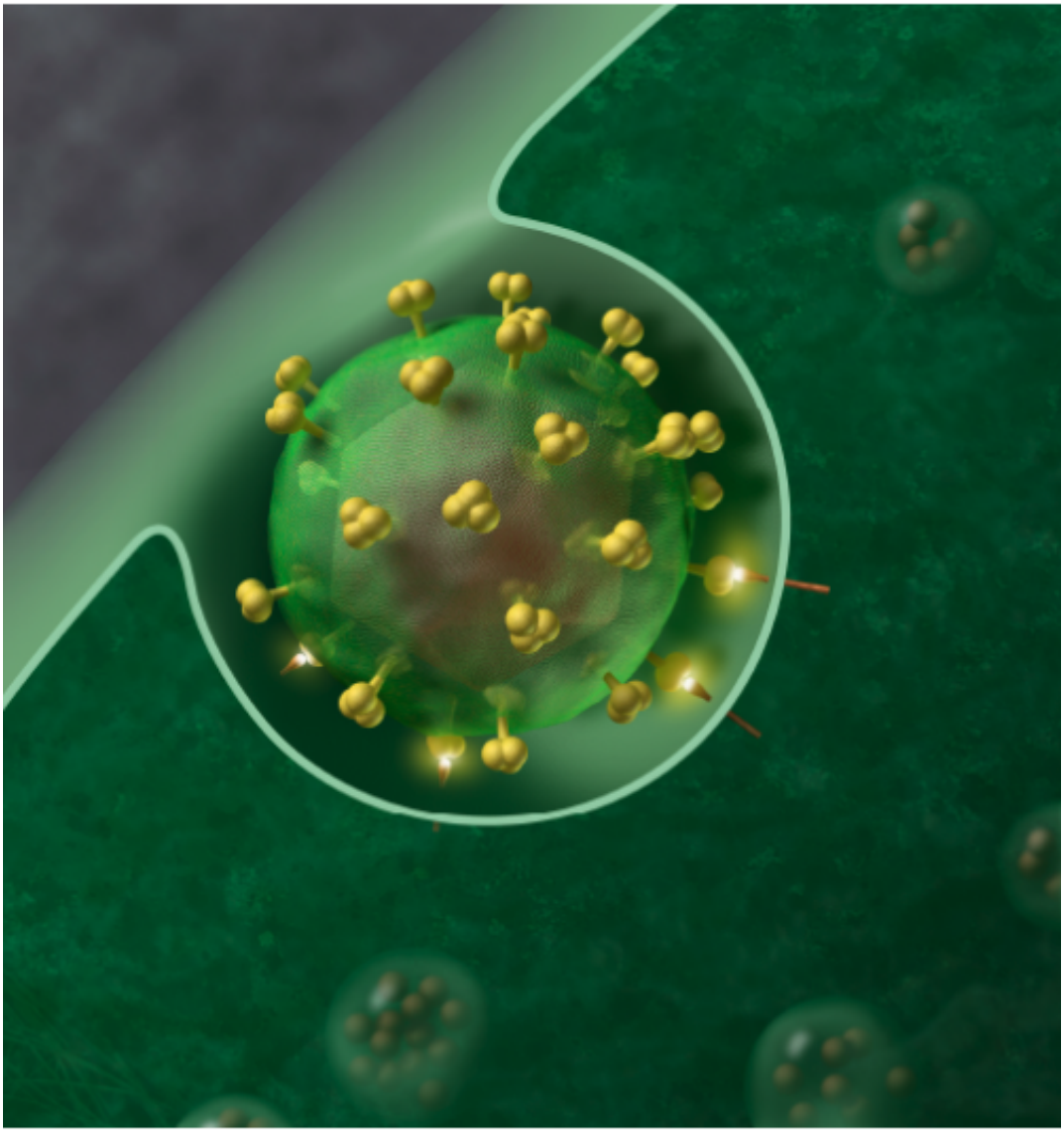
Vitamin D status related to immune response to HIV-1

June 15 2015



HIV-1 Virus. Credit: J Roberto Trujillo/Wikipedia

Vitamin D plays an important part in the human immune response and deficiency can leave individuals less able to fight infections like HIV-1. Now an international team of researchers has found that high-dose vitamin D supplementation can reverse the deficiency and also improve immune response.

"Vitamin D may be a simple, cost-effective intervention, particularly in resource-poor settings, to reduce HIV-1 risk and disease progression," the researchers report in today's (June 15) online issue of *Proceedings of the National Academy of Sciences*.

The researchers looked at two ethnic groups in Cape Town, South Africa, to see how seasonal differences in exposure to ultraviolet B radiation, dietary vitamin D, genetics, and pigmentation affected vitamin D levels, and whether high-dose supplementation improved deficiencies and the cell's ability to repel HIV-1.

"Cape Town, South Africa, has a seasonal ultraviolet B regime and one of the world's highest rates of HIV-1 infection, peaking in young adults, making it an appropriate location for a longitudinal study like this one," said Nina Jablonski, Evan Pugh Professor of Anthropology, Penn State, who led the research.

One hundred healthy young individuals divided between those of Xhosa ancestry—whose ancestors migrated from closer to the equator into the Cape area—and those self-identified as having Cape Mixed ancestry—a complex admixture of Xhosa, Khoisan, European, South Asian and Indonesian populations—were recruited for this study. The groups were matched for age and smoking. The Xhosa, whose ancestors came from a place with more ultraviolet B radiation, have the darkest skin pigmentation, while the Khoisan—the original inhabitants of the Cape—have adapted to the seasonally changing ultraviolet radiation in the area and are lighter skinned. The Cape Mixed population falls

between the Xhosa and Khoisan in skin pigmentation levels.

Cape Town is situated in the southern hemisphere at about the same distance from the equator as the Florida panhandle, slightly more than 30 degrees latitude. Ultraviolet B levels show a winter decline anywhere above 30 degrees latitude, so Cape Town has a definite winter with low levels of the ultraviolet B wavelengths needed to produce precursor vitamin D3. Add to this the fact that people now spend more time indoors during winter and wear more clothing, and exposure to ultraviolet B in winter may be insufficient to prevent vitamin D deficiency.

The researchers note that sunscreen use is not a factor in these populations. However, the darker the skin's pigment, the more ultraviolet B radiation necessary to trigger the precursor chemicals in the body to produce vitamin D.

"The skin of the indigenous people of the Cape, the Khoisan, is considerably lighter than that of either study group and may represent a long-established adaptation to seasonal UVB," according to the researchers. "The darker skin of both study populations—Xhosia and Cape mixed—denotes a degree of mismatch between skin pigmentation and environmental UVB resulting from their recent migration into the region."

The researchers found that both groups exhibited vitamin D deficiency during the winter, with women in both groups being more deficient, on average, than the men. Because of vitamin D's impact on the immune system, the researchers provided six weeks of supplemental vitamin D3 to 30 of the Xhosa participants, which brought 77 percent of the participants to optimal vitamin D status.

Jablonski and her team determined that diet, genetics and other variables

played very small roles in vitamin D status, although some genetic variations did influence the success of supplementation.

To test how vitamin D status affected the immune system and HIV-1 in particular, the researchers exposed blood samples from Xhosa and Cape mixed participants taken during the summer and winter when the subjects were vitamin D sufficient or deficient. They found that after nine days, the winter blood samples had greater infection than those taken in summer. After six weeks of vitamin D supplementation, the Xhosa blood sample levels of HIV-1 infection were the same as those during the summer.

"High-dosage oral vitamin D3 supplementation attenuated HIV-1 replication, increased circulating white blood cells and reversed winter-associated anemia," the researchers reported. "Vitamin D3 presents a low-cost supplementation to improve HIV-associated immunity."

More information: High-dose vitamin D3 reduces deficiency caused by low UVB exposure and limits HIV-1 replication in urban Southern Africans, www.pnas.org/cgi/doi/10.1073/pnas.1500909112

Provided by Pennsylvania State University