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Male fertility a matter of cell signals

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Australian scientists have discovered the chemical signals that ensure men produce sperm instead of eggs.

Dr. Josephine Bowles and Professor Peter Koopman from UQ's Institute for Molecular Bioscience led a team that found that a protein called FGF9 promotes the production of sperm in males while suppressing the development of eggs.

“It sounds obvious, that men produce sperm and women produce eggs,” Dr. Bowles said.

“But sperm and eggs start out as identical cells, and it's only through a complex process of signals that these cells end up as sperm in men and eggs in women.

“It's a critical process because if people don't produce the right type of reproductive cell, they can develop fertility problems or even cancer.”

This work follows an earlier study by the team, who identified the molecule responsible for causing eggs to develop in females: retinoic acid, a derivative of Vitamin A.

In this new study, they investigated sperm development in more detail to see whether it was triggered by an absence of retinoic acid, or whether there was a further factor at work in males.

The team identified FGF9 as a possible influencer because it is active in

the male gonad around the same time as sperm development begins.

The researchers studied the workings of FGF9 in male and female gonads, including in mice that lacked the protein and those in which FGF9 was expressed at abnormally high levels.

They found that the protein acts directly on the reproductive cells in males, making them less responsive to retinoic acid and actively promoting sperm development.

“It now appears that whilst retinoic acid pushes reproductive cells towards developing as eggs, FGF9 opposes this process and drives them towards becoming sperm,” Dr. Bowles said.

“It means there is a failsafe built into the system. If a female is lacking retinoic acid, it doesn't mean her reproductive cells will develop into sperm because she won't have FGF9 to trigger spermatogenesis.

“Retinoic acid is more abundant in the developing ovary and FGF9 is more abundant in the developing testis, so the crucial decision of whether a reproductive cell commits to becoming an egg or a sperm is determined by the type of gonad in which it is located.”

The discovery has added a new layer of understanding to the process of reproductive cell development and could lead to improved IVF and a greater understanding of how to control stem cells.

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