour, at least 10% of the chylomicrons are still circulating.

While dissolved progesterone circulates in the chylomicrons, it will be distributed to the various tissues. Unlike other steroid hormones, progesterone tends to become concentrated inside cells. Its concentration in red blood cells is twice as high as its concentration in serum,[2] and the brain contains a still higher concentration. These intracellular reservoirs of progesterone prolong the elevated blood levels, so that the observed hormone level after a single oral dose is much more stable than are the triglyceride levels after a fatty meal. The perfect absorption, and the

prolonged action make the oil-dissolved oral progesterone much more efficient and economical than injected or suppository forms.

Since progesterone tends to promote its own synthesis, it shouldn't be necessary to keep using it, unless the ovaries have been removed, or the thyroid or cholesterol level is very low, or aging has damaged their ability to convert cholesterol to progesterone. While an excess of carotene can inhibit progesterone synthesis, a carrot salad (grated carrots, vinegar, coconut oil, and salt) can often help to normalize progesterone, apparently by protecting against intestinal absorption of bacterial endotoxin, and by helping to reduce the reabsorption of estrogen which has been excreted in the bile.

The beneficial hormonal effects that have been seen during antibiotic therapy (raising progesterone while lowering cortisol and estrogen) can be achieved safely with the carrot salad in most cases, without the possible toxic effects of the antibiotics.

REFERENCES

1. New and Non-Official Remedies, 1912, Supplement, pages 158, 160.

2. E. Mulder, et al., "Metabolism of free and conjugated steroids by intact and hacmolysed mammalian erythrocytes," Biochem. Biophys. Acta 260: 290-297, 1972.

15

TRANSDERMAL PROGESTERONE FOR PREMENSTRUAL SYNDROME

For many years, Katharina Dalton studied the use of injected progesterone as therapy for the premenstrual syndrome. A typical patient required several progesterone injections per month, more or less permanently. While this was feasible in her practice in London, it is not comfortable or convenient, in some cases leads to serious reactions at the injection sites, and in the United States would be too expensive for general use. When the syndrome is disabling, even the burden of frequent and expensive injections was usually seen as a welcome alternative. However, a less expensive and more pleasant form of administration could make the therapy available to millions of women who are now disabled for one or more days each month. A satisfactory alternative to injections for many women is to use a dissolved form of progesterone in a vitamin E base for transdermal use. (This form is especially suitable for treating localized problems, including arthritis, varicose veins, and facial or body hair that has developed from excess androgens.)

After animal experiments revealed that progesterone in vegetable oil was absorbed effectively through the skin, in 1977 I began experiments with women who suffered with the premenstrual syndrome. The first three were completely disabled by epilepsy, suicidal depression, and optical neuritis, and they all had dramatic, immediate recoveries.

The effectiveness of the transdermal absorption route of administration varies with the individual, but compares favorably with injections in the amount assimilated. (Neither method is as economical as oral use.) Thickness of skin or degree of circulation in the skin (these can be very abnormal in hypothyroidism, for example) and the amount of adipose tissue apparently make some difference in the rate of absorption and response. When a small daily dose (e.g., 5 or 10 mg.) is sufficient, this can be taken as about 1/8 teaspoonful of a 10 percent solution rubbed into the skin, for example on the front of the neck, or the inside of the arms, where the skin is thin, after having spread a few drops of olive oil or coconut oil over the skin to make the viscous solution spread more easily. For large doses, the appropriate amount can be applied to a larger area of skin after a hot bath, once or twice a day if necessary.

Although progesterone will dissolve in warm vegetable oil, when the oil cools nearly all of the progesterone crystallizes out of solution. This is why vitamin E is necessary as the solvent, for transdermal use as well as oral use.

Over the years I have seen transdermal progesterone used in hundreds of women suffering from the full range of perimenstrual symptoms, including migraine, acne, depression, mastalgia, edema, and lethargy. Nearly all the women, applying the lotion themselves, are able to find the appropriate dosage for controlling their symptoms.

Often thyroid therapy or a change in diet or light-exposure or amount of activity is necessary for complete relief from symptoms. Progesterone therapy can offer quick relief to many people whose real problem is diet-induced hypothyroidism, but it shouldn't be considered as a substitute for the correct diet, or for thyroid supplementation when that is needed.

It is necessary to be clear in describing the amounts that can be used, while leaving it up to the patient to find the dose which controls her symptoms, because some women have an exaggerated idea of the power of a "hormone." The behind-the-ear scopolamine patch has had its influence on the idea of transdermal therapy, and many women have tried just touching the oil to their wrists.

It is sometimes helpful for the physician to administer one dose (sometimes using a twenty percent solution) in the office, and to wait 30 or 40 minutes to make sure that it was large enough to take effect. Once having felt sudden relief from the correct dose, it is easier for the patient to understand how it should be used. (This trial dose in the office is a good idea when using oral doses, too, but for an additional reason, namely, to watch for signs of an overdose. It is probably impossible to overdose using the transdermal method.)

Many of the solvents which hold progesterone stably in a concentrated solution are highly allergenic. Injectable progesterone in oil could be used transdermally except for this problem. If necessary, micropulverized progesterone can be dissolved in warm olive oil for patients who react to other materials, or who have a history of skin allergies. Progesterone usually corrects such allergies, but some women have found that taking it orally in oil was preferable.

The French have two standard topical progesterone preparations that have been used for many years for breast pain and facial hair.

Besides the slow and steady absorption permitted by the transdermal method, and the fact that many women with PMS are

exaggeratedly sensitive to ingesting anything that tastes odd, there is a special set of problems that make the topical use of progesterone very valuable. As I mentioned above, the French advocate topical progesterone for mastalgia, but I think thyroid supplementation is the more general solution to that problem. But in the case of bursitis, arthritis, tendonitis, "fibrositis," and varicose veins, it is possible to achieve a higher local concentration with transdermal use, than can conveniently be achieved by oral administration. (Though the two can be combined usefully.)

As with oral progesterone, it is important to correct a goiter before using transdermal progesterone, because progesterone acts directly on the thyroid gland to facilite its secretion, and the sudden correction of thyroid function can lead to a hyperthyroid state, as the goiter unloads the stored hormone.

Progesterone is so insoluble in water that it can penetrate tissue to a remarkable depth, before a significant amount of it is carried away in the body fluids. Tissue proteins have a great affinity for oils. Failure to consider these points has made many people doubt that topical treatment could affect the underlying tissues.

16

THE PROGESTERONE DECEPTIONS

In the 1930s, it was demonstrated that estrogen, even in small doses, produced abortions, and that when it is given early enough, even a very small dose will prevent implantation of the fertilized embryo. Progesterone was known, by the early 1940s, to protect against the many toxic effects of estrogen, including abortion, but it was also known as nature's contraceptive, since it prevents pregnancy without harmful side-effects, by different mechanisms, including prevention of sperm entry into the uterus. That is, progesterone prevents the miscarriages which result from excess estrogen,(1,2) but if used before intercourse, it prevents conception, and thus is a true contraceptive, while estrogen is an abortifacient, not a contraceptive.

In the 1950s, there was a search for chemicals which would prevent ovulation. According to Carl Djerassi,(3) drug companies were extremely reluctant to risk a religious backlash against their other products, and so hesitated to market contraceptives. Obviously, the induction of monthly abortions would have been even harder to sell.

According to Djerassi,(3) "Until the middle 1940s it was assumed that progesterone's biological activity was extremely specific and that almost any alteration of the molecule would diminish or abolish its activity." This would obviously discourage interest from the drug companies, who could patent a substance which they had chemically modified, but could not patent a simple natural substance. However, many substances--even non-steroidal chemicals--turned out to have estrogenic action.(4)

By 1942, Hans Selye had demonstrated that natural steroids retain their activity when administered orally. But every drug company with a steroid patent had an obvious interest in having the public believe that there is a reason that the natural steroids cannot be conveniently used. The doctrine that natural steroids are destroyed by stomach acid appeared, was promoted, and was accepted. In the manufacture of progesterone, the precursor steroid is boiled in hydrochloric acid to free it from its glucose residue; no one seriously believed that stomach acid hurts progesterone, except the public.

The real issue is solubility. Hydrocortisone is reasonably soluble in water, but progesterone is extremely insoluble in water, and, though it is

vastly more soluble in vegetable oil than in water, it does not stay in solution at room temperature even at the low concentration of 1 part in 1000 parts of vegetable oil.

When people speak of an allergy to progesterone (or even to penicillin) they generally are not aware of the presence of a very toxic solvent.(5) A few years ago, progesterone was often sold dissolved in benzyl benzoate; the Physician's Desk Reference warned of possible allergic reaction to progesterone. Now, it is supposedly sold dissolved in vegetable oil, with about 10% benzyl alcohol as a bacteriostatic agent. Bacteriostatic water contains 0.9% to 1.9% benzyl alcohol, and can irreversibly harm nerves.(6,7) Awareness of benzyl alcohol's toxicity goes back to 1918 at least; it was proposed as an effective insecticide, and was found to be toxic to many animal systems. The safe systemic dose(7) is exceeded with an injection of 150 mg. of progesterone, yet the local concentration is far higher. It can cause a severe reaction even when used at a lower concentration, in bacteriostatic water.(5)

Other alcohols, including ethanol, have been used as solvents, but since they (ethanol even more than benzyl alcohol) have an affinity for water, the solution decomposes in contact with tissue water.

In spite of the toxicity of the vehicle, several beneficial effects can be obtained with injected progesterone, in serious conditions such as epilepsy or cancer of the breast or uterus. Many researchers have commented on the very obvious difficulty of giving very large amounts of progesterone.(8) My comparisons of oral progesterone in tocopherol with other forms and methods of administration show a roughly similar efficiency for oral and injected progesterone, and about 1/20 the effect for suppositories. Crystals of progesterone are visible in the suppositories I have examined, and this material is obviously wasted.

An old theory of vitamin E's mechanism of action in improving fertility was that it spares progesterone.(9) It is established that some of the effects of vitamin E and progesterone are similar; for example, both prevent oxygen waste and appear to improve mitochondrial coupling of phosphorylation with respiration. I suspected that if they actually both work at the same mitochondrial site, then they must have a high mutual solubility. Knowing the long-standing problem of administering large doses of progesterone without a toxic solvent, I applied for and was granted a patent for the composition of progesterone in tocopherol. One of my reasons for publishing in the form of patents is that I have had many years of experience in having my discoveries taken up by others without acknowledgment. My dissertation research, which established

that an estrogen excess kills the embryo by suffocation, and that progesterone protects the embryo by promoting the delivery of both oxygen and glucose, didn't strike a responsive chord in the journals which are heavily influenced by funds from the drug industry.

According to a consultant for a major medical journal, the idea '..of dissolving progesterone, a fat soluble steroid hormone, in vitamin E which is then incorporated into chylomicrons absorbed via the lymphatics, and thus avoids the liver on the so called first pass... ...is so simple it is amazing that the pharmaceutical companies have not jumped on it."

In the powder form, direct and intimate contact with a mucous membrane allows lipid phase to lipid phase transfer of progesterone molecules. Instead of by-passing the liver, much of the progesterone is picked up in the portal circulation, where a major part of it is glucuronidated, and made water soluble for prompt excretion. Since this glucuronide form cross-reacts to some extent with ordinary progesterone in the assay process, and since 50% of the ordinary free progesterone is carried inside the red blood cells,(10, 11) and 50% is associated with proteins in the plasma, while the glucuronide hardly enters the red blood cells at all, it is better to judge by clinical efficacy when comparing different oral forms. My comparisons show several times higher potency in the tocopherol composition than in powder form.

Since progesterone's use as a drug antedates the 1938 law requiring special federal approval, its legal status is similar to that of thyroid hormone. Unfortunately, for both thyroid and progesterone, there is a tendency to cut corners for the sake of a bigger profit margin.

For example, steroid acetates are generally a little cheaper than the simple natural steroid. Some people assume that an acetate or butyrate can be substituted for the steroid itself. This can cause dangerous reactions.

Medroxyprogesterone acetate is considered a progestin (though it is not supportive of gestation), because it modifies the uterus in approximately the way progesterone does, but it is luteolytic, and lowers the ovaries' production of progesterone while progesterone itself has a positive effect on the corpus luteum, stimulating progesterone synthesis. Defining "progestin" in a narrow way allows many synthetics to be sold as progestagens, though some of them are strongly estrogenic, allowing them to function as contraceptives--it is odd that contraceptives and agents which suppress progesterone synthesis should be officially called "supporters of pregnancy." It is probably partly the acetate group in the medroxyprogesterone acetate molecule which makes it bind firmly to

receptors, yet causes it to block the enzymes which would normally be involved in progesterone metabolism. (I think testosterone, even, might be a safer progestin than medroxyprogesterone acetate.) Pregnenolone acetate similarly blocks the enzymes which normally metabolize pregnenolone.(12) In aspirin, it has been found that it is the acetyl group which (by a free radical action) blocks an enzyme involved in prostaglandin synthesis.

If the category called "progestogens" or "progestins" is to be defined on the basis of a single tissue reaction, then it is possible to classify progesterone with the toxic synthetic substances, but then it becomes highly deceptive to imply that progesterone is just a progestin, or that it has any of the other properties of the toxic synthetics, but this continues to be done. The warnings about "progestins causing birth defects," for example, cause epileptic women to use conventional anti-seizure drugs (all of which cause birth defects) during pregnancy, and to avoid natural progesterone, which generally could control their seizures. Thus, a false message attached to progesterone creates precisely the harm it claims to want to prevent. In my communications with the regulatory agencies, I have concluded that their attempts to deceive are too blatant to ascribe to incompetency. Whether it's the Forest Service or the FDA, the principle is the same: the regulatory agencies have been captured by the regulated industries.

Another place to cut costs is in the tocopherol. Tocopherol acetate does have vitamin E activity, but since it is only about half as efficiently absorbed as the simple tocopherol,(13) it is a mistake to save a few dollars an ounce, at the expense of losing half of the therapeutic effect. People who have compared natural progesterone in natural tocopherols with other compositions have insisted that the other compositions must not contain progesterone.

The taste of natural vitamin E is stronger than that of the synthetic forms, but since the mixture is absorbed by any tissue it contacts, including various parts of the bowel, it can be taken in a capsule. If a small amount of olive oil is used with it, absorption through the skin is very rapid. Many women use it vaginally, spread onto a diaphragm, to hold it in contact with the membranes. The efficiency of absorption by all routes is so high that patients should be warned against its anesthetic effect, until their dosage requirement is known approximately. Some physicians prefer concentrations higher than 10%, but the risk of accidental drunkenness or anesthesia is higher with the stronger solutions.

It is an indication of the tocopherol solution's high availability that medical researchers such as Roy Hertz,(8) who thought they were administering maximal doses by combining injections with suppositories, never mentioned the problem of an anesthetic effect from an overdose. Similarly, it is evidence of the extremely poor availability of the micropulverized progesterone that the researchers have administered hundreds of milligrams per day, without mentioning the symptoms of an overdose. Because of the difficulties involved in scientifically studying the clinical effectiveness of various formulations, I think the most practical way of evaluating the effectiveness of different progesterone formulations is to measure the amount extractable from the red blood cells, a few hours after the peak serum level has been reached. This will reasonably reflect the amounts reaching brain cells, adrenal glands, and the various other cells on which progesterone has its therapeutic action.

REFERENCES

1. A. A. Gidley-Baird, et al., Failure of' implantation in human in vitro fertilization and embryo transfer patients: the effects of altered progesterone/estrogen ratios in humans and mice, Fertility and Sterility 45(1): 69-74, 1986.

2. J. L.. Yovich, et al., Early luteal serum progesterone concentrations are higher in pregnancy cycles, Fertility and Sterility 44(1): 185-189, 1985.

3. C. Djerassi, The making of the pill, Science 84: 127-129, 1984.

4. R. Kcht, Les Glandes Endocrines, Presses Universitaires de France. Paris. 1952.

S. J. A. Grant, et al., New England Journal of Medicine 306(2): 108, 1982, Unsuspected benzyl alcohol hypersensitivity.

6. T. E. Feasby, et al., Neurotoxicity of bacteriostatic water, New England Journal of Medicine 308(6): 966-7, 1983.

7. E. T. Kimura, et al., Parenteral toxicity studies with benzyl alcobol,Toxicol Appl Pharmacol 18: 60-68, 1971.

8. A. White, editor, Symposium on Steroids in Experimental and Clinical Practice, The Blakiston Co., N.Y., 1951, p. 401.

9. A. Fraschini, I Metodo Biologico di Rinvigorimento, Edizioni Minerva Medica, Milan. 1954.

10. E. Mulder, et al., Metabolism of free and conjugated steroids by intact and haemolysed mammalian erythrocytes, Biochim. Biophys. Acta 263: 290-297, 1972

11. M. Holzbauer, The association of steroids with blood cells in vivo, J. of Steroid Biochemistry 3: 579-592, 1972.

12. S. Lieberman, et al., A heuristic proposal for understanding steroidogenic processes, Endocrine Reviews 5(1): 128-148. 1984.

13. L. J. Machlin and E. Gabriel, Kinetics of tissue alpha-tocopherol uptake and depletion, following administration of high levels of vitamin E, p. 48 in Annals of the N.Y. Academy of Science 393, B. Lubin and L. J. Machlin, editors, New York, 1982.

17

PRESERVING THE TISSUES: Osteoporosis and the Skin

While I was working on my dissertation, around 1970, the opposition between stress-injury and energetic resistance became increasingly apparent to me. Estrogen (like X-irradiation, aging, or trauma) called up the cortisone response, and other factors, especially progesterone and thyroid, allowed the organism to restore itself in ways that neutralized the cortisone response. Therefore, when I saw that the estrogen-like processes became more and more dominant after middle-age, it was natural to think of progesterone and thyroid as the main factors that should be replaced. This is why in 1975 I described menopause as resembling Cushing's syndrome, which is caused by a toxic excess of cortisol. Osteoporosis, hot flashes, insomnia, and mood disorders are caused by cortisol, and so I tried using progesterone and thyroid--the anticortisol factors--for those conditions. The results were so profound that I began to study the general implications for health, and to try to understand the mechanisms so that prevention might replace treatment.

Several people who had been abandoned as hopeless terminal cases--with "epileptic brain damage," inflammatory degeneration of hip and thigh bones, diabetic gangrene, senility--recovered their health within a few days, and went on with their lives in productive and pleasant ways.

I knew that intense and frequent epileptic seizures cause the exhaustion and death of brain cells. A 52 year old woman had been having seizures for over 15 years. Her neurologist gave her a mental exam every year, and considered her to be hopelessly demented. After using progesterone for a few days, she functioned normally. After about a year, she returned to graduate school at the University of Oregon, and got a master's degree with straight As.

A 79 year old woman had had artificial hip joints implanted when she was in her fifties, but her bones had weakened to the point that no further surgical repair was possible. She settled her affairs, and didn't expect to get out of bed again. After using progesterone topically and orally, after two weeks she was able to get out of bed and return to her

normal activities. At the age of 85, she went camping on the beach in Mexico, and travelled to Scotland.

An 82 year old man was agitated and confused, and was apparently suffering from senile dementia. After being given progesterone and pregnenolone for a few days, his mind became clear, and he returned to work on scientific projects he had begun decades earlier. A squamous cell cancer on his lip regressed, and never bothered him again.

A 60 year old woman had "osteoporosis" (shrinking) of the jaw bone that was causing her teeth to loosen. After applying progesterone solution to her gums daily for a few months, her teeth became firm.

When bones had almost disappeared from X-rays, yet became firm and functional within a few weeks, it was obvious that regeneration had taken place. But when brains went in a very short time from imbecility or idiocy to intellectual productivity, I could only guess what might be happening to the cells. But I got a useful perspective on the mechanism of progesterone's action by seeing some recoveries that were even faster than those I have mentioned.

In animal experiments, I knew that estrogen causes cells to take up water within a few minutes after it reaches the tissue, and that this is at least partly the result of its interfering with the availability of oxygen. Within 40 minutes of administering a large dose of estrogen, the lungs become extremely inefficient at oxygenating the blood. This involves a sudden thickening of the alveolar membranes and the walls of capillaries, simply by taking up water. So, when I saw bulging veins disappear a few minutes after women took progesterone, along with a sudden lifting of extreme depression, 1 guessed that their circulation had become more efficient, and that better oxygenation had changed their mood.

Then, I repeatedly saw physical changes in other people that were visible within an hour, and that involved a sudden movement of water out of edematous tissues. In many people with damaged joint cartilage (confirmed by various types of examination, including arthroscopy), the joints became mobile in an hour, and by the next day, the defect no longer existed. A man who was purple from emphysema changed color within a few hours, and within a few days was going to work. The bulging eyes of exophthalmic Graves' disease receded into their sockets noticeably within an hour, and were normal the next day. Simply improving the circulation couldn't have done those things. Opposing estrogen's edema-promoting action was involved, but I couldn't imagine any mechanism that could

explain such rapid movement of water from the swollen tissue into the blood stream.

One of estrogen's effects is to lower the amount of albumin in the blood. Estrogen causes the liver to synthesize less albumin, partly by causing the messenger RNA to be destabilized and degraded. (Iron can have some similar effects on liver RNA.) When there isn't enough albumin in the blood, water moves from the blood into the tissues. Albumin binds oily substances, and its conformation seems to be opened when it binds them. Progesterone is known to adsorb strongly to proteins--it has been called a "cardinal adsorbant," meaning that it can bind in ways that cause the protein's adsorptive capacity to change I believe that progesterone and pregnenolone oppose estrogen in many ways, but the amazing speed with which they can cause major structural changes in the soft tissues convinces me that one of their first sites of action is the albumin molecule, causing its conformation to open in such a way that it is able to more strongly bind water molecules. This physical change in albumin would change the blood's osmotic/oncotic pressure, causing water to flow into capillaries. As the edema is reduced, oxygenation is more efficient, because the pathway for oxygen diffusion becomes shorter.

Albumin has been described as a first line of defense against toxins, since it binds them until the liver is able to degrade them chemically. Progesterone, pregnenolone, and cholesterol are known to increase the organism's resistance to a great variety of toxins. (Selye coined the name "catatoxic steroids" to describe steroids of this type.) If these steroids bind to albumin in a way that opens the protein to increase its binding capacity, that single process could explain the "catatoxic" effect, as well as the anti-edema effect.

When the blood is unable to retain its normal amount of water because of insufficient albumin/sodium, the blood volume is reduced as the tissues become water-logged. This causes the hematocrit (the proportion of cells in a volume of blood) to rise, and this increased packing of red blood cells causes the blood to become more viscous. (Knisely studied this phenomenon in a great variety of sickness.) Increased viscosity and slower flow decreases the bloods ability to deliver oxygen and nutrients to the tissues, including the blood vessel walls, modifying their tone. Slower flow, even without any changes in the fibrin-fibrinogen system itself, increases the formation of clots.

This description of progesterone's immediate action is intended to take some of the mystery out of its dramatic effects, but it isn't intended

to argue against any of its actions within cells. It serves to give a general picture of how progesterone can systematically reduce stress and its harmful consequences, just by making blood circulation more efficient.

At first I most often used progesterone dissolved in olive oil to stop the stress-induced processes of deterioration, with a high protein diet to support the processes of repair. Now, I have added a variety of other techniques, including the use of progesterone in vitamin E.

There always seems to be a rough balance between tissue regeneration and tissue degeneration, with growth and repair occurring when the equilibrium shifts in one direction, and with atrophy or degeneration occurring when the balance shifts in the other direction. If we can understand the mechanisms of atrophy, and how to retard or to block tissue destruction, then we can restore the balance to a degree which might allow regeneration to occur, even if we don't clearly understand the mechanisms of growth.

Skin and bones are such different types of tissue that it will be useful to start with them, because if we can see similar processes of degeneration or regeneration in them, then the chances are good that the same processes will occur in other tissues too. Bone is a relatively stable tissuc, while skin is a tissue whose cells divide rapidly.

It is common medical knowledge that cortisone and related glucocorticoid-type hormones cause skin to atrophy, becoming thinner. Using topical applications of a synthetic derivative of cortisone, C. M. Papa and A M. Kligman showed that the atrophy extended to the pigment cells, reducing their size and eliminating most of their dendritic branches. They also found that estrogen suppressed sweating and hair growth. The other steroids they tested, progesterone, testosterone, and pregnenolone, acted in the opposite direction, making aged and atrophied skin thicker and more regular. They also made the pigment cells larger, and increased their branching.

Since these hormones were already known to have protective actions against cortisone and estrogen, these results were not too surprising, though they did directly contradict the claims of people who made estrogen-containing cosmetics.

Since progesterone and pregnenolone do not cause healthy, young skin to thicken, their effect in damaged skin is probably partly to replace the deficiency of that type of steroid which occurs with aging, and to offset the damaging effects of the catabolic hormones, whose influence does not decrease with age.[2]

Many years ago it was found that in old age a woman's estrogens were increased relative to the 17-keto steroids adrenal androgens. Later, it was found that the conversion of androgen to estrogen increases with age in both men and women, and that this occurs largely in fat cells. Several years ago, P. K. Siiteri found that low thyroid modified the enzymes of fat cells in a way that would tend to increase the conversion of androgen to estrogen. More recently, it was found that adding progesterone to the enzymes had the opposite effect of aging and hypothyroidism, protecting the androgen from conversion to estrogen. These researchers (C. J. Newton and colleagues, of London) concluded that the decreased output of progesterone after the menopause might account for the increased production of estrogen.[3] Since progesterone declines in aging men, too, this could account for the same process in men.[2]

Vitamin A's effect on the skin opposes that of estrogen.' There are several mechanisms that could account for this. Vitamin A is used in the formation of steroids, and since the skin is a major site of steroid metabolism, vitamin A might help to maintain the level of the anti-catabolic steroids. A deficiency of vitamin A causes excessive release of the lysosomal enzymes, acid hydrolases, resulting in tissue catabolism." Also, vitamin A is necessary for the proper differentiation of cells in skin and other membranes. A deficiency tends to cause an increased rate of cell division, with the production of abnormal cells, and a substitution of keratinized cells for other types. Estrogen also promotes keratinization and speeds cell division. A deficiency of vitamin A can cause leukoplakia in the mouth and on the cervix of the uterus; although this is considered "pre-cancerous," I have found it to be very easily reversible, as I have discussed elsewhere.[6] I suspect that the intracellular fiber, keratin, is produced when a cell can't afford to do anything more complex. Adequate vitamin A speeds protein synthesis,' and allows it to be used more efficiently.

Prolactin (which is promoted by estrogen, and inhibited by progesterone) increases with stress and with age. It probably affects every tissue, but it seems to have its greatest efects on the secretory membranes. It is known to have strong effects on the kidney, gut and skin (sweat and oil glands, hair follicles, and feathers inbirds), and on the gills of fish. Its involvement with milk production suggests that it might mobilize calcium from bones, and inf fact it does contribute to osteoporosis. This was foreseen by G. Bourne, in his book on the

metabolism of hard tissues, when he suggested that estrogen, acting through the pituitary, might be expected to promote osteoporosis.

Since reading Bourne's book, I have doubted that it was rational to use estrogen to prevent osteoporosis, especially when it is known to be carcinogenic and when the ratio of estrogen to and androgens and progesterone increases after menopause. Now that several publications have appeared clearly showing that estrogen increases prolactin, that prolactin increases with aging, and that prolactin contributes to osteoporosis, the postmenopausal use of estrogen is worse than dubious. But this was exactly when the pharmaceutical companies needed help in continuing to sell their profitable estrogens, and this was exactly the time when the FDA came out with its official approval of estrogen for preventing osteoporosis.[8]

Some doctors combine estrogen with testosterone, and this is much safer and more likely to keep the bones healthy. But since testosterone, like estrogen and cortisone, causes the thymus gland to atrophy, it is not a very good idea for chronic use, even if it doesn't cause masculinization. The other anti-estrogens, which are present at high levels in young women, include progesterone and DHEA. I have seen several publications which I think would justify the use of physiological amounts of DHEA to prevent or to treat osteoporosis," and a few which support the use of progesterone.[10] My own observations on their use in osteoporosis have been presented many times at alternative medical conferences since the 1970s, but the main-line medical journals and conferences have declined to accept my reports, even when they advertise that all papers submitted will be presented in some form; many physicians believe that they are being presented with a fair sampling of the work being done in endocrinology, when in fact they are being given intensive advertising sessions.

Since it is known that cortisol causes bone loss, and it is widely accepted that progesterone has an "antiglucocorticoid" action, it is reasonable to think that progesterone should protect against bone loss, and that it is a progesterone deficiency after menopause which is a major factor in the ddevelopment of osteoporosis. In the first edition of Nutrition for Women (1975) I pointed this out, in comparing menopause to Cushing's disease. Nencioni and Polvani have more recently made observations which support this mechanism, in which progesterone "exerts a protective effect," by blocking the corticosteroid receptors. They observed "that the process of rapid bone resorption starts before the

onset of amenorrhea and the abrupt fall in the estrogen levels and coincides with decline in progesterone secretion."

By improving circulation of the blood and oxygenation of the tissues, progesterone and pregnenolone will decrease the need for the body to produce cortisol. Pregnenolone acts in the brain to lower the basal secretion of ACTH. This protective effect is more basic than that achieved by blocking the cortisol receptors.

The early tests of the toxicity of vitamin A used cartilage in tissue culture. The same enzymes which are released by a deficiency of vitamin A are released by a large excess, causing dissolution of the cartilage. Other studies showed that a vitamin A deificiency caused similar changes in both bone and cartilage. Although much vitamin A is consumed in the production of progesterone, these studies show a direct effect of the vitamin on tissue stability. Although I believe that a vitamin A supplement will offer considerable protection against osteoporosis (and also against aging of the skin), it is important to remember that excessive vitamin A inhibits the thyroid, and that there is less risk of toxicity when vitamin E is supplemented too. I think many of the headaches currently associated with vitamin A use are the result of a preservative in the capsules (probably a sulfite), since people who reast to the vitamin in capsule form don't react when they use a specially ordered bulk form prepared without preservatives.

Things which damage skin and bones also damage other tissues, and things which protect them also protect other tissues. The protective factors include hormones (thyroid, DHEA, progesterone, and pregnenolone), vitamins A and E, and minerals--including magnesium, calcium, and sodium. Sodium spares magnesium, and helps to make albumin function in regulating blood and tissue water content. Under some conditions, sodium can act as an antioxidant. Since the unsaturated oils (and their prostaglandin derivatives) decrease respiration, cause stress to be more harmful, and have some specific effects that promote aging of skin, bones, and other tissues, the use of coconut oil is especially important. I think its use is one of the factors that prevents osteoporosis in tropical countries.

REFERENCES

1. C. M. Papa and A. M. Kligman, chapter XI in Advances in the Biology of Skin, vol. VI, Aging, ed. by W. Montagna, Pergamon Press, N.Y., 1965.
2. C. N. Gherondache, et al., "Steroid hormones in aging men," chapter 5 in Endocrines and Aging, ed. by Gitman, 1965.

3. C. J. Newton, et al., "Aromatase activity and concentrations of cortisol, progesterone and testosterone in breast and abdominal adipose tissue," J. Steroid Biochem. 24(5), 1033-1039, 1986.

4. W. I. Bo, :Relation of vitamin A deficiency and estrogen to induction of keratinizing metaplasia," Amer. J. Clin. Nutr. 516, p. 666, 1957. Also, Proc. Soc. Exp. Biol. Med. 76, 1951.

5. O. A. Roels, "Present knowledge of vitamin A," chapter XIII in Present Knowledge in Nutrition (third edition), Nutrition Foundation, N.Y., 1967.

6. R. Peat, Nutrition for Women, 1981.

7. S. B. Porter, et al., "Vitamin A status affects chromatin structure," Internatl. J. Vit. and Nutr. Res. 56, 11-20, 1986.

8. Anonymous, "Estrogens for osteoporosis," FDA Drug Bulletin 16(1), pages 5-6, June 1986.

9. S. Brody, et al., Maturitas (Netherlands) 4(2), 113-122, 1982; M. Boross, et as., Aktuelle Gerontologie (Stuttgart) 13(1), 15-18, 1983.

10. F. P. Mandel, et al., J. Reprod. Med. 27(8), 511-519, 1982; T. Nencioni and F. Polvani, Calcitonin, p. 297-305, A Pecile, editor, Elsevier, N.Y., 1985.

18

ARTHRITIS AND NATURAL HORMONES

A very healthy 71 year-old man was under his house repairing the foundation, when a support slipped and let the house fall far enough to break some facial bones. During his recovery, he developed arthritis in his hands. It is fairly common for arthritis to appear shortly after an accident, a shock, or surgery, and Han Selye's famous work with rats shows that when stress exhausts the adrenal glands (so they are unable to produce normal amounts of cortisone and related steroid hormones), arthritis and other "degenerative" diseases are likely to develop.

But when this man went to his doctor to "get something for his arthritis," he was annoyed that the doctor insisted on giving him a complete physical exam, and wouldn't give him a shot of cortisone. The examination showed low thyroid function, and the doctor prescribed a supplement of thyroid extract, explaining that arthritis is one of the many symptoms of hypothyroidism. The patient agreed to take the thyroid, but for several days he grumbled about the doctor 'fixing something that wasn't wrong' with him, and ignoring his arthritis. But in less than two weeks, the arthritis had entirely disappeared. He lived to be 89, without a recurrence of arthritis. (He died iatrogenically, while in good health.)

Selye's work with the diseases of stress, and the anti-stress hormones of the adrenal cortex, helped many scientists to think more clearly about the interaction of the organism with its environment, but it has led others to focus too narrowly on hormones of the adrenal cortex (such as cortisol and cortisone), and to forget the older knowledge about natural resistance. There are probably only a few physicians now practicing who would remember to check for hypothyroidism in an arthritis patient, or in other stress-related conditions. Hypothyroidism is a common cause of adrenal insufficiency, but it also has some direct effects on joint tissues. In chronic hypothyroidism (myxedema and cretinism), knees and elbows are often bent abnormally.

By the 1930's, it was well established that the resistance of the organism depended on the energy produced by respiration under the influence of the thyroid gland, as well as on the adrenal hormones, and that the hormones of pregnancy (especially progesterone) could substitute for the adrenal hormones. In a sense, the thyroid hormone is the basic anti-stress hormone, since it is required for the production of the adrenal and pregnancy hormones.

A contemporary researcher, F. Z. Meerson, is putting together a picture of the biological processes involved in adapting to stress, including energy production, nutrition, hormones, and changes in cell structure.

While one of Selye's earliest observations related gastrointestinal bleeding to stress, Meerson's work has revealed in a detailed way how the usually beneficial hormone of adaptation, cortisone, can cause so many other harmful effects when its action is too prolonged or too intense.

Some of the harmful effects of the cortisone class of drugs (other than gastro-intestinal bleeding) are: Hypertension, osteoporosis, delayed healing, atrophy of the skin, convulsions, cataracts, glaucoma, protruding eyes, psychic derangements, menstrual irregularities, and loss of immunity allowing infections (or cancer) to spread.

While normal thyroid function is required for the secretion of the adrenal hormones, the basic signal which causes cortisone to be formed is a drop in the blood glucose level. The increased energy requirement of any stress tends to cause the blood sugar to fall slightly, but hypothyroidism itself tends to depress blood sugar.

· The person with low thyroid function is more likely than a normal person to require cortisone to cope with a certain amount of stress However, if large amounts of cortisone are produced for a long time, the toxic effects of the hormone begin to appear. According to Meerson, heart attacks are provoked and aggravated by the cortisone produced during stress. (Meerson and his colleagues have demonstrated that the progress of a heart attack can be halted by a treatment including natural substances such as vitamin E and magnesium.)

While hypothyroidism makes the body require more cortisone to sustain blood sugar and energy production, it also limits the ability to produce cortisone, so in some cases stress produces symptoms resulting from a deficiency of cortisone, including various forms of arthritis and more generalized types of chronic inflammation.

Often, a small physiological dose of natural hydrocortisone can help the patient meet the stress, without causing harmful side-effects. While treating the symptoms with cortisone for a short time, it is important to try to learn the basic cause of the problem, by checking for hypothyroidism, vitamin A deficiency, protein deficiency, a lack of sunlight, etc. (I suspect that light on the skin directly increases the skin's production of steroids, without depending on other organs. Different steroids probably involve different frequencies of light, but orange and red light seem to be important frequencies.) Using cortisone in this way,

physiologically rather than pharmacologically, it is not likely to cause the serious problems mentioned above.

Stress-induced cortisone deficiency is thought to be a factor in a great variety of unpleasant conditions, from allergies to ulcerative colitis, and in many forms of arthritis. The stress which can cause a cortisone deficiency is even more likely to disturb formation of progesterone and thyroid hormone, so the fact that cortisone can relieve symptoms does not mean that it has corrected the problem.

According to the Physicians' Desk Referenc, hormones similar to cortisone are useful for treating rheumatoid arthritis, post-traumatic osteoarthritis, synovitis of osteoarthritis, acute gouty arthritis, acute nonspecific tenosynovitis, psoriatic arthritis, ankylosing spondylitis, acute and subacute bursitis, and epicondylitis.

Although cortisone supplementation can help in a great variety of stress-related diseases, no curewill take place unless the basic cause is discovered. Besides the thyroid, the other class of adaptive hormones which are often out of balance in the diseases of stress, is the group of hormones produced mainly by the gonads: the "reproductive hormones." During pregnancy these hormones serve to protect the developing baby from the stresses suffered by the mother, but the same hormones function as part to the protective anti-stress system in the non-pregnant individual, though at a lower level.

Some forms of arthritis are known to improve or even to disappear during pregnancy. As mentioned above, the hormones of pregnancy can make up for a lack of adrenal cortex hormones. During a healthy pregnancy, many hormones are present in increased amounts, including the thyroid hormones. Progesterone, which is the most abundant hormone of pregnancy, has both anti-inflammatory and anesthetic actions, which would be of obvious benefit in arthritis.

There are other naturally anesthetic hormones which are increased during pregnancy, including DHEA, which is being studied for its anti-aging, anti-cancer, and anti-obesity effects. (One of the reasons that is frequently given for the fact that this hormone hasn't been studied more widely is that, as a natural substance, it has not been monopolized by a drug patent, and so no drug company has been willing to invest money in studying its medical uses.) These hormones also have the ability to control cell division, which would be important in forms of arthritis that involve invasive tissue growth.

While these substances, so abundant in pregnancy, have the ability to substitute for cortisone, they can also be used by the adrenal glands to

produce cortisol and related hormones. But probably the most surprising property of these natural steroids is that they protect against the toxic side-effects of excessive adrenal hormones. And they seem to have no side-effects of their own; after about fifty years of medical use, no toxic side effects have been found for progesterone or pregnenolone.

Pregnenolone is the material the body uses to form either progesterone or DHEA. Others, including DHEA, haven't been studied for so long, but the high levels which are normally present in healthy people would suggest that replacement doses, to restore those normal levels, would not be likely to produce toxic side effects. And, considering the terrible side effects of the drugs that are now widely used, these drugs would be justifiable simply to prevent some
of the toxic effects of conventional treatment.

It takes a new way of thinking to understand that these protective substances protect against an excess of the adrenal steroids, as well as making up for a deficiency. Several of these natural hormones also have a protective action against various poisons; Selye called this their "catatoxic" effect.

Besides many people whose arthritis improved with only thyroid supplementation, I have seen 30 people use one or more of these other natural hormones for various types of arthritis, usually with a topical application. Often the pain is relieved within a few minutes. I know of several other people who used progesterone topically for inflamed tendons, damaged cartilage, or other inflammations. Only one of these, a woman with rheumatoid arthritis in many joints, had no significant improvement. Though she used only a small amount, an hour after she had applied it to her hands and feet, she enthusiastically reported that her ankle had stopped hurting, but after this she said she had no noticeable improvement.

We often hear that "there is no cure for arthritis, because the causes are not known." If the cause is an imbalance in the normal hormones of adaptation and resistance, then eliminating the cause by restoring balance will produce a true cure. But if it is more profitable to sell powerful drugs than to sell the nutrients needed to form natural hormones (or to supplement those natural hormones) we can't expect the drug companies to spend any money investigating that sort of cure. And at present the arthritis market amounts to billions of dollars in drug sales each year.

Fasting has been found to relieve rheumatoid arthritis, and there is good evidence that a variety of bowel bacteria are involved in arthritis

and other "autoimmune diseases." Bacterial toxins and antigens interact with hormones and the immune systems, and intestinal health should be considered as an integral part of hormone therapy. Raw carrots, by stimulating the intestine, often help to lower estrogen and increase progesterone. One of the thyroid hormone's important functions is to improve digestion and bowel health.

Rheumatoid arthritis, osteoarthritis, lupus, scleroderma, and a variety of other "autoimmune" diseases and connective tissue diseases respond well to these hormonal treatments.

REFERENCES

1. T. D. Koepsell, et al., " "Non-contraceptive hormones and the risk of rheumatoid arthritis in menopausal women," Int. J. Epidemiol. 23(6), 1248-1255, 1994.

2. J. D. Taurog, et al., Cell, November, 1990.

3. R. Daley and H. G. Miller, Progress in Clinical Medicine, Second Edition, J. & A. Churchill, London, 1952.

4. T. Ushiyama, et al., "Expression of estrogen receptor related protein (p29) and estradiol binding in human arthritic synovium," J. Rheumatol. 22, 421-426, 1995.

19

THE CERVICAL CANCER SCARE AND OTHER APPROACHES TO CANCER

Many women with abnormal Pap smears, even with a biopsy showing the so-called "carcinoma in situ," have returned to normal in just two months with a diet including the following: 90 grams of protein, 500 mg. of magnesium as chloride, 100,000 units of vitamin A, 400 units of vitamin E, 5 mg. folic acid, 100 mg. pantothenic acid, 100 mg. of B, and niacinamide, and 500 mg. of vitamin C, with progesterone and thyroid as needed. Liver should be eaten once a week, because of its high B-vitamin content. Some of the women apply vitamin A (not carotene) directly to the cervix.

Estrogen is known to cause uterine cancer, but the pervasive marketing of estrogen led to solving that problem by the mass removal of American uteruses. The evidence is clear, however, that many tissues have estrogen receptors, and can be cancerized by exposure to estrogen. Breast, lung, brain, and liver are coming to be widely recognized as sites of estrogen-induced cancers in humans, 50 years after Lipschutz demonstrated the extensive nature of estrogen carcinogenesis in animals. The pancreas, which has estrogen receptors, is another organ that I believe is significantly cancerized by estrogen.

Progesterone's anti-estrogen effect has been successfully used to treat some uterine and breast cancers, but the doses were never high enough to duplicate the levels that exist in late pregnancy. I believe it is irrational to use less than the maximum physiological level, in attempting to reverse a condition which resulted from years of severe deficiency. When progesterone dissolved in benzyl alcohol with sesame oil is injected, progesterone crystals are deposited, inertly, in the tissue. Even this limited approach has produced some visible results.

I believe the fact that the cancer death rate keeps rising disproves the claim that there has been progress in the cure of cancer. Everyone over 50 contains some tissue that can be diagnosed as cancer. Though not everyone dies from cancer, it could be diagnosed in everyone, if a sufficient diagnostic effort were made. Then, 75% of "all cancers" could be "cured," though just as many people would die from it. The cancer situation is so thoroughly unscientific that I am not convinced that it is worthwhile to make any effort to diagnose cancer. At a cancer

conference, a very high proportion of the male physicians, when asked what they would do if they had prostate cancer, said they would do nothing; that response seems to be justified by the evidence accumulated for several decades, that treatment for prostate cancer hasn't clearly prolonged life. More aggressive diagnosis will certainly improve the "cure rate," but until the population's death rate from prostate cancer decreases, it is hard to have confidence in therapies based on fundamentally confused notions of the biology of cancer. If something harms your vitality, and is just as toxic to your immune system, your liver, and your brain, as it is to cancer cells, the medical situation seems analogous to that of the army that destroys a town to save it.

Benign breast disease, breast cancer and pre-cancerous conditions have been found to be associated with a progesterone deficiency and excess estrogen.(1) Some additional references are given in Nutrition for Women. Since progesterone deficiency and excess estrogen can be caused by either a thyroid deficiency or a protein deficiency, the most important cause of the steroid imbalance, and of the hormone related cancers, is hypothyroidism. Broda Barnes has discussed this issue in his books. (Protein deficiency is one cause of hypothyroidism.) Vitamin A, vitamin E, and thyroid have all been used effectively to relieve benign breast disease. Caffeine actually has been repeatedly shown to protect against cancer. Minton's so-called study which led to a generalized fear of coffee as a cause of breast disease was based on confused reasoning. 1 believe anti-inflammatory drugs such as aspirin or prostaglandin inhibitors such as indomethacin have a rational place in cancer therapy, especially if (like aspirin) they have some antihistamine activity. (The prostaglandins have now been implicated in all of the major types of cancer.) Estrogen tends to be deposited in inflamed tissues, and in that sense those drugs might be considered as part of an anti-estrogenic program.

Simple derivatives of glucose, glucuronic acid and glucaric acid, have been proposed as substances that might limit the deposition of estrogen in inflamed tissues. Recent studies using glucarate and various forms of vitamin A have produced good effects in breast cancer.

REFERENCE

1. Cowan, L. D., et al., "Breast cancer incidence in women with a history of progesterone deficiency," Am. J. Epidemiology 114, 209-217, 1981.

20

WARBURG'S CANCER THEORY, CACHEXIA AND THYROID THERAPY

Otto Warburg' demonstrated that all cancers have defective respiration, by which he meant that glucose is consumed too rapidly, even when there is adequate oxygen. The excessive consumption of glucose in the presence of oxygen is called aerobic glycolysis, and is typical of cancer. Oxygen may be consumed, but it does not result in the production of sufficient ATP to inhibit glycolysis (by the Pasteur effect). This generally means that excess lactate will be produced and will leave the cell, will be detected by other tissues, and will be processed by the liver into glucose. Lactate is a sufficient stimulus to trigger the stress reaction, and in many people causes an anxiety syndrome. Since resynthesis of glucose from lactate by the liver requires much more energy than is derived from conversion of glucose to lactate. the tumor's formation of lactate constitutes a large burden to the organism. Total energy consumption would increase, because of intense but inefficient metabolism in the tumor and in the liver, and also possibly because of stress-induced brain excitation and the catabolism of muscle and other tissue proteins. Cortisol elevates blood glucose and would inhibit the thyroid. Since there is evidence of thyroid deficiency in various cancers, and since thyroid supplementation reduces the incidence of spontaneous or induced tumors in animal studies, thyroid therapy would be desirable in cancer, especially if there is cachexia. Gerson.[2] Tallberg,[3] and others have reported good results from using thyroid as part of supportive therapy.

The stereotype of the hypothyroid person as over-weight will lead the typical physician to believe that metabolic stimulation by thyroid would be exactly the opposite of what the cachectic patient needs. The relevant effects of thyroid (especially with progesterone, to promote tissue response to thyroid, to block cortisol production, and to provide general anti-stress physiological support) however, are stimulation of protein synthesis and the prevention of lactate formation--or the stimulation of its oxidation, either by the tumor itself or by other tissues, to prevent its entry into the Cori cycle, for gluconeogenesis. Cachexia strumipriva, the wasting disease that used to result following removal of the thyroid gland when the thyroid hormone wasn't replaced. should be

kept in mind, , since it is a situation in which thyroid cures cachexia, stimulating anabolic processes.

There has been publicity in recent decades about various substances produced by cancers that induce the growth of blood vessels, providing the tumors with the circulation needed for growth. Since lactic acid is an adequate stimulus for such growth, and is produced by tumors, it is remarkable that it has been so consistently ignored as a reasonable point of intervention for limiting tumor growth. Thyroid and magnesium make respiration efficient, in the sense of producing ATP, which is required for the Pasteur effect to turn off glycolysis. Lactic acid can't be made (in humans) from fats or alcohol, a point which is often overlooked by biochemists who work with bacteria, and so the use of acetic acid, butyric acid, and other fatty acids (as in coconut oil, for example), combined with adequate thyroid hormone and magnesium, should make a significant contribution toward removing the lactate stimulus for increased blood supply to the tumor. The carbon dioxide produced by the action of thyroid is itself involved in the suppression of lactic acid formation.

Progesterone and pregnenolone, by reducing the cancer-induced excess of the glucocorticoid hormones, would also make a contribution to decreasing the supply of glucose to the tumor.

Warburg believed that a riboflavin deficiency was an important contributor to the development of defective respiration, but he also pointed out that the simple lack of oxygen would promote the development of cancer. I have emphasized the role of estrogen in creating an oxygen deficiency. Since it inhibits the secretion of thyroxin at the glandular level, and antagonizes thyroxin at the cellular level, estrogen is a good candidate for the main cause of the respiratory defect. It also antagonizes other respiratory factors, such as magnesium and vitamin E, and excess estrogen actually impedes oxygenation of the blood. (Both low thyroid and high estrogen are known to cause an emphysema-like interference with diffusion of oxygen into the lung capillaries.)

Radioactive estrogen has been shown to accumulate selectively in (liver) cancer cells, which is remarkable since that behavior is so untypical of liver cells. One of my first research projects had to do with the fact that estrogen promotes the formation of beta-glucuronidase, an enzyme which can reverse the reaction which normally occurs in the liver, detoxifying estrogen by combining it with glucuronic acid. Irritated tissues, and all cancers, contain beta-glucuronidase, with the capacity to

're-toxify" estrogen in the irritated or cancerous site, depositing it locally and negating the liver's protective function. More recently, breast cancer cells have been found to contain sulfatase enzymes, with the same kind of function, since the liver's other main route of estrogen detoxication is by combining it with sulfate. A systematic anti-estrogen program (including adequate protein to sustain liver function) would help to minimize the cancer-promoting action of this locally deposited estrogen. I think of the appearance of these estrogen-releasing enzymes in irritated tissue as part of a system for promoting regeneration. In the uterus, estrogen promotes simple growth, and progesterone promotes differentiation. 1 think something analogous happens in other tissues, with a variety of substances supporting differentiation.

Once we accept Warburg's thesis, that damaged respiration is the prime cause of cancer, the therapeutic use of thyroid in cancer seems obvious. Aging and estrogen-dominance are other states in which cells seem to be relatively insensitive to thyroid hormones. (Unsaturated fats are involved in resistance to thyroid, and promote the incidence of cancer in a variety of ways.) If the liver is a main site of T,'s conversion to T, cancer patients may require very large doses of thyroid hormone, or else direct use of T; (possibly in large doses), since the liver is so likely to be inefficient. Incidentally, thyroid's ability to improve digestion and peristalsis is important for liver function; endotoxin absorbed from the intestine can be a serious burden to the liver, and it is known to cause a large increase in the blood estrogen level.

REFERENCES

1. Otto If. Warburg, The Metabolism of Tumors, R. R. Smith, Inc. N.Y., 1931.
2. Max Gerson, 4 Cancer Therapy, Whittier Books, N.Y., 1958. (Gerson died in 1959, and subsequent editions of his book have drastically allered his conclusions; I consider them to be mere forgeries, produced for promotional purposes.
3. I. Tallberg, Protides of the Body Fluids, 1978.
4. K. Backwinkel and A. S. Jackson, "Some features of breast cancer and thyroid deficiency," Cancer 12(9), 1174-1176, 1964
5.I.A. Cuerrero and R. Carnovale, "Regression of pituitary tumor after thyroid replacement in primary hypothyroidism," Southern Medical J. 76(4), 529-531, 1983.
6. 1. Y. Reynolds, S. Rockwell, and P. M. Glaver, ('Cancer Research, Dec. 15, 1996. This study demonstrates that the oxygen-poor environment in tumors causes mutations. A. J. Graccia, ef al., have also shown that hypoxia favors the growth of tumor cells. These results confirm the work Warburg did several decades earlier

21

MIGRAINE, VARICOSE VEINS, EPILEPSY

This group of problems relates to the behavior of the muscles in the walls of blood vessels. Estrogen tends to decrease the muscle tone in veins, while increasing it (especially if adrenalin is present) in arteries, and progesterone increases the tone of veins. One aspect of estrogen's production of increased problems with blood clots is that it slows circulation, allowing clots to form in the slow moving blood of the large veins, especially in the legs.

The times (premenstrually, in pregnancy, around menopause, in hypothyroidism, for example) when estrogen is high and progesterone is low, are the times of increased incidence of migraines, epileptic seizures, and development of varicose veins.

There is increasing recognition that progesterone can cure migraines and epilepsy, but there is a mechanistic dogma about varicose veins, largely based on a strange idea that has been perpetuated by medical schools that veins "don't have muscular walls." Believing that veins don't have muscles, many physicians can't conceive of any way in which an enlarged vein could correct itself: "The valves are defective." But when they have enough progesterone in relation to estrogen, the walls contract, narrowing the channel so the valves are able to function. Visible veins around the ankles often disappear, even in older people, when the hormone balance is improved.

Since migraine and epilepsy can be debilitating, I always urge people to use progesterone to get rid of their symptoms, so they can focus on correcting the basic metabolic problems, which usually relate to diet and thyroid function.

A quick demonstration of progesterone's effect on the veins can be done by holding the hands at waist level. If the veins on the back of the hand bulge visibly, an appropriate oral dose of progesterone will regulate the tone of the smooth muscles in the veins, causing them to contract and become relatively invisible within a few minutes. Once, I watched a woman whose hands were disfigured by gnarled purple blood vessels, who took about 30 mg. of progesterone every 10 minutes. After the fifth dose, her hands suddenly (in a moment when we weren't watching them closely) were transformed into perfectly beautiful young hands. Progesterone's effects can be similarly quick in migraine and epilepsy.

22

NERVES

Almost everyone knows that estrogen causes water retention and edema, but few people seem to be aware that the edema associated with either high estrogen or low thyroid (which go together so closely) involves the retention of water without a sufficient amount of sodium to balance it--the edema is "hypotonic." This means that the water in the blood in effect forces itself into cells and connective tissues, causing them to swell. Some cells aren't damaged very much by a little swelling, but when cells are enclosed by a rigid container of bone or connective tissue, the pressure will tend to prevent the entry of blood, and will cause structural changes, simply because the contents are too big for the container.

The carpal tunnel syndrome involves the pinching of nerves by ligaments in the wrist, damaging their function. The spinal cord and brain are enclosed, and extreme swelling can cut off the blood supply, causing death. Before that point is reached, swelling can cause a great variety of nervous symptoms.

Swelling of the lower spinal cord can cause weakness or paralysis of the legs, or various sensory or circulatory problems. Veterinarians have recognized conditions in dogs and horses caused by spinal swelling (and in dogs the problem was traced to hypothyroidism), but analogous symptoms in people are often ascribed to the mysterious "multiple sclerosis."

Multiple sclerosis is strongly associated with hormone imbalances, and disproportionately affects women in their reproductive years. Progesterone and thyroid are crucial for maintaining and repairing the myelin sheath that deteriorates in MS. Blood clots are known to be associated with the "plaques" in the brain, and a low protein diet predisposes to abnormal clotting, partly through its effect on the balance of estrogen and the anti-estrogens. One of the first people I knew who used progesterone was a woman who had cured her multiple sclerosis/optic neuritis with progesterone. Often, thyroid supplementation by itself eliminates the symptoms of MS.

Since the edema of estrogen excess and thyroid deficiency is hypotonic, eating extra salt is appropriate, but the body can't retain the salt unless the hormone balance is corrected.

23

ALZHEIMER'S DISEASE

The results seen in several Alzheimer's studies could have a significance larger than what has been suggested by the investigators. A diagnostic bias has been reported to result from the use of standardized tests based on vocabulary, because education increases vocabulary, and tends to cover up the loss of vocabulary that occurs in dementia. In the Framingham study, it was concluded that there was a real association of lower educational level with dementia, but the suggestion was made that self-destructive practices such as smoking were more common among the less educated.

The Seattle study of the patients in a health maintenance organization showed a very distinct difference in educational level between the demented and the non-demented, both of whom had roughly similar frequency of prescriptions for estrogen. The features that seemed important to me, that weren't discussed by the authors, were that the demented women had a much lower rate of progestogen use, and a much higher incidence of hysterectomy, which interferes with natural progesterone production.

Although Brenner, et al., in the Seattle study concluded that "this study provides no evidence that estrogen replacement therapy has an effect on the risk of Alzheimer's disease in postmenopausal women," they reported that "Current estrogen use of both the oral and the vaginal routes had odds ratios below 1, while former use of both types yielded odds ratios above 1.... ...." (They seem to neglect the fact that Alzheimer's-type disease in old people has a long developmental history, so it is precisely the "former" use that is relevent. 31% of the demented women had formerly used estrogen, and only 20% of the control group. Since estrogen is a brain excitant, present use creates exactly the same sort of effect on verbal fluency and other signs of awareness of the environment that a little cocaine does. Anyone who neglects this effect is probably deliberately constructing a propaganda study.) This observation, that the demented had 155% as much former estrogen use as the normal group, as well as the difference in rates of progestogen use (normal patients had 50% more progestogen use than demented) and hysterectomy (demented had 44.1% vs. 17% in the normals, i.e., 259% as many; the incidence of hysterectomies after the age of 55, which is a strong indication of a natural excess of estrogen, in the demented was

374% of the incidence in the non-demented), should call for a larger study to clarify these observatons, which tend to indicate that exposure to estrogen in middle-age increases the risk of Alzheimer's disease in old age, and that even medical progestogens offer some protection against it.

(Although this study might have been bigger and better, it is far better than the junk-studies that have been promoted by the pharmaceutical publicity machine. I have seen or heard roughly 100 mentions of the pro-estrogen anti-scientific "studies," and none mentioning this one.)

REFERENCES

I. D. E. Brenner, et al., "Postmenopausal estrogen replacement therapy and the risk of Alzheimer's disease: A population-based case-control study," Am. J. Epidemiol. 140, 262-267, 1994. "Women tend to have higher age-specific prevalence and incidence rates of Alzheimer's disease than do men."

2. A.F. Jonn, The Epidemiology of Alzheimer's Disease and Related Disorders, Chapman and Hall, London, 1990, and W. A. Rocca, et al., Ann. Neurol. 30, 381-190, 1991.

3. H. C. Liu, et al., "Performance on a dementia screening test in relation to demographic variables-study of 5297 community residents in Taiwan," Arch. Neurol. 51(9), 910-915, 1994. "Commonly used dementia screening tests may be unfair to poorly educated individuals, especially women and rural residents."

4. B. L. Weiss, "Failure of nalmefene and estrogen to improve memory in Alzheimer's disease," Am. J. of Psychiatry 144, 386-7, 1987.

24

ECLAMPSIA IN THE REAL ORGANISM:

A Paradigm of General Distress Applicable to Infants, Adults, Etc.

To prevent the appropriation and abuse of our language by academic and professional cliques, I like to recall my grandparents' speech. When my grandmother spoke of eclampsia, the word was still normal English, that reflected the Greek root meaning, "shining out," referring to the visual effects that are often prodromal to seizures. The word was most often used in relation to pregnancy, but it could also be applied to similar seizures in young children. The word is the sort that might have been coined by a person who had experienced the condition, but the experience of seeing hallucinatory lights is seldom mentioned in the professional discussion of "eclampsia and preeclampsia."

Metaphoric thinking--using comparisons, models, or examples--is our natural way of gaining new understanding. Ordinary language, and culture, grow when insightful comparisons are generally adopted, extending the meaning of old categories. Although the free growth of insight and understanding might be the basic law of language and culture, we have no institutions that are amenable to that principle of free development of understanding. Institutions devoted to power and control are naturally hostile to the free development of ideas.

Among physicians, toxemia (meaning poisons in the blood) has been used synonymously with preeclampsia, to refer to the syndrome in pregnant women of high blood pressure, albumin in the urine, and edema, sometimes ending in convulsions. Eclampsia is reserved for the convulsions themselves, and is restricted to the convulsions which follow preeclampsia, when there is "no other reason" for the seizure such as "epilepsy" or cerebral hemorrhage. Sometimes it is momentarily convenient to use medical terms, but we should never forget the quantity of outrageous ignorance that is attached to so many technical words when they suggest the identity of unlike things, and when they partition and isolate things which have meaning only as part of a process. Misleading terminology has certainly played an important role in retarding the understanding of the problems of pregnancy.

In 1974, when I decided to write Nutrition for Women, I was motivated by the awful treatment I saw women receiving, especially

during pregnancy, from physicians and dietitians. Despite the research of people like the Shutes and the Biskinds, there were still "educated" and influential people who said that the mother's diet had no influence on the baby. (That strange attitude affects many aspects of behavior and opinion.)

How can people believe that the mother's diet has no effect on the baby's health? Textbooks used to talk about the "insulated" fetus, which would get sufficient nutrients from the mother's body even if she were starving. To "prove" the doctrine, it was pointed out that the fetus gets enough iron to make blood even when the mother is anemic. In the last few years, the recognition that smoking, drinking, and using other drugs can harm the baby has helped to break down the doctrine of "insulation," but there is still not a medical culture in which the effects of diet on the physiology of pregnancy are appreciated. This is because of a mistaken idea about the nature of the organism and its development. "Genes make the organism," according to this doctrine, and if there are congenital defects in the baby, the genes are responsible. A simple sort of causality flows from the genes to the finished organism, according to that idea. It was taught that if "the genes" are really bad, the defective baby can make the mother sick, and she contributed to the baby's bad genes. The idea isn't completely illogical, but it isn't based on reality, and it is demonstrably false. (Race, age and parity have no effect on incidence of cerebral palsy; low birth weight and complications of pregnancy are associated with it: J. F. Eastman, "Obstetrical background of 753 cases of cerebral palsy," Obstet. Gynecol. Surv. 17, 459-497, 1962.)

Although Sigmund Freud sensibly argued in 1897 that it was more reasonable to think that an infant's cerebral palsy was caused by the same factors that caused the mother's sickness, than to think that the baby's cerebral palsy caused maternal sickness and premature labor, more than 50 years later people were still taking seriously the idea that cerebral palsy might cause maternal complications and prematurity. (A.M. Lilienfield and E. Parkhurst, "A study of the association of factors of pregnancy and parturition with the development of cerebral palsy," Am. J. Hyg. 53, 262-282, 1951.)

Medical textbooks and articles still commonly list the conditions that are associated with eclampsia: Very young and very old mothers, a first pregnancy or a great number of previous pregnancies, diabetes, twins, obesity, excessive weight gain, and kidney disease. Some authors, observing the high incidence of eclampsia in the deep South, among

Blacks and on American Indian reservations, have suggested that it is a genetic disease because it "runs in families." If poverty and malnutrition are also seen to "run in families," some of these authors have argued that the bad genes which cause birth defects also cause eclampsia and poverty. (L. C. Chesley, et al., "The familial factor in toxemia of pregnancy," Obstet. Gynec. 32, 303-311, 1968, reported that women whose mothers suffered eclampsia during their gestation were likely to have eclampsia themselves. Some "researchers" have concluded that eclampsia is good, because many of the babies die, eliminating the " genes" for eclampsia and poverty.)* Any sensible farmer knows that pregnant animals must have good food if they are to successfully bear healthy young, but of course those farmers don't have a sophisticated knowledge of genetics.

The inclusion of obesity and "excessive weight gain" among the conditions associated with eclampsia has distracted most physicians from the fact that malnutrition is the basic cause of eclampsia. The pathologist who, knowing nothing about a woman's diet, writes in his autopsy report that the subject is "a well nourished" pregnant woman, reflects a medical culture which chooses to reduce "nutritional adequacy" to a matter of gross body weight. The attempt to restrict weight gain in pregnancy has expanded the problem of eclampsia beyond its association with poverty, into the more affluent classes.

Freud wasn't the first physician who grasped the idea that the baby's health depends on the mother's, and that her health depends on good nutrition. Between 1834 and 1843, John C. W. Lever, M.D., discovered that 9 out of 10 eclamptic women had protein in their urine. He described an eclamptic woman who bore a premature, low-weight baby, as having "...been living in a state of most abject penury for two or three months, subsisting for days on a single meal of bread and tea. Her face and body were covered with cachectic sores." ("Cases of puerperal convulsions," Guy's Hospital Reports, Volume 1, series 2, 495-517, 1843.) S. S. Rosenstein observed that eclampsia was preceded by changes in the serum (raite Pratique des Maladies des Reins, Paris, 1874). L. A. A. Charpentier specifically documented low serum albumin as a cause of eclampsia (A Practical Treatise on Obstetrics, Volume 2, William Wood & Co., 1887). Robert Ross, M.D., documented the role of malnutrition as the cause of proteinuria and eclampsia (Southern Medical Journal 28, 120, 1935).

In outline, we can visualize a chain of causality beginning with a diet deficient in protein, impairing liver function, producing inability to

store glycogen, to inactivate estrogen and insulin, and to activate thyroid. Low protein and high estrogen cause increased tendency of the blood to clot. High estrogen destroys the liver's ability to produce albumin (G. Belasco and G. Braverman, Control of Messenger RNA Stability, Academic Press, 1994). Low thyroid causes sodium to be lost. The loss of sodium albuminate causes tissue edema, while the blood volume is decreased. Decreased blood volume and hemoconcentration (red cells form a larger fraction of the blood) impair the circulation. Blood pressure increases. Blood sugar becomes unstable, cortisol rises, increasing the likelihood of premature labor. High estrogen, hypoglycemia, viscous blood, increased tendency of the blood to clot cause seizures. Women who die from eclampsia often have extensive intravascular clotting, and sometimes the brain and liver show evidence of earlier damage, probably from clots that have been cleared. (Sometimes prolonged clotting consumes fibrinogen, causing inability to clot, and a tendency to hemorrhage.) M. M. Singh, "Carbohydrate metabolism in pre-eclampsia," Br. J. Obstet. Gynaecol. 83, 124-131. 1976. Sodium decrease, R. L. Searcy, Diagnostic Biochemistry, McGraw-Hill, 1969. Viscosity, L. C. Chesley, 'Hypertensive Disorders in Pregnancy, Appleton-Century-Crofts, 1978. Clotting. T. Chatterjee, et al., "Studies on plasma fibrinogen level in preeclampsia and eclampsia, Experientia 34, 562-3, 1978; D. M. Haynes, "Medical Complications During Pregnancy, McGraw-Hill Co. Blakiston Div., 1969. Progesterone decrease, G. V. Smith, et al., "Estrogen and progestin metabolism in pregnant women, with especial reference to pre-eclamptic toxemia and the effect of hormone administration," Am. J. Obstet. Gynecol. 39, 405, 1940; R. L. Searcy, Diagnostic Biochemistry, MeGraw-Hill, 1969

But the simple chain of causality has many lines of feedback, exacerbating the problem, and the nutritional problem is usually worse than a simple protein deficiency. B vitamin deficiencies alone are enough to cause the liver's underactivity, and to cause estrogen dominance, and a simple vitamin A deficiency causes an inability to use protein efficiently or to make progesterone, and in itself mimics some of the effects of estrogen.

The clotting which sometimes kills women, can, if it is not so extensive, cause spotty brain damage, similar to that seen in "multiple sclerosis," or it can occur in the liver, or other organ, or in the placenta, or in the fetus, especially in its brain and liver. Some cases of supposed "post-partum psychosis" have been the result of multiple strokes. When large clots occur in the liver or placenta, the fibrinogen which has been

providing the fibrin for disseminated intravascular coagulation can appear to be consumed faster than it is produced by the liver. I think its disappearance may sometimes be the result of the liver's diminished blood supply, rather than the "consumption" which is the way this situation is usually explained. It is at this point that hemorrhages, rather than clots, become the problem. The undernourished liver can produce seizures in a variety of ways--clots, hemorrhages, hypoglycemia, and brain edema, for example, so eclampsia needn't be so carefully discriminated from "the other causes of seizures."

Because I had migraines as a child, I was interested in their cause. Eating certain foods, or skipping meals, seemed to be involved, but 1 noticed that women often had migraines premenstrually. Epilepsy too, I learned, often occurred premenstrually.

In my experience of migraine, nausea and pain followed the visual signs, which consisted of a variable progression of blind spots and lights. When I eventually learned that I could stop the progression of symptoms by quickly eating a quart of ice cream, I saw that my insight could be applied to other situations in which similar visual events played a role, especially "eclampsia" and "epilepsy."" For example, a woman who was 6 months pregnant called me around 10 o'clock one morning, to say that she had gone blind, and was alone in her country house. She said she had just eaten breakfast around 9 AM, and wasn't hungry, but I knew that the 6 month fetus has a great need for glucose, so I urged her to eat some fruit. She called me 15 minutes later to report that she had eaten a banana, and her vision had returned.

Early in pregnancy, "morning sickness" is a common problem, and it is seldom thought to have anything to do with eclampsia, because of the traditional medical idea that the fetus "causes" eclampsia, and in the first couple of months of pregnancy the conceptus is very small. But salty carbohydrate (soda crackers, typically) is the standard remedy for morning sickness. Some women have "morning sickness" premenstrually, and it (like the nausea of migraine) is eased by salt and carbohydrate. X-ray studies have demonstrated that there are spasms of the small intestine (near the bile duct) associated with estrogen-induced nausea.

Hypoglycemia is just one of the problems that develops when the liver malfunctions, but it is so important that orange juice or Coca Cola or ice cream can provide tremendous relief from symptoms. Sodium (orange juice and Pepsi provide some) helps to absorb the sugar, and--more basically--is essential for helping to restore the blood volume. Pepsi has been recommened by the World Health Organization for the

rehydration of babies with diarrhea, in whom hypovolemia (thickening of the blood from loss of water) is also a problem.

The problem of refeeding starving people has many features in common with the problem of correcting the liver malfunction and hormone imbalances which follow prolonged malnutrition of a milder sort. The use of the highest quality protein (egg yolk or potato juice, or at least milk or meat) is important, but the supplementation of thyroid containing T, is often necessary. Intravenous albumin, hypertonic solutions of glucose and sodium, and magnesium in an effective form should be helpful (magnesium sulfate injected intramuscularly is the traditional treatment for eclampsia, since it is quickly effective in stopping convulsions). While the sodium helps to restore blood volume and to regulate glucose, under some circumstances (high aldosterone) it helps to retain magnesium; aldosterone is not necessarily high during eclampsia.. Triiodothyronine directly promotes cellular absorption of magnesium. Hypertonic glucose with minerals is known to decrease the destruction of protein during stress: M. Jeevanandam, et al., Metabolism 40, 1199-1206, 1991.

Katherina Dalton observed that her patients who suffered from PMS (and were benefitted by progesterone treatment) were likely to develop "toxemia" when they became pregnant, and to have problems at the time of menopause. In these women, it is common for "menstruation" to continue on the normal cycle during the first several months of pregnancy. This cyclic bleeding seems to represent times of an increased ratio of estrogen to progesterone, and during such periods of cyclic bleeding the risk of miscarriage is high. Researchers found that a single injection of progesterone could sometimes eliminate the signs of toxemia for the remainder of the pregnancy. Katherina Dalton, who continued to give her patients progesterone throughout pregnancy, later learned that the babies treated in this way were remarkably healthy and bright, while the average baby delivered after a "toxemic" pregnancy has an IQ of only 85.

Marian Diamond's work with rats clearly showed that increased exposure to estrogen during pregnancy reduced the size of the cerebral cortex and the animals' ability to learn, while progesterone increased the brain size and intelligence. Zamenhof's studies suggested that these hormones probably have their effects largely through their actions on glucose, though they also affect the availability of oxygen in the same way, and have a variety of direct effects on brain cells that would operate toward the same end.

If Katherina Dalton's patients' IQs averaged 130, instead of the expected 85, the potential social effects of proper health care during pregnancy are enormous.

But there is evidence that healthy gestation affects more than just the IQ. Strength of character, ability to reason abstractly, and the absence of physical defects, for example, are strongly associated with weight at birth.

Government studies and Social Security statistics suggest the size of the problem. The National Institute of Neurological Diseases and Stroke found that birth weight was directly related to IQ at age four, and that up to half of all children who were underweight at birth have an IQ under 70.(Chase.) According to standard definitions, about 8% of babies in the U.S. have low birth weight.

Among people receiving Social Security income because of disability that existed at the age of 18, 75% were disabled before birth. In 94% of these cases, the abnormally was neurological. (HEW.)
A study of 8 to 10-year-old children found that abstract verbal reasoning and perceptual/motor integration are more closely related to birth weight than they are to IQ. (Wiener.)

National nutritional data show that in the U.S. the development of at least a million babies a year is "substantially compromised" by prenatal malnutrition. Miscarriages, which are also causally related to poor nutrition, occur at a rate of a few hundred thousand per year. (Williams.)

When a muscle is fatigued, it swells, taking up sodium and water, and it is likely to become sore. Energy depletion causes any cell to take up water and sodium, and to lose potassium. An abnormal excess of potassium in the blood, especially when sodium is low, affects nerve, muscle, and secretory cells; a high level of potassium can stop the heart, for example. Cellular energy can be depleted by a combination of work, insufficient food or oxygen, or a deficiency of the hormones needed for energy production. When the swelling happens suddenly, the movement of water and sodium from the blood plasma into cells decreases the volume of blood, while the quantity of red cells remains the same, making the blood more viscous.

During the night, as adrenalin, cortisol, and other stress hormones rise, our blood becomes more viscous and clots more easily. In rats, it has been found that the concentration of serum proteins increases significantly during the night, presumably because water is moving out of

the circulatory system. Even moderate stress causes some loss of water from the blood.

If a person is malnourished, a moderate stress can overcome the body's regulatory capacity. If tissue damage is extreme, or blood loss is great, even a healthy person experiences hypovolemia and shock. C.A. Crenshaw, who was a member of the trauma team at Parkland Hospital in Dallas that worked on Kennedy and Oswald, had been involved in research with G. T. Shires on traumatic shock. In his words, "we made medical history by discovering that death from hemorrhagic shock (blood loss) can be due primarily to the body's adjunctive depletion of internal salt water into the cells." (Shires' work involved isotopes of sodium to show that sodium seems to be taken up by cells during shock.)

According to Crenshaw, "Oswald did not die from damaged internal organs. He died from the chemical imbalances of hemorrhagic shock. From the time he was shot...until the moment fluids were introduced into the body..." [19 minutes] "there was very little blood circulating in Oswald's body. As a result, he was not getting oxygen, and waste built up in his cells. Then, when the fluids were started, the collection of waste from the cells was dumped into the bloodstream, suddenly increasing the acid level, and delivering these impurities to his heart. When the contaminated blood reached the heart, it went into arrest...." The "waste" he refers to includes potassium and lactic acid Crenshaw advocates the use of Ringer's lactate to replace some of the lost fluid. Since the blood already contains a large amount of lactate because the body is unable to consume it, this doesn't seem reasonable. I think a hypertonic version of Locke's solution, containing glucose and sodium bicarbonate as well as sodium chloride, would be better, though I think the potassium should be omitted too, and extra magnesium would seem desirable. Triiodothyronine, I suspect, would help tremendously to deal with the problems of shock, causing potassium, magnesium, and phosphate to move back into cells, and sodium to move out, helping to restore blood volume and reduce the wasteful conversion of glucose to lactic acid.

Albumin has been used therapeutically in preeclampsia (Kelman), to restore blood volume. Synthetic polymers with similar osmotic properties are sometimes used in shock, and might also be useful in eclampsia, but simply eating extra protein quickly restores blood albumin. For example, in a group of women who were in their seventh month of pregnancy, the normal women's serum osmotic pressure was 247 mm. of water, that of the women with nonconvulsive toxemia was 215 mm., and

in the women with eclampsia, the albumin and osmotic pressure were lowest, with a pressure of 175 mm. In the eighth month, the toxemic women who ate 260 grams of protein daily had a 7% increase in osmotic pressure, and a group who ate 20 grams had a decline of 9%.(Strauss) In a group of preeclamptics, plasma volume was 39% below that of normal pregnant women.

Besides protein deficiency and other nutritional deficiencies, excess estrogen and low thyroid can also limit the liver's ability to produce albumin. Hypovolemia reduces liver function, and (like hepatic infarcts) will reduce its ability to maintain albumin production..

The studies which have found that hospitalized patients with the lowest albumin are the least likely to survive suggest that the hypovolemia resulting from hepatic inefficiency is a problem of general importance, and that it probably relates to the multiple organ failure which is an extremely common form of death among hospitalized patients. A diet low in sodium and protein probably kills many more people than has been documented. If old age is commonly a hypovolemic condition, then the common salt restriction for old-age hypertension is just as irrational as is salt-restriction in pregnancy or in shock. Thyroid (T;), glucose, sodium, magnesium and protein should be considered in any state in which weakened homeostatic control of the composition of plasma is evident.

*Note: Although Konrad Lorenz (who later received the Nobel Prize) was the architect of the Nazi's policy of "racial hygiene" (extermination of those with unwanted physical. cultural, or political traits which were supposedly determined by "genes") he took his ideas from the leading U.S. geneticists, whose works were published in the main genetics journals. Following the Nazi's defeat, some of these journals were renamed, and the materials on eugenics were often removed from libraries, so that a new historical resume could be presented by the profession.

ADDITIONAL REFERENCES

1. G. Wiener, et al., "Correlates of low birth weight: Psychological status at eight to ten years of age," Pediatr. Res. 2, 110-118, 1968.
2. A. Chase, "The great pellagra cover-up," Psychol. Today, pp. 83-86, Feb., 1975.
3. Prevention Handbook, Natl. Assoc. for Retarded Citizens, 1974.
4. US HEW, The Women and Their Pregnancies, W.B. Saunders Co., 1972.
5. M. Winick and P. Rosso, "The effect of severe early malnutrition on cellular growth of human brain," Pediatr. Res. 3, 181-184, 1969.
6. Roger Williams, Nutrition Against Disease, Pitman Publ., 1971.
7. H.M. Schmeck, Jr., "Brain harm in US laid to food lack," N.Y. times, Nov. 2, 1975.

8. R. Hurley, Poverty and Mental Retardation: A Causal Relationship, Random House, 1970.
9. D. Shanklin and J. Hodin, Maternal Nutrition and Child Health, C. C. Thomas, 1978.
10. H.H. Reese, H. A. Paskind, and E. L. Sevringhaus, 1936 Year Book of Neurology, Psychiatry and Endocrinology, Year Book Publishers, Chicago, 1937.
11. M. B. Strauss, "Observations on the etiology of the toxemias of pregnancy: The relationship of nutritional deficiency, hypoproteinemia, and elevated venous pressure to water retention in pregnancy," Am. J. Med. Sci. 190, 811-824, 1935.
12. "Albumin concentration can be used for mild preeclampsia," Obstet. Gynecol. News, October 1, 1974.
13. L. Kelman, et al., "Effects of dietary protein restriction on albumin synthesis, albumin catabolism, and the plasma aminogram," Am. J. Clin. Nutr. 25, 1174-1178, 1972.
14. T. H. Brewer, "Role of malnutrition, hepatic dysfunction, and gastrointestinal bacteria in the pathogenesis of acute toxemia of pregnancy," Am. J. Obstet. Gynecol. 84, 1253-1256, 1962
15. "Plasma volume 'a clue' to hypertension risks," Obstet. Gynecol. Observer, August/September, 1975.
16. C. A. Crenshaw, MD), J. Hansen and J. G. Shaw, JFK: Conspiracy of Silence, Signet, 1992.
17. T. Backstrom, "Epileptic seizures in women related to plasma estrogen and progesterone during the menstrual cycle," Acta Neurol. Scand. 54, 321-347, 1976
18. C. Muller, et al., "Reversible bilateral cerebral changes on magnetic resonance imaging during eclampsia," Deutsche Medizinische Wochenschrift 121(39), 1184-1188, 1996.
edema was demonstrated.)

25

ESTRIOL, DES, DDT, ETC.

As the result of industrial promotion, including product advertising and grants for research, "weak estrogens" and "antioxidants" derived from soy are being discussed as means to prevent breast and prostate cancer, heart disease, stress and aging.

Japanese women used to be very free of breast cancer, and when their children grew up in the U.S., their incidence of the disease was like that of Americans. How odd that the soybean should be singled out for responsibility. Japanese breast cancer incidence has risen sharply in recent years. Did they stop eating tofu? Did their traditional use of seaweed as food have nothing to do with their health? Did the traditional home-bound isolation of Japanese women, their avoidance of smoking and drinking, have no effect on hormones and cancer? Their calorie intake? Iodine and trace minerals? What types of protein and fat, in what quantities, did they use?

Another so-called weak estrogen, estriol, is being promoted by drug companies for the "alternative medical" market, with the circulation of an editorial from JAMA, recommending it for preventing breast cancer. A review of the use of estrogens reported in JAMA (only up to 1987) found nearly 200 different "indications" for its use. (Palmlund, 1996.) Using the conservative language of that journal, such use could be said to constitute wildly irresponsible "empirical" medical practice. More appropriate language could be used.

Pollution of the environment and food supply by estrogenic chemicals is getting increased attention. Early in the study of estrogens, it was noticed that soot, containing polycyclic aromatic hydrocarbons, was both estrogenic and carcinogenic. Since then, it has been found that phenolics and chlorinated hydrocarbons are significantly estrogenic, and that many estrogenic herbicides, pesticides, and industrial by-products persist in the environment, causing infertility, deformed reproductive organs, tumors, and other biological defects, including immunodeficiency. In the Columbia River, a recent study found that about 25% of the otters and muskrats were anatomically deformed.

Estrogenic pollution kills birds, panthers, alligators, old men, young women, fish, seals, babies, and ecosystems. Some of these chemicals are sprayed on forests by the US Department of Agriculture,

where they enter lakes, underwater aquifers, rivers, and oceans. Private businesses spray them on farms and orchards, or put them into the air as smoke or vapors, or dump them directly into rivers. Homeowners put them on their lawns and gardens.

Natural estrogens, from human urine, enter the rivers from sewage. Many tons of synthetic and pharmaceutical estrogens, administered to menopausal women in quantities much larger than their bodies ever produced metabolically, are being added to the rivers.

In the same way that weak estrogens in the environment may become hundreds of times more estrogenic by synergistic interactions (J. A. McLachlan, et al., Science, June 7, 1996), combinations of natural, medical, dietary, and environmental estrogens are almost certain to have unexpected results. The concept of a "protective estrogen" is very similar to the idea of "protective mutagens" or "protective carcinogens, " though in the case of estrogens, their promoters don't even know what the normal, natural functions of estrogen are.

In November, 1995, an international conference was held to study the problem of "Environmental endocrine-disrupting chemicals," and to devise strategies for increasing public awareness of the seriousness of the problem. Their "Statement from the work session" says "New evidence is especially worrisome because it underscores the exquisite sensitivity of the developing nervous system to chemical perturbations that result in functional abnormalities." "This work session was convened because of the growing concern that failure to confront the problem could have major economic and societal implications." "We are certain of the following: Endocrine-disrupting chemicals can undermine neurological and behavioral development and subsequent potential of individuals...." "Because the endocrine system is sensitive to perturbation, it is a likely target for disturbance." "Man-made endocrine-disrupting chemicals range across all continents and oceans. They are found in native populations from the Arctic to the tropics, and, because of their persistence in the body, can be passed from generation to generation." " ...many endocrine-disrupting contaminants, even if less potent than the natural products, are present in living tissue at concentrations millions of times higher than the natural hormones." "The developing brain exhibits specific and often narrow windows during which exposure to endocrine disruptors can produce permanent changes in its structure and function."

In spite of this increased exposure to estrogens, there is a new wave of advertising of estrogenic substances, based on the idea that weak

estrogens will provide protection against strong estrogens. The environmental background of estrogenic pollution already provides a continuous estrogenic exposure. In the 1940s, Alexander Lipshuts demonstrated that a continuous, weak estrogenic stimulus was immensely effective in producing, first fibromas, then cancer, in one organ after another, and the effect was not limited to the reproductive system. How is it possible that the idea of "protection" from a weak estrogen seems convincing to so many? Isn't this the same process that we saw when the nuclear industry promoted Luckey's doctrine of "radiation hormesis," literally the claim that "a little radiation is positively good for us"?

DES (diethyl stilbestrol) is one of the most notorious estrogens, because studies in humans revealed that its use during pregnancy not only caused cancer, miscarriages, blood clots, etc., in the women who used it, but also caused cancer, infertility, and deformities in their children, and even in their grandchildren. (But those transgenerational effects are not unique to it.)

Besides the absurd use of DES to prevent miscarriages, around 1950 it was also used to treat vulvovaginitis in little girls, for menstrual irregularity at puberty, to treat sterility, dysfunctional bleeding, endometriosis, amenorrhea, oligomenorrhea, dysmenorrhea, migraine headaches, nausea and vomiting, and painful breast engorgement or severe bleeding after childbirth.

DES is a "weak" estrogen, in the sense that it doesn't compete with natural estrogens for the "estrogen receptors." (Estriol binds more strongly to receptors than DES does: "Cytosolic and nuclear estrogen receptors in the genital tract of the rhesus monkey," J. Steroid Bioch. 8(2), 151-155, 1977.) Pills formerly contained from 5 to 250 mg. of DES. The 1984 PDR lists doses for hypogonadism and ovarian failure as 0.2 to 0.5 mg. daily. In general, dosage of estrogens decreased by a factor of 100 after the 1960s.

An aggressively stupid editorial by Alvin H. Follingstad, from the Jan. 2, 1978, issue of JAMA, pages 29-30, "Estriol, the forgotten estrogen?" is being circulated to promote the use of estriol, or the phytoestrogens. It argues that women who secrete larger amounts of estriol are resistant to cancer.

By some tests, estriol is a "weak estrogen," by others it is a powerful estrogen.

When estriol was placed in the uterus of a rabbit, only 1.25 meg. was sufficient to prevent implantation and destroy the blastocyst. (Dmowski, et al., 1977.) Since the effect was local, the body weight of

the animal doesn't make much difference, when thinking about the probable effect of a similar local contentration of the hormone on human tissues. The anti-progestational activity of estriol and estradiol are approximately the same. (Tamotsu and Pincus, 1958.)

When 5 mg. of estriol was given to women intravaginally, this very large dose suppressed LH within 2 hours, and suppressed FSH in 5 hours. Given orally, 8 mg. had similar effects on LH and FSH after 30 days, and also had an estrogenic effect on the vaginal epithelium.. These quick systemic effects of a "weak estrogen" are essentially those of a strong estrogen, except for the size of the dose. (Schiff, et al., 1978.)

When administered subcutaneously, estriol induced abortions and stillbirths (Velardo, et al.)

Another indication of the strength of an estrogen is its ability to cause the uterus to enlarge. Estriol is slightly weaker, in terms of milligrams required to cause a certain rate of uterine enlargement, than estradiol. (Clark, et al., 1979.) But isn't the important question whether or not the weak estrogen imitates all of the effects of estradiol, including carcinogenesis and blood clotting, in addition to any special harmful effects it might have?

When added to long-term culture of human breast cancer cells, estriol stimulated their growth, and overcame the antiestrogenic effects of tamoxifen, even at concentrations hundreds of times lower than that of tamoxifen. "The data do not support an antiestrogenic role for estriol in human breast cancer." (Lippman, et al., 1977.)

Studies of the urinary output of estriol/estradiol in women with or without breast cancer do not reliably show the claimed association between low estriol/estradiol and cancer, and the stimulating effect of estriol on the growth of cancer cells suggests that any alteration of the estrogen ratio is likely to be a consequence of the disease, rather than a cause. The conversion of estradiol to other estrogens occurs mainly in the liver, in the non-pregnant woman, as does the further metabolism of the estrogens into glucuronides and sulfates. The hormonal conditions leading to and associated with breast cancer all affect the liver and its metabolic systems. The hydroxylating enzymes are also affected by toxins. Hypothyroidism (low T3), low progesterone, pregnenolone, DHEA, etiocholanolone, and high prolactin, growth hormone, and cortisol are associated with the chronic high estrogen and breast cancer physiologies, and modify the liver's regulatory ability.

The decreased output of hormones when the fetal-placental system is dying is a natural consequence, since the placenta produces

hormones, and during pregnancy converts estradiol to estriol. Since estradiol in excess kills the fetus, its conversion by the placenta to estriol is in accord with the evidence showing that estriol is the more quickly excreted form. (G. S. Rao, 1973.) The conversion of 16-hydroxy androstenedione and 16-hydroxy-DHEA into estriol by the placenta (Vega Ramos, 1973) would also cause fetal exhaustion or death to result in lower estriol production. But a recent observation that a surge of estriol production precedes the onset of labor, and that its premature occurrence can identify women at risk of premature delivery (McGregor, et al., 1995) suggests that the estriol surge might reflect the mother's increased production of adrenal androgens during stress. (This would be analogous to the situation in the polycystic ovary syndrome, in which excessive estradiol drives the adrenals to produce androgens.)

Estetrol, which has one more hydroxyl group than estriol, is a "more sensitive and reliable indicator of fetal morbidity than estriol during toxemic pregnancies," because it starts to decrease earlier, or decreases more, than estriol. (Kundu, et al., 1978.) This seems to make it even clearer that the decline of estriol is a consequence, not a cause, of fetal sickness or death.

A 1994 publication (B. Zumoff, "Hormonal profiles in women with breast cancer," Obstet. Gynecol. Clin. North. Am. (U.S.) 21(4), 751-772) reported that there are four hormonal features in women with breast cancer: diminished androgen production, luteal inadequacy, increased 16-hydroxylation of estradiol, and increased prolactin. The 16-hydroxylation converts estradiol into estriol.

A new technique for radiographically locating a hormone-dependent breast cancer is based on the fact that estriol-sulfate is a major metabolite of estradiol. The technique showed the tumor to have about a six times higher concentration of estriol-sulfate than liver or muscle. (N. Shimura, et al., "Specific imaging of hormone-dependent mammary carcinoma in nude mice with ['3'I]-anti-estriol 3-sulfate antibody," Nucl. Med. Biol. (England) 22(5), 547-553, 1995.)

Another association of elevated conversion of estradiol to estriol with disease was found to occur in men who had a myocardial infarction, compared to controls who hadn't. (W. S. Bauld, et al., 1957.)

The estrogens in clover have been known for several decades to have a contraceptive action in sheep, and other phytoestrogens are known to cause deformities in the genitals, feminization of men, and anatomical changes in the brain as well as functional masculinization of the female brain. (Register, et al., 1995; Levy, et al, 1995; Clarkson, et al., 1995;

Gavaler, et al., 1995.) The effects of the phytoestrogens are very complex, because they modify the sensitivity of cells to natural estrogens, and also modify the metabolism of estrogens, with the result that the effects on a given tissue can be either pro-estrogenic and anti-estrogenic. For example, the flavonoids, naringenin, quercetin and kaempherol (kaempherol is an antioxidant, a phytoestrogen, and a mutagen) modify the metabolism of estradiol, causing increased bioavailability of both estrone and estradiol. (W. Schubert, et al., "Inhibition of 17-beta-estradiol metabolism by grapefruit juice in ovariectomized women," Maturitas (Ireland) 30(2-3), 155-163, 1994.)

Since phenolic compounds often function as "antioxidants," as well as estrogens, we are seeing an epidemic of marketing claims for plant substances that are "better than vitamin E" and "better than Premarin," but something that these super-antioxidants have in common with all estrogens is that they are easily oxidized, forming cycles of oxidation-reduction that consume oxygen, waste energy, and produce immense quantities of free radicals, causing genetic damage as well as other changes. That the damage might lead to cancer or seizures is bad enough, but the awful thing is that some of the changes are passed on in heredity, as cancer, or anatomical or neurological abnormalities.. L.C. Strong pioneered in the study of the hereditary toxicity of estrogen, generations ago, and transgenerational effects have been seen with DES and other estrogens.

Why do plants make phytoestrogens? There is some information indicating that these compounds evolved to regulate the plants' interactions with other organisms--to attract bacteria, or to repel insects, for example, rather than just as pigment-forming materials. (Baker, 1995.) The fact that some of them bind to our "estrogen receptors" is probably misleading, because of their many other effects, including inhibiting enzyme functions involved in the regulation of steroids and prostaglandins. Their biochemistry in animals is much more complicated than that of natural estrogens, which is itself so complicated that we can only guess what the consequences might be when we change the concentration and the ratio of substances in that complex system. (See quotation from Velardo, et al., page 6)

These "natural" effects in sheep were forerunners of the observed estrogenic effects in wild animals, caused by pollutants. Twenty-five years ago I reviewed many of the issues of estrogen's toxicity, and the ubiquity of estrogenic substances, and since then have regularly spoken about it, but I haven't concentrated much attention on the phytoestrogens,

because we can usually just choose foods that are relatively free of them. They are so often associated with other food toxins--antithyroid factors, inhibitors of digestive enzymes, immunosuppressants, etc.--that the avoidance of certain foods is desirable. Recently an advocate of soybeans said "if they inhibit the thyroid, why isn't there an epidemic of hypothyroidism in Asia?" |I happened to hear this right after seeing newspaper articles about China's problem with 100,000,000 cretins; yes, Asia has endemic hypothyroidism, and beans are widely associated with hypothyroidism.

When I first heard about clover-induced miscarriages in sheep, I began reading about the subject, because it was relevant to the work !I was doing at that time on reproductive aging. Sheep which are adapted to living at high altitude, where all animals have reduced fertility, have an adaptive type of hemoglobin, with a greater affinity for oxygen. Fetal hemoglobin, in animals at sea-level, has a great affinity for oxygen, making it possible for the fetus to get enough oxygen, despite its insulation from the mother's direct blood supply. The high-altitude-tolerant sheep have hemoglobin which is able to deliver sufficient oxygen to the uterus to meet the needs of the embryo/fetus, even during relative oxygen-deprivation. These sheep are able to sustain pregnancy while grazing on clover. It seemed evident that estrogen and high altitude had something in common, namely, oxygen deprivation, and it also seemed evident that these sheep provided the explanation for estrogen's abortifacient effects.

Estrogen's effects, ranging from shock to cancer, all seem to relate to an interference with the use of oxygen. Different estrogens have different affinities for various tissues, and a given substance is likely to have effects other than estrogenicity, and the presence of other substances will modify the way a tissue responds, but the stressful shift away from oxidative production of energy is the factor that all estrogens have in common. Otherwise, how could suffocation and x-irradiation have estrogenic effects?

Pharmaceutical misrepresentations regarding the estrogens rank, in terms of human consequences, with the radiation damage from fall-out from bomb tests and reactor-leaks, with industrial pollution, with degradation of the food supply--with genocide, in fact.

Advertising gets a bad name when it can't be distinguished from mass murder. At a certain point, we can't afford to waste our time making subtle distinctions between ignorance and malevolence. If we begin pointing out the lethal consequences of "stupid" or quasi-stupid

commercial/governmental policies, the offenders will have the burden of proving that their actions are the result of irresponsible ignorance, rather than criminal duplicity. From the tobacco senators to the chemical/pharmaceutical/food/energy industries and their agents in the governmental agencies, those who do great harm must be held responsible.

The idea of corporate welfare, in which public funds are given in massive subsidies to rich corporations, is now generally recognized. Next, we have to increase our consciousness of corporate responsibility, and that ordinary criminal law, especially RICO, can be directly applied to corporations. It remains to be seen whether a government can be made to stop giving public funds to corporations, and instead, to begin enforcing the law against them--and against those in the agencies who participated in their crimes.

In the U.S., the death penalty is sometimes reserved for "aggravated homicide." If those who kill hundreds of thousands for the sake of billions of dollars in profits are not committing aggravated homicide, then it must be that no law written in the English language can be objectively interpreted, and the legal system is an Alice in Wonderland convenience for the corporate state.

REFERENCES

1. Dr. Bernard Weiss, Dept. of Environmental Medicine, University of Rochester School of Medicine, Rochester, NY. and 17 others, work session on environmental endocrine-disrupting chemicals, Nov. 5-10, 1995.
2. Isaac Schiff, et al., "Effects of estriol administration on the hypogonadal woman," Fertil Steril. 30(3), 278-282, 1978.
3. N. P. J. Kundu, et al., "Sequential determination of serum human placental lactogen, estriol, and estetrol for assessment of fetal morbidity," Obstet. Gynecol. 52(5), 513-520, 1978
4. M. E. Lieberman, et al., "Estrogen control of prolactin synthesis in vitro," P.N.A.S. (USA) 75(12), 5946-5949, 1978.
5. Mare Lippman, et al., "Effects of estrone, estradiol and estriol on hormone-responsive human breast cancer in long term tissue culture," Cancer Res. 37(6), 1901-1907, 1977.
6. W. P. Dmowski, et al., "Effect of intrauterine estriol on reproductive function in the rabbit." Fertil. Steril. 28(3), 262-8, 1977.
7. W. S. Bauld, et al, "Abnormality of estrogen metabolism in human subjects with myocardial infarction," Canadian Jour. Biochem. and Physiol. 35(12), 1277-1288, 1957. (The conversion of estradio! to estriol was higher in men with previous myocardial infarction than in controls.)
8. R. A. Edgren and D. W. Calhoun, "Interaction of estrogens on the vaginal smear of spayed rats," Am. J. Physiol. 189(2). 355-337, 1957. "Employing the vaginal smear as an index of effect, combinations of various estrogenic substances were tested for interaction. Studies were concentrated at the approximate 50% response level." "These data are interpreted as indicating simple additive relationships among the compounds tested." "Curiously then, estrogens that showed inhibitory interrelationships when tested on uterine growth had simple additive interactions when tested on the vaginal smears." "..it seems reasonable to postulate that a

given hormone combination may evoke differing levels of response in different target organs, and particularly, that increase of one component may increase response at one site while decreasing it at another. Many steroids...are present in the mammalian circulation during various phases of the sex cycle and are known to modify the effects of any given estrogen. This hormonal multiplicity apparently constitutes an estrogen-buffering system and supports the hypothesis that sexual responses depend '...upon a rather precise hormonal homeostasis."

9. R. C. Merrill, "Estriol: A review," Physiol. Revs. 38(3), 463-480, 1958. "...estriol itself is a potent estrogen, contrary to the usual conception of its being just a metabolite of the more potent estrone and estradiol. Although ordinarily less effective than estrone and estradiol in promoting vaginal cornification, estriol, under optimum conditions, approaches their effectiveness for this purpose. Estriol is more potent than estrone or estradiol in causing establishment and opening of the vaginal orifice, in promoting imbibition of uterine fluid, in increasing lactic dehydrogenase activity in the uterus, and in stimulating mitotic activity in the epidermis of the mouse ear. The activity of estriol is of the same order of magnitude as that of estrone and estradiol in other estrogenic actions, such as to promote uterine growth at low concentrations (although less effective at high doses), to increase beta-glucuronidase and reduced diphosphopyridine nucleotide oxidase activity in the uterus, to reduce motility of the uterus in vivo, and to stimulate ovarian growth, body weight, phagocytosis of carbon by reticuloendothelial cells, ciliary movements of the buccopharyngeal mucose of the frog, and new bone formation. The fibromatogenic activity of estriol in the guinea pig is much less than that of estrone or estradiol. Recent experiments suggest and partly verify the hypothesis that estriol stimulates the cervix, vagina and vulva.more effectively than estrone or estradiol, whereas the latter are much more effective on the corpus uteri."

10. T. Miyake and G. Pincus, "Anti-progestational activity of estrogens in rabbit endometrium," Proc. Soc. Exptl. Biol. and Med. 99(2) 478-482, 1958. "The anti-progestational activity of 4 estrogens--estrone, estradiol, estriol, and stilbestrol-administered subcutaneously progesterone into Clauberg rabbits has been demonstrated.... " "The anti-progestational activities of these estrogens are approximately the same." "..estrogen may depress reactivity of the endometrium to progesterone rather than neutralize or inactivate progesterone in the body."

11. J. T. Velardo, et al., "Effect of various steroids on gestation and litter size in rats," Fertility and Sterility 7(4), 301-311, 1956. ...certain metabolites of estrogenic and progestative substances that were previously considered to be 'weak' or inert may well play a role in the reproductive process." "We have been impressed with the probability that any endocrine receptor-organ response is not accomplished by the independent action of one hormone alone. It appears more likely that such response is the physiological expression of the sum total of the biologic hormones and their metabolites in concert on the receptor organs." "The effect of estriol on the birth rate of these rats was more dramatic." " ...when estriol was used before mating, it reduced the litter size to 66 per cent of the controls." "However, when the same dose was employed from the day of mating and daily thereafter beyond the time of usual implantation, 6 days later, a reduction of live births to 33 per cent of the controls was produced. In this experiment the medication was withheld until after ovulation had presumably occurred. The presence of placental scars and an increased incidence of abortions and stillbirths argues against the possibility that the fertile ova have been "locked' by the estrogen in the tubes." "...the incidence of placental scars, abortions, and stillbirths further bears witness to the possibility that the steroids employed interfered with the optimum differentiation of progestational endometrial changes, rather than affecting any suppression of ovulatory mechanisms."

12. B. Register, et al., "Effect of neonatal exposure to diethylstilbestrol, coumestrol, and beta-sitosterol on pituitary responsiveness and sexually dimorphic nucleus volume," P.S.E.B.M. 208, 72, 1995.

13. J. R. Levy, et al., "Effect of prenatal exposure to the phytoestrogen genistein on sexual differentiation in rats," P.S.E.B.M. 208, 60, 1995.
14. B.D. Lyn-Cook, et al., "Methylation profile and amplification of proto-oncogenes in rat pancreas induced with phytoestrogens," PSEBM 208, 116, 1995.
15. J. S. Gavaler, et al., "Phytoestrogen congeners of alcoholic beverages: Current status,: **PSEBM 208, 98, 1995**
16. A. I. Nwannenna, et al., "Clinical changes in ovariectomized ewes exposed to phytoestrogens and 17beta-estradiol implants," PSEBM 208, 92, 1995.
17. P. L. Whitten, et al., "Influence of phytoestrogen diets on estradiol action in the rat uterus," Steroids 59, 443-449, 1994. "Coumestrol did not antagonize the uterotrophic action of estradiol when administered either prior to, or jointly with, E2 treatment, or when administered orally or parenterally:" "These findings contradict the assumption that all phytoestrogens are necessarily antiproliferative agents..."
18. M. E. Baker, "Endocrine activity of plant-derived compounds: An evolutionary perspective," PSEBM 208, 131, 1995.
19. I. Palmlund, "To cell from environment," Chapter 19 in Cellular and Molecular Mechanisms of Hormonal Carcinogenesis, published by Wiley-Liss.
20. J. H. Clark, et al., "Nuclear binding of the estrogen receptor: Heterogeneity of sites and uterotropic response," Steroid Hormone Receptor Systems, page 17, 1979.
21. P. Vega Ramos, et al., "Formation of oestriol from C19, 16-oxygenated steroids by microsomal preparations of human placenta," Res. on Steroids, vol. V, page 79, Proc. of the Fifth Meeting of the International Study Group for Steroid Hormones, edited by M. Finkelstein, et al., 1973.
22. G. S. Rao, "Enzymes in steroid metabolism," Res. on Steroids, vol. V. page 175, 1973.
23. L. H. Carter and C. B. Harrington, Administrative Law and Politics HarperCollins, 1991. "Capture occurs when agencies informally promote the very interests they are officially responsible for regulating." In 1925, Coolidge's appointment of "anti-public" W. E. Humphrey to the FTC led some of its former supporters to call for the abolition of the FTC.

"If nearly a century of regulatory history tells us anything, it is that the rules-making agencies of government are almost invariably captured by the industries which they are established to control." Robert Heilbroner, In the Name of Profit, 1972, p. 239. "Federal economic regulation was generally designed by the regulated interest to meet its own end, and not those of the public or the commonweal." Gabriel Kolko, The Triumph of Conservatism: A Reinterpretation of American History, 1900-1916, 1963.

"It is a given in the modern doctrine of most tort laws that the existence of potential liability if anything encourages citizens to use greater thoughtfulness and care in their daily actions, and no obvious reasons suggest the same dynamic should not affect public officials." Adm. Law. & Pols., p. 404. "That Congress decided, after the passage of the Fourteenth Amendment, to enact legislation specifically requiring state officials to respond in federal court for their failures to observe the constitutional limitations on their powers is hardly a reason for excusing their federal counterparts for the identical constitutional transgressions." "In situations of abuse, an action for damages against the responsible official can be an important means of vindicating constitutional guarantees...." Justice White, Butz v. Economou, p. 409, Adm. Law & Pols.

26

SUNLIGHT: USING IT TO ENHANCE LIFE

GLOSSARY:

Mutations are changes in DNA molecules which can kill cells, or accelerate their aging, or contribute to the development of cancer.

Cellular respiration: the ability of cells to consume oxygen and produce useful biological energy.

Free radicals are parts of molecules that can be produced by radiation (including sunlight), which contribute to cells' aging, cancer, and mutations.

The thymus gland is an essential part of our immune system, and it shrinks when we don't get enough light.

Melatonin, or pineal hormone: the pineal gland in the brain responds to an absence of light (or to any stress which increases the adrenalin systems) by secreting a hormone called melatonin, which lightens the skin, makes the brain sluggish, turns off thyroid and progesterone production, and suppresses immunity and fertility.

Immunosuppression refers to any process that lowers the efficiency of our immune system, such as stress, radiation, or poisoning.

Q: You mention sunlight as beneficial to your health. How?

For example, it can cure depression, improve immunity, stimulate our metabolism while decreasing food craving, and increase our intelligence.

Although exposure to sun does contribute to aging of the skin, people who spend years working outdoors have a reduced incidence of cancer of internal organs. For many years, it has been known that the death rate increases during the winter months and also increases at night (winter or summer). Most deaths occur just before dawn when the body is in its least efficient state. It is just in the last few decades that we have been learning the reasons for this beneficial effect of light. It turns out that daylight stimulates our ability to use oxygen for energy production, and protects our tissues from some of the free-radical toxins that are produced by normal metabolism, by stress, or by radiation.

While ultraviolet light, and even blue light, tend to suppress our cells' ability to produce energy, those types of light penetrate only a short distance into living tissue, and so it is mainly the skin which is damaged by too much sunlight. Since blood does circulate in the layers of skin which receive ultraviolet rays, prolonged sun exposure can damage the immune system by injuring white blood cells, but usually the stimulating effect of the other types of light that penetrate more deeply offset this effect on the immune system.

Many health food stores are now selling melatonin, to induce sleep and "prevent cancer." They have taken some information out of context, and don't realize how dangerous melatonin is. It makes the brain sluggish, causes the sex organs to shrink, and damages immunity by shrinking the thymus gland. It suppresses thyroid and progesterone, and increases estrogen. It is the hormone of darkness and winter, and is produced in the pineal gland by any stress which increases adrenalin. Adequate sunlight suppresses the formation of melatonin.

This means that the immune system is most responsive in the summer, when days are long. Daylight stops the stress reaction, and protects our immune system.

Long hours of daylight increase progesterone production, and this contributes to a sense of well-being, and to the protection of all our tissues.

Q: Doesn't exposure to the sun age you?

This effect is variable, and depends on our hormones and diet. The unsaturated oils have been identified as a major factor in skin aging. For example, two groups of rabbits were fed diets containing either corn oil or coconut oil, and their backs were shaved, so sunlight could fall directly onto their skin. The animals that ate corn oil developed prematurely wrinkled skin, while the animals that ate coconut oil didn't show any harm from the sun exposure. In a study at the University of California, photographs of two groups of people were selected, pairing people of the same age, one who had eaten an unsaturated fat rich diet, the other who had eaten a diet low in unsaturated fats. A panel of judges was asked to sort them by their apparent ages, and the subjects who consumed larger amounts of the unsaturated oils were consistently judged to be older than those who ate less, showing the same age-accelerating effects of the unsaturated oils that were demonstrated by the rabbit experiments.

While it is important to avoid overexposure to ultraviolet light, the skin damage that we identify with aging is largely a product of our diet.

Q: Don't you have to avoid sunlight because of skin cancer?

The type of skin cancer which is clearly caused by sunlight is a relatively harmless type of cancer, which appears only in sun-damaged skin. Melanoma, which is often called a skin cancer, because it sometimes begins in moles, does not have such a simple relationship to sunlight, and its incidence is significantly increased by the use of estrogen.

It is often said that the great increase in deaths from melanoma during the last 60 years has been caused by an increased popularity of sunbathing, but during the same time there has been a great increase in the incidence of cancer of the prostate, which is in a location that gets very little exposure to light. What these two cancers have in common is a sensitivity to estrogen, and it is during this same period of time that we have been exposed to increased amounts of estrogen-like chemicals in the environment as a result of industrial pollution: Dioxins, phenols, chlorinated hydrocarbons, DDT, smoke, etc. It is likely that these cancers (and others) are caused by the estrogenic pollutants.

The incidence of melanoma is consistently lower at greater elevations, where ultraviolet light is more intense, than at lower elevations. It is common for melanoma to develop on relatively shaded areas, including the middle of the back and the inside of the thigh, unlike the ordinary less malignant skin cancers, which develop most often on the forehead, nose, ear, cheek, and lip, where sun exposure is greatest. People who work outside have a low incidence of melanoma according to some studies, and this is sometimes said to be because they don't get sunburned, as pale people do when they spend time in the sun after being indoors for long periods. Sunburn does cause freckling, which is a clumping of pigment cells, but recent studies show that children who get sunburned are not at increased risk for melanoma. Sunburn causes complex changes in the tissue, including weakened immunity.

To avoid the aging and immunosuppressive effects of sunlight, it seems best for sunlight to come through a window glass which removes most of the ultraviolet light, and some of the blue light. Plastic film is available which contains copper that removes this harmful part of sunlight, and can be applied to ordinary window glass. Sitting in sunlight coming through a window of this sort, for short times during the day, is

very protective. Besides protecting against cancer, it helps to keep the mood and energy level high, by keeping melatonin low and stimulating metabolism.

Recently, the polyunsaturated oils have been identified as the main thing in cells that radiation interacts with, to cause cellular damage. Vitamin E, taken internally or even applied to the skin, has been found to reduce the damage produced by exposure to ultraviolet radiation, which is logical, since it interrupts the chain reactions of toxic free-radicals produced when unsaturated oils are oxidized by radiation or other injury. Aspirin has been found to have a similar effect in reducing the harmful effects which develop in the skin after sunlight over-exposure. Coconut oil has been used for generations in "suntan lotions," and whether it is absorbed through the skin or eaten as a food, it clearly has a protective antioxidant function. Carotene seems to work with vitamin E in the skin to reduce injury by ultraviolet radiation. Caffeine also has shown a protective action against radiation, but its mechanism of action isn't clearly understood.

Q: Why not use sun-blockers, so you can get light without getting burned?

If a sunscreen lotion is based on the use of an opaque reflective material, such as zinc oxide or titanium oxide, that substance remains mostly on the surface of the skin. This should make it fairly harmless, though it is possible that traces of titanium could be absorbed with oils into the skin, where it could be made toxic by interaction with ultraviolet rays.

However, other chemicals used in the sunscreen lotions, such as PABA derivatives, also react dangerously with light, and are easily absorbed in significant quantities into the deeper layers of the skin, where they can cause mutations.

For example, several recent studies have found that the sun-blockers, which decrease the ordinary skin damage caused by ultraviolet rays, actually increase the risk of developing melanoma, by causing mutations when the cells' chromosomes interact with the sunscreen and the light. (Something similar happens in the disease, porphyria. A pigment that accumulates causes the skin to become very sensitive to the sun. Estrogen is known to intensify the disease.)

Even natural colored compounds, which have sometimes been used in suntan lotions, should be avoided, since they might be able to transmit the energy of light to the chromosomes, causing mutations.

Radiation from the sun reacts with the unsaturated fats you have eaten to cause oxidative damage to skin cells. Vitamin E, vitamin A and carotene are antioxidants that prevent skin cell damage, when they are taken internally or applied to the surface of the skin.. None of these causes any harmful effects in the sun.

Aspirin reduces the iron content of the blood serum, and also inhibits the formation of the sometimes-toxic prostaglandins from fatty acids. Coconut oil is very resistant to radiation damage and, like vitamin E, tends to stop the chain reactions that occur in unsaturated fats. The old formula for suntan oil, cocount oil with iodine, might turn out to be a safe sunscreen, since the brown iodine absorbs light, as other "U.V. blockers" do, but iodine is also an effective chain breaker that inactivates free radicals, and it can't be absorbed into cells in its brown form. It doesn't have the potential for causing cancer that the popular sunscreens do.

Q: Is sunlight still beneficial if you use a safe sun blocker?

The popular chemical sun blockers are meant to stop the ultraviolet rays. If they can do that, without increasing the risk of melanoma, then they are very beneficial, because this will allow you to get a long exposure to direct sunlight, which penetrates deeply and has an antistress effect. But so far, there is no research that shows any of the chemical ultraviolet blockers is safe.

Q: Why do people seem to get sicker in the wintertime, often right after Christmas?

Nights are much longer in the winter, and even in the summer, death rates are higher during the night than in daytime. December 21 is the day with the fewest hours of sunlight, but the cumulative damage of prolonged darkness reaches its peak about a month later. Cold temperatures do have some harmful effects, but by keeping people indoors, or bundled up in thick clothing, cold weather also causes us to get very little exposure to sunlight. Winter sickness is mainly the result of a "light deficiency."

When young sailors spent 6 months in the continuous polar night of Antarctica, they developed the same signs of nocturnal stress that are common in old people during the night. Many old people habitually get up before dawn, because they find it impossible to stay asleep. Even healthy young people (and animals) experience some degree of nocturnal stress as soon as the light is turned off at night, and their body responds with an increased production of adrenalin and cortisol.

The energy-producing part of cells, the mitochondrion, shows signs of being increasingly damaged as the night progresses, but they are gradually restored to their normal condition during the daytime light hours. This means that our greatest ability to resist stress is in the late afternoon, and we are most susceptible to injury at dawn. In the winter, nights are long and days are short, so we experience a cumulative increase in our susceptibility to stress-injury during the winter months.

The light which penetrates deeply into our tissues (mainly orange and red light) is able to improve the efficiency of energy production, and to suppress the toxic free-radicals that are always being formed in cells.

Q: Can you get enough sunlight during the summer to hold you through the winter?

No, many of the beneficial effects of bright light disappear during just a few hours of darkness, though the restoration of our tissues that happens during the summer puts us into a better state for surviving the winter, for example by allowing massive regeneration of the thymus to occur. (This occurs in adults, not just in children. The idea that the thymus disappears after puberty is based on autopsies. If a person lives for even 3 hours after an accident or the onset of sickness, the thymus has had time to shrink.)

Frequent short exposures to bright light is almost as valuable as continuous sunlight, and it is less likely to cause skin aging.

Q. How much sunlight do we need a day for general health?

If artificial light is bright enough, it is as effective as sunlight at stopping the stress reaction, but people seldom use lights that are bright enough. Generally, people and animals are healthier when days are longer than 12 hours, that is, after March 21 and before September 20. When days are shorter than 12 hours, artificial lights should be used from sunset until bedtime, but the greatest brightness probably doesn't have to be continuous. Studies on isolated organs and tissues suggest that a few

seconds of penetrating bright light are enought to break the free radical chain reactions, slowing the production of toxic substances, which tend to increase in concentration during nocturnal stress. A few seconds' exposure to the direct light of ten 150 Watt incandescent bulbs, for just a few minutes every two or three hours, might provide more effective protection than continuous exposure to a single 100 Watt light.

SUMMARY

In fall and winter, use very bright incandescent lights daily from sunset until bedtime.

Expose as much skin as possible to the bright light; even a minute is better than nothing. Thin, light-colored clothing transmits a considerable amount of light.

Infrared bulbs, with clear glass, are especially beneficial. Special low temperature red lights are available.

It is better to get your sunlight through windows, because it has less ultraviolet light than direct sunlight.

Don't use sun-blocking lotions, other than the simply reflective type (zinc oxide or titanium oxide).

Decrease the use of unsaturated oils in the diet, and use coconut oil as food and also on the skin during exposure to direct sunlight.

Vitamin E and aspirin reduce the harmful effects of sunburn, even when used after exposure to the sun, they can be applied topically to the burned skin. Vitamin E often contains some soy oil, so 1 recommend small doses of about 100 mg. per day.

REFERENCES

1 B. K. Armstrong, "Stratospheric ozone and health," Int. J. Epidemiol. 23(5), 873-995. 1994.

2 R. J. Berger and N. H. Phillips, "Constant light suppresses sleep and circadian rhythms in pigeons without consequent sleep rebound in darkness," Amer. J. Physiol.-Regul. Integr. C 36(4), R945-%952, 1994. "Sleep patterns...showed no evidence of prior sleep deprivation during LL."

3 A. Bibikova and U. Oron, "Regeneration in denervated toad (Bufo viridis) gastrocnemius muscle and the promotion of the process by low energy laser irradiaton," Anat. Rec. 242(1), 123-128, 1995.

4 I.. Bolognani, et al., "Effects of low-power 632 nm radiation (HeNe laser) on a human cell line: Influence on adenylnucleotides and cytoskeletal structures," J. Photochem. Photobiol. B-Biol. 26(3), 257-264, 1994.

5 N. V. Bulyakova and M. F. Popova, "Stimulation of post-traumatic regeneration of skeletal muscles of old rats after X-ray irradiation," Bull. Exp. Biol. & Med. 103(4), 546-550, 1987.

6 A. Cagnacci, R. Soldani, C. Romagnolo, and S.S.C. Yen, "Melatonin-induced decrease of body temperature in women: A threshold event," Neuroendocrinology 60(5), 549-552, 1994.

7 J.T. Chuang, and M.T. Lin, "Pharmacological effects of melatonin treatment on both locomotor activity and brain serotonin release in rats," J. Pineal Res. 17(1), 11-16, 1994.

8 A. M. F. Conti, "Effects of low-power 632 nm radiation (HeNe laser) on a human cell line: Influence on adenylnucleotides and cytoskeletal structures," J. Photochem. Photobiol. B-Biol 26(3), 257-264, 1994.

9 A. Distefano and L. Paulesu, "Inhibitory effect of melatonin on production of IFN gamma or TNF alpha in peripheral blood mononuclear cells of some blood donors," J. Pineal Res. 17(4), 164-169, 1994.

10 V. A. Frolov, "Seasonal structural and functional changes in the rabbit heart," Bulletin of Experimental Biology and Medicine, 420-423, 1984.

11 V. A. Frolov, V. P. Pukhlyanko, and T. A. Kanskaya, "Changes in left ventricular mitochondria in intact rabbits during the 24 hour period," Bull. Exp. Biol. & Med., 353-356, 1985.

12 R. P. Gallagher, et al., "Sunlight exposure, pigmentation factors, and risk of nonmelanocytic skin cancer: 1. Basal cell carcinoma," Arch. Dermatol. 131(2), 157-163, 1995. ["The lack of association between cumulative sun exposure and BCC contradicts conventional wisdom about the cause of this tumor...."]

13 R. P. Gallagher, et al., "Sunlight exposure, pigmentation factors, and risk of nonmelanocytic skin cancer: 2. Squamous cell carcinoma," Arch. Dermatol. 131(2), 164-169, 1995. ["...No association was seen between risk of SCC and cumulative lifetime sun exposure."]

14 S. L.. Harrison, et al., "Sun exposure and melanocytic naevi in young Australian children," Lancet 344(8936), 1529-1532, 1994. (Sunburn.)

15 M. Hasegawa, A. Adachi, T. Yoshimura, and S. Ebihara, "Retinally perceived light is not essential for photic regulation of pineal melatonin rhythmicity in pigeon: Studies with microdialysis," J. Comp. Physiol. A 175(5), 581-586, 1994.

16 J. 1. Kitay and M. D Altschule, The Pineal Gland, Harvard Univ. Press, Cambridge, 1954.

17 .L H. Kligman, P.S. Zheng, "The protective effect of a broad-spectrum sunscreen against chronic UVA radiation in hairless mice: A histologic and ultrastructural assessment," J. Soc. Cosmet. Chem. 45(1), 21-33, 1994. (OXYBENZONE caused more skin damage than was seen in unprotected mice.]

18. Kunkel and Williams, J. Biological Chemistry, 1951.

19. W. Malorni, et al., "Both UVA and UVB induce cytoskeleton-dependent surface blebbing in epidermoid cells," J. Photochem. Photobiol. B-Biol 26(3), 265-270, 1994.

20 A. L. Maksimov and T. B. Chernook, "Biorhythmic aspects of intercontinental Antarctic adaptation," Izvestiya Akademii Nauk Kirgiskoy SSR No. 2, pp. 35-37, 1986.

21. F. Nachbar and H. C. Korting, "The role of vitamin E in normal and damaged skin," J. Molecular Med.-Jmm. 73(1), 7-17, 1995.
22 R. Pasquali, et al., Acta Endocrinologica 107, 42-48, 1984.(Thyroid seasonal changes in men.)
23 D. Pastore, M. Greco, V. A. Petragallo, and S. Passarella, "Increase in H+/e(-) ratio in mitochondria irradiated with helium-neon laser," Biochem. Mol. Biol. Int. 34(4), 1994.
24 A. T. Pikulev, et al., Radiobiology 24(1), 29-34, 1984.Krebs cycle enzymes.
25 Yu. I. Prokopenko, Gigiyena i Sanitariya 12, pp. 8-10, 1982, "Adaptogenic light."
26 J. M. Rivas and S. E. Ullrich, "The role of Il-4, IL-10, and TNF-alpha in the immune suppression induced by ultraviolet radiation," J. Leukocyte Biol. 56(6), 769-775, 1994.
27 E. S. Robinson, et al., "Malignant melanoma in ultraviolet irradiated laboratory opossums: Initiation in suckling young, metastasis in adults, and xenograft behavior in nude mice," Cancer Res. 54(22), 5986-5991, 1994.
28 G. L. Schieven and J. A. Ledbetter, "Activation of tyrosine kinase signal pathways by radiation and oxidative stress," Trends Endocrinol. Metab. 5(9), 383-388, 1994. "The ability of radiation and oxidative stress to bypass control by normal ligands to act on receptors and their signal transduction pathways offers a new perspective on the ways in which organisms can respond to stress.
29 B. J. Vermeer and M. Hurks, "The clinical relevance of immunosuppression by UV irradiation," J. Photochem. Photobiol. B-Biol. 24(3), 149-154, 1994.
30 P. Wallberg and E. Skog, "Increasing incidence of basal cell carcinoma," Br. J. Dermatol. 131(6), 914-915, 1994.
31 J. Westerdahl, et al., "At what age do sunburn episodes play a crucial role for the development of malignant melanoma?" Fur. J. C'ancer 30A(11), 1647-1654, 1994.

27

UNSATURATED VEGETABLE OILS: TOXIC

GLOSSARY:

Immunodeficiency (weakness of the immune system) can take many forms. AIDS. for example, refers to an immunodeficiency which is "acquired," rather than "inborn." Radiation and vegetable oils can cause "acquired immunodeficiency." Unsaturated oils, especially polyunsaturates, weaken the immune system's function in ways that are similar to the damage caused by radiation, hormone imbalance, cancer, aging, or viral infections. The media discuss sexually transmitted and drug-induced immunodeficiency, but it isn't yet considered polite to discuss vegetable oil-induced immunodeficiency.

Unsaturated oils: When an oil is saturated, that means that the molecule has all the hydrogen atoms it can hold Unsaturation means that some hydrogen atoms have been removed, and this opens the structure of the molecule in a way that makes it susceptible to attack by free radicals.

Free radicals are reactive molecular fragments that occur even in healthy cells, and can damage the cell. When unsaturated oils are exposed to free radicals they can create chain reactions of free radicals that spread the damage in the cell, and contribute to the cell's aging.

Rancidity of oils occurs when they are exposed to oxygen, in the body just as in the bottle. Harmful free radicals are formed, and oxygen is used up.

Essential fatty acids (EFA) are, according to the textbooks, linoleic acid and linolenic acid, and they are supposed to have the status of "vitamins," which must be taken in the diet to make life possible. However, we are able to synthesize our own unsaturated fats when we don't eat the "EFA," so they are not "essential." The term thus appears to be a misnomer. [M. E. Hanke, "Biochemistry," Encycl. Brit. Book of the Year, 1948.]

Q: You say vegetable oils are hazardous to your health. What vegetable oils are you talking about?

Mainly, I'm referring to soybean oil, corn oil, safflower oil, canola, sesame oil, sunflower seed oil, palm oil, and any others that are labeled as "unsaturated" or "polyunsaturated." Almond oil, which is used in many cosmetics, is very unsaturated.

Chemically, the material that makes these oils very toxic is the polyunsaturated fat itself. These unsaturated oils are found in very high concentrations in many seeds, and in the fats of animals that have eaten a diet containing them. The fresh oils, whether cold pressed or consumed as part of the living plant material, are intrinsically toxic, and it is not any special industrial treatment that makes them toxic. Since these oils occur in other parts of plants at lower concentration, and in the animals which eat the plants, it is impossible to eat a diet which lacks them, unless special foods are prepared in the laboratory.

These toxic oils are sometimes called the "essential fatty acids" or "vitamin F," but this concept of the oils as essential nutrients was clearly disproved over 50 years ago.

Linoleic and linolenic acids, the "essential fatty acids," and other polyunsaturated fatty acids, which are now fed to pigs to fatten them, in the form of corn and soy beans, cause the animals' fat to be chemically equivalent to vegetable oil. In the late 1940s, chemical toxins were used to suppress the thyroid function of pigs, to make them get fatter while consuming less food. When that was found to be carcinogenic, it was then found that corn and soy beans had the same antithyroid effect, causing the animals to be fattened at low cost. The animals' fat becomes chemically similar to the fats in their food, causing it to be equally toxic, and equally fattening.

These oils are derived from seeds, but their abundance in some meat has led to a lot of confusion about "animal fats." Many researchers still refer to lard as a "saturated fat," but this is simply incorrect when pigs are fed soybeans and corn.

Q: How are these oils hazardous to your health?

Ultimately, all systems of the body are harmed by an excess of these oils. There are two reasons for this. One is that the plants produce the oils for protection, not only to store energy for the germination of the seed. To defend the seeds from the animals that would eat them, the oils block the digestive enzymes in the animals' stomachs. Digestion is one of our most basic functions, and evolution has built many other systems by

using variations of that system; as a result, all of these systems are damaged by the substances which damage the digestive system.

The other reason is that the seeds are designed to germinate in early spring, so their energy stores must be accessible when the temperatures are cool, and they normally don't have to remain viable through the hot summer months. Unsaturated oils are liquid when they are cold, and this is necessary for any organism that lives at low temperatures. For example, fish in cold water would be stiff if they contained saturated fats. These oils easily get rancid (spontaneously oxidizing) when they are warm and exposed to oxygen. Seeds contain a small amount of vitamin E to delay rancidity. When the oils are stored in our tissues, they are much warmer, and more directly exposed to oxygen, than they would be in the seeds, and so their tendency to oxidize is very great. These oxidative processes can damage enzymes and other parts of cells, and especially their ability to produce energy.

The enzymes which break down proteins are inhibited by unsaturated fats, and these enzymes are needed not only for digestion, but also for production of thyroid hormones, clot removal, immunity, and the general adaptability of cells. The risks of abnormal blood clotting, inflammation, immune deficiency, shock, aging, obesity, and cancer are increased. Thyroid and progesterone are decreased. Since the unsaturated oils block protein digestion in the stomach, we can be malnourished even while "eating well."

Plants produce many protective substances to repel or injure insects and other animals that eat them. They produce their own pesticides. The oils in seeds have this function. On top of this natural toxicity, the plants are sprayed with industrial pesticides, which can concentrate in the seed oils.

It isn't the quantity of these polyunsaturated oils which governs the harm they do, but the relationship between them and the saturated fats. Obesity, free radical production, the formation of age pigment, blood clotting, inflammation, immunity, and energy production are all responsive to the ratio of unsaturated fats to saturated fats, and the higher this ratio is, the greater the probability of harm there is.

There are interesting interactions between these oils and estrogen. For example, puberty occurs at an earlier age if estrogen is high, or if these oils are more abundant in the diet. This is probably a factor in the development of cancer.

All systems of the body are harmed by an excess of these oils. There are three main kinds of damage: one, hormonal imbalances, two, damage to the immune system, and three, oxidative damage.

Q: How do they cause hormonal imbalances?

There are many changes in hormones caused by unsaturated fats. Their best understood effect is their interference with the function of the thyroid gland. Unsaturated oils block thyroid hormone secretion, its movement in the circulatory system, and the response of tissues to the hormone. When the thyroid hormone is deficient, the body is generally exposed to increased levels of estrogen. The thyroid hormone is essential for making the "protective hormones" progesterone and pregnenolone, so these hormones are lowered when anything interferes with the function of the thyroid. The thyroid hormone is required for using and eliminating cholesterol, so cholesterol is likely to be raised by anything which blocks the thyroid function. [B. Barnes and L. Galton, Hypothyroidism, 1976, and 1994 references.]

Q: How do they damage the immune system?

Vegetable oil is recognized as a drug for knocking out the immune system. Vegetable oil emulsions were used to nourish cancer patients, but it was discovered that the unsaturated oils were suppressing their immune systems. The same products, in which vegetable oil is emulsified with water for intravenous injection, are now marketed specifically for the purpose of suppressing immunity in patients who have had organ transplants. Using the oils in foods has the same harmful effect on the immune system. [E. A. Mascioli, et al.,Lipids 22(6) 421, 1987.] Unsaturated fats directly kill white blood cells. [C. J. Meade and J. Martin, Adv. Lipid Res., 127, 1978.]

Q: How do they cause oxidative damage?

Unsaturated oils get rancid when exposed to air; that is called oxidation, and it is the same process that occurs when oil paint "dries." Free radicals are produced in the process.

This process is accelerated at higher temperatures. The free radicals produced in this process react with parts of cells, such as

molecules of DNA and protein and may become attached to those molecules, causing abnormalities of structure and function.

Q: What if I eat only organically grown vegetable oils?

Even without the addition of agricultural chemicals, an excess of unsaturated vegetable oils damages the human body. Cancer can't occur, unless there are unsaturated oils in the diet. [C. Ip, et al., Cancer Res. 45, 1985.J Alcoholic cirrhosis of the liver cannot occur unless there are unsaturated oils in the diet. [Nanji and French, Life Sciences. 44, 1989.] Heart disease can be produced by unsaturated oils, and prevented by adding saturated oils to the diet. [J. K. G. Kramer, et al., Lipids 17, 372, 1983.]

Q. What oils are safe?

Coconut and olive oil are the only vegetable oils that are really safe, but butter and lamb fat, which are highly saturated, are generally very safe (except when the animals have been poisoned). Coconut oil is unique in its ability to prevent weight-gain or cure obesity, by stimulating metabolism. It is quickly metabolized, and functions in some ways as an antioxidant. Olive oil, though it is somewhat fattening, is less fattening than corn or soy oil, and contains an antioxidant which makes it protective against heart disease and cancer.

Israel had the world's highest incidence of breast cancer when they allowed the insecticide lindane to be used in dairies, and the cancer rate decreased immediately after the government prohibited its use. The United States has fairly good laws to control the use of cancer-causing agents in the food supply, but they are not vigorously enforced. Certain cancers are several times more common among corn farmers than among other farmers, presumably because corn "requires" the use of more pesticides. This probably makes corn oil's toxicity greater than it would be otherwise, but even the pure, organically grown material is toxic, because of its intrinsic unsaturation.

In the United States, lard is toxic because the pigs are fed large quantities of corn and soy beans. Besides the intrinsic toxicity of the seed oils, they are contaminated with agricultural chemicals. Corn farmers have a very high incidence of cancer, presumably because of the pesticides they use on their crop.

Although I don't recommend "palm oil" as a food, because I think it is less stable than coconut oil, some studies show that it contains valuable nutrients. For example, it contains antioxidants similar to vitamin E, which lower both LDL cholesterol and a platelet clotting factor. [B. A. Bradlow, University of Illinois, Chicago; Science News 139, 268, 1991.] Coconut oil and other tropical oils also contain some hormones that are related to pregnenolone or progesterone.

Q: Isn't coconut oil fattening?

Coconut oil is the least fattening of all the oils. Pig farmers tried to use it to fatten their animals, but when it was added to the animal feed, coconut oil made the pigs lean [See Encycl. Brit. Book of the Year, 1946].

Q: What about olive oil? Isn't it more fattening than other vegetable oils?

In this case, as with coconut oil, "fattening" has more to do with your ability to burn calories than with the caloric value of the oil. Olive oil has a few more calories per quart than corn or soy oil, but since it doesn't damage our ability to burn calories as much as the unsaturated oils do, it is less fattening. Extra virgin olive oil is the best grade, and contains an antioxidant that protects against cancer and heart disease. [1994, Curr. Conts.]

Q: Does that mean that using olive oil helps to prevent cancer?

Some studies in Europe suggest that, but studies in animals show that when the total calorie intake is excessive, even a small amount of linoleic acid is enough to increase the incidence of cancer, and olive oil contains some linoleic acid. The people who use more olive oil might eat less bread and pasta, and as a result might be less obese, and so less likely to get cancer. Eating any fat with a starch makes the starch less harmful. I, and it's clearly better to use olive oil than the more highly polyunsaturated seed oils.

Q: Is "light" olive oil okay?

No. Now and then someone learns how to make a profit from waste material. "Knotty pine" boards were changed from a discarded material to a valued decorative material by a little marketing skill. Light olive oil is a low grade material which sometimes has a rancid smell and probably shouldn't be used as food.

Q: Is margarine okay?

There are several problems with margarine. The manufacturing process introduces some toxins, including a unique type of fat which has been associated with heart disease. [Sci. News, 1974; 1991.] There are likely to be dyes and preservatives added to margarine. And newer products contain new chemicals that haven't been in use long enough to know whether they are safe.

However, the basic hardening process, hydrogenation of the oils, has been found to make the oils less likely to cause cancer. If I had to choose between eating ordinary corn oil or corn oil that was 100% saturated, to make a hard margarine, I would choose the hard margarine, because it resists oxidation, isn't suppressive to the thyroid gland, and doesn't cause cancer.

Q: What about butter?

Butter contains natural vitamin A and D and some beneficial natural hormones. It is less fattening than the unsaturated oils. There is much less cholesterol in an ounce of butter than in a lean chicken breast [about 1/5 as much cholesterol in fat as in lean meat on a calorie basis, according to R. Reiser of Texas A & M Univ., 1979].

Q: Are fish oils good for you?

Some of the unsaturated fats in fish are definitely less toxic than those in corn oil or soy oil, but that doesn't mean they are safe. Fifty years ago, it was found that a large amount of cod liver oil in dogs' diet increased their death rate from cancer by 20 times, from the usual 5% to 100%. A diet rich in fish oil causes intense production of toxic lipid peroxides, and has been observed to reduce a man's sperm count to zero. [H. Sinclair, Prog. Lipid Res. 25, 667, 1989.]

Q: What about lard?

In this country, lard is toxic beause the pigs are fed large quantities of corn and soy beans. Besides the natural toxicity of the seed oils, the oils are contaminated with agricultural chemicals. Corn farmers have a very high incidence of cancer, presumably because corn "requires" the use of more pesticides. This probably makes corn oil's toxicity greater than it would be otherwise. but even the pure, organically grown material is toxic, because of its unsaturation.

Women with breast cancer have very high levels of agricultural pesticides in their breasts [See Science News, 1992, 1994].

Israel had the world's highest incidence of breast cancer when they allowed the insecticide lindane to be used in dairies, and the cancer rate decreased immediately after the government prohibited its use. The United States has fairly good laws to control the use of cancer-causing agents in the food supply, but they are not vigorously enforced. [World Incid. of Cancer, 1992.]

Q: I have no control over oils when cating out. What can I do to offset the harmful effects of polyunsaturated oils?

A small amount of these oils won't kill you. It is the proportion of them in your diet that matters. A little extra vitamin E (such as 100 units per day) will take care of an occasional American restaurant meal. Based on animal studies, it would take a teaspoonful per day of corn or soy oil added to a fat-free diet to significantly increase our risk of cancer. Unfortunately, it is impossible to devise a fat-free diet outside of a laboratory. Vegetables, grains, nuts, fish and meats all naturally contain large amounts of these oils, and the extra oil used in cooking becomes a more serious problem.

Q Why are the unsaturated oils so popular if they are dangerous?

It's a whole system of promotion, advertising, and profitability.

50 years ago, paints and varnishes were made of soy oil, safflower oil, and linseed (flax seed) oil. Then chemists learned how to make paint from petroleum, which was much cheaper. As a result, the huge seed oil industry found its crop increasingly hard to sell. Around the same time, farmers were experimenting with poisons to make their pigs get fatter

with less food, and they discovered that corn and soy beans served the purpose, in a legal way. The crops that had been grown for the paint industry came to be used for animal food. Then these foods that made animals get fat cheaply came to be promoted as foods for humans, but they had to direct attention away from the fact that they are very fattening. The "cholesterol" focus was just one of the marketing tools used by the oil industry. Unfortunately it is the one that has lasted the longest, even after the unsaturated oils were proven to cause heart disease as well as cancer. [Study at L.A. Veterans Hospital, 1971.]

I use some of these oils (walnut oil is very nice, but safflower oil is cheaper) for oil painting, but I am careful to wash my hands thoroughly after I touch them, because they can be absorbed through the skin.

SUMMARY

Unsaturated fats cause aging, clotting, inflammation, cancer, and weight gain.

Avoid foods which contain the polyunsaturated oils, such as corn, soy, safflower, flax, cottonseed, canola, peanut, and sesame oil.

Mayonnaise, pastries, even candies may contain these oils; check the labels for ingredients.

Pork is now fed corn and soy beans, so lard is usually as toxic as those oils; use only lean pork.

Fish oils are usually highly unsaturated; "dry" types of fish, and shellfish, used once or twice a week, are good. Avoid cod liver oil.

Use vitamin E.

Use coconut oil, butter, and olive oil.

Unsaturated fats intensify estrogen's harmful effects.

REFERENCES

1. C. F. Aylsworth, C. W. Welsch, J. J. Kabora, J. E. Trosko, "Effect of fatty acids on junctional communication: Possible role in tumor promotion by dietary fat," Lipids 22(6). 445-54, 1987.
2. J. M. Bell and P. K. Lundberg, "Effects of a commercial soy lecithin preparation on development of sensorimotor behavior & brain biochemicals in the rat," Dev. Psychobiol. 8(1). 59-66, 1985.
3. R. S. Britton and B. R. Bacon, "Role of free radicals in liver diseases and hepatic fibrosis," Hepatogastroenterology 41(4), 343-348, 1994.
4. M. S. Brown, et al., "Receptor mediated uptake of lipoprotein-cholesterol and its utilization for steroid synthesis," Recent Progress in Hormone Res. 35, 315-257, 1979.
5. P. A. Cerutti, "Oxy-radicals and cancer," Lancet 455(8926), 862-863, 1994.
6. I. Davies and A. P. Fotheringham, "Lipofuscin--Does it affect cellular performance?" Exp. Gerontol. 16, 119-125, 1981.
7. K. L. Erickson, et al., "Dietary lipid modulation of immune responsiveness," Lipids 18, 468-74, 1983.
8. V. A. Folcik and M. K. Cathcart, "Predominance of esterified hydroperoxy-linoleic acid in human monocyte-oxidized LDL.," J. Lipid Res. 35(9), 1570-1582, 1994.
9. Fuller, C. J. and I. Jialal, "Effects of antioxidants and fatty acids on Jow-density-lipoprotein oxidation," Am. J. Clin. Nutr. 60(6 Suppl.), S1010-S1013, 1994.
10. M. C. Galli, et al., "Peroxidation potential of rat thymus during development and involution," Comp. Biochem. Physiol (C) 107(3), 435-440, 1994.
11. J. M. Gaziano, et al., "Supplementation with beta-carotene in vivo and in vitro does not inhibit low density lipoprotein oxidation," Atherosclerosis 112(2), 187-195, 1995.
12. M. B. Grisham, "Oxidants and free radicals in inflammatory bowel disease." Lancet 344(8926), 859-861, 1994.
13. J. M. C. Gutteridge, "Antioxidants, nutritional supplements and life-threaening diseases," Brit. J. Biomed. Sci. 51(3), 288-295, 1994.
14. D. Harman, et al., "Free radical theory of aging: effect of dietary fat on central nervous system function," J. American Geriatrics Soc. 24(1), 292-98, 1976.
15. W. S. Hartroft and E. A. Porta, "Ceroid pigments," chapter VIII in Present Knowledge in Nutrition, 3rd Edition, Nutrition Foundation, N.Y., 1967.
16. H. J. Helbock, et al., (Univ. of Calif. Berkeley) January, 1993 Pediatrics; in Science News 143, 78, 1993. "Toxic 'fats" in preemie supplement."
17. H. R. Hirsch, "The waste-product theory of aging: Cell division rate as a function of waste volume." Mech. Ageing Dev. 36, 95-107, 1986.
18. S. G. Imre, et al., "Increased proportion of docosahexanoic acid and high lipid peroxidation capacity in erythrocytes of stroke patients," Stroke 25(12), 2416-2420, 1994.
19. Clement Ip, et al., "Requirement of essential fatty acids for mammary tumorigenesis." Cancer Res. 45(5), 1997-2001, 1985.
20. P. V. Johnston, "Dietary fat, eicosanoids, and immunity:" Adv. in Lipid Res. 21, 103-41, 1985.
21. S. Kasayna, et al., "Unsaturated fatty acids are required for continuous proliferation of transformed androgen-dependent cells by fibroblast growth factor family proteins." Cancer Research 54(24), 6441-6445, 1994.
22. H. A. Kleinveld, et al., "Vitamin E and fatty acid intervention does not attenuate the progression of atherosclerosis in watanabe heritable hyperlipidemic rabbits." Arterioscler. Thromb. Vasc. Biol. 15(2), 290-297, 1995.
23. J. K. G. Kramer, et al., Lipids 17, 372. 1983.

24. I. A. Kudryavtsev, et al., "Character of the modifying action of polyunsaturated fatty acids on growth of transplantable tumors of various types," Bull. Exp. Biol & Med. 105(4), 567-70, 1986.

25. R. D. Lynch, "Utilization of polyunsaturated fatty acids by human diploid cells aging in vitro," Lipids 15(6), 412-20, 1967.

26. M. Martinez and A. Ballabriga, "Effects of parenteral nutrition with high doses of linoleate on the developing human liver and brain," Lipids 22(3), 133-8, 1987.

27. R. S. Mehta, et al., "High fish oil diet increases oxidative stress potential in mammary gland of spontaneously hypertensive rats," (lin. Exp. Pharmacol. Physiol. 21(11). 881-889. 1994.

28. A. A. Nanji and S. W. French, "Dietary linoleic acid is required for development of experimentally induced alcoholic liver-injury," Life Sciences 44, 223-7, 1989.

29. J. A. Lindsay, et al., "Fatty acid metabolism and cell proliferation." Lipids 18, 566-9, 1983.

30. M. I.. Pearce and S. Dayton, "Incidence of cancer in men on a diet high in polyunsaturated fat," Lancet 1, 464-467, 1971.

31. Pryor, W. A., "Free radicals and lipid proxidation--whal they are and how they got that way," Natural Antioxidants in Human, pp. 1-24, 1994.

32. P. Purasiri, et al., "Modulation of cytokine production in vivo by dietary essential fatty acids in patients with colorectal cancer," Clin. Sci. 87(6), 711-717, 1994.

33. S. Rapoport and T. Schewe, "Endogenous inhibitors of the respiratory chain." Trends in Biochemical Sci., Aug., 1977, 186-189.

34. H. Selye, "Sensitization by corn oil for the production of cardiac necrosis..." Amer. J. of Cardiology 23, 719-22, 1969.

35. D. A. Street, et al., "Serum antioxidants and myocardial infarction--Are low levels of carotenoids and alpha-tocopherol risk factors for myocardial infarction?" C'irculation 90(3). 1154-1161, 1994.

36. M. Takei, et al., "Inhibitory effects of calcium antagonists on mitochondrial swelling induced by lipid peroxidation or arachidonic acid in the rat brain in vitro," Neurochem. Res. 29(9), 1199-1206, 1994.

37. J. P. Thomas, et al., "Involvement of preexisting lipid hydroperoxides in ('u21-stimulated oxidation of low-density lipoprotein," Arch. Biochem. Biophys. 315(2), 244-254, 1994.

38. C. W. Welsch, "Review of the effects of dietary fat on experimental mammary gland tumorigenesis: Role of lipid peroxidation," Free Radical Biol. Med. 18(4), 757-773, 1995.

28

DANGERS OF IRON--EXACERBATED BY ESTROGEN

The questions in this chapter came from a two day conference in Indianapolis, in 1994.

GLOSSARY:

Free radicals are fragments of molecules that are very destructive to all cells and system of the body.

Respiration refers to the absorption of oxygen by cells, which releases energy. The structure inside the cell in which energy is produced by respiration is called the mitochondrion.

Oxidation refers to the combination of a substance with oxygen. This can be beneficial, as in normal respiration that produces energy, or harmful, as in rancidity, irradiation, or stress reactions.

Antioxidants: Vitamin E and vitamin C are known as antioxidants, because they stop the harmful free-radical chain reactions which often involve oxygen, but they do not inhibit normal oxidation processes in cells. "Chain breaker" would be a more suitable term. It is often the deficiency of oxygen which unleashes the dangerous free-radical processes. Many substances can function as antioxidants/chain breakers: thyroxine, uric acid, biliverdin, selenium, iodine, vitamin A, sodium, magnesium, and lithium, and a variety of enzymes. Saturated fats work with antioxidants to block the spread of free-radical chain reactions.

Age pigment is the brown material that forms spots on aging skin, and that accumulates in the lens of the eye forming cataracts, and in blood vessels causing hardening of the arteries, and in the heart and brain and other organs, causing their functions to deteriorate with age. It is made up of oxidized unsaturated oils with iron.

Anemic means lacking blood, in the sense of not having enough red blood cells or hemoglobin. It is possible to have too much iron in the blood while being anemic. Anemia in itself doesn't imply that there is a nutritional need for iron.

Q: You believe iron is a deadly substance. Why?

Iron is a potentially toxic heavy metal. In excess, it can cause cancer, heart disease, and other illnesses.

Q: Could you tell us about some of these studies?

In the 1960s the World Health Organization found that when iron supplements were given to anemic people in Africa, there was a great increase in the death rate from infectious diseases, especially malaria. Around the same time, research began to show that the regulation of iron is a central function of the immune system, and that this seems to have evolved because iron is a basic requirement for the survival and growth of cells of all types, including bacteria, parasites, and cancer. The pioneer researcher in the role of iron in immunity believed that an excess of dietary iron contributed to the development of leukemia and lymphatic cancers.

For about 50 years, it has been known that blood transfusions damage immunity, and excess iron has been suspected to be one of the causes for this. People who regularly donate blood, on the other hand, have often been found to be healthier than non-donors, and healthier than they were before they began donating.

Just like lead, mercury, cadmium, nickel, manganese and other heavy metals, stored iron produces destructive free radicals. The harmful effects of iron-produced free radicals are practically indistinguishable from those caused by exposure to X-rays and gamma rays; both accelerate the accumulation of age-pigment and other signs of aging. Excess iron is a crucial element in the transformation of stress into tissue damage by free radicals.

In one of Hans Selye's pioneering studies, he found that he could experimentally produce a form of scleroderma (hardening of the skin) in animals by administering large doses of iron, followed by a minor stress. He could prevent the development of the condition by giving the animals large doses of vitamin E, suggesting that the condition was produced by iron's oxidative actions.

Many recent studies show that iron is involved in degenerative brain diseases, such as Parkinson's, ALS (Lou Gehrig's disease), Huntington's chorea, and Alzheimer's disease. Iron is now believed to

have a role in skin aging, atherosclerosis, and cataracts of the lenses of the eyes, largely through its formation of the "age pigment."

Q: How does excess iron accelerate our aging process?

During aging, our tissues tend to store an excess of iron. There is a remarkably close association between the amount of iron stored in our tissues and the risk of death from cancer, heart disease, or from all causes. This relationship between iron and death rate exists even during childhood, but the curve is downward until the age of 12, and then it rises steadily until death. The shape of this curve, representing the iron burden, is amazingly similar to the curves representing the rate of death in general, and the rate of death from cancer. There is no other relationship in biology that I know of that has this peculiar shape, with its minimum at the age of 12, and its maximum in old age at the time of death.

One of the major lines of aging research, going back to the early part of this century, was based on the accumulation of a brown material in the tissues known as "age-pigment." The technical name for this material, "lipofuscin," means "fatty brown stuff." In the 1960s, the "free radical theory" of aging was introduced by Denham Harman, and this theory has converged with the age-pigment theory, since we now know that the age-pigment is an oxidized mass of unsaturated fat and iron, formed by uncontrolled free radicals. Until a few years ago, these ideas were accepted by only a few researchers, but now practically every doctor in the country accepts that free radicals are important in the aging process.

A nutrition researcher in San Diego suspected that the life-extending effects of calorie restriction might be the result of a decreased intake of toxins. He removed the toxic heavy metals from foods, and found that the animals which ate a normal amount of food lived as long as the semi-starved animals. Recently, the iron content of food has been identified as the major life-shortening factor, rather than the calories. [Choi and Yu, Age vol. 17, page 93, 1994.]

Q: Exactly how much iron do we need to eat?

Children's nutritional requirements are high, because they are growing, but there are indications that in the U.S. even children eat too much iron. Some researchers are concerned that the iron added to cereals is contributing to the incidence of leukemia and cancers of the lymphatic

tissues in children. [Goodfield, 1984.] During the time of rapid growth, children are less likely than adults to store too much iron. At birth, they have a large amount of stored iron, and this decreases as they "grow into it." It is after puberty, when growth slows and the sex hormones are high, that the storage of iron increases. [Blood, Sept., 1976.]

In a study of the "malnourished" children of migrant fruit pickers in California, these children who were "seriously anemic" were actually more resistant to infectious diseases than were the "well nourished" middle class children in the same region.

If the normal amount of dietary iron causes an increased susceptibility to infections even in children, and if a subnormal amount of iron slows the aging process, I think we are going to have to reconsider our ideas of nutritional adequacy, to look at the long range effects of diet, as well as the immediate effects. My current studies have to do with analyzing our ability to handle stress safely, in relation to our diet. 1 believe our nutritional recommendations for iron have to be revised sharply downward.

Q. Don't women need extra iron?

That's a misunderstanding. Doctors generally don't realize that only a few milligrams of iron are lost each day in menstruation. The real issue is that you can hardly avoid getting iron, even when you try.

Women absorb iron much more efficiently than men do. From a similar meal, women will normally absorb three times as much iron as men do. When pregnant, their higher estrogen levels cause them to absorb about nine times as much as men. Every time a woman menstruates, she loses a little iron, so that by the age of 50 she is likely to have less iron stored in her tissues than a man does at the same age, but by the age of 65 women generally have as much excess iron in their tissues as men do. (During those 15 years, women seem to store iron at a faster rate than men do, probably because they have more estrogen.) At this age their risk of dying from a heart attack is the same as that of men.

Some women who menstruate can donate blood regularly without showing any tendency to become anemic.

Since the custom of giving large iron supplements to pregnant women has been established, there has been an increase in jaundice of the newborn. It has been observed that women who didn't take iron supplements during pregnancy have healthy babies that don't develop jaundice. I have suggested that this could be because they haven't been

poisoned by iron. Those supplements could also be a factor in the increased incidence of childhood cancer.

Q: Don't you need iron supplements if you are anemic?

In general, no.

Many doctors think of anemia as necessarily indicating an iron deficiency, but that isn't correct. 100 years ago, it was customary to prescribe arsenic for anemia, and it worked to stimulate the formation of more red blood cells. The fact that arsenic, or iron, or other toxic material stimulates the formation of red blood cells doesn't indicate a "deficiency" of the toxin, but simply indicates that the body responds to a variety of harmful factors by speeding its production of blood cells. Even radiation can have this kind of stimulating effect, because growth is a natural reaction to injury. Between 1920 and 1950, it was common to think of "nutritional growth factors" as being the same as vitamins, but since then it has become common to use known toxins to stimulate the growth of farm animals, and as a result, it has been more difficult to define the essential nutrients. The optimal nutritional intake is now more often considered in terms of resistance to disease, longevity or rate of aging, and even mental ability.

An excess of iron, by destroying vitamin E and oxidizing the unsaturated fats in red blood cells, can contribute to hemolytic anemia, in which red cells are so fragile that they break down too fast. In aging, red cells break down faster, increasing the tendency to become anemic, but additional iron tends to be more dangerous for older people.

Anemia in women is caused most often by a thyroid deficiency (as discussed in the chapter on thyroid), or by various nutritional deficiencies. Estrogen (even in animals that don't menstruate) causes dilution of the blood, so that it is normal for females to have lower hemoglobin than males.

Q. What should I do if my doctor tells me I'm anemic? Is there any situation in which a person needs to take iron supplements?

Iron deficiency anemia does exist, in laboratory situations and in some cases of chronic bleeding, but I believe it should be the last-suspected cause of anemia, instead of the first. It should be considered as a possible cause of anemia only when very specific blood tests show an abnormally low degree of iron saturation of certain

proteins. Usually, physicians consider the amount of hemoglobin or of red cells in the blood as the primary indicator of a need for iron, but that just isn't biologically reasonable.

If a large amount of blood is lost in surgery, a temporary anemia might be produced, but even then it would be best to know whether the iron stores are really depleted before deciding whether an iron supplement would be reasonable. Liver (or even a water extract of wheat germ) can supply as much iron as would be given as a pill, and is safer.

Q. What foods contain iron?

Flour, pasta, etc., almost always contain iron which has been artificially added as ferrous sulfate, because of a federal law. Meats, grains, eggs, and vegetables naturally contain large amounts of iron. A few years ago, someone demonstrated that they could pick up a certain breakfast cereal with a magnet, because of the added iron. Black olives contain iron, which is used as a coloring material. You should look for "ferrous" or "ferric" or "iron" on the label, and avoid foods with any added iron. Many labels list "reduced iron," meaning that iron is added in the ferrous form, which is very reactive and easily absorbed

Q.: Why does federal law require the addition of iron to those foods?

Industrially processed grains have most of the nutrients, such as vitamin E, the B vitamins, manganese, magnesium, etc., removed to improve the products' shelf life and efficiency of processing, and the government required that certain nutrients be added to them as a measure to protect the public's health, but the supplementation did not reflect the best science even when it was first made law, since food industry lobbyists managed to impose compromises that led to the use of the cheapest chemicals, rather than those that offered the greatest health benefits. For example, studies of processed animal food had demonstrated that the addition of iron (as the highly reactive form, ferrous sulfate, which happens to be cheap and easy to handle) created disease in animals, by destroying vitamins in the food. You should read the label of ingredients and avoid products that contain added iron, when possible.

Q: Can cooking in an iron frying pan put iron into food?

Yes, especially if the food is acidic, as many sauces are. The added iron will destroy vitamins in the food, besides being potentially toxic in itself.

Q: What about aluminum?

Aluminum and iron react similarly in cells and are suspected causes of Alzheimer's disease.

The aluminum industry started propagandizing more than 50 years ago about the "safety" of aluminum utensils, claiming that practically none of the toxic metal gets into the food. Recent research showed that coffee percolated in an aluminum pot contained a large amount of dissolved aluminum, because of coffee's acidity.

Q: What kinds of cooking pots or utensils are safe?

Glass utensils are safe, and certain kinds of stainless steel are safe, because their iron is relatively insoluble. Teflon-coated pans are safe unless they are chipped.

Q: How do I know which stainless steels are safe?

There are two main types of stainless steel, magnetic and nonmagnetic. The nonmagnetic form has a very high nickel content, and nickel is allergenic and carcinogenic. It is much more toxic than iron or aluminum. You can use a little "refrigerator magnet" to test your pans. The magnet will stick firmly to the safer type of pan.

Q: Why is there iron in most multi-vitamin and mineral products?

Although several researchers have demonstrated that iron destroys vitamins, there is enough wishful thinking in industry, government, and the consuming public, that such mistakes can go on for generations before anyone can mobilize the resources to bring the truth to the public. Ten years ago, I thought it was a hopeful sign of increased awareness of iron's danger when the manufacturer of a new iron product mentioned in the Physician's Desk Reference that it hadn't yet been reported to cause cancer.

Q. I can't avoid all those foods, especially the bread and grains. What can I do to keep the iron I ingest from harming me?

Iron destroys vitamin E, so vitamin E should be taken as a supplement. It shouldn't be taken at the same time as the iron-contaminated food, because iron reacts with it in the stomach. About 100 mg. per day is adequate, though our requirement increases with age, as our tissue iron stores increase. Coffee, when taken with food, strongly inhibits the absorption of iron, so I always try to drink coffee with meat. Decreasing your consumption of unsaturated fats makes the iron less harmful.

Vitamin C stimulates the absorption of iron, so it might be a good idea to avoid drinking orange juice at the same meal with iron-rich foods. A deficiency of copper causes our tissues to retain an excess of iron, so foods such as shrimp and oysters which contain abundant copper should be used regularly.

Q: How does copper help us?

Copper is the crucial element for producing the color in hair and skin, for maintaining the elasticity of skin and blood vessels, for protecting against certain types of free radical, and especially for allowing us to use oxygen properly for the production of biological energy. It is also necessary for the normal functioning of certain nerve cells (substantia nigra) whose degeneration is involved in Parkinson's disease. The shape and texture of hair, as well as its color, can change in a copper deficiency.

Too much iron can block our absorption of copper, and too little copper makes us store too much iron. With aging, our tissues lose copper as they store excess iron. Because of those changes, we need more vitamin E as we age.

SUMMARY:

Iron is a potentially toxic heavy metal; an excess can cause cancer, heart disease, and other illnesses.

Other heavy metals, including lead and aluminum, are toxic; pans and dishes should be chosen carefully.

Iron causes cell aging.

Drinking coffee with iron rich foods can reduce iron's toxic effects.

Use shrimp and oysters, etc., to prevent the copper deficiency which leads to excess storage of iron.

Avoid food supplements which contain iron.

Take about 100 units of vitamin E daily; your vitamin E requirement increases with your iron consumption.

REFERENCES

1. Allen, D. R., et al., "Catechol adrenergic agents enhance hydroxyl radical generation in xanthine oxidase systems containing ferritin: Implications for ischemia reperfusion," Arch. Biochem. Biophys. 315(2), 235-243, 1994.
2. M. Bartal, et al., "Lipid peroxidation in iron deficiency anemia-Reply," Acta Haematol. 91(3), 170, 1994.
3. R. J. Bergeron, et al., "Influence of iron on in vivo proliferation and lethality of L1210 cells," J. Nutrition 115(3), 369-374, 1985.
4. P. Carthew and A. G. Smith, "Pathological mechanisms of hepatic tumor formation in rats exposed chronically to dietary hexachlorobenzene," J. Applied Toxicology 14(6), 447-52, 1994.
5. Chen, Y., et al., "Weak antioxidant defenses make the heart a target for damage in copper-deficient rats," Free Radical Biol. Med. 17(6), 529-536, 1994.
6. J. J. C. Chiao, et al., "Iron delocalization occurs during ischemia and persists on reoxygenation of skeletal muscle," J. Lab. Clin. Med. 124(3), 432-438, 1994.
7. Choi, J. H. and B. P. Yu, "Modulation of age-related alterations of iron, ferritin, and lipid peroxidation in rat serum," Age 17(3), 93-97, 1994.
8. P. C. Elwood, "Iron, magnesium, and ischemic heart disease," Proc. of Nutrition Society 53(3), 599-603, 1994.
9. J. Goodfield, An Imagined World, Penguin Books, N.Y., 1984.
10. M. Galleano and S. Puntarulo, "Mild iron overload effect on rat liver nuclei," Toxicol. 93(2-3), 125-34, 1994,
11. E. C. Hirsch, "Biochemistry of Parkinson's disease with special reference to the dopaminergic systems," Mol. Neurobiol. 9(1-3), 135-142, 1994.
12. G. M. Kainova, et al., "Activation of endogenous lipid peroxidation in the brain during oxidation stress induced by iron and its prevention by vitamin E," Bull. Exp. Biol. & Med. 109(1), 43-45, 1989.
13. S. Kiechl, et al., "Body iron stores and presence of carotid atherosclerosis--results from the Bruneck study," Arterioscler. Thromb. 14(10), 1625-1630, 1994.
14. L. H. Kligman and P. S. Zheng, "The protective effect of a broad-spectrum sunscreen against chronic UVA radiation in hairless mice: A histologic and ultrastructural assessment," J. Soc. Cosmet. Chem. 45(1), 21-33, 1994. ["... mice protected with the oxybenzone containing sunscreen, surprisingly, had damage that exceeded what was seen in unprotected mice."
15. S. Kamimura, et al., "Hepatic fibrosis in rats fed a liquid diet with ethanol and carbonyl! iron," Int. Hepatol. Commun. 3(2), 70-76, 1995.

16. Y. Kondo, et al., "Regional differences in late-onset iron deposition, ferritin, transferrin, astrocyte proliferation, and microglial activation after transient forebrain ischemia in rat brain," J. Cereb. Blood Flow Metab. 15(2), 216-226, 1995.
17. A. V. Kozlov, et al., "Role of endogenous free iron in activation of lipid peroxidation during ischemia," Bull. Exp. Biol. Med. 99(1), 1984.
18. D. J. Lamb and D. S. Leake, "Iron released from transferrin at acidic pH can catalyse the oxidation of low density lipoprotein," FEBS Lett 352(1), 15-18, 1994.
19. E. E. Letendre, "Importance of iron in the pathogenesis of infection and neoplasm," Trends in Biochemical Sci., April, 1985, 166-168.
20. V. M. Mann, et al., "Complex 1, iron and ferritin in Parkinson's disease substantia nigra," Ann. of Neurology 36(6), 876-81, 1994.
21. Z. Maskos and W. H. Koppenol, "Oxyradicals and multivitamin tablets," Free Radical Biol. & Med. 11, 669-670, 1991.
22. S. Ozsoylu, "Lipid peroxidation in iron deficiency anemia," Acta Haematol. 91(3), 170, 1994.
23. Pecci, L., et al., "Aminoethylcystein ketimine decarboxylated dimer protects submitochondrial particles from lipid peroxidation at a concentration not inhibitory of electron transport," Biochem. Biophys. Res. Commun. 205(1), 264-268, 1994.
24. R. A. Sabroe, et al., "Polymyositis and malignant melanoma," Br. J. Dermatol. 132(2), 312-313, 1995.
25. J. T. Salonen, et al., "Lowering of body iron stores by blood letting and oxidation resistance of serum lipoproteins: A randomized cross-over trial in male smokers," J. Intern. Med. 237(2), 161-168, 1995.
26. M. Savoiardo, et al., "Magnetic resonance imaging in progressive supranuclear palsy and other parkinsonian disorders," J. Neural Trans. (suppl. 42), 93-110, 1994.
27. J. J. Strain, "Putative role of dietary trace elements in coronary heart disease and cancer," Brit. J. Biomed. Sci. 51(3), 241-251, 1994.
28. Vanrensburg, S. J., et al., "Lipid peroxidation and platelet membrane fluidity--implications for Alzheimer's disease?", Neuroreport 5(17), 2221-2224, 1994.
29. G. F. Vile and R. M. Tyrrell, "UVA radiation-induced oxidative damage to lipids and proteins in vitro and in human skin fibroblasts is deendent on iron and singlet oxygen," Free Radical Biol. Med. 18(4), 721-730, 1995.
30. M. Vlad, et al., "Concentration of copper, zinc, chromium, iron aud nickel in the abdominal aorta of patients deceased with coronary heart disease," J. Trace Elem. Electr. Hlth. Dis. 8(2), 111-114, 1994,
31. L. J. Wesselius, et al., "Increased release of ferritin and iron by iron-loaded alveolar macrophages in cigarette smokers," Amer. J. Respir. Crit. Care Med. 150(3), 690-695, 1994.

Transfusions: Amer. J. of Surgery 155, p. 43, 1988.

*A Finnish study, two years ago, indicated that high iron stores may increase heart attack risk: In People magazine, 1994: "Is iron a killer?" Dr. Jerome L. Sullivan, director of clinical Jabs of Veterans Affairs Medical Center at Charleston, S.C., in 1983 proposed that excess iron contributes to heart attacks. University of Kuopio in Finland: Large-scale study (nearly 2,000 men, for up to five years; next to smoking, excess stored iron is the most significant identifiable risk factor for heart attacks. It is a stronger risk factor for heart attack than high blood pressure and cholesterol.

*Dec. 7, page 6E, Register Guard (Eugene, OR): US studies showed a weak connection between iron and heart disease, and a weak connection with the iron in red meat. Epidemiologists at the Pacific Northwest Laboratory in Washington have reported that the greater the concentration of iron in a person's blood, the greater his or her risk of cancer. Richard Stevens and his co-workers found the connection from examining cancer rates in more

than 8,000 people who participated in the 1971 National Health and Nutrition Examination survey. A second Finnish study with similar findings accompanied Stevens's report in the International Journal of Cancer, and suggets that there may be cause for concern.

Register Guard (Eugene, OR), Jan. 16, 95; p 7A: Number of heart failures doubles, AP: 1982-92, heart disease death rate dropped 24.5%; number of cases of congestive heart failure doubled during roughly the same period. It killed 39,000 Americans in 1991, costs system $40 billion per year. Cancer is the biggest killer of women under 64, heart disease far surpasses cancer in women of ages 65-84.

29

COCONUT OIL

I have already discussed the many toxic effects of the unsaturated oils, and I have frequently mentioned that coconut oil doesn't have those toxic effects, though it does contain a small amount of the unsaturated oils. Many people have asked me to write something on coconut oil. I thought I might write a small book on it, but I realize that there are no suitable channels for distributing such a book--if the seed-oil industry can eliminate major corporate food products that have used coconut oil for a hundred years, they certainly have the power to prevent dealers from selling a book that would affect their market more seriously. For the present, I will just outline some of the virtues of coconut oil.

The unsaturated oils in some cooked foods become rancid in just a few hours, even at refrigerator temperatures, and are responsible for the stale taste of left-over foods. (Eating slightly stale food isn't particularly harmful, since the same oils, even when eaten absolutely fresh, will oxidize at a much higher rate once they are in the body, where they are heated and thoroughly mixed with an abundance of oxygen.) Coconut oil that has been kept at room temperature for a year has been tested for rancidity, and showed no evidence of it. Since we would expect the small percentage of unsaturated oils naturally contained in coconut oil to become rancid, it seems that the other (saturated) oils have an antioxidative effect: I suspect that the dilution keeps the unstable unsaturated fat molecules spatially separated from each other, so they can't interact in the destructive chain reactions that occur in other oils. To interrupt chain-reactions of oxidation is one of the functions of antioxidants, and it is possible that a sufficient quantity of coconut oil in the body has this function. It is well established that dietary coconut oil reduces our need for vitamin E, but I think its antioxidant role is more general than that, and that it has both direct and indirect antioxidant activities.

Coconut oil is unusually rich in short and medium chain fatty acids. Shorter chain length allows fatty acids to be metabolized without use of the carnitine transport system. Mildronate, which J discussed in an article on adaptogens, protects cells against stress partly by opposing the action of carnitine, and comparative studies showed that added carnitine had the opposite effect, promoting the oxidation of unsaturated fats during stress, and increasing oxidative damage to cells. I suspect that a

degree of saturation of the oxidative apparatus by short-chain fatty acids has a similar effect--that is, that these very soluble and mobile short-chain saturated fats have priority for oxidation, because they don't require carnitine transport into the mitochondrion, and that this will tend to inhibit oxidation of the unstable, peroxidizable unsaturated fatty acids.

When Albert Schweitzer operated his clinic in tropical Africa, he said it was many years before he saw any cases of cancer, and he believed that the appearance of cancer was caused by the change to the European type of diet. In the 1920s, German researchers showed that mice on a fat-free diet were practically free of cancer. Since then, many studies have demonstrated a very close association between consumption of unsaturated oils and the incidence of cancer.

Heart damage is easily produced in animals by feeding them linoleic acid; this "essential" fatty acid turned out to be the heart toxin in rape-seed oil. The addition of saturated fat to the experimental heart-toxic oil-rich diet protects against the damage to heart cells. Immunosuppression was observed in patients who were being "nourished" by intravenous emulsions of "essential fatty acids," and as a result coconut oil is used as the basis for intravenous fat feeding, except in organ-transplant patients. For those patients. emulsions of unsaturated oils are used specifically for their immunosuppressive effects.

General aging, and especially aging of the brain, is increasingly seen as being closely associated with lipid peroxidation.

Several years ago I met an old couple, who were only a few years apart in age, but the wife looked many years younger than her doddering old husband. She was from the Philippines, and she remarked that she always had to cook two meals at the same time, because her husband couldn't adapt to her traditional food. Three times every day, she still prepared her food in coconut oil. Her apparent youth increased my interest in the effects of coconut oil.

In the 1960s, Hartroft and Porta gave an elegant argument for decreasing the ratio of unsaturated oil to saturated oil in the diet (and thus in the tissues). They showed that the "age pigment" is produced in proportion to the ratio of oxidants to antioxidants, multiplied by the ratio of unsaturated oils to saturated oils. More recently, a variety of studies have demonstrated that ultraviolet light induces peroxidation in unsaturated fats, but not saturated fats, and that this occurs in the skin as well as in vitro. Rabbit experiments, and studies of humans, showed that the amount of unsaturated oil in the diet strongly affects the rate at which aged, wrinkled skin develops. The unsaturated fat in the skin is a major

target for the aging and carcinogenic effects of ultraviolet light, though not necessarily the only one.

In the 1940s, farmers attempted to use cheap coconut oil for fattening their animals, but they found that it made them lean, active and hungry. For a few years, an antithyroid drug was found to make the livestock get fat while eating less food, but then it was found to be a strong carcinogen, and it also probably produced hypothyroidism in the people who ate the meat. By the late 1940s, it was found that the same antithyroid effect, causing animals to get fat without eating much food, could be achieved by using soy beans and corn as feed.

Later, an animal experiment fed diets that were low or high in total fat, and in different groups the fat was provided by pure coconut oil, or a pure unsaturated oil, or by various mixtures of the two oils. At the end of their lives, the animals' obesity increased directly in proportion to the ratio of unsaturated oil to coconut oil in their diet, and was not related to the total amount of fat they had consumed. That is, animals which ate just a little pure unsaturated oil were fat, and animals which ate a lot of coconut oil were lean.

In the 1930s, animals on a diet lacking the unsaturated fatty acids were found to be "hypermetabolic." Eating a "normal" diet, these animals were malnourished, I, and their skin condition was said to be caused by a "deficiency of essential fatty acids." But other researchers who were studying vitamin B, recognized the condition as a deficiency of that vitamin. They were able to cause the condition by feeding a fat-free diet, and to cure the condition by feeding a single B vitamin. The hypermetabolic animals simply needed a better diet than the "normal," fat-fed, cancer-prone animals did.

G. W. Crile and his wife found that the metabolic rate of people in Yucatan, where coconut is a staple food, averaged 25% higher than that of people in the United States. In a hot climate, the adaptive tendency is to have a lower metabolic rate, so it is clear that some factor is more than offsetting this expected effect of high environmental temperatures. The people there are lean, and recently it has been observed that the women there have none of the symptoms we commonly associate with the menopause.

By 1950, then, it was established that unsaturated fats suppress the metabolic rate, apparently creating hypothyroidism. Over the next few decades, the exact mechanisms of that metabolic damage were studied. Unsaturated fats damage the mitochondria, partly by suppressing the repiratory enzyme, and partly by causing generalized oxidative damage.

The more unsaturated the oils are, the more specifically they suppress tissue response to thyroid hormone, and transport of the hormone on the thyroid transport protein.

Plants evolved a variety of toxins designed to protect themselves from "predators," such as grazing animals. Seeds contain a variety of toxins, that seem to be specific for mammalian enzymes, and the seed oils themselves function to block proteolytic digestive enzymes in the stomach. The thyroid hormone is formed in the gland by the action of a proteolytic enzyme, and the unsaturated oils also inhibit that enzyme. Similar proteolytic enzymes involved in clot removal and phagocytosis appear to be similarly inhibited by these oils.

Just as metabolism is "activated" by consumption of coconut oil, which prevents the inhibiting effect of unsaturated oils, other inhibited processes, such as clot removal and phagocytosis, will probably tend to be restored by continuing use of coconut oil.

Brain tissue is very rich in complex forms of fats. The experiment (around 1978) in which pregnant mice were given diets containing either coconut oil or unsaturated oil showed that brain development was superior in the young mice whose mothers ate coconut oil. Because coconut oil supports thyroid function, and thyroid governs brain development, including myelination, the result might simply reflect the difference between normal and hypothyroid individuals. However, in 1980, experimenters demonstrated that young rats fed milk containing soy oil incorporated the oil directly into their brain cells, and had structurally abnormal brain cells as a result. Lipid peroxidation occurs during seizures, and antioxidants such as vitamin E have some anti-seizure activity. Currently, lipid peroxidation is being found to be involved in the nerve cell degeneration of Alzheimer's disease.

Various fractions of coconut oil are coming into use as "drugs," meaning that they are advertised as treatments for diseases. Butyric acid is used to treat cancer, lauric and myristic acids to treat virus infections, and mixtures of medium-chain fats are sold for weight loss. Purification undoubtedly increases certain effects, and results in profitable products, but in the absence of more precise knowledge, I think the whole natural product, used as a regular food, is the best way to protect health. The shorter-chain fatty acids have strong, unpleasant odors; for a couple of days after I ate a small amount of a medium-chain triglyceride mixture, my skin oil emitted a rank, goaty smell. Some people don't seem to have that reaction, and the benefits might outweigh the stink, but these things just haven't been in use long enough to know whether they are safe. We

have to remember that the arguments made for aspartame, monosodium glutamate, aspartic acid, and tryptophan--that they are like the amino acids that make up natural proteins--are dangerously false. In the case of amino acids, balance is everything. Aspartic and glutamic acids promote seizures and cause brain damage, and are intimately involved in the process of stress-induced brain aging, and tryptophan by itself is carcinogenic.

Treating any complex natural product as the drug industry does, as a raw material to be fractionated in the search for "drug" products, is risky, because the relevant knowledge isn't sought in the search for an association between a single chemical and a single disease.

While the toxic unsaturated paint-stock oils, especially safflower, soy, corn and linseed (flaxseed) oils, have been sold to the public precisely for their drug effects, all of their claimed benefits were false. When people become interested in coconut oil as a "health food," the huge seed-oil industry--operating through their shills--is likely to attack it as an "unproved drug."

While components of coconut oil have been found to have remarkable physiological effects (as antihistamines, antiinfectives/antiseptics, promoters of immunity, glucocorticoid antagonist, nontoxic anticancer agents, for example), I think it is important to avoid making any such claims for the natural coconut oil, because it very easily could be banned from the import market as a "new drug" which isn't "approved by the FDA." We have already seen how money and propaganda from the soy oil industry eliminated long-established products from the U.S. market. I saw people lose weight stably when they had the habit of eating large amounts of tortilla chips fried in coconut oil, but those chips disappeared when their producers were pressured into switching to other oils, in spite of the short shelf life that resulted in the need to add large amounts of preservatives. Oreo cookies, Ritz crackers, potato chip producers, and movie theater popcorn makers have experienced similar pressures.

The cholesterol-lowering fiasco for a long time centered on the ability of unsaturated oils to slightly lower serum cholesterol. For years, the mechanism of that action wasn't known, which should have suggested caution. Now, it seems that the effect is just one more toxic action, in which the liver defensively retains its cholesterol, rather than releasing it into the blood. Large scale human studies have provided overwhelming evidence that whenever drugs, including the unsaturated oils, were used to lower serum cholesterol, mortality increased, from a variety of causes

including accidents, but mainly from cancer. Since the 1930s, it has been clearly established that suppression of the thyroid raises serum cholesterol (while increasing mortality from infections, cancer, and heart disease), while restoring the thyroid hormone brings cholesterol down to normal. In this situation, however, thyroid isn't suppressing the synthesis of cholesterol, but rather is promoting its use to form hormones and bile salts. When the thyroid is functioning properly, the amount of cholesterol in the blood entering the ovary governs the amount of progesterone being produced by the ovary, and the same situation exists in all steroid-forming tissues, such as the adrenal glands and the brain. Progesterone and its precursor, pregnenolone, have a generalized protective function: antioxidant, anti-seizure, antitoxin, anti-spasm, anti-clot, anti-cancer, pro-memory, pro-myelination, pro-attention, etc. Any interference with the formation of cholesterol will interfere with all of these exceedingly important protective functions.

As far as the evidence goes, it suggests that coconut oil, added regularly to a balanced diet, lowers cholesterol to normal by promoting its conversion into pregnenolone. (The coconut family contains steroids that resemble pregnenolone, but these are probably mostly removed when the fresh oil is washed with water to remove the enzymes which would digest the oil.) Coconut-eating cultures in the tropics have consistently lower cholesterol than people in the U.S. Everyone that I know who uses coconut oil regularly happens to have cholesterol levels of about 160, while eating mainly cholesterol rich foods (eggs, milk, cheese, meat, shellfish). I encourage people to eat sweet fruits, rather than starches, if they want to increase their production of cholesterol, since fructose has that effect.

Many people see coconut oil in its hard, white state, and--as a result of their training watching television or going to medical school--associate it with the cholesterol-rich plaques in blood vessels. Those lesions in blood vessels are caused mostly by lipid peroxidation of unsaturated fats, and relate to stress, because adrenaline liberates fats from storage, and the lining of blood vessels is exposed to high concentrations of the blood-borne material. In the body, incidentally, the oil can't exist as a solid, since it liquefies at 76 degrees. (Incidentally, the viscosity of complex materials isn't a simple matter of averaging the viscosity of its component materials; cholesterol and saturated fats sometimes lower the viscosity of cell components.) Most of the images and metaphors relating to coconut oil and cholesterol that circulate in our culture are false and misleading. I offer a counter-image, which is

metaphorical, but it is true in that it relates to lipid peroxidation, which is profoundly important in our bodies. After a bottle of safflower oil has been opened a few times, a few drops that get smeared onto the outside of the bottle begin to get very sticky, and hard to wash off. This property is why it is a valued base for paints and varnishes, but this varnish is chemically closely related to the age pigment that forms "liver spots" on the skin, and similar lesions in the brain, heart, blood vessels, lenses of the eyes, etc. The image of "hard, white saturated coconut oil" isn't relevant to the oil's biological action, but the image of "sticky varnish-like easily oxidized unsaturated seed oils" is highly relevant to their toxicity.

The ability of some of the medium chain saturated fatty acids to inhibit the liver's formation of fat very likely synergizes with the pro-thyroid effect, in allowing energy to be used, rather than stored. When fat isn't formed from carbohydrate, the sugar is available for use, or for storage as glycogen. Therefore, shifting from unsaturated fats in foods to coconut oil involves several anti-stress processes, reducing our need for the adrenal hormones. Decreased blood sugar is a basic signal for the release of adrenal hormones. Unsaturated oil tends to lower the blood sugar in at least three basic ways. It damages mitochondria, causing respiration to be uncoupled from energy production, meaning that fuel is burned without useful effect. It suppresses the activity of the respiratory enzyme (directly, and through its anti-thyroid actions), decreasing the respiratory production of energy. And it tends to direct carbohydrate into fat production, making both stress and obesity more probable. For those of us who use coconut oil consistently, one of the most noticeable changes is the ability to go for several hours without eating, and to feel hungry without having symptoms of hypoglycemia.

One of the stylish ways to promote the use of unsaturated oils is to refer to their presence in "cell membranes," and to claim that they are essential for maintaining "membrane fluidity." As I have mentioned above, it is the ability of the unsaturated fats, and their breakdown products, to interfere with enzymes and transport proteins, which accounts for many of their toxic effects, so they definitely don't just harmlessly form "membranes." They probably bind to all proteins, and disrupt some of them, but for some reason their affinity for proteolytic and respiration-related enzymes is particularly obvious. (I think the chemistry of this association is going to give us some important insights into the nature of organisms. Metchnikof's model that I have discussed elsewhere might give us a picture of how those factors relate in growth, physiology, and aging.) Unsaturated fats are slightly more water-soluble

than fully saturated fats, and so they do have a greater tendency to concentrate at interfaces between water and fats or proteins, but there are relatively few places where these interfaces can be usefully and harmlessly occupied by unsaturated fats, and at a certain point, an excess becomes harmful. We don't want "membranes" forming where there shouldn't be membranes. The fluidity or viscosity of cell surfaces is an extremely complex subject, and the degree of viscosity has to be appropriate for the function of the cell. Interestingly, in some cells, such as the cells that line the air sacs of the lungs, cholesterol and one of the saturated fatty acids found in coconut oil can increase the fluidity of the cell surface.

In many cases, stressful conditions create structural disorder in cells. These influences have been called "chaotropic," or chaos-producing. In red blood cells, which have sometimes been wrongly described as "hemoglobin enclosed in a cell membrane," it has been known for a long time that lipid peroxidation of unsaturated fats weakens the cellular structure, causing the cells to be destroyed prematurely. Lipid peroxidation products are known to be "chaotropic," lowering the rigidity of regions of cells considered to be membranes. But the red blood cell is actually more like a sponge in structure, consisting of a "skeleton" of proteins, which (if not damaged by oxidation) can hold its shape, even when the hemoglobin has been removed. Oxidants damage the protein structure, and it is this structural damage which in turn increases the "fluidity" of the associated fats.

So, it is probably true that in many cases the liquid unsaturated oils do increase "membrane fluidity," but it is now clear that in at least some of those cases the "fluidity" corresponds to the chaos of a damaged cell protein structure. (N. V. Gorbunov, "Effect of structural modification of membrane proteins on lipid-protein interactions in the human erythrocyte membrane," Bull. Exp. Biol. & Med. 116(11), 1364-67. 1993.

Although I had stopped using the unsaturated seed oils years ago, and supposed that I wasn't heavily saturated with toxic unsaturated fat, when I first used coconut oil I saw an immediate response, that convinced me my metabolism was chronically inhibited by something that was easily alleviated by "dilution" or molecular competition. I had put a tablespoonful of coconut oil on some rice I had for supper, and half an hour later while I was reading, I noticed I was breathing more deeply than normal. I saw that my skin was pink, and I found that my pulse was faster than normal--about 98, I think. After an hour or two, my pulse and breathing returned to normal. Every day for a couple of weeks I noticed

the same response while I was digesting a small amount of coconut oil, but gradually it didn't happen any more, and I increased my daily consumption of the oil to about an ounce. I kept eating the same foods as before (including a quart of ice cream every day), except that I added about 200 or 250 calories per day as coconut oil. Apparently the metabolic surges that happened at first were an indication that my body was compensating for an anti-thyroid substance by producing more thyroid hormone; when the coconut oil relieved the inhibition, I experienced a moment of slight hyperthyroidism, but after a time the inhibitor became less effective, and my body adjusted by producing slightly less thyroid hormone. But over the next few months, I saw that my weight was slowly and consistently decreasing. It had been steady at 185 pounds for 25 years, but over a period of six months it dropped to about 175 pounds. I found that eating more coconut oil lowered my weight another few pounds, and eating less caused it to increase.

The anti-obesity effect of coconut oil is clear in all of the animal studies, and in my friends who eat it regularly. It is now hard to get it in health food stores, since Hain stopped selling it. The Spectrum product looks and feels a little different to me, and I suppose the particular type of tree, region, and method of preparation can account for variations in the consistency and composition of the product. The unmodified natural oil is called "76 degree melt," since that is its natural melting temperature. One bottle from a health food store was labeled "natural coconut oil, 92% unsaturated oil," and it had the greasy consistency of old lard. I suspect that someone had confused palm oil (or something worse) with coconut oil, because it should be about 96% saturated fatty acids.

Recent Unsaturated Oil Research: References.

The following are some recent references 1 have seen that discuss the toxic effects of unsaturated fats, some of the things that offer protection against them., and some comparisons with saturated fats. 1 include a few references on the issue of "membrane fluidity," just to show that there is probably nothing of value in that idea.

I. Y. P. Wang and S. W. Walsh. "Aspirin inhibits both lipid peroxides and thromboxane in preeclamptic placentas." Free Radical Biol. Med. 18(3), 585-591, 1995.

2. R. Padmanabhan, et al.. "Effect of pre-treatment with aspirin on alcohol-induced neural tube defects in the TO mouse fetuses." Drug. Alcohol Depend. 36(3). 175-186. 1994. (Effect depends on time and dose.)

3. M. Puchala. "The interaction of alcohol radicals with human hemoglobin. 1. Spectral properties of hemoglobin in the visible range." Radiat. Environ. Biophys. 33(4). 325-339, 1994. (Ethyl alcohol acts against free radicals.)

4. C. L. Randall, et al. "Aspirin dose-dependently reduces alcohol-induced birth defects and prostaglandin E levels in mice." Teratology 44. 521-529, 1991.

5. C. S. Bangur. J:L. Howland. S. S. Katyare. "Thyroid hormone treatment alters phospholipid composition and membrane fluidity of rat brain mitochondria." Biochem. J. 305(1), 29-32, 1995. (Increases fluidity.)

6. J. M. Gaziano, et al.. "Supplementation with beta-carotene in vivo and in vitro does not inhibit low density lipoprotein oxidation." Atherosclerosis 112(2). 187-195. 1995. (May accelerate LPO.)

7. H. A. Kleinveld, et al., "Vitamin E and fatty acid intervention does not attenuate the progression of atherosclerosis in watanabe heritable hyperlipidemic rabbits." Arterioscler. Thromb, Vase. Biol. 15(2). 290-287. 1995. (Linoleic acid promotes oxidation.)

8. P.S. Tappia, W. J. Man, and R.F. Girimble. "Influcnice of'unsaturated farty acids on the production of tumour necrosis factor and interlcukin-6 by rat peritoneal macrophages." Mol. Cell Biochem. 143(2), 89-98, 1995.

9. T. Gunther, ct al. "Effects of magnesium and iron on lipid peroxidation in cultured hepatoeytes." Mol. Cell Biochem. 144(2). 141-145. 1995. (Magnesium protects against iron.)

10. C. W. Welsch, "Review of the effects of dietary fat on experimental mammary gland tumorigenesis: Role of lipid peroxidation," Rree Radical Biol. Med. 18(4), 757-773, 1995.

11. J. P. Allard, et al., "Effect of omega 3 fatty acids and vitamin-E supplements on lipid peroxidation measured by breath ethane and pentane output--a randomized controlled trial." Fatty Acids and Lipids: Biolo. 75, 162-165. 1994.

12. K. D. Croft, et al., "Oxidation of low-density lipoproteins: Effect of antioxidant content, fatty acid composition and intrinsic phospholipase activity on susceptibility to metal ion-induced oxidation." BBA-Lipid Lipid Metab. 1254(3), 250-256, 1995.

13. D. H. Vanpapendorp, et al., "Biochemical profile of osteoporotic patients on essential fatty supplementation." Nutr, Res, 15(3). 325-334.1995.(Fish oil increased urinary calcium. fish oil evening primrose oil increased osteocalcin and procollagen.)

14. J. H. Choi and B. P. Yu, "Brain synaptosomal aging: Free radicals and membrane fluidity:" Free Radical Biol. Med. 18(2), 133-139. 1995 ("..fluidity loss may be influenced by factors other than cholesterol. We suggest that lipid peroxidation may be a major factor in the change in fluidity during the aging process.")

15. E. Chiarpotto, et al., "Metabolism of 4-hydroxy-2-nonenal and aging" Biochem. Biophys, Res. Commun. 297(2), 477-484. 1995. (Accumulation of unsaturated fat breakdown product in old animals.)

16. J. P. Allard. et al.. "Effect of' omega 3 fatty acids and vitamin-E supplements on lipid peroxidation measured by breath ethane and pentane output--at randomized controlled trial." Fatty. Acids and Lipids: Biolo 75. 162-165. 1995.

17. A. Kolling, et al., "Membrane fluidity of microsomal and thymocyte membranes after x-ray and UV irradiation." Radiat. Environ. Biophys. 33(4). 303-313. 199.4. (Pure lipid membranes are rigidized by ionizing radiation by peroxidation: membranous protein lipid interface increases its fluidity under radiation conditions.)

18. A. A. Nanji. et al.. "Markedly inhibited cyt P450 2E1 and lipid peroxidation is associated with liver injury m fish oil-ethanol fed rats." Alcohol Clin. Exp. Rex. 18(5). 1280-1285. 1994

19. A. A. Nanji, et al.. "Effect of' type of dictary fat and ethanol on antioxidant enzyme mRNA induction in rat liver." J. Lipid Res. 36(4). 736-744. 1995. (Saturated fat and ethanol fed animals had ne fiver injury, fish oil and ethanol rats had severe liver injury.)

20. C. V. Felton, et al.. "Dietary polyunsaturated fatty acids and composition of human aortic plaques." Lancet 344(8931). 1195-1196, 1994.

21. S. C. Sahn and G. C. Gray. "Kaempferol-induced nuclear DNA damage and lipid peroxidation." Cancer L.ett. 85(2). 159-164. 1994. (Kaempferol is a polyphenolic flavonoid which is structurally similar to quercetin, which is sold as an antioxidant. Antioxidants often function as pro-oxidants.)

22. S. Harel. "Oxidation of' ascorbic acid and metal ions as affected by NaCl," J. Agr. Food Chem. 42(11). 2402-2406, 1994.

23. K. Landholm, et al. "Antiinflammatory treatment may prolong survival in undemourished patients with metastatic solid tumors." Cancer Research 54(21). S602-5606. 1994. (Prednisolone and indomethacin significantly prolonged survival.)

24. J. J. Chen and B. P. Yu. "Alterations in mitochondrial membrane fluidity by lipid peroxidation products." Free Radical Biol. Med. 17(5), 411-418, 1994.

25. J. H. Choi and B. P. Yu. "Modification of' age-related alterations of' iron. ferritin. and lipid peroxidation in rat serum," Age 17(3), 93-97, 1994.

26. H. J. Sipe, et al.. "The metabolism of beta-estradiol by lactoperoxidase: A possible source of oxidative stress in breast cancer," Carcinogenesis 15(11). 2637-2643. 1994.

27. N. W. Istfan. et al. "DNA replication time accounts for tumor growth variation induced by dietary fat in a breast carcinoma model." Cancer Lett. 86(2), 177-186, 1994.

28. A. Ishihara, et al.. ":Dietary high-linoleate safflower oil is not hypocholesterolemic in aged mice afier a long-term teeding--Comparison with lard, perilla oil and fish oil." Biol. Pharm. Bull. 18(4). 485-490. 1995. (The various unsaturated oils increased whole-body cholesterol in the first 30 days. I consider this a defensive reaction, which accounts for the temporary reduction of serum cholesterol. Safflower oil. more strongly than the other oils. then produced higher cholesterol levels in the serum as the experiment was extended to 4 months.)

29. M. J. Endresen, et al., "Effects of free fatty acids found increased in women who develop pre-eclampsia on the ability of endothelial cells to produce prostacyclin, cGMP and inhibit platelet aggregation." Scan. J. Clin. Lab. Invest. 54(7), 549-557, 1994.

30. H. Darmani, et al., "Interferon-gamma and polyunsaturated fatty acids increase the binding of lipopolysaccharide to macrophages." Int. J. Exp. Pathol. 75(5), 363-368, 1994.

31. P. Yaqoob, et al. "Inhibition of natural killer cell activity by dietary lipids." Immunol. Lett. 41(2-3). 241-247, 1994.

32. M. H. I.. Gireen. ct al.. "Effect of dict and vitamin C on DNA strand breakage in freshly-isolated human white blood cells." Mutat. Res.-DNA. Genet. Aging 316(2), 91-102. 1994. (Dietary vitamin C may provide protection against IDN. breaks, though in vitro tests showed it could also induce DNA breaks. Cells taken after eating breakfast had fewer breaks than cells taken before breakfast. ie.. fasting ovemight seems to cause genetic damage.)

33. F. Berschauer, et al.. "Nutritional-physiological effects of dietary fats in rations for growing pigs. 4. Effects of' sunflower oil and coconut oil on protein and fat retention. fatty acid pattem of back fat and blood parameters in piglets." Arch. Tieremahr (East Germany) 34(1),19-33. 1984. (Fat content in the coconut oil fed animals, afler only 34 days, was 15.9°%: in the control group. 18.6°%, and in the sunflower oil fed animals. 21.1%.]

34. J. Yazbech. et al.. "Effects of essential fatty acid deficiency on brown adipose tissue activity in rats maintained at thermal neutrality." Comp. Bioch. Physiol. A (England) 94(2), 273-276, 1989, suggested that the observed increase in resting metabolic rate produced by using coconut oil to create an essential fatty acid deficiency. is partly the result of increased heat production in the brown adipose tissue. The weight of that fat decreased by 28°%, while its ability to produce heat increased 69°.

35. R. W: Ordway. et al.. "Direct regulation of ion channels by fatty acids." Trends Neurosci. 14.96-100, 1991.

36. HG. P. Swarts, et al.. "Binding of unsaturated fatty acids to Na+.K+-ATPase leading to inhibition and inactivation." Biochim. Biophys. Acta 1024, 32-40. 1990.

37. G. Autore. et al. "Essential fatty acid-deficient diet modifies PAF levels in stomach and duodenum of endotonin-treated rats." J. Lipid Mediators Cell Signalling 9. 145-153. 1994.

38. J. Rafael. et al.. mitochondria in rats." J. Nutr. 114. 255-262. 1984.

39. P. H. Chan and R. A. Fishman, "Brain edema: Induction in cortical slices by polyunsaturated fatty acids," Science 201. 358-369. 1978. "This cellular edema was specific, since neither saturated fatty acids nor a fatty acid containing a single double bond had such effect."

40. C. LarssonBackstrom. et al., "Effects of dietary alpha- and gamma-linolenic acids on liver fatty acids. lipid metabolism. and survival in sepsis." Shock 4(1). 11-20. 1995. "Dietary GLA reduced survival from sepsis."

41. D. Chemla. et al.. "Influence of dietary polyunsaturated fatty acids on contractility, inotropy and compliance of isolated rat myocardium. J mol Cell Cardiol 27(8). 1745-1755. 1995. "There was a trend towards a lower peak lengthening velocity at preload in the LC (n-3) group together with an unchanged peak rate of isometric This resulted in a significant impairment of the two mechanical indexes testing the load dependence of myocardial relaxation." See B. Pieske. Circul. 92(5), 1169-78

42. R. Lemer. et al.. "Development and characterization of essential fatty acid deficiency in human endothelial cells in culture." Proe Natl .Acad Sei U'SA 92(4). 1147-1151. 1995. Oleic acid derivative 5.8.11-cicosatrienoic acid (20:3 omega 9) (5.8.11.14.17 eicosapentaenoic, 20-5 omega 3)): 20:3 omega 9 impaired the Ca2(i) response. indicating a suppressive effect of it. (Agonist-induced increases in concentrations of prostacycline PGI 2. and cytosolie ('a2 - were reduced in efad cells.)

43. K. Imaizumi. et al.. "Dissociation of protein kinase C activities and diacylglycerol levels in liver plasma membranes of rats on coconut oil and safflower oil diets," J. Nutr Biochem 6(10), 528-533, 1995. "The activation of PKC is affected differently in vitro by different fatty acids." "Rats on coconut oil..had a markedly lower PKC activity in liver plasma membranes with slight but significant reduction of the activity in the cytosol than did rats fed safflower oil..." ".coconut oil resulted in a higher content of diacylglycerols in these membranes than did ingestion of safflower oil, whereas the proportions of saturated fatty acids and phospholipids and membrane fluidity were similar between rats ingesting different fats." "It seems likely that saturated fats exert various physiological effects on lipid and lipoprotein metabolism, in part through PKC pathways."

44. V. Boutard, et al. "Fish oil supplementation and essential fatty acid deficiency reduce nitric oxide synthesis by rat macrophages." Kidney Int. 46(5). 1280-1286. 1994. "Both. have been shown to exert anti-inflammatory effects...."

45. A A Farooqui. K Wells. L A Horrocks, "Breakdown of membrane phospholipids in Alzheimer disease--involvement of excitatory amino acid receptors." Mol Chem Neuropathol 25(2-3) 155-173, 1995. "The release of arachidonate from the su-2 position of glycerophospholipids is catalyzed by phospholipases and lipases. These enzymes are coupled to EAA receptors. Overstimulation of these receptors may be involved in abnormal calcium homeostasis, degradation of membrane phospholipids, and the accumulation of free fatty acids, prostaglandins. and lipid peroxides. Accumulation of the mentioned metabolites, as well as abnormalities in signal transduction owing to stimulation of lipases and phospholipases, may be involved in the pathogenesis of the neurodegeneration in AD."

46. P. H. Chan and R. A. Fishman. "Transient formation of superoxide radicals in polyunsaturated fatty acid-induced brain swelling." J. of Neurochemistry 35, 1004-1007, 1980.

47. T. Gunther, et al., "Effects of magnesium and iron on lipid peroxidation in cultured hepatocytes," Mol. Cell Biochem. 144(2), 141-145, 1995. (Magnesium protects against iron.)

48. K. D. Croft, et al., "Oxidation of low-density lipoproteins: Effect of antioxidant content, fatty acid composition and intrinsic phospholipase activity on susceptibility to metal ion-induced oxidation." BBA-Lipid Lipid Metab. 1254(3), 250-256, 1995.
49. J. H. Choi and B. P. Yu, "Brain synaptosomal aging: Free radicals and membrane fluidity," Free Radical Biol. Med. 18(2), 133-139, 1995 ("...fluidity loss may be influenced by factors other than cholesterol. We suggest that lipid peroxidation may be a major factor in the change in fluidity during the aging process.")
50. J. H. Choi and B. P. Yu, "Modification of age-related alterations of iron, ferritin, and lipid peroxidation in rat serum," Age 17(3), 93-97, 1994.
51. E. Chiarpotto, et al., "Metabolism of 4-hydroxy-2-nonenal and aging," Biochem. Biophys. Res. Commun. 297(2), 477-484, 1995. (Accumulation of unsaturated fat breakdown product in old animals.)
52. M. J. Endresen, et al., "Effects of free fatty acids found increased in women who develop pre-eclampsia on the ability of endothelial cells to produce prostacyclin, cGMP and inhibit platelet aggregation," Scan. J. Clin. Lab. Invest. 54(7), 549-557, 1994. "...levels of circulating free fatty acids are increased in women who later develop pre-eclampsia long before the clinical onset of the disease." "...linoleic acid reduced the thrombin-stimulated prostacyclin release by 30-60%, oleic acid by 10-30%, wheras palmitic acid had no effect." "Linoleic acid reduced the endothelial cells' ability to inhibit platelet aggregation by 10-45%...."
53. R. Sanchez Olea, et al., "Inhibition by polyunsaturated fatty acids of cell volume regulation and osmolyte fluxes in astrocytes." Amer. J. of Physiology--cell physiology 38(1), C96-C102, 1995. "...potent blockers of regulatory volume decrease and of the swelling-activated efflux of taurine, D-aspartate, inositol, and I-125 (used as marker of Cl). ...oleic and ricinoleic acids and saturated fatty acids were ineffective." "...polyunsaturated fatty acids directly inhibit the permeability pathways correcting cell volume after swelling in cultured astrocytes."
54. M. D'Aquino, et al., "Effect of fish oil and coconut oil on antioxidant defence system and lipid peroxidation in rat liver, Free Radical Res. Commun. (Switzerland) 12-13 (1), 147-152, 1991. "...the rate of lipid peroxidation in isolated microsomes was three-fold higher in rats fed fish oil as compared to rats with coconut oil diet." "These results suggest that fish oil feeding at an amount compatible with human diet, although decreasing plasma lipids, actually challenges the antioxidant defence system, thus increasing the susceptibility of tissues to free radical oxidative damage."
55. R. Sanchez olea, et al., "Inhibition by polyunsaturated fatty acids of cell volume regulation and osmolyte fluxes in astrocytes." Amer. J. of Physiology--cell physiology 38(1), C96-C102, 1995. "...potent blockers of regulatory volume decrease and of the swelling-activated efflux of taurine, D-aspartate, inositol, and I-125 (used as marker of Cl). ...oleic and ricinoleic acids and saturated fatty acids were ineffective." "...polyunsaturated fatty acids directly inhibit the permeability pathways correcting cell volume after swelling in cultured astrocytes." aptdo postal 70-253, Mexico, DF, UNAM, INST FISIOL CELULAR.
56. W. N. Spellacy and K. L. Carlson, "Plasma insulin and blood glucose levels in patients taking oral contraceptives: Preliminary report of a prospective study," Am. J. Obst. & Gynec. 95, 474-478, 1966.
57. M. C. Galli, et al., Comp. Biochem. and Physiology C--Pharmacology Toxicology & Endocrinology 107(3), 435-440, 1994. Age-related "susceptibility was correlated with the content of polyunsaturated fatty acids and of lipophilic chain-breaking antioxidants." [Free radical injury]
58. Y. P. Wang and S. W. Walsh, "Aspirin inhibits both lipid peroxides and thromboxane in preeclamptic placentas," Free Radical Biol. Med. 18(3), 585-591, 1995.
59. C. S. Bangur, J. L. Howland, S. S. Katyare, "Thyroid hormone treatment alters phospholipid composition and membrane fluidity of rat brain mitochondria," Biochem. J. 305(1), 29-32, 1995. (Increases fluidity.)
60. R. S. Sohal, et al., "Mitochondrial superoxide and hydrogen peroxide generation, protein oxidative damage, and longevity in different species of flies," Free Rad. Biol. & Med. 19(4), 499-504, 1995. Cytochrome C oxidase protects against free radical damage. This enzyme depends on thyroid and light.
61. T. Gunther, et al., "Effects of magnesium and iron on lipid peroxidation in cultured hepatocytes," Mol. Cell Biochem. 144(2), 141-145, 1995. (Magnesium protects against iron.)
62. K. D. Croft, et al., "Oxidation of low-density lipoproteins: Effect of antioxidant content, fatty acid composition and intrinsic phospholipase activity on susceptibility to metal ion-induced oxidation." BBA-Lipid Lipid Metab. 1254(3), 250-256, 1995.
63. J. H. Choi and B. P. Yu, "Brain synaptosomal aging: Free radicals and membrane fluidity," Free Radical Biol. Med. 18(2), 133-139, 1995 ("...fluidity loss may be influenced by factors other than cholesterol. We suggest that lipid peroxidation may be a major factor in the change in fluidity during the aging process.")
64. J. H. Choi and B. P. Yu, "Modification of age-related alterations of iron, ferritin, and lipid peroxidation in rat serum," Age 17(3), 93-97, 1994.
65. E. Chiarpotto, et al., "Metabolism of 4-hydroxy-2-nonenal and aging," Biochem. Biophys. Res. Commun. 297(2), 477-484, 1995. (Accumulation of unsaturated fat breakdown product in old animals.)
66. M. J. Endresen, et al., "Effects of free fatty acids found increased in women who develop pre-eclampsia on the ability of endothelial cells to produce prostacyclin, cGMP and inhibit platelet aggregation," Scan. J. Clin. Lab. Invest. 54(7), 549-557, 1994. "...levels of circulating free fatty acids are increased in women who later develop pre-eclampsian long before the clinical onset of the disease." "...linoleic acid reduced the thrombin-stimulated prostacyclin release by 30-60%, oleic acid by 10-30%, wheras palmitic acid had no effect." "Linoleic acid

reduced the endothelial cells' ability to inhibit platelet aggregation by 10-45%...." L. A. Norris and J. Bonnar. "Effect of oestrogen dose on whole blood platelet activation in women taking new low dose oral contraceptives." Thromb, Haemost. 72(6), 926-930.1994: "Increased levels of ADP and arachidonic acid-induced aggregation were observed in women taking the 30 microgram ethinyloestradiol combination. Platelet release of beta-thromboglobulin (beta TG) was also significantly increased. Increased collagen-induced aggregation was observed but this failed to reach statistical significance for the individual treatment groups.") Estrogen dominance is an essential factor in preeclampsia. Women who have died of (eclamptic) convulsions have been found to have massive clots in their brain blood vessels. Much of this work had its origin in the 1930s (Shute and others), and was buried by the power of the estrogen industry.

67. H. Darmani, et al.. "Interferon-gamma and polyunsaturated fatty acids increase the binding of lipopolysaccharide to macrophages," Int. J. Exp. Pathol. 75(5), 363-368. 1994.

68. G. Autore, et al., "Essential fatty acid-deficient diet modifies PAF levels in stomach and duodenum of endotoxin-treated rats," J. Lipid Mediators Cell Signalling 9, 145-153. 1994. Deficiency of "essential" fats decreases damage from endotoxin.

69. N. Auge, et al.. "Proliferative and cytotoxic effects of mildly oxidized low-density lipoproteins on vascular smooth-muscle cells," Biochem. J. 309(Part 3). 1015-1020, 1995. "The proliferative effect on smooth-muscle cells is counterbalanced at high concentrations of mildly oxidized I.DLs (or at high oxidation levels) by their cytotoxic effect."

70. S. K. Clinton, et al.. "The combined effects of dietary fat and estrogen on survival, 7.12-dimethylbenz(a)-anthracene-induced breast cancer and prolactin metabolism in rats." J. Nutr. 125(5), 1192-1204, 1995. "Mortality in controls was doubled by feeding a high fat diet..." "..the presence of estrogen may be a prerequisite for significant dietary modulation."

71. P. S. Tappia, et al., "influence of unsaturated fatty acids on the production of tumour necrosis factor and interleukin-6 by rat peritoneal macrophages," Mol Cell Biochem 143(2), 89-98, 1995. at 50 micro moles all fatty acids suppressed PKA activity, except oleic acid which increased it; PKC activity was enhanced by linoleic acid and oleic acid. 100 mc M L.A enhanced PKC by 146%, while EPA and DHA suppressed PKC.

72. R. Lemer, et al., "Development and characterization of essential fatty acid deficiency in human endothelial cells in culture." Proc Natl Acad Sci USA 92(4), 1147-1151, 1995. Oleic acid derivative 5,8,11-eicosatrienoic acid (20:3 omega 9)(5,8,11,14,17 eicosapentaenoic, 20-5 omega 3)): 20:3 omega 9 impaired the Ca2(i) response. indicating a suppressive effect of it. (Agonist-induced increases in concentrations of prostacycline PGI 2, and cytosolic Ca2+ were reduced in efad cells.)

73. K. Imaizumi. et al., "Dissociation of protein kinase C activities and diacylglycerol levels in liver plasma membranes of rats on coconut oil and safflower oil diets," J. Nutr Biochem 6(10), 528-533, 1995. activation of PKC is affected differently in vitro by different fatty acids." "Rats on coconut oil..had a markedly lower PKC adivity in liver plasma membranes with slight but significant reduction of the activity in the cytosol than did rats fed safflower oil..." "...coconut oil resulted in a higher content of diacylglycerols in these membranes than did ingestion of safflower oil, whereas the proportions of saturated fatty acids and phospholipids and membrane fluidity were similar between rats ingesting different fats." "It seems likely that saturated fats exert various physiological effects on lipid and lipoprotein metabolism, in part through PKC pathways."

74. V. Boutard, et al., "Fish oil supplementation and essential fatty acid deficiency reduce nitric oxide synthesis by rat macrophages," Kidney Int. 46(5), 1280-1286, 1994. "Both..have been shown to exert anti-inflammatory effects...."

75. M E Miller, et al., "Influence of hormones on platelet intracellular calcium." Thrombosis Research 77(6), 515-530, 1995. "Platelet intracellular calcium concentration and release was significantly decreased in women ingesting tamoxifen compared to controls and significantly increased, as was platelet adhesion, in oral contraceptive users." "Only oral contraceptive users had increased sensitivity to aggregating agents. .platelet calcium levels are closely related to the degree of platelet adhesion and aggregation in vivo."

76. F. Mercure and G. Vanderkraak, "Inhibition of gonadotropin-stimulated ovarian steroid production by pufa in teleost fish," Lipids 30(6). 547-554, 1995. "EPA and DHA inhibited gonadotropin-stimulated testosterone production in a dose-related manner...."

77. A A Farooqui, K Wells, L A Horrocks, "Breakdown of membrane phospholipids in Alzheimer disease--involvement of excitatory amino acid receptors," Mol Chem Neuropathol 25(2-3) 155-173, 1995. "The release of arachidonate from the sn-2 position of glycerophospholipids is catalyzed by phospholipases and lipases. These enzymes are coupled to EAA receptors. Overstimulation of these receptors may be involved in abnormal calcium homeostasis, degradation of membrane phospholipids, and the accumulation of free fatty acids, prostaglandins, and lipid peroxides. Accumulation of the mentioned metabolites, as well as abnormalities in signal transduction owing to stimulation of lipases and phospholipases, may be involved in the pathogenesis of the neurodegeneration in AD."

A LOGICAL DIET

Most diets are promoted for a single purpose, such as weight loss or heart protection, and usually they don't work even for a limited purpose. If a diet allows you to adapt to varied activities with a minimum of stress, it will help you to avoid many serious problems. Years ago, a retired dentist studied healthy people and their diets around the world, and found that many different diets supported good health, but when they began eating the "western" diet, based on grains, they quickly developed all the degenerative diseases.

There are some simple biochemical reasons for avoiding grains and beans, that I have discussed in more detail elsewhere. Plants put their most effective poisons into their seeds to protect their progeny. These toxins block digestive enzymes, lowering the food value of the material, but they also poison many other physiological processes--hormone production, immunity, and brain development, for example.

People who are accustomed to eating wheat shaped into dozens of foods that differ only in appearance and flavor sometimes say "there's nothing left to eat" if they eliminate grains, or stop relying on them for their main source of calories.

If we restrict ourselves mainly to animal proteins and low-starch fruits, we avoid the nutrient-poor foods, and still have an almost infinite variety of very pleasant foods. These foods are generally so rich in nutrients that a person could choose just a few of them, and be assured of an abundance of vitamins, minerals, and proteins.

Nutritional deficiency diseases probably wouldn't have been discovered if our diets hadn't been based on grains. The starches in grains aren't their only problem, but starch is uniquely suited to activate the formation of fat, and to stimulate appetite, especially an appetite for more carbohydrate, to restore the blood glucose that has been used up in making fat. Starch also has the ability to stimulate allergic responses, to plug small blood vessels and to accelerate aging (according to the work of G. Volkheimer, and others).

There is one form of grain that is relatively harmless because of the traditional method of processing it, and that is corn that has been made into tortillas or other native American foods, using alkali to detoxify it and make it more digestible. Pellagra was strongly associated with the use of ordinary corn, but not with the traditional preparations. Tortillas

fried in coconut oil and salted make a pleasant snack which is less nutritious than potato chips, but less allergenic and more digestible.

The sugars and minerals in fruits tend to stabilize the blood sugar, and when they are taken with protein foods, they allow the proteins to be used constructively, rather than being converted into energy. This combination minimizes the stress hormones, and promotes thyroid function, so that energy is available for use, rather than being stored as fat. For example, a glass of orange juice and an egg make a good breakfast, and cherries and cheese make a good snack. Chicken and watermelon, pineapple and ham, any combination of fruit and protein will make a balanced meal. Milk evolved as a complete food, according to this principle of combining sugar, protein, and minerals.

People who drink a quart of milk and a quart of orange juice every day are much less likely to have a hormonal imbalance than people who eat the average "well balanced" diet containing mostly vegetables, grains, and legumes.

One vegetable has a special place in a diet to balance the hormones, and that is the raw carrot. It is so nearly indigestible that, when it is well chewed or grated, it helps to stimulate the intestine and reduce the reabsorption of estrogen and the absorption of bacterial toxins. In these effects on the bowel, which improve hormonal balance, a carrot salad resembles antibiotic therapy, except that the carrot salad can be used every day for years without harmful side-effects. Many people find that daily use of the raw carrot eliminates their PMS, headaches, or allergies. The use of oil and vinegar as dressing intensifies the bowel-cleansing effect of the salad. Coconut oil is more germicidal and thyroid promoting than olive oil, but a mixture of coconut and olive oil improves the flavor. Lime juice, salt, cheese and meats can be used to vary the flavor.

CONCLUSION

Context is everything. The idea of balance--physiological, hormonal, or nutritional balance, for example--requires contextual thinking. Environmentalism is a form of contextual thinking. There are no closed systems, anywhere. Before the second world war, there were many influential people and institutions devoted to contextual thinking. With the rise of overwhelming corporate/state influence in the world, manipulative "public relations" has replaced critical thinking even, to a great extent, in the universities.

The main channels of communication are controlled by a few monopolies, which combine financial, weapons, pharmaceutical, agricultural, and energy interests in ways that are creating an interlocking set of almost rational-seeming beliefs. To orient yourself within this system requires some attention and effort, but once you perceive that your health and life are in the balance, it is usually possible to find the motivation and the energy to persist in critical, evidence-based thinking.

I have looked for the best workers in many scientific fields, and it seems that their discoveries fit into a meaningful picture of life. Warburg, Shute, Biskind, Lipschutz, Selye, Szent-Gyorgyi, Barnes, Ling, Meerson, and others have revolutionized biology and medicine, but their work has never supported the dominant corporate view, and so it has been actively suppressed by the forces that control science education.

The therapeutic methods that have grown out of their discoveries are simple, basic, inexpensive, and extremely effective.

NOTE: Some businesses have misleadingly used my name and parts of my research to imply that I support their products. The only formulation of progesterone that I approve is progesterone dissolved in vitamin E, and I hold the patent on that. It is useful when applied to the skin, but oral use is more economical. As this book explains, other solvents and additives can be harmful. Almond oil, avocado oil, safflower oil, etc., sensitize the skin to the aging effects of the sun, and are inappropriate for use on the skin or internally. Diosgenin, sometimes called wild yam extract, is toxic.

For information on my other books, newsletters, tapes, progesterone in vitamin E (2,850 mg. per ounce), coconut oil, etc., write to:
Raymond Peat, P.O. Box 5764, Eugene, Oregon 97405
www.efn.org/~raypeat Tel. (541) 683-4279

FROM PMS TO MENOPAUSE:
Female Hormones in Context

By Raymond Peat

Many myths about female sexuality and health have been built into both medical education and popular culture. Understanding the subject scientifically means going against the current of both conventional medicine and alternative medicine.

To illustrate the roles of hormones and the various therapeutic approaches, a variety of problem areas, affecting women from childhood to old age, are considered in detail. For example, various sections focus on:

Eliminating migraine headaches
Alleviating the symptoms of menopause
Losing unwanted fat without "dieting"
Regulating fertility
Protecting pregnancy
Curing arthritis
Correcting nervous disorders

Raymond Peat received his PhD in Biology from the University of Oregon, specializing in physiology. He has written *Mind and Tissue, Progesterone in Orthomolecular Medicine, Generative Energy,* and *Nutrition for Women,* besides articles in journals. He has taught at the University of Oregon, Urbana College, Montana State University, National College of Naturopathic Medicine, Universidad Veracruzana, and the Universidad Autonoma del Estado de Mexico, and founded Blake College, International University. He does independent research and private endocrine and nutritional consulting.