

# Protein in zebrafish found to keep out sperm of other fish

September 7 2018, by Bob Yirka

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A small team of researchers with the Vienna Biocenter has discovered that a protein that exists on the exterior of zebrafish eggs acts as a sentry—allowing only sperm from zebrafish to enter. In their paper published in the journal *Science*, the group describes discovering the protein and the way they tested its purpose. Ruth Lehmann with the NYU School of Medicine writes a Perspective [piece](#) on the work done by the team in the same journal issue.

For fish like the zebrafish, it is important to protect eggs from fertilization by other fish species—this is because they lay their eggs in

the water. The eggs are subsequently fertilized by [sperm](#) that males eject into the water. The researchers in this new effort have found the mechanism involved—the fish produce a protein that serves as a gatekeeper, allowing only zebrafish sperm to enter.

The researchers discovered the protein as they were conducting a study of the zebrafish genome—they found a gene responsible for producing a previously unknown 80 amino acid protein. Because of its location in the genome, the researchers suspected it was involved in reproduction. The discovery led them to design and carry out experiments to determine its purpose.

The researchers used CRISPR to engineer test zebrafish that produce a homolog of a protein from another fish species—medaka. This allowed medaka sperm to fertilize [eggs](#) from the test zebrafish, but blocked the [zebrafish](#) sperm. This established that the purpose of the [protein](#) was to serve as a gatekeeper, which is why they named it Bouncer.

The results are important, Lehmann notes, because they bring scientists closer to understanding species-specific fertilization. She further notes that despite efforts by researchers over the years, the mechanism by which an egg and sperm produce a zygote is still not very well understood. Therefore, any new piece of information is important. The researchers plan to continue their study of Bouncer, with a specific goal of determining the bonding factors that come into play between egg and sperm.

**More information:** Sarah Herberg et al. The Ly6/uPAR protein Bouncer is necessary and sufficient for species-specific fertilization, *Science* (2018). [DOI: 10.1126/science.aat7113](https://doi.org/10.1126/science.aat7113)

## Abstract

Fertilization is fundamental for sexual reproduction, yet its molecular

mechanisms are poorly understood. We found that an oocyte-expressed Ly6/uPAR protein, which we call Bouncer, is a crucial fertilization factor in zebrafish. Membrane-bound Bouncer mediates sperm-egg binding and is thus essential for sperm entry into the egg. Remarkably, Bouncer not only is required for sperm-egg interaction but is also sufficient to allow cross-species fertilization between zebrafish and medaka, two fish species that diverged more than 200 million years ago. Our study thus identifies Bouncer as a key determinant of species-specific fertilization in fish. Bouncer's closest homolog in tetrapods, SPACA4, is restricted to the male germline in internally fertilizing vertebrates, which suggests that our findings in fish have relevance to human biology.

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