

ADVANTAGES OF CRYOCONSERVATION OF SPERM IN REPRODUCTIVE BIOTECHNOLOGY

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Cryopreservation of sperm is one of the most important procedures in the development of biotechnologies for assisted reproduction. In some farm animals, the use of cryopreserved semen has multiple benefits. Cryopreservation of sperm allows long-term storage, dispersal of genes of genetically superior animals from one generation to another and long-distance transport of semen. Another advantage of using cryopreserved semen is that it facilitates the easy sowing of females at the optimal time of reproduction. Moreover, cryopreservation of sperm is an essential biotechnology for the management of sperm banks, thus contributing to the conservation of animal biodiversity and the protection of rare and endangered species. In scientific research, the main attention in this field has been paid to the improvement of biotechnologies and freezing-thawing regimes of semen in animal species of agricultural interest. The scientific interest consists in the use of antioxidants, cryoprotectants in optimal concentrations and minimizing the freezing-thawing time, which are some of the essential requirements in maintaining the structure and function of sperm during cryopreservation. The latter are very vulnerable in the freezing and thawing process, because the reproductive cells are very sensitive to thermal changes and their viability is compromised after thawing. Currently, neither the major achievements of scientific research on the synthesis of synthetic media and freezing protocols, the properties of the researched antioxidants, elucidating how low temperatures cause damage to sperm and a number of other factors do not fully solve the problem of sperm quality. The main damage that occurs during cryopreservation results from the exposure of reproductive cells to temperature variations, which leads to the formation of ice crystals, which structurally damage the inside of the cell and the environment. In parallel, osmotic changes occur. In addition, during freezing and thawing, irreversible lipid-protein changes occur in the plasma membrane as the primary structure of sperm. Thermal variations also change the configuration of phospholipids that increase the rigidity and fragility of the plasmalemma, as well as its permeability, causing a decrease in sperm metabolism. The cryopreservation process also causes chromatin damage that results in DNA fragmentation, the integrity of which varies with protamine, histone, and the intact disulfide bridges between cysteine residues. The effects of molecule damage during cryopreservation are directly reflected on the fertilizing capacity of frozen-thawed sperm. Thus, cryopreservation of sperm is an essential biotechnology of assisted reproduction in virtually all species of mammals, including humans.

Keywords: cryopreservation of sperm, reproductive biotechnology, sperm banks, freezing-thawing regimes, sperm quality.