Study finds vitamin B12 is a key player in cellular reprogramming and tissue regeneration

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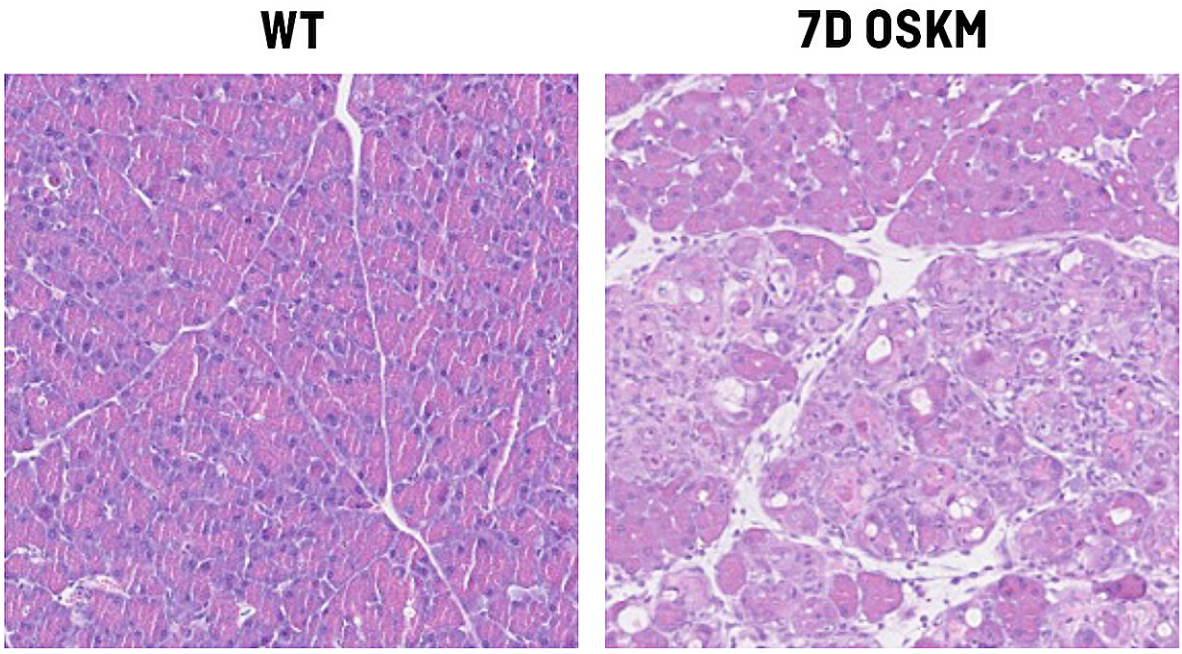

On the right, cells in the pancreas undergoing reprogramming; on the left, regular pancreas tissue. Credit: IRB Barcelona

Vitamin B12 is a well-known micronutrient that has long been acknowledged for its essential role in maintaining nerve function, supporting red blood cell production, and facilitating DNA synthesis, all

vital processes for overall health. Researchers led by Dr. Manuel Serrano at IRB Barcelona have now revealed that vitamin B12 also plays a pivotal role in cellular reprogramming and tissue regeneration. The findings have been published in the journal *Nature Metabolism*

The research was focused on an experimental process known as cellular reprogramming which is thought to mimic the early phases of tissue repair. The IRB team found that cellular reprogramming in mice consumes large amounts of vitamin B12. Indeed, the depletion of vitamin B12 becomes a limiting factor that delays and impairs some aspects of the reprogramming process.

Considering the abundance of vitamin B12 in the normal diet of mice, the investigators were surprised to observe that the simple supplementation of vitamin B12 significantly enhanced the efficiency of reprogramming.

Therapeutic potential in ulcerative colitis

The researchers validated their findings in a model of ulcerative colitis, demonstrating that the intestinal cells initiating repair undergo a process similar to cellular reprogramming and also benefit from vitamin B12 supplementation. Patients with intestinal bowel disease could potentially benefit from vitamin B12 supplementation.

"Our research uncovers a critical role of vitamin B12 in cellular reprogramming and tissue repair. These findings hold promise for regenerative medicine, with the potential to benefit patients through an improved nutrition," says Dr. Manuel Serrano.

Understanding the role of vitamin B12 in cellular reprogramming

In this study, the researchers delved into the metabolic requirements of cellular reprogramming and found that vitamin B12 is a limiting factor for a particular branch of metabolism involved in a reaction known as methylation. Precisely, the DNA of the cells initiating reprogramming or tissue repair require very high levels of this methylation reaction and therefore of vitamin B12.

The researchers discovered that vitamin B12 insufficiency during reprogramming or tissue repair resulted in significant epigenetic changes, leading to errors in the function of multiple genes.

"Supplementation with vitamin B12 corrected this imbalance, resulting in enhanced gene function fidelity and overall improved reprogramming efficiency," confirms Dr. Marta Kovatcheva, first author of the study and a postdoctoral researcher in the same laboratory.

Separate study links vitamin B12 to lower inflammation

The group led by Dr. Serrano has recently published another study, in collaboration with the laboratory of Dr. Rosa Lamuela-Raventós at the University of Barcelona (UB), and Dr. Ramon Estruch at the Hospital Clínic of Barcelona, in which they concluded that people with higher levels of vitamin B12 in blood had lower levels of inflammatory markers (IL-6 and CRP).

The researchers also observed a similar relationship in aged mice. These observations suggest that vitamin B12 exerts anti-inflammatory action by reducing these markers in the body and they provide valuable insights into the potential health benefits of vitamin B12.

More information: Marta Kovatcheva et al, Vitamin B12 is a limiting

factor for induced cellular plasticity and tissue repair, *Nature Metabolism* (2023). DOI: 10.1038/s42255-023-00916-6

Vílchez-Acosta, A. et al, Vitamin B12 emerges as key player during cellular reprogramming, *Nature Metabolism* (2023). DOI: 10.1038/s42255-023-00917-5. www.nature.com/articles/s42255-023-00917-5

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