The properties of paleosols as indicators of biosphere development gain increasing attention of researchers for evaluation of the possible consequences of global changes of environment and climate. Recently the subject of paleomicrobiome long-term sustainability mechanisms and transformation of microorganisms required for survival in subsurface sediments became a subject of great scientific interest. The question about functional activity and structure of microbiological community in subsurface sites remains open. Proven that microbiological community stays “preserved” and keeps original properties from the moment of burial, paleosols can be considered as natural collections of microorganisms and may have a great biotechnology potential.

### MATERIALS & METHODS

Subjects of the study were the buried subarkan paleosols (deposition depth 0.5 and 2.5 m, burial age 3500 and 4500 years respectively), modern chestnut soils and buried permafrost marine terrace sediments (deposition depth 9 m). The structure of the hydrolytic microbial complex was determined by the microcosm method with initiation of microbial succession by humidification and introduction of purified polysaccharides: chitin (ICN Biomedicals, Germany) and pectin (Sigma, Germany) at concentrations of 0.2%. Soil humidified with water (1 mL/5 g soil) without a substrate was used as a control. Bacterial cell numbers, mycelium length, and biomass of actinomycetes and fungi were determined by the fluorescence microscopy (Axioskop 2 plus, Zeiss, Germany) on days 0, 3, and 10. Diversity and abundance of metabolically active cells representing individual phylogenetic groups were determined using fluorescence in situ hybridization (FISH).

### APPLICATION OF PHYSIOLOGICAL AND BIOCHEMICAL METHODS FOR COMPARATIVE ANALYSIS OF THE FUNCTIONAL ACTIVITY AND COMPOSITION OF HYDROLYTIC MICROBIAL COMPLEXES OF MODERN AND BURIED CHESTNUT SOILS AND BURIED PERMAFROST SOILS

**AIM OF THE STUDY**

The comparative analysis of the functional activity and composition of hydrolytic microbial complexes of modern and buried chestnut soils and buried permafrost soils.

**RESULTS**

The absolute values of biomass in the control soil samples had a gradual decrease of the values with increasing age and depth of deposition of the samples, while the samples of buried soils and buried permafrost sediments responded much better to introduction of substrates (biomass increased 5–7 fold if compared to control) than the samples of modern soils. The fraction of cells identified as metabolically active was comparable in all soil samples (30–40% of the total cell number), except permafrost samples (10%). The rate of increase of the share of active microorganisms in both samples of buried soil and sediments was much higher than in the modern soils and the intensity of response correlated with the age and deposition depth of the sample.

### CONCLUSION

Active procaryote biomass after humidification and introduction of substrate (10^th day of the experiment) in samples of: A — modern soil; B — soil, buried ~3500 years ago; C — soil, buried ~4500 years ago; D — buried permafrost sediments.