Heart and Bone Damage from Low Vitamin D Tied to Declines in Sex Hormones

ScienceDaily (Nov. 16, 2009) — Researchers at Johns Hopkins are reporting what is believed to be the first conclusive evidence in men that the long-term ill effects of vitamin D deficiency are amplified by lower levels of the key sex hormone estrogen, but not testosterone.

In a national study in 1010 men, to be presented Nov. 15 at the American Heart Association's (AHA) annual Scientific Sessions in Orlando, researchers say the new findings build on previous studies showing that deficiencies in vitamin D and low levels of estrogen, found naturally in differing amounts in men and women, were independent risk factors for hardened and narrowed arteries and weakened bones. Vitamin D is an essential part to keeping the body healthy, and can be obtained from fortified foods, such as milk and cereals, and by exposure to sunlight.

"Our results confirm a long-suspected link and suggest that vitamin D supplements, which are already prescribed to treat osteoporosis, may also be useful in preventing heart disease," says lead study investigator and cardiologist Erin Michos, M.D., M.H.S.

"All three steroid hormones -- vitamin D, estrogen and testosterone -- are produced from cholesterol, whose blood levels are known to influence arterial and bone health," says Michos, an assistant professor at the Johns Hopkins University School of Medicine and its Heart and Vascular Institute. "Our study gives us a much better understanding of how the three work in concert to affect cardiovascular and bone health."

Michos says the overall biological relationship continues to puzzle scientists because studies of the long-term effects of adding estrogen in the form of hormone replacement therapy in women failed to show fewer deaths from heart disease. Indeed, results showed that in some women, an actual increase in heart disease and stroke rates occurred, although, bone fractures declined.

The Hopkins team's latest data were provided by analyzing blood samples from a subset of men participating in a study on cancer. That study was part of a larger, ongoing national health survey involving both men and women and was designed to compare the risk of diseases between those with the lowest blood levels of vitamin D to those with higher amounts. An unhealthy deficiency, experts say, is considered blood levels of 20 nanograms per milliliter or lower.

The men in the study had their hormone levels measured for both chemical forms of testosterone and estrogen found in blood, when each is either unattached or circulating freely, and when each is attached to a separate protein, known as sex hormone binding globulin, or SHBG for short.

Initial results showed no link between vitamin D deficiency and depressed blood levels of either hormone. And despite finding a harmful relationship between depressed testosterone levels and rates of heart disease, stroke, and high blood pressure, as well as osteopenia in men, researchers found that it was independent of deficiencies in vitamin D.

However, when researchers compared ratios of estrogen to SHBG levels, they found that rates of both diseases, especially osteopenia, the early stage of osteoporosis, were higher when both estrogen and vitamin D levels were depressed.

For every single unit decrease in ratios of estrogen to SHBG (both in nanomoles per liter), men low in vitamin D showed an 89 percent increase in osteopenia, but men with sufficient vitamin D levels had a less worrisome 64 percent jump.

Using the same measure of estrogen levels, men low in vitamin D were also at heightened risk of cardiovascular diseases, at 12 percent, compared to men with adequate levels of the vitamin, at 1 percent, numbers that researchers say are still statistically significant.

"These results reinforce the message of how important proper quantities of vitamin D are to good bone health, and that a man's risk of developing osteoporosis and heart disease is heavily weighted on the complex and combined interaction of how any such vitamin deficits interact with both their sex hormones, in particular, estrogen," Michos says.

Michos and her team next plan to analyze blood samples from women to see if the same results from men hold true.

Michos recommends that men and women boost their vitamin D levels by eating diets rich in fatty fish, such as cod, sardines and mackerel, consuming fortified dairy products, taking vitamin supplements, and in warmer weather briefly exposing skin to the sun's vitamin-D producing ultraviolet light.

She points out that clinical trials are under way to determine whether or not vitamin D supplements can prevent incidents of or deaths from heart attack, stroke and other signs of cardiovascular disease.

The U.S. Institute of Medicine suggests that an adequate daily intake of vitamin D is between 200 and 400 international units, but Michos feels this is inadequate to achieve optimal nutrient blood levels (above 30 nanograms per milliliter). Previous results from the same nationwide survey showed that 41 percent of men and 53 percent of women are technically deficient in the nutrient, with vitamin D levels below 28 nanograms per milliliter.

Funding for this study was provided by the Hormone Demonstration Project, a part of the Maryland Cigarette Restitution Fund Research Grant Program at the Johns Hopkins University. Additional support was provided by the American College of Cardiology Foundation and a Clinician Scientist Award at the Johns Hopkins University.

Besides Michos, other researchers at Johns Hopkins involved in this study were Jared Reis, Ph.D.; and Meredith Shields and Elizabeth Platz, Ph.D., Sc.D., at the University's School of Public Health; and Sabine Rohrmann, now at the German Cancer Research Center in Heidelberg. Another investigator in this research was Nader Rifai, Ph.D., at Children's Hospital Boston and Harvard Medical School.

Story Source:
Adapted from materials provided by Johns Hopkins Medical Institutions, via EurekAlert!, a service of AAAS.

Reference website:

http://www.sciencedaily.com/releases/2009/11/091115123715.htm?form_372.replyids=1&form_363.replyids=1&form_346.userid=215&form_346.replyids=4895