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Does vitamin D has role in human infertility?

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Vitamin D is a fat soluble vitamin that we typically get from the sun. We can obtain vitamin D sparingly from milk products or fortified orange juice but this does not add up to much. More significant amounts are found in beef liver or salmon (but only the wild caught variety). Unfortunately few of us are eating these things in quantity. People need varying degrees of vitamin D depending on where they live and their diets.

Vitamin D's most important role in the human body is to keep bones healthy and strong by absorbing calcium from diet and maintaining calcium and phosphorous homeostasis. An epidemic of vitamin D deficiency has been emerging over the past two decades. Recent research has pointed to additional ways that vitamin D deficiency factors into our overall health, including its role in chronic diseases like diabetes, obesity, autoimmune disease, cardiovascular disease and cancer. Mounting evidences suggests that vitamin D deficiency is also linked to increased risk of infertility. In this context it would be better to mention that the overall semen quality of men is decreasing. Indeed, as much as 20% of young men have sperm concentration below the WHO recommendation level and 40% present with sperm concentrations below a level that is considered optimal for fertility. The prevalence of vitamin D insufficiency nearly doubled from 2004 to 2014. Among women of reproductive age, more than 40 percent are insufficient in vitamin D.

The role of vitamin D in reproduction was initially reported in animal experiments with mice. Mice with either vitamin D deficiency or lack of vitamin D receptor reported underdevelopment of the uterus and inability to form normal mature eggs, resulting in infertility. If pregnancy is achieved in such kind of mice, the fetus showed impaired growth. Reproduction is normalized in these mice with vitamin D supplementation. These studies suggest that vitamin D's role in female reproduction.

This is not the first time that vitamin D linked to infertility. A study done by Dr. Anne Clark, Australian scientist in 2008, found almost one-third of the 800 infertile men included in their study had lower than normal levels of vitamin D. Another study, published in *The Journal of Nutrition*, also found that vitamin-D-deficient female rats had reduced reproduction rate by 75 percent, diminished litter sizes by 30 percent, and also found impaired neonatal growth. Another study, published in November 2009, confirmed that human sperm does in fact have a vitamin D receptor. Analysis indicated that vitamin D is produced locally in the sperm, which suggests that vitamin D may be involved in the signaling between cells in the reproductive system. According to the authors, the study revealed "an unexpected role of this vitamin D in the acquisition of fertilizing ability," and the results imply that vitamin D is involved in a variety of sperm signaling pathways.

For the time being, we know that vitamin D exists in two forms: vitamin D2 (ergocalciferol) and D3 (cholecalciferol). In animals, D3 is synthesized in the skin from its derivate (7- dehydrocholesterol) in the presence of ultraviolet B radiation (UVB), while D2 is made in fungi and yeast. Vitamin D uptake in the common diet is of minor significance, although cholecalciferol can be found in sea fish fat and liver oil, while ergocalciferol in green plants and mushrooms. In serum, vitamin D is transported by vitamin D-binding protein (VDBP) to the liver and metabolized to an active form of 25-hydroxycalciferol (25[OH] D). An optimal level of vitamin D concentration in blood serum should range between 50 and 125 nmol/L, even though some environmental studies imply that the target level should be set much higher—up to 250, or even at 300

nmol/L. Its chemical structure resembles steroid hormones and it acts likewise via nuclear receptor (VDR, vitamin D receptor). In the kidneys, 25[OH] D is decomposed by 1-α-hydroxylase (by CYP27B1) to an active form of 1, 25-dihydroxyvitamin D.

In case of vitamin D deficiency, intake of food rich in vitamin D or its supplementation should be recommended. However, because of the fat soluble nature of vitamin D it is absorbed slowly and therefore can sometimes take 6 to 12 months to increase levels normalize. Role of vitamin D in human infertility is the burning topic of fertility related research scientists. New therapeutic approaches such as vitamin D supplementation in the treatment of female and male infertility are also emerging in research field. Recognizing the fact that sperm quality is decreasing, increased PCOD cases in female and infertility is a problem affecting about 10–15% of couples, this editorial might provide a rationale for further research in this area. I want to emphasize the fact that in infertility cases drastic improvements in reproductive failure may not be achieved by vitamin D treatment alone.

