Probl Cryobiol Cryomed 2025; 35(4):246
https://doi.org/10.15407/cryo35.04.246

Study of the physical properties of hydrogel films for low-temperature storage of microorganisms

O.V. Zubkov, O.V. Trufanov
Institute for Problems of Cryobiology and Cryomedicine of the National Academy of Sciences of Ukraine, Kharkiv, Ukraine

Hydrogels are widely used in various fields — in particular, as matrices for the immobilization of microorganisms during cultivation or low-temperature storage (Daniel A *et al*., 2022; Vysekantsev I *et al*., 2020), as biodegradable alternatives to synthetic polymeric materials in food packaging (Leonard L *et al*., 2015), and as biocompatible wound dressings with incorporated active pharmaceutical ingredients (Sulaeva I *et al*., 2020). This diversity of applications necessitates the improvement of their physical (moisture content, swelling degree, solvent loss) and technological properties (homogeneity, shape retention, transparency). To enhance these properties, we proposed the incorporation of additional components — specifically, gel- and hydrocolloid-forming agents.

Sodium alginate-based films were prepared according to the methodology described in previous studies (Trufanov O *et al*., 2024). The film formulations included the following components: dietary fiber from various sources, carrageenan, guar and xanthan gums, gelatin, modified corn starch, pectins of different modifications, and microcrystalline cellulose of various types.

In the finished films, transparency, shape retention, and homogeneity were assessed visually, followed by determination of moisture content, swelling degree, and solvent loss using a modified gravimetric method (Janik W *et al*., 2023).

A total of 14 sodium alginate-based film samples were obtained. All samples exhibited high moisture content, potentially providing favorable conditions for microbial viability. The swelling degree varied depending on the added components: some samples absorbed almost no water after drying, while others demonstrated significant water uptake. Upon re-drying, the loss of dissolved substances did not exceed 60%, indicating moderate leaching.

The best shape retention and homogeneity were observed in films with added carrageenan, modified pectins, and gelatin. Only the films containing various types of dietary fiber and microcrystalline cellulose were found to be opaque.

The incorporation of additional gel- and hydrocolloid-forming components into alginate films improves their physical and technological properties. This enables the rational selection of optimal components for the targeted application of alginate films in the food, pharmaceutical, and biotechnological industries.

Probl Cryobiol Cryomed 2025; 35(4):246
https://doi.org/10.15407/cryo35.04.246a

Hormonal stimulation of silver crucian carp using a combination of surfagon (GnRH) and metoclopramide for the reintroduction of rare fish species based on cryobank resources

K.S. Fomenko [1], A.M. Khomenko [1], D.A. Ostras [2]
[1] Institute for Problems of Cryobiology and Cryomedicine of the National Academy of Sciences of Ukraine, Kharkiv, Ukraine
[2] Lyceum Honey Academy LLC, Kharkiv, Ukraine

Climate change caused by global warming significantly affects natural habitats, biodiversity, and the sustainable development of humanity (Chao, 2018; IPCC, 2014). Simultaneously, the Holocene extinction continues, differing from previous mass extinctions by a significantly higher rate of species loss (ranging from 100 to 1000 times faster, according to various estimates) (Ceballos, 2015), which is clearly linked to human activities.

Rising water temperatures can lead not only to a shift in spawning periods but also to a complete cessation of spawning (Pankhurst, 2011). This poses several risks, from threats to food security to challenges in the conservation and restoration of vulnerable species populations. These risks are the most critical in Ukraine. This particularly concerns the populations of rare fish species that are not subject to aquaculture management or monitoring. Cryobanks provide a solution for the long-term preservation of genetic material (specifically sperm) of endangered and vulnerable species (Martinez-Paramo, 2016). The next step involves using this material for the reintroduction of populations and developing methods of artificial reproduction.

The basic protocol used was adapted from methods applied to sturgeon species. Specifically, the following scheme was employed: 5 μg of Surfagon per 1 kg of fish body weight, and 5 ml of metoclopramide per 1 kg of fish body weight. Stimulation of females with Surfagon in combination with metoclopramide was carried out in two stages: a priming dose amounting to 10% of the total dose was administered first, followed 12 hours later by the main dose containing the remaining 90%. Metoclopramide was administered once, simultaneously with the second Surfagon dose, in its full amount. Injections were made into the muscle of the pectoral fin. This method did not result in any lethal cases among the experimental fish.

Conclusions. The method proved effective in spawning stimulation. GnRH is an effective agent, particularly for the artificial stimulation of spawning in fish listed in the Red Book of Ukraine, as it exerts a gentler effect on the overall organism compared to pituitary extracts.