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ABSTRACT BOOK

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Mammoth microfloras preserved in Yakutian permafrost

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Vital processes in the biosphere as the formation of atmospheric gas, soil fertility, the formation of groundwater and minerals, the mechanisms of food cycle and self-cleaning of the planet and many others are managed without the participation of microorganisms.

In the proposed research we present alive bacteria of Pleistocene age identified from microfloral elements related with mammoth fauna (e.g., Neustroev, 2007, 2010; Tarabukina et al., 2010). Microbiological studies of paleomicroflora extracted from Mokhsunuokhsk and Yukagir mammoths, Oimyakon and Khroma young mammoths and Kolyma woolly rhinoceros, the young mammoth of Yuka, the Yukagir horse and the Yukagir bison all preserved in permafrost, allow identification of a unique bacteria of the genus *Bacillus*, which not only survived (for 18-30 thousands of years), but retained the ability to produce biologically active substances. The results are as amazing as the preserved remains of fossil animals themselves.

Microbiological studies of fossil animals preserved in permafrost started in 2003, and in November 2004 the first results appeared, indicating the allocation of strains of bacteria of the genus *Bacillus* from tissues of Pleistocene mammoth that show biologically active properties. Later on, the allocation of *Bacillus* from microflora of mammoth fauna is confirmed by studies of the State Research Center of Biotechnology "Vector" (Novosibirsk, 2005), and the center of sanitary-epidemiological service of the Republic of Sakha (Yakutia) (Yakutsk, 2007), both specialized laboratories of the Anti-Plague Institute of Siberia and the Far East (Irkutsk, 2010).

The microbiological studies on soft tissues of Mokhsunuokhsk and Yukagir mammoths, Oimyakon and Khroma young mammoths, Kolyma woolly rhino, young mammoth of Yuka, and Yukagir horses and bison allow isolating 43 strains of microorganisms, including 26 strains of bacteria assigned to the genus *Bacillus*. According to biochemical, and physiological properties they are attributed to the species: *Bac. megatherium*, *Bac. subtilis*, *Bac. alvei*, *Bac. pumilis*, *Bac. brevis*, *Bac. popillae*, *Bac. steurothermophilus*, and *Bac. circulans*.

We studied the physiological and biochemical, antagonistic, antibiotic-resistant, and oil-oxidizing, properties including emulsifying and herbal stimulant ones. We investigated the electron microscopic morphological characteristics, by obtain scans of strains of *Bacillus*, isolated from representatives of the mammoth fauna (e.g., Tarabukina, 2005, 2007).

According to the results of our research, we can conclude a high antagonistic activity of strains of the isolated bacteria of the genus *Bacillus* in relation to opportunistic and pathogenic microorganisms, including toxigenic fungi. It should be noted that in the Pleistocene paleomicroflora there is no putrefactive microorganisms. The obtained results of microbiological research and observations suggest that strains of antagonist-bacteria of *Bacillus* dominating in paleomicroflora contribute to the preservation of soft tissues of mammoth fauna representatives, preserved in permafrost.

The study allowed for the first time to certify and deposit strains of bacteria *Bacillus subtilis* «Kolyma-7/2K» and *Bacillus subtilis* «Oimyakon-6/1», extracted from the Kolyma woolly rhinos and the Oimyakon young mammoth in the collection of microorganisms of the Russian Research of Agricultural Microbiology (St. Petersburg, 2010) for further modern biotechnological studies.

References

- Neustroev, M.P. 2007. Research of bacteria of genus *Bacillus*, recovered from the Yukagir mammoth (electronical-microscopic research). In N.P. Tarabukina, M.P. Neustroev, S.I. Parnikova, M.P. Fedorova, A.A. Bylgaeva, The Yukagir mammoth – Saint Petersburg: Saint Petersburg University publishing House, pp. 196-204.
- Neustroev, M.P. 2010. About prospects of microbiological researches on the representatives of the mammoth fauna, remained in a permafrost. Vth International Conference on Mammoths and their Relatives Mammoths and their Relatives from the Pliocene to Present-Day: Biotopes, evolution and human impact (le Puy-en-Velay (Haute-Loire, France), September 2010, 57-58.
- Tarabukina N.P. 2005. Research of bacteria of sort *Bacillus* allocated from the Yukagir Mammoth. Proceedings of the International Symposium on Yukagir Mammoth, June, 2005, Nagakute, Japan, pp.19.
- Tarabukina, N.P. 2007. The antagonistic properties of strains of the bacteria *Bacillus*, recovered from the Yukagir mammoth. In N.P. Tarabukina, M.P. Neustroev, S.I. Parnikova, M.P. Fedorova, A.A. Bylgaeva, The Yukagir mammoth – Saint Petersburg: Saint Petersburg University publishing House, 204-213.
- Tarabukina, N.P. M.P. Neustroev, M.P. Fedorova, S.I. Parnikova, M.M. Neustroev 2010. Yakutiya zoolite microflora. Vth International Conference on Mammoths and their Relatives Mammoths and their Relatives from the Pliocene to Present-Day: Biotopes, evolution and human impact (le Puy-en-Velay (Haute-Loire, France)- September 2010, 59-60.

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