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ADVANTAGES AND PROSPECTS OF USING MICROALGAE TO OBTAIN BIOLOGICALLY ACTIVE SUBSTANCES FOR THERAPEUTIC PURPOSES

Bodnar O. I.
Ternopil Volodymyr Hnatiuk National Pedagogical University

E-mail: bodnar@chem-bio.com.ua

Unicellular green algae *Chlorella vulgaris* is well-known as a traditional model object for studying the biochemistry and classic object for biotechnologically obtained useful products: proteins, lipids, carotenoids, vitamins, etc. [2, 4, 5].

Currently, the proven effectiveness and prospects of lipid microalgae use in the process of biofuel synthesis and in development of bioactive medications. In algal biofuel industry now, there are two main trends [3]:

1) increase the gross (total) content of lipids in cells through technological manipulation and usage of biosynthesis regulators and lipids accumulation;

2) directed regulation of certain lipid classes biosynthesis – as main components of biofuel and biologically active substances.

Among the biologically active additives (BAA) that are commonly used for the prevention of metabolic disorders are native dried microalgae and substances based on them in complexes with essential micronutrients [1, 2, 5]. We already know about the high saturation of algae cells by lipids of different classes that formed the idea of possible removal of separate lipid fractions and their usage in the biotechnology of production of some products with nutritional, pharmaceutical and cosmetic purposes. Algae cells are able to adapt to metal ions using different mechanisms: membrane and intracellular binding by subcellular structures, binding by exo- and endometabolites. We used the ability of chlorella cells to absorb and accumulate inorganic compounds of metals and non-metals against the concentration gradient from the culture medium and incorporate them into macromolecules [2, 3].

The experiments were held on crops micropopulations of freshwater green alga *Chlorella vulgaris* Beij. Algae were cultivated under conditions of the accumulating culture on the Fitzgerald's medium N 11 in the modification of Zender and Gorham under at the illumination of 2500 Lx (16:8 hrs.) at 23–25°C. Into medium we added aqueous sodium selenite (Na_2SeO_3) per Se (IV) – 10.0 mg/dm^3, chromium chloride ($CrCl_3 \cdot 6H_2O$) – 5.0 Cr^{3+} mg/dm^3. The biomass of alive cells was selected after seven days of culturing and lipids were extracted using the Folch method. Experimental diabetes mellitus (DM) was caused by a single injection of streptozotocin at the rate of 65 mg/kg in rats with obesity, which was later modeled by giving rats some high-calorie foods with sodium glutamate. Starch solution of selenium-chromium-lipid complex, 1 ml of which contained 1.85 mcg of selenium, 1.1 mcg of chromium in 0.5 mg of lipid was injected to white mongrel male rats weighing 160-180 g daily for 2 weeks after the development of diabetes [1, 2, 4].

At the physiologically normal conditions, the level of free radicals formation and antioxidant reserve capacity of the system is balanced. During diabetes, as one of the most complex metabolic disorders, can be observed the activation of free radical oxidation.

Under these conditions in animals were seen significant metabolic changes in the body comparing to the control animals. So, were increased indicators of oxidative stress - the contents of ROS (reactive oxygen species) (in 1.7 times), TBA-active products (1.9 times in blood, 1.8 times in liver), diene conjugates (in 2.0 times in blood, 1.4 times in liver). In addition we could observed

decreasing catalase activity (1.3 times in blood, but increased by 20% in liver) and superoxide dismutase (2.1 times in blood, 21% in liver) and reduced glutathione content (1.2 times in blood, by 35% in liver). Regarding glutathione peroxidase, its value was within normal limits, both in blood and in liver.

When giving to rats food with added selenium-chromium-lipid complex on the background of diabetes, we found that indicators of oxidative status of their organism, compared with those with diabetes, improved, but remained lower than in animals of the control group. Thus, we observed the decrease of TBA-active products content in the blood on 16% and 10% in liver, diene conjugates on 12% in blood and 7% in liver, ROS – on 40%. In blood, compared with diabetic animals, was the increased catalase activity (on 31%), superoxide dismutase (on 27%), and glutathione peroxidase (on 13%).

That is way, the results of the conducted studies showed a positive effect of selenium-chromium lipid substance obtained from chlorella for the simulation of type II diabetes on the background of obesity. Under these conditions, the body oxidative status indicators in rats comparing with the indicators in animals with diabetes improved, but remained lower than in healthy animals of control group. The mentioned complex lead to the normalization of a number of metabolism indicators and reduction of intoxication background, which accompanies hyperglycemic pathology.

Lipid substances obtained from algae and enriched with trace elements are promising in the prevention and correction of metabolic and regulatory processes.

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