# Researchers develop 'super stem cells' with potential to improve IVF and regenerative medicine



Researchers at the University of Copenhagen have announced a significant development in cell biology with the creation of what they describe as “super stem cells.” These cells are characterised as being younger, healthier, and more versatile than conventional stem cells, and they hold potential to enhance medical treatments such as in vitro fertilization (IVF).

The study, conducted at the Novo Nordisk Foundation’s MEDICINE MEDICINE CENTER (Renew), revealed that by substituting glucose with galactose in the stem cells’ culture medium, the cells altered their energy production method. This shift led to a profound transformation where the stem cells were effectively “reprogrammed” into a more primitive and efficient state. Consequently, they displayed a heightened capacity to differentiate into various cell types, including liver, nervous system, and skin cells.

Robert Bone, assistant professor and lead author of the study, explained, “By modifying their diet, stem cells are rejuvenated and become ‘super stem cells’. This change forces them to metabolise energy in another way, which reactivates their development potential.”

The metabolic switch induced by galactose encourages cells to engage in oxidative phosphorylation, a more efficient energy generation process that supports both their differentiation ability and longevity. Professor Joshua Brickman, the principal author, highlighted the simplicity of this approach: “The really surprising thing is that they not only become better in their function, but also remain in good condition for a longer time. And everything is achieved through a relatively simple method.”

One immediate application of these super stem cells lies in improving IVF treatments. The research team observed that the enhanced cells showed particular efficiency in forming the yolk sac tissue—a crucial structure that develops early in embryos and is essential for their proper implantation. Robert Bone noted, “One of the things that these cells make better is to generate the cell line that becomes the yolk sac. This is very relevant because previous studies have shown that the formation of the yolk sac is crucial for an implanted embryo to succeed.”

Brickman added, “We want to apply this metabolic change to the cultivation of embryos in IVF, hoping that implementation rates will increase and improve the success of treatments.”

The implications of this discovery extend well beyond fertility. It could provide new avenues in regenerative medicine for treating various conditions, including Parkinson’s disease, heart failure, liver cirrhosis, osteoporosis, and diabetes, by enabling the regeneration of damaged or aged tissues.

Additionally, the researchers found that this metabolic alteration activates a protein associated with cell ageing. This activation improves DNA interactions with key proteins, thereby reducing genetic “noise” and enhancing the accuracy with which cells read and execute their biological instructions—processes that typically decline with age.

Notably, this advancement does not rely on complex genetic modification or sophisticated technology but rather on a straightforward nutritional change. Brickman emphasised, “We are not genetically modifying cells or applying expensive treatments. We only change the sugar they consume. And that opens many clinical and therapeutic possibilities.”

However, the study’s extrapolation towards human clinical applications has been met with caution. Ángel Raya Chamorro from the Bellvitge Biomedical Research Institute (Idibell) expressed reservations, stating, “One thing is what he puts in the study and another is what he puts in the press release.” He contended that suggestions regarding applications in regenerative medicine and IVF might be overstated without further evidence.

In comments made to SMC, Raya questioned the absence of experiments using human cells. “We need to try it in humans to be applicable, both for regenerative medicine and IVF. What I do not understand is why they have not tried the same methodology—switching glucose for galactose—in human cells. They do a very small test with mouse embryos, and I do not know why they have not also tried human embryos, if that type of experiment is technically very simple to try in humans.”

Raya concluded that the method’s applicability might be limited to mouse embryonic stem cells and could primarily benefit research groups working with such cells by providing more functional and homogeneous populations.

This research offers a promising approach to enhancing stem cell functionality through metabolic modulation, with potential impacts in reproductive medicine and tissue regeneration, pending further investigation and application in human systems.

Source: [Noah Wire Services](https://www.noahwire.com)

## Bibliography

1. <https://healthsciences.ku.dk/newsfaculty-news/2025/04/researchers-create-super-stem-cells-seeing-potential-for-improved-fertility-treatment/> - This article corroborates the creation of 'super stem cells' by University of Copenhagen researchers, highlighting their potential for improved fertility treatments by enhancing their ability to develop into various cell types.
2. <https://phys.org/news/2025-04-super-stem-cells-versions-diet.html> - This news piece supports the idea that changing the diet of stem cells, specifically by replacing glucose with galactose, leads to the creation of 'super stem cells' with better differentiation capabilities.
3. <https://www.genengnews.com/topics/translational-medicine/sugar-swap-leads-to-sweet-spot-in-creating-super-stem-cells/> - This article explains the metabolic shift from glycolysis to oxidative phosphorylation in stem cells when their sugar source is changed, leading to enhanced differentiation and regenerative potential.
4. <https://bioengineer.org/scientists-develop-super-stem-cells-paving-the-way-for-enhanced-fertility-treatments/> - This piece highlights the potential of 'super stem cells' in enhancing fertility treatments and notes that the metabolic change is not a passive effect but actively reprograms the cells for improved functionality.
5. <https://news.europawire.eu/university-of-copenhagen-researchers-create-super-stem-cells-with-enhanced-regenerative-capabilities/eu-press-release/2025/04/25/15/27/05/153043/> - This press release details the development of 'super stem cells' and their enhanced regenerative capabilities, emphasizing potential applications in IVF and regenerative medicine.
6. <https://www.noahwire.com> - While not specifically validating the research results, this source provides a broader context to the research on 'super stem cells' and their potential applications in medicine.
7. <https://news.google.com/rss/articles/CBMimgFBVV95cUxPSHd4WnZ2X3hBRlJ5NHk5RldlcktNX21zdWwxYXdQNUt5ZFNqRTlZN01fenhZcDNNdFRTaG9NV1A4X3ZrYklOQWpocVV6NU1TaktDUDJPSFJRcmp2cjByZl9QbV9hY3I5WnAyQ0JQazhybl9PQzNlTVpXdF9rYTBpZTB6YkhmUEJfaGRTOHFHNnI0c2lKTWxBUGJR?oc=5&hl=en-US&gl=US&ceid=US:en> - Please view link - unable to able to access data