**Study of the gamete interaction during mammalian fertilization**

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Mammalian fertilization is the process by which a spermatozoon and an oocyte meet and interact to produce a new being. The oocyte is a large round cell surrounded by the Zona Pelucida (ZP), a glycoproteic envelope that the fertilizing spermatozoon has to cross to reach the oocyte membrane and fuse with it.

If several spermatozoa succeed to cross the ZP and fuse with the oocyte, more than one paternal genetic material are incorporated into the egg. This process, called polyspermy, leads to fertilization failure. One well-documented mechanism ensuring monospermy is the calcium induced hardening of the ZP, occurring after sperm/egg fusion [1]. However, we found that in some cases, one or several sperm can cross the ZP and doesn’t fertilize, even if it is a fertilized oocyte or not. This observation shows that a spermatozoon, normally able to fertilize after the ZP crossing, does not necessarily fuse.

Our goal is to better understand the gamete interaction mechanism by determining why these spermatozoa are unable to fuse. The only currently known factors mandatory for fusion in mammals are: three proteins (CD9 and Juno on the egg, and Izumo1 on the sperm) and one specific flagellum beating mode. [2]

We study each one of these factors during an in vitro fertilization: dynamics of the 3 proteins and beating of the flagellum. Our hypothesis is that the post-fusion remodeling of the egg plasmic membrane could have as consequences that, neither the oocyte membrane, nor the sperm one are anymore able to interact properly with each other to fuse.

Preliminary results show, by immunostaining, that a release of Juno from the egg membrane occurs after fusion, resulting in protein coverage of the sperm heads localized in the vicinity of the oocyte. We also observe that spermatozoa crossing the ZP have not necessarily the specific beating leading to fertilization.

[1] Sato K. Polyspermy-preventing mechanisms in mouse eggs fertilized in vitro*. J Exp Zool* . 1979;210:353–359.

[2]Ravaux et al, A specific flagellum beating mode for inducing fusion in mammalian fertilization and kinetics of sperm internalization, *Scientific Reports*, 2016; 10.1038/srep31886