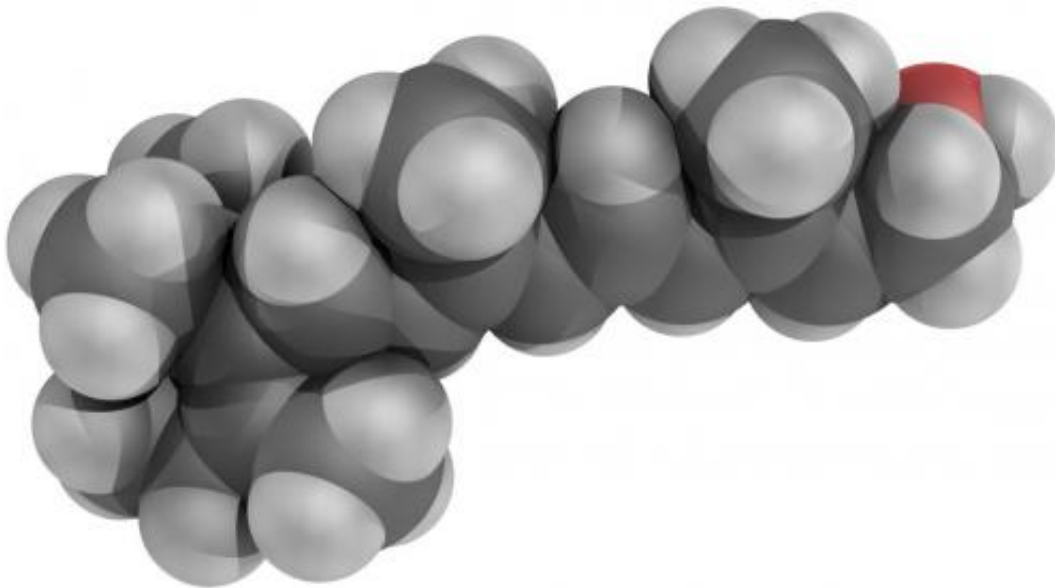


Study shows vitamin A deficiency promotes type 2 barrier immunity

January 24 2014, by Bob Yirka



Retinol or Vitamin A 3D space model (balls model). Credit: YassineMrabet, Wikipedia.

(Medical Xpress)—A team of researchers made up of members from a variety of institutions across the U.S. has found that a lack of vitamin A in the diet may help ward off worm infections. In their paper published in the journal *Science*, the team describes several experiments they conducted with vitamin A and mice to learn about its impact on barrier immunity and what they found as a result.

A lack of [vitamin](#) A in the diet has been linked to several maladies, from

night blindness to an increased risk of asthma attacks. It's also been linked to immunity problems. Understanding how vitamin A works with the immune system is important because millions of impoverished people the world over suffer from such a deficiency. In this new effort the researchers investigated the role of vitamin A and barrier immunity, the so-called first line of defense, where T cells are activated against invaders in the skin or the gastrointestinal tract.

To learn more about the relationship between T cell activation and vitamin A, the researchers took two approaches, one involved feeding [mice](#) a vitamin A restricted diet. The other involved causing a reduction in the production of retinoic acid in mice—a metabolite of vitamin A.

A reduction in either showed a corresponding reduction in innate lymphoid cells 2 (LL2) but an increase in innate lymphoid cells 3 (LL3). Prior research has found that both LL2 and LL3 play a role in innate immunity, thus a reduction in LL2 due to lowered vitamin A levels in both humans and mice would seem to reduce the effectiveness of an immune response. The increase of LL3, on the other hand was a surprise. Thus far it's not clear if it implies an increased [immune response](#) in general, though it does appear to offer protection from another threat—parasitic worms. In another set of experiments, the researchers exposed mice on a vitamin A restricted diets to parasitic worms and found it caused a drop in infection rates. They found the same outcome with mice with reduced levels of [retinoic acid](#).

The researchers suggest that the immune system in mice responds to the sudden loss of vitamin A by boosting other avenues of defense. What's still not clear, however, is if boosting vitamin A in the diets of malnourished people puts them at greater risk of contracting parasitic [worm infections](#).

More information: Adaptation of Innate Lymphoid Cells to a

Micronutrient Deficiency Promotes Type 2 Barrier Immunity, *Science* 24 January 2014: Vol. 343 no. 6169 pp. 432-437. [DOI: 10.1126/science.1247606](https://doi.org/10.1126/science.1247606)

ABSTRACT

How the immune system adapts to malnutrition to sustain immunity at barrier surfaces, such as the intestine, remains unclear. Vitamin A deficiency is one of the most common micronutrient deficiencies and is associated with profound defects in adaptive immunity. Here, we found that type 3 innate lymphoid cells (ILC3s) are severely diminished in vitamin A–deficient settings, which results in compromised immunity to acute bacterial infection. However, vitamin A deprivation paradoxically resulted in dramatic expansion of interleukin-13 (IL-13)–producing ILC2s and resistance to nematode infection in mice, which revealed that ILCs are primary sensors of dietary stress. Further, these data indicate that, during malnutrition, a switch to innate type 2 immunity may represent a powerful adaptation of the immune system to promote host survival in the face of ongoing barrier challenges.

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