Freeze-drying of mammalian gametes and somatic cells – limitations and prospects

Summary

Current research trends focus on improving techniques for preserving biological materials from various mammalian species, including farm animals and companion animals, especially endangered species, and storing them in biobanks of genetic reserves. At present, the preservation technique used almost exclusively in biobanking is cryopreservation, which involves freezing samples in liquid nitrogen, and sperm cells are the most commonly stored biological material. However, this procedure is expensive and entails some difficulties, mainly due to the need for a continuous supply of liquid nitrogen and the risk of contamination of samples. Therefore, increasing attention is paid to the possibility of storing male gametes, as well as somatic cells, in a freeze-dried state, as in the case of food, drugs or vaccines. The ability of living organisms to survive severe dehydration even for many years has been observed in nature. This strategy is successfully used by many plants and invertebrates. While freeze-drying requires the use of specialized equipment, the costs of storing samples are low, and the freeze-dried material can be kept at temperatures above zero (e.g. 4 or 25°C) for a long time. It is also very easy to transport samples preserved in this manner. The aim of this review is to present the procedure of sperm lyophilization, to discuss the latest achievements in this field, the disadvantages, advantages and potential applications of the procedure, and expected benefits of the freeze-drying of mammalian somatic cells.

KEY WORDS: biobanks, freeze-drying, sperm cells, somatic cells, protectants, assisted reproductive techniques