



THE ESTR

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athed in estrogen in the womb, all fetuses begin life as females. The male of the species is created about two months after conception when a burst of testosterone produces the masculine sex organs. With no need for such a cataclysmic event to create her primary sexual infrastructure, the female experiences her first hormonal surge at puberty when an upswing in estrogen ripens her reproductive tract and proclaims her maturity to the world by producing breasts and the monthly cycle whose advent, in all cultures, is recognized as a major life event.

Estrogen, then, is the source of womanhood. But it also plays a central, and rather surprising, role in women's health beyond reproduction. It has been shown to promote certain diseases like cancers of the breast and endometrium and to ward off others like heart disease and osteoporosis. Indeed, researchers are beginning to see estrogen as a powerful elixir, affecting the growth of a woman's cells, her bone density, her cholesterol levels, her youthfulness, and even her perception, coordination and sexual desire. Yet, as medical science is discovering its many roles in a woman's life, society is blithely attempting to ignore estrogen's signals.

For all its attractions, the life of the modern woman runs directly counter to the impulses of her hormones—and to the ways of her female ancestors. Never before in history have women come into puberty so early, yet borne so few children, had those children so late and then lived so long after

Girls are maturing into women at ever-younger ages, and scientists are just now beginning to understand how this early maturation affects their health.

OGEN REPORT

Never before have women come into puberty so early and lived so long. And never before have they been exposed to so much estrogen. Is it possible, scientists wonder, to get too much of a good thing?

menopause. This is a profound evolutionary transformation that has led women—and society—into a brave new world of possibility.

Yet women are attempting to reforge their identities as if their essential body chemistry had no bearing on the matter, as if womanhood had no biological definition. The truth is, all human beings are shaped by their hormones as surely as life is powered by the sun. At a time when a 59-year-old postmenopausal woman can give birth to a test-tube baby, there is no doubt that science can change much, but it can't change everything.

It has obviously been a blessing to push procreation past the age of menopause, to separate the joy of sex from the burden of child-raising, and to free women for other pursuits beyond domestic ones. But a woman ignores the message of her hormones at her peril. As in some Faustian bargain, there are proving to be unexpected costs to this unprecedented hormonal tampering, costs that can be counted in diverse ways: in the soaring teenage pregnancy rates, the frightening rise in breast cancer, the heightened frustrations with infertility, the intensification of some of the more irksome symptoms of menopause and the grave anxieties about the Hormone Replacement Therapy (HRT) used to ease this life change. The culture may be pushing one way, but women's own bodies are pushing another.

At the heart of the matter is the fact that, as epidemiologist Malcolm Pike, Ph.D., has put it, women have shifted from a traditional condition of "incessant pregnancy" to one of

"incessant ovulation." By his count, a woman who might have ovulated 150 times in her lifetime 200 years ago is likely to ovulate 450 times today. "From an evolutionary perspective, it is quite abnormal for our species to have so many ovulatory events," says Patricia Whitten, Ph.D., an anthropologist at Emory University. If this were simply a matter of a few hundred extra eggs being flushed out unfertilized at menstruation, that might not be cause for concern. But ovulation involves the secretion of powerful

earlier age. And because women now spend 75 percent of their reproductive lives—in most cases, their years of peak fertility—trying to avoid pregnancy, this flood continues unabated until menopause.

Ironically, the final phase of a woman's hormonal life has remained relatively steady. The age of menopause now stands at 51.2, having hovered at about 50 years for the past hundred years. Meanwhile, the average life span for American women has increased markedly, from 48 years at the turn of the century to nearly 80

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hormones, chiefly estrogen, and the consequences are serious indeed.

In all industrialized countries, the emergence into womanhood occasioned by the start of menstruation is happening earlier than ever. With little fanfare, but with immense significance, the average age of menarche—or first menstruation—has dropped from 16 years of age 150 years ago to 12½ today. Most researchers attribute the shift to improved nutrition, which explains why skinny ballerinas are often so slow to go through puberty. Whatever the cause, the effect is to flood the female body with estrogen at an ever-

today, creating an extended posthormonal stage that has never before existed in a woman's life.

All these changes are confounding medical science's ideas about what is physiologically normal and society's ideas about what is culturally acceptable. Is it normal, or healthy, for a woman to be exposed to so much estrogen—those 450 cycles—until menopause? To start her periods so early? To put off childbearing so long? Maybe not. A body of epidemiological evidence has been accumulating to suggest that the current delay and reduction in childbearing—and the concomitant

BY JOHN SEDGWICK

SELF MARCH 1994 133

THE ESTROGEN REPORT

increase in estrogen exposure—may have contributed to the dramatic rise in the incidence of breast cancer. In 1940, one woman in 20 could expect to contract the disease; in 1960, one woman in 14; today, the rate is an astonishing one in eight. These same factors may have caused an upsurge in cancers of the ovary and the endometrium, the lining of the uterus that is shed during menstruation.

Estrogen is known to encourage cell growth, and the more cells grow and divide, the greater the chance of having one of them go awry. When cancer cells do develop, estrogen may fuel their growth. For this reason, early menarche and late menopause are already recognized as risk factors for cancers of the reproductive system. Dr. Pike believes the cessation of ovulation at menopause may also explain why the incidence of these diseases tapers off later in life. (There are some researchers who believe that estrogenic chemicals like PCBs, DDT and dioxins may have the same cancer-causing effect. DDT, for example, has been implicated

seems to be. Evidence from studies on rats indicates that the placental hormone, chorionic gonadotropin, which is released during pregnancy, may also reduce the risk. But estrogen seems to be the major culprit.

In response to these data, Pike and his colleagues have recently recommended in *Science* that women be given oral contraceptive “antihormones” to combat the effects of the estrogen by suppressing ovulation, just as the Pill does. In fact, much of Pike’s work stems from discoveries of the cancer-curbing effects of combination oral contraceptives, which have both estrogen and progesterone. (The original Pill had only estrogen and resulted in higher rates of endometrial cancer.) Pike is fine-tuning a new contraceptive formulation that works against all three cancers by mixing gonadotropin-releasing hormone with a bit of estrogen and progesterone. If the clinical trial currently under way is successful, he predicts, the new formulation could reduce all three cancers by up to 70 percent over a 15-year period.

obvious solution is to replace the lost estrogen with supplements. But that raises the fear that women will be doing to themselves after menopause what they’ve done to themselves before it, namely endangering their health with “extra” estrogen.

Since the large-scale, long-term prospective trials that would clarify the issue are years away from completion, the HRT decision is a scary one to make. In some respects, it looks like a choice between dying by fire or drowning. In boosting estrogen back toward premenopausal levels, HRT appears to increase the risk of breast cancer by about 50 percent, and it has a similar effect on endometrial cancer. But at the same time, it reduces the dangers of bone-weakening osteoporosis, which can strike after the estrogen shutdown, and it reduces the chance of a heart attack by about 50 percent (since estrogen improves the ratio of “good” cholesterol to “bad”). Heart attacks are 10 times more common in women than breast cancer, but to many women, breast cancer is about 10 times more fearsome.

Because of the many variables of what *The New England Journal of Medicine* terms a “clinical conundrum,” it is no surprise that there are as many opinions about HRT in the medical profession as there are physicians. Daniel F. Hayes, M.D., the medical director of the Breast Evaluation Center at Harvard University’s Dana Farber

Cancer Institute, takes what is probably the consensus view of the medical establishment, which is basically neutral. Dr. Hayes recommends HRT only for women who are at high risk for osteoporosis or heart disease. Still, 15 percent of this country’s postmenopausal women are on HRT, making Premarin, which is the preferred estrogen supplement, one of the nation’s most prescribed medications. The momentum appears to be solidly on the pro-HRT side.

But if there is a lot to be learned about the impact of estrogen on women’s health, there is even more to be discovered about its effects on

Now that women live until 80, menopause is far closer to the midpoint of their lives than to the end, and it comes at a time when they still think of themselves as young.

in the increased breast-cancer rates of several towns on Long Island where spraying was heavy during the 1950s and '60s. See “Environmental Estrogens,” page 179.)

Pregnancies, especially if they are early and numerous, can reduce the risks of breast cancer, most likely because they interrupt the production of sex hormones by the ovaries although some research does implicate other factors. Early motherhood may be beneficial, for example, because breast cells remain in a more cancer-susceptible immature state until pregnancy. The older the mother is, the less powerful this protection

While there appear to be dangers associated with having too much estrogen, there may also be risks involved in having too little. By outliving their menstrual cycles, women have increased the incidence of what might be thought of as estrogen-deficiency illnesses, those that occur most frequently among postmenopausal women. Osteoporosis is up by 10 percent; heart disease has become the leading killer of women; even Alzheimer’s disease, which new studies have found responds to treatment with estrogen, is rising so rapidly it is expected to jump 250 percent by the year 2050. The

their behavior. Because of the disease focus of most medical research, scientists have been slow to plumb even as obvious a relationship as the one between estrogen and sexuality, to say nothing of estrogen's more subtle contributions to a woman's frame of mind. Yet the ramifications of these behavioral connections potentially dwarf the medical ones, simply because our hormones influence so much of what we do, think and feel.

Perhaps the most important example of this underlying hormonal impulse lies in the sexual precocity that stems from the startlingly early maturation of young girls. It seems to have escaped the attention of politicians, religious leaders and some social scientists, who are busy being appalled by the increasing sexuality of American youth. To be a 12½-year-old today is, physiologically, to be a 16-year-old of the not-too-distant past. It is inevitable that kids act their physiological age; their hormones have pushed up their "normal" schedule of sexual development. The only surprising part is that anyone should think that the sexual maturity fueled by our hormones can be put off for a more convenient time.

As the statistics on early pregnancy demonstrate, hormones will out, regardless of our wishes. In 1940, the earliest year for which comparable data can be obtained, the birthrate for unmarried American teenagers between 15 and 19 was 7.4 per thousand; by 1991, that figure had shot up to 45 per thousand. In 1991, there were an astounding 1.1 million teenage pregnancies, 28,000 of them involving girls under 15. It is estimated that one female teenager out of four will become pregnant by age 18, and nearly one out of two will be pregnant by age 20. The AIDS rate for 20-to-30-year-olds, who presumably contracted the disease as teenagers, leads the nation.

It is customary to place the blame for these statistics on a sexually permissive society, saturated with the images of Madonna's rocket-shaped brassiere and Marky Mark in his skivvies. Marilyn Yalom, Ph.D., at

(continued on page 174)



There is little scientific reassurance for a woman who might be considering estrogen replacement therapy. Much more research needs to be done.

STONE

(continued from page 127)

directions, slowly returning your arm to the floor. Rest for four seconds between repetitions. Do six reps with your right arm, then six with your left. (Use a lighter weight if you can't do six.)

Dumbbell salute *Strengthens the upper back and stretches the chest.*



in a straight-backed chair with your feet on the floor. Hold a five-pound dumbbell in your right hand, and cross your right arm over your



thighs so that your hand rests to the outside of your left thigh, palm facing up. Grasp the left side of the chair with your left hand. Lift your right arm, keeping it straight but not locked, until the



weight is level with your left shoulder and hold for five seconds. Then with your arm still straight, raise it above your right shoulder. Without arching your back, lean your right arm back a few inches until you feel a stretch in

your chest. Hold for five seconds. Lower the weight to your left side. Switch arms and repeat. Do eight repetitions with each arm.

Hang loose *Stretches the lower back.*

Sitting in a chair with your feet flat on the floor, knees shoulder width apart, turn your torso to the left, and place a hand on either side of your left knee. Tuck your chin, allowing your shoulders to hang forward. Then exhale and slowly lower your upper body toward your left thigh until your chest is resting on or near your thigh and your fingertips skim the floor. Hold for 10 seconds. Inhale and



tighten your abs and buttocks as you roll back up. Repeat to the right side. Do three repetitions on each side.



Towel de-tenser *Stretches the upper back and chest.*

Stand with your feet about six inches apart, knees slightly bent and shoulders relaxed. Hold a rolled-up towel behind your buttocks, one hand at either end, with your palms facing away from your

body. Keeping your shoulders relaxed, slowly push the towel back as far as you comfortably can. Don't arch your back. Hold until you feel the tension, then release. Do six repetitions to start and build to 10.

Bow stretch

Stretches the hip flexors. Sit on the floor with the soles of your feet together and as close to your body as possible. Bending forward from the hips with your back flat, hold on to your ankles, and rest your elbows on the insides of your knees.

Gently push your knees toward the floor with your elbows. Hold for as long as possible, up to 15 seconds. Repeat three times.



Lower-back lean

Stretches the extensor muscles of the lower back. Lie on your

back on the floor with your knees bent, feet flat on the floor and your arms out to the side. Contracting your abdominals, draw your knees up over your hips (the small of your back should be flat on the floor). Slowly lower both knees to the left until your left knee rests on the floor. Hold for five seconds. Bring your knees back to center, then over to the right side, and hold for five seconds. Raise your knees back to center again, then place your feet on the floor. Relax. Repeat three



times, building, as you get stronger, to six on each side.



ESTROGEN

(continued from page 135)

Stanford University's Institute for Research on Women and Gender, for instance, calls American teenage sexuality "socially constructed." And Susan Harlap, M.D., chief of epidemiology at Memorial Sloan-Kettering Cancer Center, blames the teen-pregnancy rate on "the demands placed on individuals by TV and the media."

But this attitude overlooks some important physiological facts. In 1870, only 13 percent of European girls were capable of giving birth at age 17½, whereas 94 percent of American girls are fertile at that age today. Furthermore, with menarche comes an avalanche of hormones, estrogen in particular, that many researchers believe creates a desire for sex that perfectly complements the new capacity for it—the software, as it were, to go with the hardware.

From an evolutionary point of view, it makes sense that estrogen should have this effect, since it increases the chances that a female will fulfill her genetic imperative to get her eggs fertilized. Yet it has been extraordinarily difficult to prove, largely because it is so hard to disentangle hormonal factors from social ones in determining the root cause of sexual behavior. Are girls having sex because they want to or because societal pressure forces them into it? Conversely, if girls are not having sex, is it because they're not interested?

Richard Udry, Ph.D., Kenan Professor at the Carolina Population Center at the University of North Carolina-Chapel Hill, first started trying to prove that hormones contribute to sexuality back in the 1970s, and he's still at it. "There can't be any doubt that there is an important causal relationship between the onset of puberty and the sexual behavior of adolescents," he says. "The problem becomes increasingly difficult when you say, 'Well, what is it about puberty, and how does it work?'" The best he has been able to do is to show a midcycle peak of sexual activity in a group of married couples when the wife's estrogen levels are highest. "It suggests that sexual behavior has something to do with hormones and estrogen," he says. But he is hard-pressed to say exactly what. (continued)

VITAMINS

(continued from page 149)

dummy pill. La Haye isn't going to all this expense just to make a health claim on the label of its present over-the-counter ICAPS PLUS product. Instead, it seeks FDA approval to market a more potent variation as a prescription drug, presumably at a higher price. If La Haye succeeds, other firms likely will clamor to develop "nutraceuticals"—or prescription vitamins. "We think it will be the wave of the future," says La Haye's executive vice president Larry Laks. Such a development would certainly offer better documented health claims for supplements. It also means that consumers would pay much higher prices for these products.

Meanwhile, back at Houston's Whole Foods Market on South Shepherd Drive, many versions of the vitaminlike substance Coenzyme Q₁₀ are back on the shelves—this time without anything the FDA can call a health claim. Also crowding the shelves are amino acids and many other products that may or may not work but have gotten around the labeling restrictions

with clever names: "Aller-Bee-Gone" (high desert bee pollen and other things, \$40 for 144 tablets), "Cramp Bark" (vitamin B₆ and 10 herbs with cramp bark, 24 tablets for \$5.99), "Positive Attitude" (nine different herbs, including magnolia and several Chinese botanicals, 60 tablets for \$11.95). Whether the government will let you continue to buy these concoctions is now up to the FDA and Congress, which will wrestle with the issues yet again this year.

The bottom line is that when you go into a pharmacy or health food store to buy vitamins or other supplements, you should be an educated consumer. Read the ongoing research about any herbs or amino acids you're thinking about taking. Learn how antioxidant vitamins may protect against cancer and how vitamin E may help prevent heart attacks. Talk to your doctor. He, like Mike Wise's, is probably learning a lot about how vitamins can be used to promote good health.

But don't forget that by definition supplements are something that completes or adds to the nutrients you get by eating a well-balanced diet. They were never meant to be the main course. ☺

ESTROGEN

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Carol Worthman, Ph.D., an anthropologist at Emory University, has come a bit closer. She studied the !Kung San people of southwestern Africa, and while she didn't detect a meaningful increase in sexual activity at the midcycle peak, she did see a significant rise in "self-confidence" and "extroversion"—traits with obvious sexual implications—during the estrogen surge. "The women tended to socialize more," she says, "and to be happier about their relationships."

Dr. Worthman's is a lonely voice in the field. Because of the touchy politics of the issue, researchers are not all that eager to investigate the relationship between hormones and behavior, even if they could get money for such basic research. It isn't much of a leap from the relatively benign notion that a woman's behavior is affected by her body chemicals to the tired, politically charged idea that women are unfit to govern or to run large corporations because they supposedly get cranky once a month. And when it comes to teenage sexuality,



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society would prefer to believe it didn't exist, no matter how many facts pile up to the contrary.

Other researchers, like Barbara Sherwin, Ph.D., of McGill University, argue that testosterone, not estrogen, is the major player in acute sexual desire. (Although testosterone is regarded as the "male hormone," women possess small quantities of it, just as men have small quantities of the "female hormone" estrogen.) Dr. Sherwin has given testosterone to women who have had their ovaries removed and seen their libido rise to such levels that, as she once told an interviewer, "We've had some husbands call and say, 'Take my wife off that stuff.'"

Of course, this research doesn't rule out estrogen as the source; it merely demonstrates that when a woman takes testosterone, she gets randy. And Kim Wallen, Ph.D., a psychologist at the Yerkes Primate Center in Atlanta, remains unshaken in his belief that, for women, estrogen is the force that drives the flower. He argues that the very variability of estrogen levels accounts for much of the teenage pregnancy rate. Because of the social prohibitions on having sex, females hold off until their

estrogen levels peak at the most fertile point of their cycle, when they can't hold off anymore. "We have a lot of anecdotal reports of girls coming into clinics and saying, 'I only had sex once,'" Dr. Wallen explains. "Which is probably true, but they had it at the worst possible time. That's why they got pregnant."

Obviously, the social ingredient of the nation's R-rated culture should not be dismissed; it probably explains why the United States is the world leader in teenage pregnancy, outdistancing Canada by nearly two to one and the Netherlands by seven to one. But to recognize the power of social forces should not be to deny the power of hormonal ones. Each adds to the other. With hormones and cultural pressures both pushing for sex, Wallen says, you get a powerful "amplification" of desire. Sex becomes irresistible. "There's physical maturation, and there's sociological maturation," says Worthman. "The problem is that the two have become dis-synchronized."

There is another dis-synchronization at the other end of a woman's life. At the turn of the century, a woman didn't think much about her postmenopausal years because there weren't many. Now that women live until 80, menopause is far

closer to the midpoint of their lives than to the end, and it comes at a time when women still like to think of themselves as young. They are eager to continue their sexual lives long past the point when their bodies start telling them to stop. HRT can bring reality back in line with their wishes, almost magically undoing the ravages of aging. Where menopause can make sex painful because of vaginal dryness and thinning, HRT can reverse those symptoms. It can also restore some of the luster to a woman's appearance, as it can thicken and moisten her skin and fill out her hair. It may improve her sleep as well, and not just because it brings an end to the night sweats associated with menopause. According to studies in English sleep laboratories, women on estrogen dream more, increasing their peacefulness and making them feel more rested in the morning.

More subtly, perhaps, but no less importantly, estrogen may make them think more like a woman. Doreen Kimura, Ph.D., a behavioral endocrinologist at the University of Western Ontario, has done extensive research on estrogen and discovered that it may be responsi-

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ESTROGEN

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ble for the uniquely female way of responding to the world. For some time, it has been apparent to researchers that while men perform better on spatial tests, mathematical reasoning and targeting remote objects, women have superior manual dexterity, better verbal skills and greater "perceptual speed," such as picking out all the *a*'s in this sentence.

Dr. Kimura speculates that some of these traits may have been advantageous in hunter-gatherer times, when men had to navigate great distances to hunt while women did the detail work of raising a family. Kimura has determined that many of the distinctive

cognitive skills of women are linked to estrogen levels; thus, they wax and wane over the monthly cycle as hormones rise and fall. At midcycle, Kimura has found, women are, in effect, most female in these cognitive areas; during menstruation, they are most like men.

Although Kimura has studied only premenopausal women, presumably the cognitive advantages of womanhood lessen with the last menstruation. To the extent that it mimics the body's natural cycle, HRT would maintain them. Last year, a team of researchers at Columbia University reported that estrogen supplements restored some premenopausal vigor to the brain, which in turn helped ward off some of the cognitive diminishment brought on by the largely female disease of Alzheimer's.

It is possible that the symptoms of menopause have been exacerbated by the separation of sex from procreation just as breast cancer rates appear to have been. Ann M. Voda, R.N., Ph.D., of the University of Utah School of Nursing, says that the women who live on Mexico's Yucatán Peninsula, who might go through as many as 17 pregnancies and 14 live births in the course of their reproductive lives, have no experience of hot flashes, vaginal dryness or any of the other complaints of menopause that have become so common elsewhere.

For all the newfound enthusiasm for HRT, however, one should remember that it wasn't always so popular. It first gained widespread use in the Sixties on the strength of a little book called *Forever Feminine*, which was funded by the very hormone manufacturers that stood to profit from it. HRT lost favor when it was discovered that straight estrogen pills dramatically increased the chances of endometrial cancer. In a woman's normal cycle, cells of the endometrium proliferate during the estrogen phase, and the progestin phase disposes of the overgrowth. When the only hormone being replaced was estrogen, the cells continued to grow without restriction, and the risk of cancer skyrocketed. That danger has supposedly been eased by adding progestin to the hormone mix. But there remains the serious possibility that the second hormone won't completely eliminate the danger or that it will simply counteract the advantages of the estrogen. And there is always the chance that some new malady will rise up out of nowhere to scare everyone off HRT once more.

Since so much is still unknown about HRT—as, indeed, about the body's own natural hormones—a large part of any decision rests on instinct and faith. You either trust medical science to improve your life, or you don't. At a time when mothers are bearing their daughters' children for them, society seems more trusting than usual. Satisfaction, of course, is never guaranteed, and time will reveal the consequences.

For now, women are boldly imposing their own schedule on the body's natural rhythms. They may be frightened of the hazards of hormone manipulation, but they are still entranced by the prospect of gaining control over the powerful and mysterious blood chemicals that define so much of who they are.



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