

Shared genetics in humans and roundworms shed light on infertility, study finds

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A discovery by Rutgers scientists links a protein in sperm to the same molecule needed for reproduction in tiny roundworms and provides clues to human infertility.

In a study [published](#) in *Current Biology*, Andrew Singson, a professor in the Department of Genetics in the School of Arts and Sciences, and colleagues from the National Institutes of Health and the College of William and Mary in Virginia, identified a protein, SPE-45, on the [sperm](#) of *C. elegans* [worms](#) that help bind sperm to eggs during fertilization. It is the same as the Izumo protein considered essential for humans and other mammals to reproduce that was discovered a decade ago by Japanese scientists who named it after a marriage shrine in Japan.

"Humans and worms are connected by a common ancestor that lived more than 700 million years ago and this discovery will give us insight into their shared genetics and fertility pathways," said Singson, a principal investigator at the Waksman Institute of Microbiology.

The research suggests that a [common ancestor](#) to both worms and humans had a SPE-45/Izumo-like gene that was required for sperm to function properly at fertilization, said Singson, who has been researching the biological process of fertility for the past two decades.

"Twenty years ago when we started this research, we predicted that we would find the genes that are required for fertility from worms to humans," said Singson. "Now we know that this kind of molecule functions the same way beyond the mammalian branch of the tree of life."

In the United States, one in eight couples has fertility problems. While about 70 percent of the cases can be attributed equally to the man or woman, 30 percent of the time no explanation can be found.

In the new Rutgers study, scientists found that worms produced normal-looking sperm but could not create offspring because the [sperm cell](#) lacked the SPE-45 protein on its surface similar to sperm in humans and other mammals that lacked the Izumo protein. Blocking the protein

prevents sperm from binding and fusing with the egg.

"The [protein](#) works like molecular Velcro and helps the sperm and egg bind and fuse," said Singson. "This type of finding can play an indispensable role in understanding the [biological process](#)."

The discovery was corroborated by a team of scientists working at Emory University in Georgia and Setsunan University in Japan. Taking a different approach and using computer analysis to look at DNA sequences, this international team came up with the same conclusion which was also published in *Current Biology*. Comparing the worm and mammalian DNA sequences they created a hybrid SPE-45/Izumo molecule that can cure infertility in worms.

"This makes the results much more solid because two research groups have basically validated the results of the other," Singson said.

Since studying [human](#) infertility directly is very challenging due to many ethical and experimental limitations, making a genetic connection between worms and humans will help in future treatments because scientists can do experiments in worms to learn more about the function of Izumo-like molecules that they cannot do in mammals, Singson said.

"Finding new fertility genes in the worm can help us further understand the molecular basis of human fertility," he said. "The end result of this knowledge could be more informed and effective treatments for human infertility and reliable contraceptives for both sexes."

Provided by Rutgers University

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