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⭐ Abstract title:
Finding the best sperm

Biography
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Abstract text

The basic sperm analysis has limited predictive value in the achievement of success in either natural or assisted conception, in part because several non-measured molecular factors within the sperm cells are crucial to succeed.

There are upper limits of assisted reproduction success. If we look carefully to the results exhibited by all ART programs, we may find two similar patterns among them: first, often a couple needs several attempts to get a child. Second, not every patient succeeds.

In some cycles, there may be no embryos to transfer or they are unable to implant. Another subsequent cycle ends up in a child, even when using the same gamete's combination. Same gamete providers-different cycles-different results.

This, together with the fact that in an ART procedure, gametes are provided by the patients and afterwards the laboratory intervenes in the preparation and selection, lead us to wonder how much this intervention affects the reproductive performance of a couple. Regarding spermatozoa, you may find from thousands to millions within an ejaculate, they are different, they behave differently, and their adequate selection may be key for reproductive success. Using one specific spermatozoon leads oocyte fertilization, develops to a good quality embryo who implants, and a child is born. Choosing another instead, may result in an embryo that is arrested or is unable to implant…. even within the same ejaculate… even within different ejaculates from the same man.

Within an ejaculate, you may find that every single sperm is theoretically unique from the genetic viewpoint. The number of genetic combinations possible exceed the number of available spermatozoa even in the best ejaculates. Their genetic, and subsequently their molecular traits are exclusive, as expected after combining maternal and paternal chromosomes during spermatogenesis, and the DNA crossover between homologous regions. This has been previously confirmed sequencing and comparing single sperm DNA, and this uniqueness makes people have different children depending on the sperm that fertilizes the oocyte. But most importantly, they can lead you to success or failure.

When sperm is selected by an operator, they may have in their hands the possibility to choose, and their selection must be made according to the best criteria and available evidence. Most importantly, several millions of spermatozoa will be ruled out (unlike oocytes, here is where the key of sperm selection potential resides).

A good sperm selection protocol may change the whole picture and improve the entire embryos' cohort quality. Good sperm-Good embryo. Bad sperm-Bad embryo.

So far, several sperm phenotypical and molecular markers of fertility have been described as being related with reproductive success: DNA integrity, membrane charge, apoptotic traits, hyaluronic acid receptors, platelet activating factor, and a long etc.., and some can also be used to select sperm individually for using them in assisted reproduction techniques. Nevertheless, robust evidence for significant improvement in reproductive performance after its application is scarce, or almost inexistent.

From ultrahigh magnification to magnetic activated cell sorting, through physiological ICSI, hypoosmotic swelling tests, electrophoresis, microfluidic devices, birefringence, etc., several papers and research projects have aimed to separate ejaculates into two sperm populations or more, which contain the good and the bad. Available information is still limited, coming mainly from the developers of each technique, without enough evidence and non-contrasted by other independent groups.

First it´s a matter of finding and defining the molecular traits that identify the best sperm to be selected (or the worse to be removed), those strongly linked with reproductive results, and then developing "sperm-friendly" and cost/effective selection techniques, to lead us to move from auto or subjective sperm selection towards smart or objective sperm selection ultimately improving reproductive results.