

## SECTION 3. ECOLOGY

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### PROTECTIVE EFFECT OF HYDRATED FULLERENE C<sub>60</sub>: WHAT THE CARDBOARD PACKAGING SUGGESTED

### ЗАХИЩА ДЯ ГІДРАТОВАНОГО ФУЛЕРЕНУ C<sub>60</sub>: ЩО ПІДКАЗАЛА КАРТОННА УПАКОВКА

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Our preliminary studies of the biological action of two different compounds, hydrated fullerene C60 (C60) and nanocrystalline cerium dioxide (NCD) allowed us to reveal the protective effect of these nanoparticles during low-temperature storage of biological macromolecules [1; 2; 3, p. 5]. In particular, the use of C60 nanoparticles was helpful in developing a method of preparing *Crassostrea gigas* oysters for long-term hypothermic storage while maintaining their nutritional quality [4, p. 5].

However, a certain part of information that deserves attention was not covered in previous publications. Previously, in order to establish the possibility of using C60 to prolong the shelf life of *Crassostrea gigas* oysters, we determined the optimal storage conditions and indices of mollusk food suitability, which indicate the beginning of autolytic processes in their tissues [5, p. 5].

The studied oysters were divided into two groups: control (intact animals) and experimental ones. The mollusks of the experimental group, before hypothermic storage (at a temperature of 4–5°C), were kept in seawater with the addition of C60 for one day. The humidity in the storage chamber was replenished with the help of a damp, cotton cloth, which was used to cover the mollusks. For hypothermic storage, some of the mollusks were laid out on ceramic pallets. Another group of mollusks (n=10) was stored in cardboard packaging under similar conditions. After every three days, the preservation of mollusks was evaluated. A more detailed design and method of conducting the experiment is presented as reported [5, p. 5].

The results of the study showed that the condition of oysters stored in cardboard packaging was significantly different from the shellfish stored on ceramic pallets. Tables 1 and 2 demonstrate the organoleptic indices as one of the sensitive parameters for evaluating the preservation of mollusks. All mollusks of the control group died at the final stage of observation, as evidenced by the opening of the shell. On the 6th day of observation, the oysters of the experimental group remained alive, their shells were tightly closed, but some indices of food quality underwent changes (Table 2).

In our opinion, the death of the investigated mollusks, which were stored in cardboard packaging, could be caused by mineral oils that may be present in the cardboard.

Now there is a crucial issue of contamination of paper and cardboard packaging with mineral oils, which is possible when using secondary raw materials, printing inks for applying inscriptions and drawings, lubricating components of equipment [6; 7, p. 5]. The hydrocarbon components of mineral oils are known to have toxic, carcinogenic and mutagenic properties [8; 10, p. 5].

Table 1

**Indices of organoleptic assessment of oysters during hypothermic storage  
(control group)**

Parameters	Weighting factor, unit	Assessment of oysters during storage, points		
		24 hrs	72 hrs	144 hrs
General appearance	0.1	5	3	1
Vital signs	0.1	5	3,5	0
Body color	0.1	5	3	2
Body consistency	0.2	5	3	1
Smell	0.25	5	3	2
Taste	0.25	5	3	-
General assessment	1.0	30	18.5	6.0

Table 2

**Indices of organoleptic assessment of oysters during hypothermic storage  
(experimental group)**

Parameters	Weighting factor, unit	Assessment of oysters during storage, points		
		24 hrs	72hrs	144 hrs
General appearance	0.1	5	5	5
Vital signs	0.1	5	4	3
Body color	0.1	5	4	3
Body consistency	0.2	5	3,5	3
Smell	0.25	5	4	3
Taste	0.25	5	3	3
General assessment	1	30	23.5	20.0

Thus, our research allowed us to assume that hydrated C60 fullerene can be considered as a component capable of enhancing the adaptation potential of living beings to toxic (negative) environmental influences.

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