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# Reviewing Role of Vitamin D in Endocrine Disorders

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It may be time for endocrinologists to rethink [vitamin D](#) levels in their patients, according to some experts. With research challenging the recommended daily intake of vitamin D as well as studies on the role vitamin D plays in inflammation and disease prevention, clinicians have a great deal to consider.

In a study published in the journal *Cell Reports*, for instance, researchers report that inactivation of the vitamin D receptor induced [diabetes](#) and [atherosclerosis](#) in animal models.<sup>1</sup>



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Researchers found that inactivating the vitamin D receptor on monocytes and macrophages promoted inflammation of the liver and in artery walls. It also increased the ability of monocytes in the blood to adhere and migrate into blood vessel walls.

“We found a novel factor in that the monocytes carry the cholesterol into the plaque and that is what is leading to atherosclerosis,” said senior study investigator Carlos Bernal-Mizrachi, MD, who is an associate professor of medicine and of cell biology and physiology at Washington University School of Medicine in St. Louis, Missouri.

He said inadequate vitamin D turned immune cells into transporters of fat. Bernal-Mizrachi, who is also an endocrinologist, said this may help pave the way for a better understanding of how diabetes and atherosclerosis are linked and provide new possibilities for therapy.

It is well established that LDL cholesterol carries fat deposits to vessel walls. Now this study suggests that when monocytes don't have enough vitamin D, they can do it, too.

“The findings are important for endocrinologists because we don't just treat diabetes; we also treat [heart disease](#). And as endocrinologists, we have to work to try to find out the role of vitamin D,” Bernal-Mizrachi said in an interview with *Endocrinology Advisor*.

## Vitamin D and Inflammation

For years, researchers have been studying vitamin D's possible roles in inflammation and inflammatory diseases, such as [type 2 diabetes](#) and atherosclerosis.

Co-study investigator Amy Riek, MD, who is an assistant professor of medicine at Washington University, said it was known that when monocytes matured and became macrophages, they would eat **cholesterol** deposited inside the blood vessel wall, according to a press release.

However, in these experiments when the monocytes didn't have vitamin D, they were still in circulation absorbing cholesterol and carrying it in the bloodstream. This is an important discovery, Riek said, because it is much easier to find treatments that target something in the blood as opposed to targeting the same cells after they move into the wall of a blood vessel.

In the study, the researchers found the problem was reversible in the mice. When the animals that had developed type 2 diabetes and atherosclerosis received bone marrow transplants from mice with healthy vitamin D receptors on their monocytes and macrophages, their inflammation levels decreased, and the animals had lower blood glucose and became more sensitive to **insulin**.

Currently, Bernal-Mizrachi and Riek are conducting clinical studies in patients with type 2 diabetes, treating them with vitamin D to see whether it can prevent some of the complications of diabetes and inflammation. As part of their study, they are isolating monocytes from the blood of patients before and after vitamin D therapy.

## Revisiting Recommended Vitamin D Intake

Along with the new research connecting vitamin D to endocrine diseases like diabetes, researchers at the University of California, San Diego and Creighton University are challenging the intake of vitamin D recommended by the Institute of Medicine (IOM).

In particular, the researchers believe the current Recommended Dietary Allowance (RDA) for vitamin D underestimates the need by a factor of 10.

In a letter published in the journal *Nutrients*, the researchers confirmed a calculation error, noted by other investigators, by using a data set from a different population.<sup>2</sup> Cedric Garland, DrPH, who is an adjunct professor at the University of California San Diego's Department of Family Medicine and Public Health, said his team confirmed findings published by Paul Veugelers from the University of Alberta School of Public Health that were reported October 2014 in the same journal.<sup>3</sup>

Both of the studies suggest that the IOM substantially underestimated the vitamin D requirements, according to Garland. In a press release, he said the error has broad implications for public health regarding disease prevention and achieving the stated goal of ensuring that the whole population has enough vitamin D to maintain **bone health**.

The recommended intake of vitamin D specified by the IOM is 600 IU per day through age 70 years and 800 IU per day for those aged older than 70 years. However, according to Garland, these doses are only about one-tenth of those needed to cut incidence of diseases related to **vitamin D deficiency**.

## Vitamin D for Disease Prevention

Another article published in the *Journal of Aging and Gerontology* suggests that vitamin D may play a vital role in the prevention and treatment of many diseases associated with aging.<sup>4</sup>

Researchers at Loyola University Chicago Marcella Niehoff School of Nursing (MNSON) reviewed evidence that suggests an association between vitamin D deficiency and chronic diseases associated with aging such as cognitive decline, depression, **osteoporosis**, cardiovascular disease (CVD), **hypertension**, type 2 diabetes and cancer.

“There is evidence to suggest that vitamin D can decrease inflammation regardless of disease, diabetes, multiple sclerosis, etc. However, that evidence [comes from] observational studies that looked at associations between

vitamin D and inflammation. There are few clinical trials that have tested this effect,” said study co-author Sue Penckofer, PhD, RN, study author and a professor at MNSON. “Clinical trial evidence about vitamin D preventing diabetes or helping with diabetes blood sugar control is not available.”

For now, it is uncertain if asymptomatic individuals should be routinely **screened for vitamin D levels**. Due to the lack of prospective clinical trials, it is hard to assess the risks and benefits.

“Currently, investigators are trying to accumulate the evidence to determine all of this information, particularly since costs of vitamin D can range from \$50 to \$250 depending on the method used for the test. That is a lot of money for persons to pay if insurance does not cover it,” Penckofer told *Endocrinology Advisor*.

## References

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2. Heaney R et al. *Nutrients*. 2015;7(3):1688-1690.
3. Veugelers P, Ekwaru JP. 2014;6(10):4472-4475.
4. Meehan M, Penckofer S. *J Aging Gerontol*. 2014;2(2):61-70.

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