

Sperm Motion and Metabolism in Physiological Conditions



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Background: Sperm cells are assessed in an in vitro setting under conditions that are quite different from their natural environment: low viscosity media, high oxygen content, often in a two-dimensional setting. The natural environment often includes highly viscous fluids in branched microchannels, which changes the sperm motion significantly. Physical factors such as surface and fluid properties might have a significant impact on successful sperm migration and therefore in sperm selection procedures.

Main Questions: How do sperm move in body fluids? How can we emulate in vivo conditions in the laboratory?

Experimental Design: Bovine sperm cell motion is investigated in highly viscous media and isolated bovine oviduct fluid. Metabolic measurements are conducted with a Seahorse device for measuring oxygen consumption and extracellular acidification rates.

Main Results: Sperm cells swim with straighter paths and lower average lateral head displacement in high viscosity media and oviduct fluid. The metabolic rates of bovine sperm cells that have migrated in a swim-up procedure to the upper fraction are higher, while the ATP content of such sperm is lower. Swim-up sperm of the upper fraction tend to have longer flagella than sperm in the lower fraction.

Conclusions: It is worth investigating sperm behaviour in emulated body fluids to gain a better understanding of in vivo sperm migration.

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