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Spergen-1 Might Be an Adhesive Molecule Associated with Mitochondria in the Middle Piece of Spermatozoa

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Abstract

Spergen-1, a recently identified molecule specifically expressed in haploid spermatids in testis, is a small protein of 154 amino acids with a mitochondria-targeting signal at the N terminus. To examine the localization of spergen-1 protein in germ cells, we performed immunocytochemistry with the anti-spergen-1 antibody on frozen sections of rat testis and purified spermatozoa. Immunolabeling for spergen-1 was detected in mitochondria of elongating spermatids and of the middle pieces of matured spermatozoa. Immunoelectron microscopy revealed that spergen-1 was localized to the surface of mitochondria in the middle piece of spermatozoa. To investigate the properties of spergen-1, COS-7 cells were transfected with vectors encoding various spergen-1 mutants. The transfection experiments showed that spergen-1 expressed in the cells tended to agglutinate mitochondria and assemble them into aggregations and that the C-terminal region of spergen-1 as well as the N-terminal mitochondrial targeting signal was requisite for induction of mitochondrial aggregation. These results suggest that spergen-1, a mitochondria-associated molecule in spermatozoa, has a property to induce mitochondrial aggregation at least in cultured cells. We hypothesize that spergen-1 might function as an adhesive molecule to assemble mitochondria into the mitochondrial sheath around the outer dense fibers during spermiogenesis.

Keywords




spergen-1; spermiogenesis; mitochondria; spermatids; mitochondrial sheath; spermatozoa; testis; spermatogenesis

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