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Evolutionary consequences of sperm cell aging.



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Animal breeding research, reproductive biology, and cellular biogerontology show that fertilization rates and zygote viability critically depend on sperm age. Sexual selection research focuses on differences between male genotypes in sperm performance, such as motility, competitive ability, or compatibility with eggs, but without considering sperm age. A combined view (that the thermodynamically inevitable decline in sperm performance selects for traits in diploid individuals to prevent fertilization with aged sperm) has received very little attention. In this paper, I correct this bias and show that many male and female traits affect sperm aging or the sperm age distribution at any reproductive event. Such traits coincide well with condition-dependent traits considered sexually selected: multiple mating by both sexes, high sperm production rates, the delivery of dense ejaculates containing many sperm (including nonfertilizing types), the packaging of sperm into spermatophores, male and female sperm ejection, sexual coercion, as well as the production of showy antioxidants and various cellular and nuclear repair mechanisms. I conclude that altering the sperm age distribution at any step during reproduction can be an origin of sexually selected traits, and may explain presently observed paternity variation without assuming genetic incompatibility of gametes.

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