ABSTRACTS
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Strategies in fertility preservation - New horizons for domestic and wild carnivores

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There are specific components of the rapidly emerging field of fertility preservation in men, women and children that are highly compatible with preserving valuable genomes of individuals or populations of domestic and wild carnivores (1). Besides the more ‘classical’ approaches focusing on sperm and oocyte preservation, strategies associated with gonadal tissue preservation combined with in vitro culture are especially attractive for better rescuing, protecting and extending the fertility (1). In addition, recent studies about induced pluripotent stem cells in felids could boost the production of haploid gamete-like cells from rare or endangered individuals (2).

In terms of preservation strategies, the possibility of freezing large volumes of semen using directional freezing (orienting extracellular ice crystals in one direction permitting more frozen cells to align between the crystals and remain undamaged) has allowed preserving the semen of various mammal species and could be successfully applied to gonadal tissues as well. Also, vitrification still is regarded as ‘novel’ and continues to be enthusiastically used because of its relative simplicity and low cost. Nonetheless, although isolated cells and tissues can be successfully frozen or vitrified there remains difficult-to-mitigate chilling and cryo-injuries to DNA, membranes and cell junctions (3) that are especially sensitive in carnivores. Thus, there are significant opportunities in the more detailed exploration of preserving carnivore gametes via alternate solutions such as desiccation or liquid environment at supra-zero temperatures. These approaches also would offer benefits related to much simpler sample processing and long-term storage without the need for liquid nitrogen. Interestingly, injection of freeze-dried cat spermatozoa into oocytes can lead to early embryo development. However, sperm centrosomal sensitivity to desiccation is a study priority that was confirmed recently in our laboratory where we observed compromised sperm aster formation after injecting dehydrated (at ambient temperature in trehalose) cat spermatozoa into conspecific oocytes. Preservation in liquid environments at supra-zero or ambient temperatures also is an emerging area in single cell preservation. As an alternate to sperm storage in classical semen extenders at cold temperature, we now can effectively preserve cooled (4°C) cat spermatozoa for up to 2 weeks in a trehalose solutions while retaining DNA integrity and centrosomal structure (presence of centrin) as well as function (sperm aster formation). Regarding the preservation of maternal genomes, desiccation has already been shown as a really encouraging strategy. Cat germinal vesicles can be compacted and successfully air-dried. At last, new options involving the bio-stabilization of multi-cellular structures at room temperatures currently are under development and could offer convenient options for the preservation of gonadal tissues in a vast array of carnivore species.