Why your fertility cells must have 'radio silence'

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Researchers in Kobe, Japan, and Montreal, Canada, have uncovered a previously unknown mechanism which causes embryonic germ cells – which later develop into sperm or ova – to go through a period of "transcriptional silence," during which information from the cell's DNA cannot be copied. Without this important phase, unique to cells of this type, an organism produces sterile offspring.

The study was conducted by a team led by Dr. Akira Nakamura at the RIKEN Center for Developmental Biology (CDB) in Kobe and by Dr. Paul Lasko, Chair of McGill University's Department of Biology. Their results were published in January, 2008, in the journal *Nature*.

"A fundamental characteristic of embryonic germ cells in all organisms is that they don't transcribe their own genes for a certain time during embryonic development," Dr. Lasko explained. "They are transcriptionally silent; that's what makes them special. It's not fully understood why this is the case, but if that silencing doesn't happen, then the germ cells don't work. They don't migrate correctly and they don't make their way into the gonads."

Dr. Nakamura was a post-doctoral fellow in Dr. Lasko's lab in the mid-1990s when they co-discovered the Polar Granule Component (PGC) gene in drosophila, commonly known as the fruit fly. If the mother fly lacks PGC, her offspring will be unable to produce germ cells. Initially, Dr. Lasko said, they discovered that the PGC gene produced an RNA, but they did not believe it produced any proteins.

Using current technology, Dr. Nakamura discovered that PGC does indeed produce a protein which regulates Transcription Elongation Factor B (TEF-B), the genetic machinery that expresses proteins.

“It’s a very small, 71-amino acid protein,” Dr. Lasko explained. “The average length of a protein is about 400 to 500 amino acids, so this is extremely small. Back when we did the initial research, there weren't very many genes known that encoded such a short protein. The significance of this is that Nakamura has shown that this little protein seems to be the key regulator that keeps gene expression shut off in germ cells.”

Mutant fruit flies without the ability to produce the protein produce sterile offspring which produce no sperm or eggs.

“What the study argues is that this regulation of TEF-B might be very important for germ cell development in a variety of organisms. That's something people will want to look at in mammals,” Dr. Lasko said.

Source: McGill University