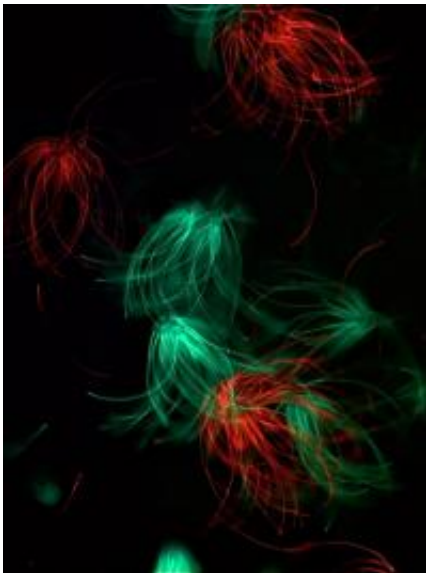


Some mouse sperm can identify, and even cooperate with, its brethren

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Sperm from two different male deer mice, each dyed a unique color, form cooperative groups with sperm from the same male. Image by Heidi S. Fisher/Harvard University

(PhysOrg.com) -- Some mouse sperm can discriminate between its brethren and competing sperm from other males, clustering with its closest relatives to swim faster in the race to the egg. But this sort of cooperation appears to be present only in certain promiscuous species, where it affords an individual's sperm a competitive advantage over that of other males.

The work is described this week in the journal *Nature* by biologists Heidi S. Fisher and Hopi E. Hoekstra of Harvard University.

"The race among [sperm](#) toward the egg is fierce, but never more so than when sperm of different males compete," says Fisher, a postdoctoral researcher in Harvard's Department of Organismic and [Evolutionary Biology](#). "In some species where females mates with multiple males, groups of sperm join forces in order to outswim their uncooperative competitors. We've shown that in deer mice, cooperation only occurs among close relatives -- sperm from the same male."

This ability of sperm to discriminate between related and unrelated sperm is not seen in [monogamous species](#), in which sperm of different males are unlikely to ever interact. The results suggest that competition among males drives [cooperative behavior](#) among their sperm.

Fisher and Hoekstra studied sperm from two species of deer mice, *Peromyscus polionotus* and *Peromyscus maniculatus*. Although closely related, these two species differ greatly in their [sexual behavior](#): *P. polionotus* is monogamous, while *P. maniculatus* females are promiscuous, mating with successive males as little as one minute apart.

The scientists found that only sperm from the promiscuous species showed the ability to discriminate between closely related and more distantly related sperm. When sperm from different *P. polionotus* males was combined in a Petri dish, it showed no selective [aggregation](#).

"This finding that sperm can discriminate suggests that sperm may be much more complex than we've appreciated," says Hoekstra, John L. Loeb Associate Professor of the Natural Sciences at Harvard. "Because more than 95 percent of mammals are promiscuous, it's possible this ability to discriminate and cooperate may be fairly widespread."

Fisher and Hoekstra say it's not yet clear exactly how sperm identifies its relatives. Previous research by a different group at Harvard has suggested that a single gene allows cooperative yeast to recognize related individuals. Fisher and Hoekstra found that one mouse's sperm can even discriminate against that of its brother, suggesting that the recognition system must be very fine-tuned.

"Whatever the recognition factor is, it would have to be highly variable," Fisher says. "It may involve a hyper-variable protein expressed on the outside of the sperm head."

The current work builds upon research published in 2002 by Harry Moore and colleagues at the University of Sheffield. Moore found that sperm from wood mice could clump together to increase swimming velocity during their migration towards the egg, but did not identify kinship as the factor determining which spermatozoa join forces.

"Since all but one sperm fail to fertilize after joining a group, this altruistic behavior has been assumed, but never demonstrated, to occur only between closely related sperm," Hoekstra says. "Our results show that the temporary alliances among sperm are not passively formed, rather they represent a complex discriminatory behavior driven by sexual selection."

Moore also investigated whether human sperm clusters together in the same way, finding little evidence that it does.

"Most rodent sperm has a hooked head, enabling [mouse](#) sperm to cluster together," Fisher says. "In humans, the sperm head is rounder, which does not facilitate clustering."

Provided by Harvard University

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