

For sperm, faster isn't always better: New study uncovers a reproduction conundrum

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When it comes to sperm meeting eggs in sexual reproduction, conventional wisdom holds that the fastest swimming sperm are most likely to succeed in their quest to fertilize eggs. That wisdom was turned upside down in a new study of sperm competition in fruit flies (*Drosophila melanogaster*), which found that slower and/or longer sperm outcompete their faster rivals.

The study, recently published online in <u>Current Biology</u> and forthcoming in print on Sept. 25, was done by a team of scientists led by corresponding author Stefan Lüpold, a post-doctoral researcher in the Department of Biology in the College of Arts and Sciences. The team made the discovery using fruit flies that were genetically altered so that the heads of their sperm glow fluorescent green or red under the microscope. The fruit flies, developed by biology Professor John Belote, enable researchers to observe sperm in real time inside the female reproductive tract.

"Sperm competition is a fundamental biological process throughout the animal kingdom, yet we know very little about how ejaculate traits determine which males win contests," says Lüpold, a Swiss National Science Foundation Fellow working in the laboratory of biology Professor Scott Pitnick. "This is the first study that actually measures sperm quality under competitive conditions inside the female, allowing us to distinguish the traits that are important in each of the reproductive phases."



The research is also significant because the scientists studied naturally occurring variations in sperm traits, rather than manipulating the test populations for specific traits. After identifying and isolating groups of males with similar ejaculate traits that remained constant across multiple generations, the scientists mated single females with pairs of males from the different groups. "This approach allowed us to simultaneously investigate multiple ejaculate traits and also observe how sperm from one male change behavior depending upon that of rival sperm," Lüpold says.

Female fruit flies mate about every three days. Sperm from each mating swim through the female bursa into a storage area until eggs are released. Eggs travel from the ovaries into the bursa to await the sperm. However, sperm battles actually take place within the storage area. After each mating, new sperm try to toss sperm from previous matings out of storage. The female then ejects the displaced sperm from the reproductive system, eliminating the ejected sperm from the mating game. The researchers observed that longer and slower-moving sperm were better at displacing their rivals and were also less likely to be ejected from storage than their more agile counterparts.

"The finding that longer sperm were more successful is consistent with earlier studies," Lüpold says. "However, the finding that slower sperm also have an advantage is counterintuitive."

Why slower sperm have an advantage is still open to speculation. "It could be that, when swimming back and forth in storage, slower sperm hit the exit less frequently and are therefore less likely to be pushed out," Lüpold says. "Or, because sperm velocity is dependent on the density of sperm within the narrow storage area, it could be that velocity isn't really the target of sexual selection in <u>fruit flies</u>, but is rather a consequence of the amount of <u>sperm</u> packed into the storage organ."



Provided by Syracuse University

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