

The decondensation of the guinea pig spermatid nucleus depends on the stability of the perinuclear theca substructure.

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The perinuclear theca (PT) is the cytoskeletal coat of mammalian sperm nucleus, and it is conformed by the subacrosomal and postacrosomal layers. The PT of the mature guinea pig spermatozoa presents a substructure (ST) located as a belt in the apical portion of the postacrosomal layer. The ST is absent in capacitated acrosome reacted spermatozoa. During fertilization, soon after fusion of the sperm and egg plasma membranes, the sperm head suffers the loss of the PT and decondensation of the chromatin for the formation of the male pronucleus. The objective of this research was to define: if sperm nuclei decondensation depends on the integrity of the PT. For that, it was evaluated if in vitro decondensation of the sperm nucleus vary under different sperm physiological states, that differ in the integrity of their PT, as is the case of the acrosome reacted spermatozoa.

Material and methods

For nuclei decondensation, combination of two reagents was used: dithiothreitol (DTT), for disulfide rupture between DNA-associated protamines and heparin which has been suggested to compete with DNA for protamines. The assayed samples were: 1) mature non-capacitated spermatozoa with intact PT and ST, 2) the same sample types as (1) but phalloidin treated, for the PT actin cytoskeleton stabilization, that further results in the ST stabilization. Two parameters were evaluated, the loss of the ST, by electron microscopy, and the swelling of the heads by photonic microscopy.

Results

DTT-heparin treatment produced stronger nuclei decondensation in spermatozoa with synchronous acrosome reaction, induced by A23187, than in mature non-capacitated spermatozoa (evaluations were performed from heparine

15 sec up to 3 min). When heparine or DTT were separately assayed, no nuclei decondensation was observed. In mature non-capacited spermatozoa treated with phalloidin, DTT-heparine treatment did not produced nuclei decondensation, additionally the ST was retained and furthermore alternate electron dense/electron light small zones were observed at the base of the ST.

Discussion

Results presented suggested: 1) that whole PT with intact ST retards nuclear decondensation, 2) while, whole PT in which the ST is absent allows a slight nuclear decondensation and 3) that the PT integrity alteration, as a result of the acrosomal reaction, that also includes the absence of the ST, is indispensable for an appropriated nuclear decondensation.

REFERENCES

Hernández, E.O., Trejo, R., Espinosa, A.M. and Mújica, A. 1994. Calmoduline binding proteins in the membrana vesicles releases during the acrosomal reaction and in the perinuclear material in isolated acrosome reacted sperm heads. *Tissue Cell.* 26:849-865.

Juárez-Mosqueda, M.L. and Mújica, A. 1999. A perinuclear theca subestructura is formed during epididymal guinea pig sperm maturation and disappear in acrosome reacted cell. *J. Struct. Biol.* 128:225-236.

Reyes, R., Rosado, A., Hernández, E. O., and Delgado, N.M. 1989. Heparin and glutathione: Physiological decondensing agents of human sperm nuclei. *Gamete Res.* 23. 39-47.