

The below details are required:

1. Conference Topic of interest: Nanotech in Life Sciences and Medicine

Characterization of the interaction of graphene oxide with the mammalian sperm membrane

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Abstract:

The growing use of Graphene Oxide (GO) as a biomaterial has risen questions regarding its safety, including in terms of reproductive ability. It has been shown that graphene is able to interact with the cytoplasmic membrane [1, 2]. Previous work has shown that treatment with graphene oxide in a media enabling capacitation increases membrane fluidity, resulting in higher rates of capacitation and “*in vitro*” fertilization [3].

This lead us to question whether Graphene Oxide is changing the composition of the membrane or if this is due to the physical connection.

Thermogravimetric Analysis indicates that the effects exerted by GO is not directly related to its attachment to sperm membrane (data not shown). A cytofluorimetric study using Filipin III as a marker for cholesterol shows a decrease of this sterol in the samples treated with graphene oxide, in a concentration dependent fashion. Indicating that GO is extracting the cholesterol from the membrane. Furthermore, Differential Scanning Calorimetry study comparing GO with other molecules used to remove cholesterol, shows that it has a stronger effect than the traditionally used bovine serum albumin (BSA) but to a decreased effect compared to the toxic Methyl- β -cyclodextrin (MBCD).

Keywords: Graphene Oxide (GO), boar spermatozoa, capacitation, cholesterol, Cytoplasmic membrane.

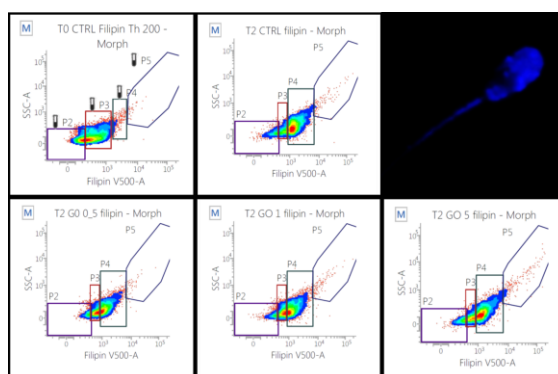


Figure 1: Cytofluorometry of spermatozoa incubated for 2 hours with different concentrations of GO (0,5 μ g/mL; 1 μ g/mL; 5 μ g/mL) stained with Filipin III to mark the cholesterol.

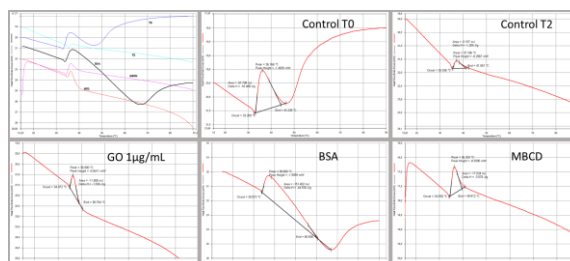


Figure 2: Differential Scanning Calorimetric analysis of the membrane response to a temperature scan. Comparison between GO and other cholesterol extractors (BSA and methyl- β -cyclodextrin)

References:

1. Liu, S. B. et al. ACS Nano 2011, 5, 6971–6980.
2. Hashemi, E. et al. RSC Adv. 2014, 4, 27213-27223.
3. Bernabò, N., et al.,. Carbon. (In press)