# Even when faint, ovary scent draws sperm cells

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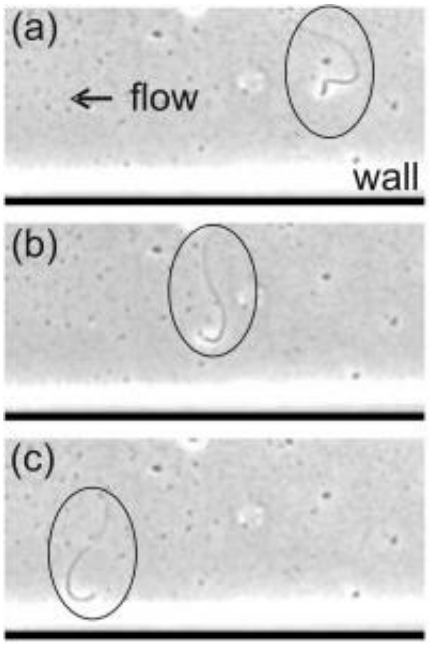


Phase contrast images of a sperm cell moving down toward the extract wall in response to the extract gradient. The sperm cell in each frame is circled for clarity. Images shown were taken at 0.6 second intervals. Credit: Stephen C. Jacobson

Mice are known to have a keen sense of smell, but it's not just their noses that are adept at picking up a scent, a new study shows. In this week's *Analytical Chemistry*, scientists at Indiana University Bloomington report biochemical machinery that allows mouse sperm cells to follow the weakest of scents. Even when ovary extracts were

diluted 100,000 times, some sperm cells still found their mark.

"Sperm are known to exhibit chemotaxis toward extracts from various female reproductive organs, but the role of chemotaxis in reproduction is not known," said IUB Associate Professor of Chemistry Stephen C. Jacobson. "The chemicals that actually attract sperm have not been identified. Systematic study of various compounds released by the female reproductive organs under various conditions might further our understanding of these processes."

Understanding why, how and when sperm are attracted to ovaries may help scientists understand problems with human conception.

"Defects in sperm chemotaxis may be a cause of infertility, and consequently, sperm chemotaxis could potentially be used as a diagnostic tool to determine sperm quality or as a therapeutic procedure in male infertility," Jacobson said.

The project is a collaboration between research groups led by Jacobson and IUB Distinguished Professor of Chemistry Milos V. Novotny. Their work led to the development of a "flow-through" device, a sort of liquid treadmill for sperm cells, which allows researchers to follow the lateral movement of sperm as the cells swim through a liquid medium.

The device feeds three streams of liquid into a single chamber. Beyond the chamber, flows are split into three exit streams. Flow rate can be regulated simply by raising or lowering the height of the source medium, in this case a buffer solution. The researchers affixed a microscope and camera to the device and then recorded video of the sperm during assays.

"We combined in a microfluidic device the ability to generate a chemical gradient with transporting sperm cells to evaluate sperm

chemotaxis," Jacobson said. "The use of microfluidic devices appears to be an ideal approach for precisely controlling the chemical gradient and accurately tracking chemotactic events. This combination led to greater repeatability in the experimental conditions over the course of the assays, which is currently not possible with conventional assays. These results are an important first step toward having an easy-to-use platform to rapidly evaluate and quantify chemotaxis."

The researchers hope their device will help other scientists more accurately examine the chemotaxis of all types of cells. The method also eliminates the phenomenon of "trapping," which causes study results to become ambiguous.

"The ability to differentiate chemotaxis from trapping helps to determine whether sperm were attracted to the test substance or the swim velocity was reduced close to the test substance," Jacobson said. "In the latter case, the test substance may have had a negative influence on the sperm, resulting in suppression of their movement."

Novotny is the Lilly Chemistry Alumni Chair in the Indiana University Bloomington Department of Chemistry, where he also directs the Institute for Pheromone Research.

Source: Indiana University