How Hormones Affect Health
An Interview with Walter Simon Newman, Jr., M.D.

Q. What are hormones?
A. Hormones are agents produced by the endocrine and exocrine systems. Glands in the body make substances that stimulate other parts of the body. For example, insulin is a hormone, released by the pancreas. There are pituitary hormones. Estrogen is produced by the ovaries, and testosterone produced by the testes. There are hundreds of hormones. Some familiar ones are insulin, cortisol, testosterone, estrogen, and progesterone. Vitamin D is a pro-hormone, or a hormone-like substance.

Exocrine glands secrete hormones into ducts. For example, the gall-bladder and the pancreas have a duct; these are part of the exocrine system. Endocrine glands secrete hormones directly into the bloodstream; these are called ductless glands. Most hormones are produced by the endocrine system. Thyroid hormone, parathyroid hormone, testosterone, and estrogen have no duct.

Two hormones are involved in bone formation. Parathyroid hormone (from the parathyroid gland) removes calcium from the bone, and calcitonin fixes calcium to the bone. They are opposing hormones and are the real workhorses in bone metabolism.

Generally, calcium and calcitonin regulatory cells are in balance. Osteoclasts and osteoblasts (cell builders) are stimulated by these two hormones, which are located next to the thyroid gland. This tricky metabolic cascade is under the influence of vitamin D, which must be present with calcium for proper bone metabolism.

Q. What is osteoporosis?
A. Osteoporosis (“porous bone”) results from a lack of the calcium matrix in the bones, often as a part of aging. It is the end result of a continuum of disorders from normal bone to osteopenia (bone thinning that precedes full-blown osteoporosis). The continuum ranges from normal bone density to osteopenia to osteoporosis to fracture, representing a relative decrease in the calcium matrix of bone.

Q. How do hormones affect osteoporosis?
A. Hormones stimulate cells. Two kinds of cells are involved in the complex process of bone formation. Parathyroid hormone is produced by small glands in the neck. Parathyroid hormone releases calcium from bone, and vitamin D helps fix calcium to the bone. Calcium cannot be absorbed adequately by bone if vitamin D stores are inadequate. Many steps are required to make bone. The osteoblasts lay down bone. Osteoclasts cause bone cells to turn over. A delicate balance is necessary for good bone formation. Bone is living tissue; we make bone, and we restore bone under the stimulation of parathyroid hormone, vitamin D, and other substances. Vitamin D does not automatically repair osteoporosis, osteopenia, or fractures.

Q. Are both women and men affected by hormonal bone loss?
A. Yes, but women are affected more often. Estrogen is very important in women’s bone health; as estrogen levels fall, osteoporosis and osteopenia increase. The real difference is estrogen. Also, women usually live longer than men. Most nursing home residents are women. In nursing homes, the prevalence of osteoporosis and osteopenia is high, but the prevalence of women is also high. As for the public health aspect, osteoporosis and osteopenia are more common in women, but so is old age. Men do not have osteoporosis and osteopenia as pervasively as women do.

Q. Do any nutrients or vitamins function as hormones?
A. By definition, a hormone is a manufactured product. We can give people synthetic or natural hormones. Estrogen, thyroid hormone, and cortisone are all hormones, but they are not considered nutrients or natural. Vitamin D is actually a pre-hormone or a pro-hormone; since by definition a hormone is released by an organ in the endocrine system.

Q. In what way is vitamin D a hormone?
A. This fat-soluble vitamin is not considered a hormone, but it works with parathyroid hormones and other hormones (estrogen) to make bone and helps in the absorption of calcium.

Q. Does vitamin D help prevent cancer?
A. We are not sure, but we think so. There appears to be an association between high levels of vitamin D and a low incidence of cancer and heart disease. Conversely, low vitamin D is associated with a higher incidence of cancer and heart disease. It has not yet been shown that supplementing with vitamin D changes that risk, so the evidence right now is epidemiological.

The risk of heart disease and cancer seems to be associated with vitamin D levels, but we haven’t shown that giving vitamin D will reverse the risk. Some articles mention reducing the severity of breast cancer in women and prostate cancer in men, but we cannot consider it a risk reducer. We cannot claim that if you eat mushrooms, you can lower your risk of heart disease and certain cancers.

One of the most unusual connections that has gained a lot of press lately is a possible link between vitamin D and autism. However, the government has not accepted these findings. The associations are definitely there, but we can’t say that taking vitamin D lowers your risk.

Vitamin D Insufficiency In Parkinson’s Disease

Researchers from Emory University School of Medicine in Atlanta, Georgia, have proposed a role for vitamin D deficiency in Parkinson’s disease (PD). They sought to compare the occurrence of vitamin D deficiency in patients with PD with age-matched healthy controls and in patients with Alzheimer’s disease (AD).

It is important to determine 25-hydroxyvitamin D [25(OH)D] levels in the diagnosis of vitamin D deficiency and, more rarely, vitamin D intoxication. Despite the name, vitamin D is a pro-hormone; it is synthesized in the body if there is adequate sunlight. Vitamin D maintains calcium and phosphate levels in the blood and plays an important role in regulating the immune system.

Researchers recruited participants between May 1992 and March 2007. Every fifth consecutively enrolled PD patient was selected from the clinical research database. Unrelated patients with AD (n = 97) and controls (n = 99) were randomly selected from the database after they were matched for age, sex, race, APOE genotype, and geographic location.

The researchers found that significantly more patients with PD (55 percent) had insufficient vitamin D levels than did controls (36 percent) or patients with AD (41 percent). The mean 25(OH)D concentration in the cohort with PD (31.9 ng./mL.) was lower than in the AD patients (34.8 ng./mL.) and in the controls (37 ng./mL.).

This report, which involved predominantly Caucasians with PD, suggested a higher prevalence of hypovitaminosis in PD patients than in either healthy controls or patients with AD. These data support a possible role of vitamin D insufficiency in PD.

(Source: Archives of Neurology, 2008; 65:1348-1352.)

"You should have come to me sooner."
Vitamin D Deficiency in Young Children

Vitamin D deficiency may be more common than we once thought. The recent medical literature is full of reports on the consequences of vitamin D deficiency and its beneficial effects in preventing or treating a variety of maladies.

Although the focus of most research has been on bone disease, vitamin D deficiency in adults has been linked to conditions as diverse as asthma, cancer, cardiovascular disease, diabetes mellitus, depression, and schizophrenia. Overall, it is estimated that as many as one billion people have low levels of vitamin D.

To examine vitamin D status in young children, investigators from Children’s Hospital in Boston sought to determine vitamin D levels in 247 infants (age, birth to one year) and 133 toddlers (one to two years of age).

They established that the prevalence of vitamin D deficiency was 12 percent, and 40 percent of children had suboptimal vitamin D levels. The prevalence of deficiency was similar in infants and toddlers and did not vary by skin pigmentation.

The researchers concluded that suboptimal vitamin D status is common among otherwise healthy young children. Because the vitamin is present in only low concentration in human milk, breast-fed infants and toddlers may be at risk for developing vitamin D-deficient rickets. Vitamin D deficiency may be a more serious problem in children than in adults. Predictors of vitamin D status vary in infants and toddlers, and this information is important to consider in the care of these young patients. One-third of vitamin D-deficient participants exhibited demineralization, highlighting the deleterious skeletal effects.

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Studies have not yet shown that taking 1,000 or 800 International Units (I.U.) of vitamin D lowers cancer risk. We do know that vitamin D deficiency is epidemic, and more clinicians are measuring vitamin D levels. The prevalence of vitamin D deficiency is at least 50 percent among people over 50 years of age.

Q. As we age, does our requirement for the vitamin change?
A. Definitely. As we age, the ability to convert the vitamin D precursor to active vitamin D is more difficult, and osteoporosis and fractures increase.

About six months ago, the Academy of Pediatrics raised the minimum vitamin D requirement for children to 400 I.U. per day, the same as for adults. Thus, most of us who are studying vitamin D feel that the adult level should be significantly higher, probably 800 to 1,000 I.U. per day.

The Academy was the first to realize the importance of vitamin D, and it raised the minimum for kids. It is recommended that our current standard intake of 400 I.U. daily be increased to 1,000 I.U. or more. The toxic levels would be raised quite a bit, but toxicity is another story. At least 30 percent of our population in the United States is deficient with the current level. If we raise it to 1,000 I.U. per day, that number would probably be closer to 80 to 90 percent of the population. But it is difficult get even 400 I.U. in the typical diet, but if you take it as a supplement, then you are there.

Q. What are vitamin D1 and vitamin D3?
A. There are long metabolic pathways where vitamin D is synthesized in precursors, but generally we speak of vitamin D3 and vitamin D2. There is a difference in structure between the two. There was some concern that vitamin D2 was not as effective as D3, but recent tests show that they are both utilized and absorbed by the human body, and they are both effective.

Q. Are vegetables good sources of vitamin D?
A. No. Peanuts have only a very small level.

Q. How much vitamin D is found in mushrooms?
A. The presence of significant of vitamin D in mushrooms is a major breakthrough because it is a very-low-calorie source: 90 grams, which is one serving, has 22 calories. You would need 32 ounces of milk to get to 400 I.U., or 600 calories (30 times the number of calories).
Genetics May Affect Testing For Drugs in Athletes

A genetic peculiarity could help devisive athletes beat drug tests and could unfairly ruin players who are honest. The genetic variation affects an enzyme that processes testosterone. Although testosterone is primarily known as a male sex hormone, it is made in the body by both men and women.

To differentiate between naturally present hormone and synthetic testosterone from steroid use, drug tests measure a ratio of two chemicals found in urine. One chemical, epitestosterone glucuronide (EG), is made at a constant level in the body, regardless of testosterone levels. The other chemical, testosterone glucuronide (TG), is a by-product of testosterone. Testosterone abuse is usually assessed by the urinary testosteronetoepitestosterone (T/E) ratio. Levels above 4.0 are considered suspicious.

The large variation in TG excretion and its strong association with a deletion polymorphism in the uridine diphospho-glucuronosyl transferase (UGT) 2B17 gene challenge the accuracy of the T/E ratio test. The enzyme UGT2B17 adds a chemical to testosterone to prepare it for secretion in the urine. Scientists in Sweden found that some people completely lack the gene that produces UGT2B17, and this difference can affect results of doping tests.

About 15 percent of 145 healthy male volunteers lacked the enzyme entirely; 52 percent of the men had one copy of the gene, and one-third of the men had two copies. Some of the men were selected to get a single injection of testosterone. The researchers monitored production of TG in the men's urine for 15 days after the injection. About 40 percent of the subjects who lacked the enzyme never secreted enough TG to raise suspicions in the standard test even after their hormone injection. As Anders Rane, M.D., Ph.D., of the Karolinska Institute in Stockholm, explains, there is a chance that many such individuals have escaped detection. On the other hand, 14 percent of people with two copies of the gene made so much TG that the current test would identify them as cheaters even before they received a testosterone injection.

No one actually knows whether there have been false-positive or false-negative results among the winners of various games, but it could have happened, Dr. Rane says. About two-thirds of the East Asians in the study lacked the enzyme, and fewer than 10 percent of the Swedish participants lacked it. Various ethnic groups may use different enzymes to process testosterone, says Glenn Cunningham, M.D., an endocrinologist at Baylor College of Medicine in Houston, Texas.

There is no apparent athletic advantage or disadvantage associated with lacking the enzyme, Dr. Rane says. He suggests combining genetic testing with periodic urinal testing that tracks individual athletes over time. Dr. Cunningham thinks that they have made a strong case for genetic testing in addition to current assessments.

Because of the expense, genetic testing is not feasible for large numbers of people. Such tests will probably be used in elite amateur and professional sports, but it is unclear whether it will be available for college and high school athletes.

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Q. What is osteomalacia?

A. Soft bones result from a lack of vitamin D and calcium. The full-blown disorder, which was common before we supplemented cow's milk with vitamin D, was rickets, vitamin D deficiency at its extreme. Rickets was pretty common in the 19th century, as was scurvy, caused by a lack of vitamin C. Scurvy was a bleeding disorder that affected British sailors at sea. They called themselves "Limey" because they would take limes to prevent scurvy. The other common disorder was vitamin D-dependent rickets.

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Do Women Have More Dental Problems?

The transition from foraging to farming has been associated with a decline in oral health, with women experiencing a more rapid and dramatic decline than men. Historically, anthropologists have attributed this difference to behavioral factors such as sexual division of labor and gender-based dietary preferences.

John R. Lukacs, Ph.D., Professor of Anthropology at the University of Oregon, argues that the effect of dietary changes on women's oral health was intensified by the increased demands on women's reproductive systems. These included the increase in fertility that accompanied the rise of agriculture, with these factors thereby contributing to the differences in the prevalence of dental caries (cavities). A comprehensive review of dental records in prehistoric and current human populations reveals that women have more dental problems than men because of reproductive and fertility factors that seem to be linked to female hormones.

(From: Current Anthropology, 2008; 49:901-914.)

Topical Corticosteroids Not Effective for Sunburn

Topical steroids do not help to improve acute sunburn when they are applied after a person has been exposed to short-wave ultraviolet B radiation (UV-B), report Danish researchers.

A sunburn is an intense, delayed, transient inflammatory response caused by acute overexposure to ultraviolet radiation (UVR) in sunlight, primarily UV-B.

Annesofie Faurschou, M.D., and Hans C. Wolf, M.D., from Copenhagen conducted a randomized, double-blind trial in 20 healthy volunteers (age range, 23 to 62 years) with Fitzpatrick skin type I to III to evaluate the effect of topical corticosteroids in treating acute sunburn. A person's skin type is often categorized according to the Fitzpatrick skin type scale and is determined genetically. Eye and hair color are also classified according to these criteria.

Six areas were marked on the back of each study participant. Two of these areas received either a moderate-potency or high-potency corticosteroid 30 minutes prior to UV-B exposure as a control; the remaining four areas were treated with either a moderate-potency or high-potency corticosteroid six hours or 23 hours after UV-B exposure.

The scientists concluded that treatment with topical moderate-potency or high-potency corticosteroids did not provide a useful decrease in acute sunburn reaction when it was applied six or 23 hours after UV exposure.

(From: Archives of Dermatology, 2008; 144:620-624.)

Tests to Testy: A Look at Anabolic Steroids

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be confounding. On the other hand, low levels of legally prescribed steroids administered in moderation and under the guidance of a medical professional can benefit the body.

Organic properties of testosterone have healthful benefits, including the mental alertness and physical maintenance sought by both male adolescents during their maturation and males in adulthood. Lawful prescriptions can help treat everything from minor aches and pains to breast cancer, palmonary fibrosis (a disease characterized by an irreversible scarring of the lungs), and pet ailments. Veterinarians have administered appropriate doses of corticosteroids to animals for years, treating conditions like arthritis, inflammation, and energy deficiencies. As with human beings, how closely monitored the injections are by a licensed professional makes a difference as well as the legal status of the particular drug. Like other forms of psychological and physical treatments, it is vital to the outcome of treatment to be properly assessed and monitored.

The truth is: the abuse of steroids and other psychoactive substances impairs the individual's judgment on proper administration including how much, little, or often to take something. Whether the drug is legal does not matter when it comes to the abusive tendencies of the user.