Dynamics of acrosome reaction during intra-specific sperm competition in rodents

Sperm acrosome integrity is disturbed in promiscuous species field mice (*Apodemus*) and more than half of the spermatozoa undergoing spontaneous acrosome reaction (AR) before binding to the *zona pellucida*. In *Muridae* it is documented a generally high rate of spontaneous AR, and the percentage increases in promiscuous species up to 60 % in 60 min capacitation *in vitro*. The acrosome integrity positively corellates with presence of CD46 protein which absence in wood mouse is fenotypicaly same as in CD46 knock-out mouse leading to accelerated spontaneous AR. It is necessary to clarify whether for mouse sperm it is essential the primary binding of intact sperm to *zona pellucida* of the egg or whether it is preferred secondary sperm binding after spontaneous AR. In this context, the question is whether there is a relocalization of the key fusion protein IZUMO in sperm during spontaneous AR. IZUMO relocalization was monitored by immunofluorescence at specific times of capacitation *in vitro* during spontaneous and induced AR. IZUMO relocalization as closely connected to actin cytoskeleton, and β1 integrins. Dynamics and localization of β1 integrin during spontaneous and induced AR was also detected by immunofluorescence. Our results indicate that IZUMO as well as β1 integrin is relocalized during spontaneous AR from the acrosomal membrane to the equatorial and post-acrosomal segment of the sperm head. Findings, that crucial molecular changes essential for sperm-egg fusion represented by dynamic movements of IZUMO happening also during spontaneous AR contribute to the understanding of the process of fertilization in mice.

Initiation and subsequent relocation of the IZUMO in *Apodemus* species positively correlated with the degree of promiscuity and instability of the acrosome. Sperm after spontaneous AR seems to have the same fertilizing potential as those after induced AR. Spontaneous AR probably represents a unique mechanism for accelerating the process of fertilization in a highly promiscuous environment under selective pressure of intra-specific sperm competition.