



For immediate release — Friday, November 7, 2025

Transdisciplinary study opens door to better understanding sperm function, male infertility

New transdisciplinary work between researchers at the University of Lethbridge and the University of Calgary has upended long-held beliefs about the biological process that sperm undergo while travelling through the female reproductive system — findings that could open the door to a much greater understanding of reproductive biology and fertility.

Recognizing that over the past decade there has been a surge of interest in improving male fertility across species, Drs. Nehal Thakor (ULethbridge), Jacob Thundathil (UCalgary) and Saurabh Tiwari (UCalgary) began looking beyond the accepted conventions of what makes sperm fertile.

“Male factors contribute to approximately half of infertility cases in humans, with unexplained infertility affecting one out of three couples, primarily attributed to these factors,” says Thundathil. “The clinical values of conventional semen analysis, such as sperm motility, concentration, and morphology, are inadequate in diagnosing male infertility as they do not account for sub-microscopic or molecular-level differences in sperm.”



Through their work, the group discovered that as sperm undergo the process of capacitation in the female, a biological process required to gain fertilization capabilities, mRNA translation (protein synthesis) is activated, and new proteins are made. It was previously thought that sperm were translationally quiescent (in a dormant state) during capacitation.

“What this means is that mRNA is not just being carried along by the sperm, waiting to activate when fertilization begins, rather they are activated as part of the capacitation process and may play a role in that process,” says Thakor. “That’s telling us that for an improved evidence-based diagnosis and infertility treatment, we need to better understand the molecular mechanisms governing male fertility.”

Similar to humans, male fertility is crucial in animal breeding systems and particularly integral to Alberta’s multi-million cattle breeding industry where cryopreserved semen from an elite bull is distributed worldwide to breed numerous cows through artificial insemination.

Thakor, a molecular biologist in the ULeithbridge Department of Biological Sciences, and Thundathil, a reproductive physiologist and veterinarian in UCalgary's Faculty of Veterinary Medicine have combined the expertise of their labs to examine the problem, utilizing bovine sperm samples.

Their paper, authored with PhD student Tiwari, [*Systematic mRNA interactome analysis reconceptualizes translational quiescence in bovine sperm*](#), was recently published in the esteemed *Nature Portfolio* journal, *Communications Biology*.

"Currently, veterinarians try to assess how sound a bull is as a breeder by looking at its overall health and microscopic evaluation of sperm quality," says Thakor. "But what our findings suggest is that we should not end there, rather we should be looking deeper and understanding the molecular mechanisms in place. If mRNA is activated and producing new proteins during the capacitation process, what genes are being activated and what part of the fertility process are they responsible for?"

He gives the example of a bull that produces a million sperm, all of which are motile, and yet during capacitation, most of them turn out to be infertile. On the other hand, another bull could produce half as many sperm but yield many more fertile sperm because the translation process is more successful. Their study lays the groundwork for a pathway to figuring out why.

"We have some idea of the different genes that are activated, and these could be used as biomarkers and this can translate to biomedical sciences in humans as well," he adds. "Using biomarker identification, we think that there might be a chance for intervention to enhance fertility. The next step is using really high-end techniques, such as ribosome profiling. That has never been done on sperm before to see what mRNAs are being activated during the capacitation process and underlying biological mechanisms."

Their study is truly unique, evidenced by being published in *Communications Biology*, a journal that only accepts novel findings.

"We had to go through two rounds of revisions where the reviewers suggested further experiments to prove our concept and we were able to do so," says Tiwari. "I'm excited about understanding the fundamentals of this process. That drives my curiosity for how reproductive biology works and discovering how we can mitigate a really challenging situation where couples cannot conceive."

To view online: <https://www.ulethbridge.ca/unews/article/transdisciplinary-study-opens-door-better-understanding-sperm-function-male-infertility>

-- 30 --

Contact:

Trevor Kenney, Manager of Public Affairs
403-329-2710

403-360-7639 (cell)
trevor.kenney@uleth.ca
@ULethbridge

Our University's Blackfoot name is Iniskim, meaning Sacred Buffalo Stone. The University is located in traditional Blackfoot Confederacy territory. We honour the Blackfoot people and their traditional ways of knowing in caring for this land, as well as all Indigenous Peoples who have helped shape and continue to strengthen our University community.