HUMAN SPERM MID-PIECE SIZE TRADES-OFF WITH THE PRINCIPAL TAIL TIP LENGTH TO PRODUCE SUPERIOR SPERM IN SWIM-UP

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Introduction: Sperm morphology is correlated with fertilization rates; thus sperm length correlates with increased cell motility. In virtually all animal spermatozoa through the entire length of the principal piece proceeds a flagellar microtubular complex, known as axoneme, containing only the central pair of microtubules in the tip of the sperm principal part, which stabilizes sperm swimming behavior. A swim-up technique is used in andrology clinics to separate mobile from sub-fertile spermatozoa from patients undergoing in-vitro fertilization treatment. The hypothesis tested was that swim-up spermatozoa will be longer, having a longer mid-piece (containing mitochondria performing oxidative phosphorylation), and longer tail tips as compared to untreated cells from the same patient.

Methods: Sperm morphological traits are presented as a mean of two observations. After ejaculate liquefaction at 37° C, sperm motility was assessed in duplicates on slides using a phase-contrast microscope connected to a video-camera. Spermatozoa belonging to the rapidly moving class (WHO Class A, velocity >25 µm/s) were used in the analyses.

Results: There was no difference between treatments in total length, but swim-up spermatozoa had a shorter tail tip length and a longer mid-piece. Sperm total length has explained a significant proportion of variance in fast sperm motility (multiple regression, r²= 0.29, n=24, F(2,21) = 4.19, p< 0.03). Men producing relatively high sperm concentrations had longer mid-pieces in the swim-up fraction (residuals of sexual abstinence time, model: F(3,13)= 4.63, p= 0.020; univariate: F(2,15) = 6.90, p<0.01).

Conclusion: Relatively short sperm cells with long mid-pieces have a largest chance to fertilize an ovum.