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Opinion Article

Prominence of Cryobanking in Aquatic Ecosystems and Aquaculture in Reproductive Course of Action

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ABOUT THE STUDY

Germplasm cryobanking possesses significant ramifications in reproductive procedures in cultured marine and freshwater aquatic species because it simplifies broodstock management. Cryopreservation is a way of storing and preserving genetic material that is both safe and effective. Cryobanks in aquatic species have been established for a variety of purposes in fish farming, ranging from reproductive control to genetic selection of high-reproductive-value males. To increase gamete quality during storage or for conservation purposes, research has been performed on the design of procedures for novel and problematic species, commercial or model species. Protocols for sperm from a variety of fish and invertebrate species, as well as oocytes and larvae (mostly from invertebrates), have been successfully created. Determining the essential players in the cryopreservation process is critical for improving post-thaw survival of any biological material. As a result, several methodologies and procedures have been used to detect and decrease cryodamage, as well as to identify the major causes. Each treatment is species-specific and depends on the biological material to be maintained, however in order to standardize methods, common features must be considered. Germ cells are another source of cryobanking material.

Cryopreserved spermatogonia could be transferred across similar species, allowing the all-fish genome to be preserved by developing into male or female gametes in the host gonads. Due to this capability, cryopreserved spermatogonia xenotransplantation is becoming a helpful approach for producing surrogate brood stocks, especially in species that are difficult to keep in captivity, have a high age at maturity, or have reproductive issues. Cod broodstock selection projects are now ongoing, and when combined with genomic technology, they will result in the discovery of cod with commercially valuable features. In such initiatives, cryopreservation of male gametes will be a key component in the establishment of families for laboratory and hatchery production.

The first effective cryopreservation of Atlantic halibut sperm was reported in a flatfish species. Since then, other studies have documented improvements in both the purity of cryopreserved sperm and the technology important in industrial purposes. The discovered technologies enable for the preservation of a significant volume of sperm (5–100 ml) generated by each guy while keeping a high fertilization capacity. This has increased the applicability of cryopreservation for commercial operators and provided a useful tool for seed stock production and broodstock management, addressing some of the issues of non-synchronization between the sexes at the end of spawning (females still have good eggs while males produce poor sperm quality with high viscosity) and reducing breeder manipulation for spawning.

Strategies for additional flatfish species, such as Senegalese sole and summer flounder, have also recently been created. Protocols for Senegalese sole were adopted from turbot, and research to improve the quality of post-thaw samples is still continuing. Cryobanks have been developed for a variety of aquatic species in Asia, Europe, United States, Brazil, Australia, and New Zealand. The maintenance of these banks necessitates genetics, reproductive physiology, cryobiology, and data management skills and technical capability. To achieve maximum survival, cryopreservation techniques must be carefully devised for each species and type of cell.

Cryobanking allows desirable generations to be preserved genetically. It enables for cross-breeding at various periods throughout the year. It aids in the storage of germplasm for genetic selection programmes or species conservation. Hybridization programmes and genetic engineering studies in fish can benefit from cryopreserved spermatozoa.

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