3D Robust Spatiotemporal Molecular Model of Acrosome Biogenesis

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Biogenesis of the acrosome is a unique cellular process which taking place in the testis during the process of spermiogenesis (final stage of spermatogenesis during which round spermatid develops into the testicular spermatozoa). As a unique cellular process, it includes large amount of cell-specific proteins and their organization into the complex cytoskeletal, membranous and acrosome matrix structures. The aim of the presented project is a spatiotemporal characterization of the process in the mice model under physiological and pathological conditions with emphasis on 3D microscopic analysis of cleared seminiferous tubules. Here, utilization of the massive parallel image processing on the seminiferous tubules volumetric data enables reconstruction of the individual (sub)cellular components (e.g. acrosome, Golgi complex, nucleus) as 3D surface models. Furthermore, specific monoclonal antibodies, molecular dyes and mice transgenic models allow molecular profiling of individual structures of interest. Finally, the correlation of obtained massive parallel 3D imaging data with various standard laboratory techniques (e.g. electron/holographic microscopy, immunocytochemistry, immunohistochemistry, flow cytometry, immunoblot) enables building robust and complex models of the acrosome biogenesis process and analyze its individual stages from new perspectives. Such models would further improve our understanding of the natural acrosome biogenesis and (sub)cellular and molecular etiopathogenetic mechanisms of its disrupted development.

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