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The determination of the real nano-scale sizes of bacteria in chernozem during microbial succession by means of hatching of a soil in aerobic and anaerobic conditions

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In recent years there's been particular attention paid to the smallest life's forms– bacteria which size can be measured in nanometer. These are the forms of bacteria with diameter of 5-200 nm. Theoretical calculations based on the content of the minimum number of DNA, enzyme, lipids in and ribosome in cells indicates impossibility of existence of a living cells within diameter less than 300 nm. It is theoretically possible for a living cell to exist within possible diameter of approximately 140 nm. Using a fluorescence microscope there's been indicated in a number of samples from lakes, rivers, soil, snow and rain water that 200 nm is the smallest diameter of a living cell. Supposingly, such a small size of bacteria in soil is determined by natural conditions which limit their development by nutritious substances and stress-factors. Rejuvenescence of nanobacteria under unfavourable natural conditions and stress-factors is studied in laboratory environment.

The object of the current study has become the samples of typical arable chernozem of the Central Chernozem State Biosphere Reserve in Kursk. The detailed morphological description of the soil profile and its basic analytical characteristics are widely represented in scientific publications. The soil is characterized by a high carbon content which makes up 3,96% ,3,8% , and 2,9% for the upper layers of the A horizon, and 0,79% for the layer of the B horizon. A microbial succession was studied under aerobic and anaerobic conditions by means of experiments with microcosms in upper A horizons and B horizon of a chernozem. The final aim is to identify the cells size of bacteria in aerobic and anaerobic soil conditions in chernozem during the microbial succession, by dampening and application of chitin by means of «cascade filtration» method. The study of the microcosms is important for understanding natural mechanisms in soil and will be useful for the development of new soil models in laboratory.

Thus, by means of «cascade filtration» method there've been made some results on true size, quantity and biomass of bacteria. Development of a bacteria in various soil horizons and their layers in aerobic and anaerobic conditions and calculations of biomass of bacteria in upper layer horizon A and lower layer horizon B have also become the subjects of the studies. It was identified that the quantity of bacteria in aerobic conditions increase during the microbial succession while bacteria sized 230 and 380 nm were dominating. In anaerobic conditions the process of connecting cells sized 170 nm and bacteria is observed. Biomass of bacteria is higher in anaerobic conditions in upper layer horizon A because of elevated variety of bacteria. In horizon B in anaerobic conditions it is of maximum because of anaerobic situation *in situ*. Thus, distribution of bacteria's size depends on aeration of soil. That helps to acknowledge the receipt of theory of a great number of researchers about that fact that the size of bacteria in the soil in anaerobic conditions decrease under stress-factors.

This work touches upon such a poorly investigated subject as nanobacteria in the soil. But this knowledge plays a significant role in land reclamation oil-cut and prognostication pollution of the soil by pathogenic bacteria.