

Thesis Title: Studies on the Role of 21 K-Sialoglycoprotein on
 Epididymal Sperm Functions

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ABSTRACT

This project was designed to investigate the possible roles of a major epididymal sialoglycoprotein in rat sperm-egg interaction. Employing a specific radiolabelling technique, the major 21 K-sialoglycoprotein was purified from the rat epididymal fluid and found to possess an α -lactalbumin-like activity. Galactosyltransferase was detected on the rat sperm surface. It was implied to participate in the binding of sperm to the zona pellucida, a protection coat of egg and the egg plasma membrane. Thus 21 K-sialoglycoprotein with the α -lactalbumin-like activity was shown to interact with the sperm galactosyltransferase during the sperm transit through the male tract. The interaction was demonstrated using a conjugate between the 21 K-sialoglycoprotein and horseradish peroxidase. Using the conjugate, the galactosyltransferase was found

distributed all over the sperm surface of the immature caput epididymal sperm whereas it was present only on the acrosome region of the mature cauda epididymal sperm.

In the female tract, sperm undergo capacitation and acrosome reaction before becoming competent to fertilize an egg. Sperm capacitation was induced by calcium. It was found that the 21 K-sialoglycoprotein bound calcium, suggesting that it may interact with calcium in the process of capacitation.

In addition, the fate of sperm surface galactosyltransferase was examined after *in vitro* acrosome reaction. Contrary to the expectation, the galactosyltransferase was not lost after acrosome reaction but redistributed to the equatorial acrosomal region. Thus, the relocation of the galactosyltransferase may contribute to the acquired fertilizing capacity of the sperm. Presumably, the 21 K-sialoglycoprotein was lost after the acrosome reaction. The enzyme was further implied to mediate the sperm-egg interaction by binding to N-acetylglucosamine residues of the zona pellucida and the egg plasma membrane since the interaction was specifically inhibited by 21 K-sialoglycoprotein, α -lactalbumin, N-acetylglucosamine and N-acetylglucosamine-specific wheat germ agglutinin.