

Three-Dimensional Analyses of Mitochondria in Rat Spermatogenic Cells with SBF-SEM

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Spermatogenesis is a series of complex process involving spermatogonial proliferation, meiosis of spermatocytes, and spermatid transformation (spermiogenesis). Meiosis of spermatocytes reduces the chromosome number by half and creates four spermatids. However, subcellular organelle dynamics is well unknown during spermatogenesis. Mitochondria contain mitochondrial DNA, produce ATP and regulate apoptosis. In the present study, we examined the number and distribution of mitochondria in spermatocytes and spermatids by serial block-face imaging using scanning electron microscopy (SBF-SEM) to acquire 3-dimensional ultrastructural information. We prepared carbon-based conductive resin blocks of rat testis. The serial images of rat testis were obtained by SBF-SEM and handled with ImageJ and Fiji plugins, and segmentation of mitochondria and nucleus and image analyses were performed in microscopy image browser and Amira. We identified spermatocytes by synaptonemal complexes and spermatids by acrosome. We analyzed five spermatocytes and ten spermatids. The average number of mitochondria in spermatocytes or spermatids was 425.4 ± 155.7 or 428.1 ± 25.0 , respectively. There was no difference in mitochondrial number of both cell types. Mitochondria in spermatocytes also created clusters, whereas ones in spermatids distributed equally in the periphery. The results of the present study suggest regulating appropriately the number of mitochondria in spermatogenic cells containing spermatocytes and spermatids.