Regulation of human sperm capacitation and the acrosome reaction by actin modulation.

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Context: The spermatozoon is capable of fertilizing an oocyte only after undergoing biochemical changes in the female reproductive tract, referred to as capacitation. The capacitated spermatozoon interacts with the egg and undergoes the acrosome reaction, which enables its penetration into the egg. Actin polymerization occurs during capacitation, whereas prior to the acrosome reaction, F-actin must undergo depolymerization.

Objective: Understanding the mechanism that regulate actin dynamics.

Methods: F-actin levels were determined by FITC-phaloidin, acrosome reaction by FITC-PSA and sperm motility by CASA.

Patients: Human sperm were obtained from healthy donors.

Results: As opposed to gelsolin, cofilin is mainly phosphorylated/inhibited at the beginning of the capacitation, and dephosphorylation occurs towards the end of the process. In addition, unlike gelsolin, cofilin phosphorylation is not affected by changing the cellular levels of PIP2(4,5). Despite the different regulation of the two proteins, the role of cofilin appears similar to that of gelsolin, and its activation leads to actin depolymerization, inhibition of sperm motility and induction of the acrosome reaction. Moreover, gelsolin translocates from the tail to the head during capacitation, and cofilin disappeared from the head and probably translocates to the tail in the capacitation process.

Conclusions: Gelsolin and cofilin have a similar role in F-actin depolymerization, but act at different times and locations during capacitation. Thus, for the sperm to achieve high levels of F-actin along the capacitation process, both proteins must be inactivated at different times.

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