Do Better Sperm sire fitter offspring?

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All of the living creatures reproduce to pass their genome to the next generations. Animal cells contain two copies of the animal genome, which makes them “diploid”. In order to reproduce both male and female specific cells need to undergo a set of divisions to produce “haploid” gametes containing only a single copy of the genome. Gene activity levels differ among cell types within a living organism. For a long time, scientists believed gene activity is absent in mature male gametes but there is growing evidence of gene activity in sperm after meiosis. Several studies on different models e.g. mice, rats and fruit flies revealed the existence of gene activity in the haploid phase. If gene activity occurs in a cell, selection may act on different characteristics of the cell. The effects of selection on the gamete phase in animals are still unknown; therefore the aim of this study is to test for the existence of selection on different characteristics of sperm (i.e. haploid selection) and to understand its possible consequences in the zebrafish, *Danio rerio*.

To understand the consequences of haploid selection on both, the haploid and the diploid phase of the zebrafish life cycle, we selected for longer-lived sperm within ejaculates over three generations; in the other words, we let the short-lived sperm die and only those sperm, which lived longer were able to fertilize eggs (hereafter referred to as “selection” lines). We wanted to see whether this selection on sperm longevity affects different aspects of sperm performance e.g. sperm life span and sperm swimming speed as well as the performance of the resulting descendants. We compared these selected lines with lines where we did not select against the shorter-lived sperm but where all sperm were allowed to fertilize eggs (hereafter referred to as no-selection lines).

We looked for a possible effect of selection on sperm life span on the next generations by assessing embryo survival, fertilization success, sperm longevity and sperm swimming speed. We found a significant difference in embryo survival in the first generation where the offspring in the selection lines survived better than offspring from the no-selection lines. We also found a significant difference in sperm swimming speed over time between selection and no-selection lines in the first and second generation of offspring where sperm in the offspring from the selection lines swam faster than sperm from no-selection lines. There was no significant difference in sperm life span between the two selection and no-selection lines in neither the second nor the third generation.

Therefore, there results showed that haploid selection is more important than it was thought.

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