

Journal of Andrology, Vol 22, Issue 2 235-244, Copyright © 2001 by The American Society of Andrology

JOURNAL ARTICLE

Sperm structural and motility changes during aging in the Brown Norway rat

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The Brown Norway rat provides a useful model to study aging of the male reproductive tract because of the selective age-dependent pathological changes that are found in the testis, epididymis, and prostate. In the testis, there is a clear age-dependent decrease in both steroidogenesis and spermatogenesis. In the epididymis, some striking segment-specific changes occur at the histological and biochemical levels prior to the major loss of spermatogenesis. We hypothesized that formation of spermatozoa in the testis and maturation of spermatozoa in the epididymis (ie, acquisition of motility and loss of the cytoplasmic droplet) may be altered during aging. Changes in the morphology of spermatozoa were assessed by light and electron microscopy. Using computer-assisted sperm analysis, the motility parameters of spermatozoa obtained from the caput and cauda epididymidis of young and old Brown Norway rats were compared. In old animals, we also compared the motility of spermatozoa from epididymides adjacent to regressed testes with those from epididymides adjacent to nonregressed testes. There was a marked increase with age in the number of spermatozoa with abnormal flagellar midpieces; the nature of these defects did not change with age. In caput epididymidis, the percentage of motile sperm was similar in young and old rats. In contrast, the percentage of motile spermatozoa was significantly decreased in cauda epididymidis of old rats; spermatozoa from the regressed testis side had altered motility characteristics. Furthermore, in the cauda epididymidis on the regressed testis side of aged Brown Norway rats, the proportion of spermatozoa that retained their cytoplasmic droplet was markedly elevated. Some of these effects are likely due to changes taking place in spermatozoa during the process of spermatogenesis in the testis (eg, formation of the flagellum), whereas others could occur during sperm maturation in the epididymis (eg, acquisition of motility). The multiple effects of aging on sperm morphology, the acquisition of motility, and the shedding of the cytoplasmic droplet clearly indicate that the quality of spermatozoa is affected by aging.

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