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Vitamin D increases the number of blood stem cells during embryonic development

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Short exposure to vitamin D influences the number of blood stem cells in human umbilical cords and zebrafish embryos, Harvard researchers report October 4 in *Cell Reports*. They hypothesize that the levels of

vitamin D during fetal development may play a role in preventing the onset of blood-related disorders later in life. Vitamin D deficiency affects more than one billion people worldwide, and it is known that children born with severe vitamin D deficiency often develop a variety of blood-related issues, including anemia and low platelet numbers.

"There are global issues with insufficiency of vitamin D and we don't really have a full appreciation of how that might alter how some of the normal regulatory programs in our bodies respond," says senior author Trista North, a stem cell biologist at Beth Israel Deaconess Medical Center. "We clearly showed that not getting enough vitamin D can alter how blood stem cells are formed. Vitamin D was having a direct response on the blood stem cells and it changed what those cells did in terms of multiplying and staying alive."

North and her collaborators found, in both human and zebrafish tissue, that vitamin D affects inflammatory signals that help control the formation of blood stem cells. They also found that when Vitamin D exposure was blocked, fewer cells were formed. "What was surprising was that Vitamin D is having an impact so early," says North. "We really only thought about Vitamin D in terms of bone development and maintenance, but we clearly show that, whether they were zebrafish or human blood stem cells, they can respond directly to the nutrient."

One caveat is the researchers did face difficulty testing the response in mice, as the animals don't have the same vitamin D inflammatory targets observed in both fish and humans. Additionally, the investigators didn't know the vitamin D levels in the umbilical cord blood samples they tested, so they don't know whether vitamin D came from a person who had healthy levels of the nutrient and how that influenced the outcome of their analysis. As a next step, North and her colleagues hope to test cord blood samples for which they know the vitamin D status to see if umbilical cords with healthy levels respond better or worse to

stimulation than cords from vitamin-D-deficient donors.

Although this study examined how vitamin D affected early development of blood stem cells, more research needs to be done to examine how it can influence other critical processes during embryonic development. North and her collaborators hope that these studies one day help us understand the importance of vitamin D supplementation during pregnancy to ensure that mothers maintain healthy levels of vitamin D.

"I think when people start to look at other organ systems and stem cell populations, it will be interesting to know if doctors start to recommend anything to help with vitamin D levels in pregnant mothers," says North. "This study was just scratching the surface, and there will be a whole lot more to follow up."

More information: *Cell Reports*, Cortes, Chen, Stachura, North et al: "Developmental Vitamin D availability impacts hematopoietic stem cell production" www.cell.com/cell-reports/full … 2211-1247(16)31217-7 , DOI: 10.1016/j.celrep.2016.09.012

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