

Scientists reveal how females store sperm for decades

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Sperm in search of the ovum.

(PhysOrg.com) -- Scientists have discovered that all sorts of females – from birds to reptiles to insects – have a nifty trick to prolong the lifespan of sperm, letting them store it for weeks, months or even years on end.

They found that [females](#) do this by lowering the metabolic rate of [sperm](#), so it can survive in their bodies almost indefinitely.

In one extreme example, biologists have shown that queen ants fertilise their eggs with sperm they've stored for up to 30 years. Normally, once it's outside the male's body, it doesn't survive for long.

The findings could explain why, in reproductive medicine, sperm samples aren't necessarily the best way to predict if someone can father

children or not.

"Infertility tests on sperm are notoriously unreliable, and this could be one reason why," says Dr. Klaus Reinhardt from the University of Sheffield, who led the study, published in [Proceedings of the Royal Society B](#).

It seems that females lower sperm's metabolic rate and stop sperm generating excessive amounts of highly damaging, reactive oxygen molecules – called [free radicals](#). Having a slower metabolism in turn means sperm age much more slowly than usual.

At the moment, Reinhardt and his colleagues have no idea how females manage this.

"All cells produce these molecules, but sperm tend to produce more, probably because they have such fast metabolisms. What's more, reactive oxygen molecules are thought to accelerate aging in all cells. So it follows that getting rid of free radicals might extend the lifespan of sperm," says Reinhardt.

The idea that free radicals contribute to aging isn't new. Nutritionists have long promoted the idea of eating foods like fruit and vegetables, because evidence suggests they contain antioxidants which mop up free radicals.

While some had suggested that females prevent sperm producing free radicals by lowering their metabolic rate, no-one had shown this, until now.

"Females could be manipulating sperm in such a way that they produce much fewer radicals in the first place," explains Reinhardt.

So Reinhardt and his colleague Anne-Cécile Ribou from the University of Perpignan in France decided to borrow a technique from the field of cancer research to investigate.

They used a technique called fluorescence-lifetime measurement to analyse sperm taken from the female crickets' reproductive tracts. The technique let them monitor both the metabolic rate of male crickets' sperm cells and how many oxidative free radicals they produce at the same time.

They found that the metabolic rate of sperm stored in the female Mediterranean field cricket for anything from an hour to 26 days went down by a massive 37 per cent compared with un-stored sperm. This tied in with the finding that a low metabolic rate corresponded with low free radical production.

But they also discovered that in sperm taken from the male the processes are entirely different: sperm that metabolise more quickly don't necessarily create more [reactive oxygen](#) molecules.

"So in this case the current view in ageing research that a higher metabolism equals faster ageing doesn't hold," says Reinhardt.

Another thing the team noticed is that the metabolic rate in un-stored sperm doesn't predict its [metabolic rate](#) once it's stored in the female.

"This is pretty much why fertility predictions may not work so well. One reason that females don't let sperm keep going like hell once inside their reproductive tracts is probably that it is cheaper for them to shut down sperm than to support their energy requirements."

"This is something we'd like to investigate in the future," Reinhardt says.

More information: Anne-Cécile Ribou and Klaus Reinhardt, Reduced metabolic rate and oxygen radicals production in stored insect sperm, *Proceedings of the Royal Society B*, published 25 January 2012, [doi:10.1098/rspb.2011.2422](https://doi.org/10.1098/rspb.2011.2422)

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