Effect of humic compounds on adsorption of virulent bacteriophages on host cells: case study for *Escherichia coli* and C600-9g, and *Staphylococcus aureus* A515 – bacteriophage phA515

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Bacteria and bacteriophages successfully coexist for more than two billion years. In addition to biological mechanisms, a significant contribution to this phenomenon is made by such a factor as the presence of humic substances (HS). It is particular importance for high-density ecosystems. The aim of this work was to assess contribution of HS into adsorption of bacteriophage on the surface of the host cell. We used two laboratory models of the host and virulent bacteriophage, nominally: *Escherichia coli* (str. C600) and bacteriophage *9g*, and clinical isolate *Staphylococcus aureus* (str. A515) and bacteriophage *phA515*. *E. coli C600* is a representative of Gram-negative bacteria, whereas *St. aureus A515* is a representative of Gram-positive microorganisms. Both host strains were first grown in LB medium overnight, diluted, was grown to logarithmic phase and then washed with M9 minimum medium. The cultures of bacteriophages were added to the cells with multiplicity of one phage particle per hundred cells. Then, the content of free phage was measured. Three HS samples were tested in this study: aqueous HA (SRHA), peat HA and coal HA. They were added to test media in concentrations of 100 µg/mL. For *E. coli C600 / 9g*, an increase in the bacteriophage single burst was observed: up to 1200 particles per cell compared to 800 in the control. In the presence of peat HA, the phage unit cycle did not change, but the yield of phage particles was five times larger than for SRHA. The presence of coal HA caused an increase in the amount of adsorbed phage particles and a decrease in the half-adsorption time of phage particles (from 5 to 2.5 min). For the *St. aureus A515 / phA515*, the presence of all HS samples caused an increase in the time of half-adsorption from 4 to 8 min, which might be associated with enhanced aggregation of the cells as compared to control. The presence of SRHA has also caused an increase in the release time of phage particles without an increase in the page yield per cell. In case of SRHA, it can be concluded that we observed an increase in the single burst time. Conclusion can be made that HS affect all most important environmental characteristics of bacteriophage. This may be important for explanation of the persistence of virulent bacteriophages and of their hosts in natural ecosystems. Some ways for a use of HS in controlling phage cycle might be suggested.