

Host-parasite interactions in closed and open microbial cultivation system

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We studied interaction between bacteria and phages within a host-parasite system, the members of the system being continuously and closely cultivated. The objects of our research were auxotrophic strain *Brevibacterium* 22L and bacteriophage *Brevibacterium* sp., strain À, discovered in the soil of the Soviet Union Republic of Latvia using enrichment method.

1. Closed system. We investigated the dependence of bacteriolysis time upon the multiplicity of phage infection. It was shown that reduction of phage amount by one bacterium leads to increase of marked lysis. Another important factor, determining cytolysis in fluid medium, is the physiological state of bacterial population. Specific growth rate of bacteria at the moment of phage infection was chosen as the index of the physiological state of bacteria. It was revealed that the shortest latent period and the maximal phage burst is observed when the bacteria located in a favorable nutrient medium are in the logarithmic phase. If the bacterial population has already passed from the logarithmic phase to the stationary one, the cells become a “bad host” for phage reproduction, and lysis occurs very slowly or even never starts at all.

2. Open system. In the process of continuous cultivation the members of the host-parasite system showed an ability to coexist over a long period of time. After phage infection there were variations in the size of both populations, and then the density of the host population reached the level close to that of the uninfected culture. In this situation the phage population repeated the fluctuations of density of the host population, but in phase opposition. It was established that bacterial resistance to phage appears relatively easily. It is assumed that the first resistance has a physiological nature, because after lysis 0.2% of the initial number of cells in the population survived. This figure is rather high for phage-resistant mutants. It was shown that prolonged cultivation of the members of the host-parasite system leads to coevolution of bacteria and phages. Phage stress effect on a bacterium results in appearance of bacteria resistant to this phage, then a phage mutant appears which is able to lyse these bacteria, etc.