



## Radio Resistance

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The purpose of this project is to develop technology and commercial production of a new class of biotech drugs based on biomass extreme microorganisms radio, chemo protective and immune corrective action to increase resistance of the population in environmentally disadvantaged areas at higher concentrations of harmful substances in the environment and during space flights.

As a source of biologically active substances with radio - and chemo protective effect, as well as the ability to normalize the immune processes in the human body is planned to use biomass of extremophiles (mostly), in particular halophiles - microorganisms living in extremely salty waters (Kara Bogaz Gol, the Dead sea et al.), radio resistant microorganisms, living in the water of cooling circuits of nuclear reactors, and other microorganisms which synthesize exotic valuable biologically active substances. These micro-organisms living in extreme conditions evolutionarily developed a number of unique biologically active compounds that provide them maximum protection against adverse effects from the environment. Studies have shown that these substances in the biomass of extremophiles are able to exert a protective effect on the human body. Currently, some preparations made from biomass extremophiles have passed extensive testing and put into practice. Others have been laboratory tested and showed high radio and chemo protective properties.

Mechanisms of therapeutic and prophylactic action of preparations from biomass of extremophiles on the human body and animals can be divided into several components, although, of course, that only their complex effect provides high efficacy.

1. Biomass of extremophiles contains harmoniously balanced mix of vitamins and minerals (macro and micronutrients). The use of this biomass as a food additive helps compensate the lack of them in the body, ensure the normal operation of enzyme systems and, therefore, vital to normalize metabolic processes that take place with the participation of enzymes.
2. Biomass of extremophiles contains a number of substances with antioxidant activity, able to bind free radicals and thereby prevent damage to the hereditary apparatus of cells, inhibit lipid peroxidation, provide unbiased information transmission during cell division and normal course of metabolic processes.
3. Extremophiles, in addition to known substances may synthesize and others unknown to science components that allow them to live in extreme conditions. These substances may provide the ability to increase resistance of human and animal damaging effects from radiation, toxic substances and other adverse environmental factors.
4. A number of substances synthesized by extremophiles, rarely gets into the human body, so the organism will recognize them not only as a source of matter and energy, but also as an unknown signal, for which there is no standard response program.
5. Unknown factors, for example, a complex set of biologically active compounds in the biomass of extremophiles, perceived as a signal for which there is no standard response program and the biological system by activating regulatory mechanisms seek to increase their productivity (in the general sense of this word) because increase in productivity is universal method to compensate for possible losses in the future.

6. It is known that drab food, for example, meat, bread and cereal absorbed about 75% and addition of vegetables increases the digestibility up to 85-90%. Biomass of extremophiles containing rich complex of vitamins, minerals, exotic proteins and lipids, which diversify food and increases its digestibility.

Technological principles of intensive cultivation of extreme microorganisms developed and tested in practice.

The project realization will be based on the results of the use of previously developed and practically proven preparations and principles, as well as broad cooperation between specialists in the field of microbiology, biotechnology, biophysics, biochemistry, genetics, and biomedical research.

Announced projects can be considered the initial stage of the program to develop a new class of biologically active substances. The project is expected to improve the technology of production known preparation from biomass halo bacteria. Is planned development of an industrial technology and biomedical tests of new preparation, code-named Radiobad.

Results obtained in preliminary studies on radio resistant microorganisms allow with a high degree of probability to suggest that the surprising combination of a number of biologically active compounds that help to survive radio resistant microorganisms in conditions of extremely high levels of radiation and contained in their dried biomass components caused positive action on human organism preventive health, and also caused radio protective efficacy of preparation made from this biomass.

It is shown that radiosensitive and chemo sensitivity microorganisms, placed in a culture medium in which was developed radio resistant microorganisms withstand the action of such a powerful oxidant, as hydrogen peroxide in concentrations harmful to these and many other organisms under normal conditions. Introduction in laboratory animals the biomass of radio resistant microorganisms prevented their death when exposed to ionizing radiation at a dose of LD100.

It should also be noted that chemically synthesized or separated by chemical methods from natural sources radio protective, chemo protective or immune corrective agents may be in some cases even more active than biomass of extremophiles, but they usually have

side effects and is usually are introduced into the body by injection that creates a series of inconveniences, whereas the biologically active food additives are harmless even at multiple overdoses.

During this project realization is planned to achieve the following objectives:

1. Steady the features of the mechanism of the protective action of drugs from the biomass of extremophiles and other microorganisms on the human body.
2. Develop optimized cultivation technology of extreme microorganisms.
3. Create a unified set of equipment for cultivation of microorganisms, including extremophiles.
4. Examine the process of disintegration of microorganisms after biosynthesis.
5. Develop conditions of gentle drying of biomass, preventing the loss of biological activity of the active ingredients.
6. Develop the technology of preparation suitable for use forms of biologically active agents.
7. Study the chemical composition of biomass components.
8. Conduction the laboratory and clinical trials to determine the efficacy of the actual dose.
9. Create the production of new class of biotech preparations with radio-, chemo protective and immune corrective action.

#### Expected results and their use

Realization of the project will permit:

1. Find the approaches to the study of patterns of evolutionary adaptations of living systems to extreme conditions.
2. Develop the technology of effective cultivation of extremal microorganisms in conditions of small-tonnage production.
3. Establish production of natural, effective and, at the same time, harmless drugs with chemo- and radio protective and immune corrective properties.
4. To rise human health status in unfavorable environmental conditions and employees of hazardous industries.

#### Scope of activities

1. Development of principles of biotechnological production of biologically active substances.

2. Dependence of the stability of organisms from content of composition of exotic inherent of extreme microorganisms biologically active compounds of long-chain carotenoids, ectoine, vitamin-mineral complexes and others.
  3. Development of high-performance technologies of little tonnage biosynthesis of biologically active substances.
  4. Development of methods for rapid analysis of the physiological state of microbial systems in the process of cultivation and their use for the effective management of processes directed biosynthesis.
  5. Increased production of biologically active compounds to increase the overall resistance of the human body to infections (SARS), the protection of public health in environmentally disadvantaged areas, as well as the health of workers and employees of hazardous industries
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### Technical approach and methodology

Will be applied and optimized intensity of the continuous cultivation of microorganisms using the latest achievements in the field of controlled biosynthesis of biologically active substances, based on existing experience of authors.

In the course of the project will be specified theoretical assumptions of increasing resistance due to exotic biologically active substances synthesized by extremophiles.

There is a basic collection of extreme microorganisms and experience their cultivation in the laboratory and experimental-industrial conditions.

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