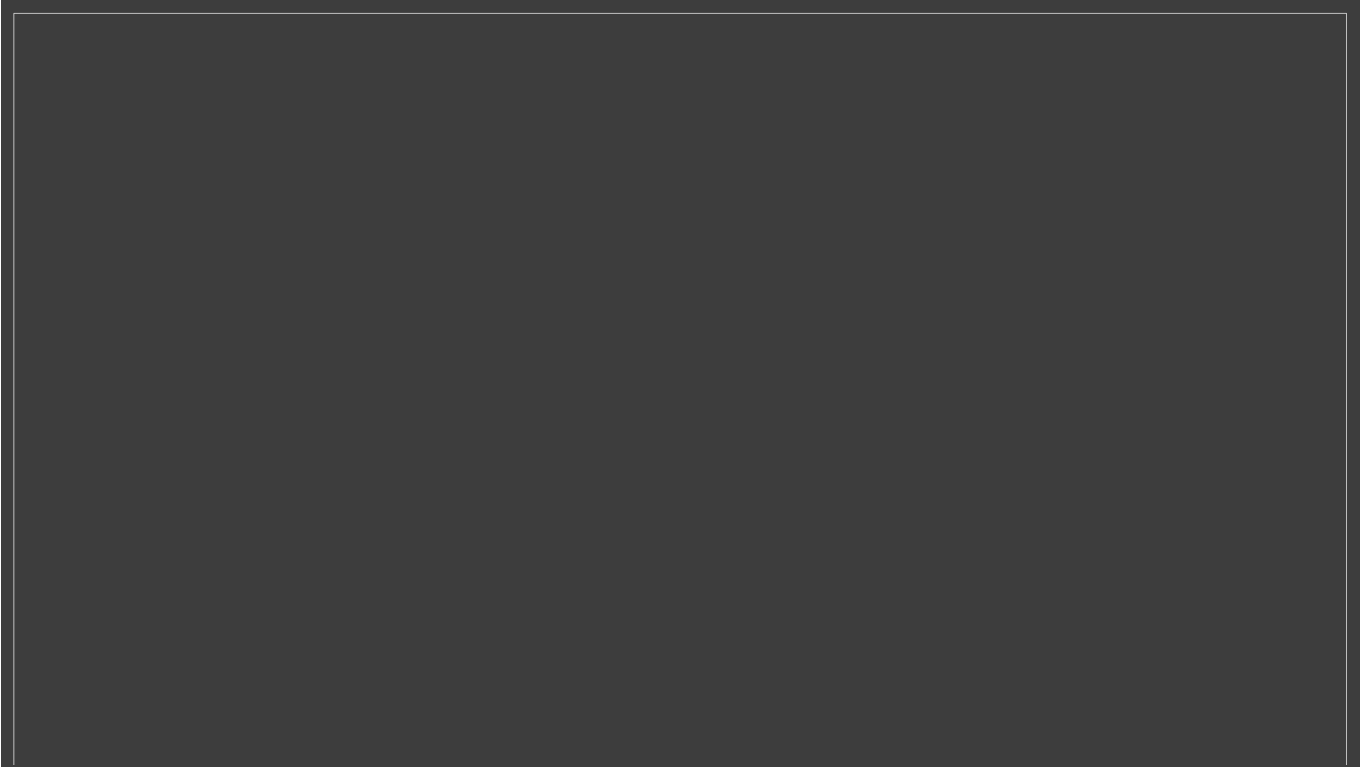


Scientists find protein that unites sperm and egg

Newly discovered molecule plays crucial role in conception.

Erika Check Hayden

16 April 2014



Protein helps sperm attach to egg

A molecule called Juno appears to be a crucial factor in conception.

REF. 1

Scientists have identified a long-sought fertility protein that allows sperm to dock to the surface of an egg. The finding, an important step in understanding the process that enables conception, could eventually spawn new forms of birth control and treatments for infertility.

“It’s very important, because we now know two of the proteins that are responsible for the binding of sperm to the egg,” says Paul Wassarman, a biochemist and developmental biologist at the Icahn School of Medicine at Mount Sinai in New York.

The work, published today in *Nature*¹, was led by Gavin Wright, a biochemist at the Wellcome Trust Sanger Institute in Hinxton, UK. He and his team were looking for a counterpart to a protein called Izumo1, discovered in 2005 on the surface of sperm cells².

Scientists knew that Izumo1 allowed sperm to join to an egg to begin the process of fertilization. But nobody knew what protein on the surface of the egg attached to Izumo1.

Identifying the proteins involved in the joining step has been difficult because the molecules tend to bind quite weakly to each other. So Wright and his team devised a way to cluster Izumo1 proteins, then searching for the egg-cell proteins that would bind to the clusters in cell culture. Wright compares the technique to constructing a Velcro fastener out of many individual fabric loops: “Each small hook adheres weakly, but when [they are] clustered in an array, even the most fleeting interactions are stabilized and can therefore be detected,” he says.

Using this method, the team hooked a protein called folate receptor 4 that is found on the surface of the mouse egg cell. Wright’s team propose renaming the egg protein Juno, after the Roman goddess of fertility and marriage. Izumo1 is also named after a cultural

symbol of reproduction — a Japanese marriage shrine.

The team found that Juno also exists in mammals, including humans, and that without it, human eggs and sperm cannot fuse. They also found that female mice lacking Juno are healthy, but unable to reproduce. This makes the Juno–Izumo1 partnership the first discovered in any organism to be essential to reproduction, the researchers say.

Wright and his team also found that Juno has another important job — blocking other sperm cells from joining to the egg once it has been fertilized. After one sperm cell joined to the egg, Juno disappeared from the egg surface within 30–45 minutes.

The findings could be used right away in fertility treatment, Wright says. Women who are having trouble conceiving could be tested to find whether they have missing or defective Juno proteins. If they do, they could try intracytoplasmic sperm injection, in which a single sperm cell is injected into an egg. But the number of women who would benefit is unknown, because Juno has not yet been studied in connection with fertility.

The discovery also points to potential ways to block the fusion of sperm and egg to prevent pregnancy. Scientists could now study the structure of the Juno–Izumo1 complex, and perhaps develop a new class of contraceptive drugs that interfere with this junction, Wassarman says.

Nature | doi:10.1038/nature.2014.15058

References

1. Bianchi, E., Doe, B., Goulding, D. & Wright, G. J. *Nature* <http://dx.doi.org/10.1038/nature13203> (2014).
2. Inoue, N., Ikawa, M., Isotani, A. & Okabe, M. *Nature* **434**, 234–238 (2005).