Project 3.13. Modulation of stability of virions – development of bacteriophage deactivation methods.

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Background:
Within hours a single bacteriophage can be multiplied in millions of copies inside bacteria utilizing biochemical machinery of the host. This usually results in death of bacteria. In each bacterial cell up to few hundreds copies are formed and released, what cause a bacteria killing cascade, which is difficult to stop. This has profound repercussions as bacteria based processes are one of the most important in biotechnology and dominate a number of branches of industry which exploit natural metabolic capabilities of bacteria to produce active substances. Possibility of genetic modification additionally broadens the application of bacteria in food industry, agriculture and medicine. Therefore, all factors, which may cause closures of bacteria-based factories cause millions of dollars in losses. It appears that phage infections are one of the biggest threats. it sometimes appears cheaper to abandon contaminated facility and built new one, than to fight recurring bacteriophage infections.
Second reason for deciding to focus on bacteriophages is a fact that among them are species (like bacteriophage MS2), which are great models for studying viruses attacking eukaryotic (also human) cells. As such they are great to study the methods for fighting viral infections. The knowledge gained upon realization of the project might be also utilized against pathogenic viruses attacking humans, helping to fight against numerous diseases.

Aim:
Project aims at deactivation of bacteriophages. The search of the appropriate agents will begin with polymers, modified polymers, nanoparticles and food additives. Also the effect of external fields (e.g. electric) will be evaluated. Developed agents will have low antibacterial effect to be appropriate to use directly in bioreactors. The project aims at explanation of mechanisms of phage deactivation outside of host cell and how developed agents facilitate them.

Requirements:
The project is highly interdisciplinary and combines essential methods of biotechnology, molecular biology, physical chemistry and nanotechnology. The successful candidate is expected to show scientific initiative, perform experiments independently, plan the workflow, maintain research notes and participate in the decision making process. He/she will need to build experimental setups, calibrate them, plan and perform control experiments and analyze the data. Contribution through regular reporting and publishing, taking part in and presenting at group meetings and conferences is mandatory.

From our experience the background in biotechnology would be appropriate, as it allows to adapt to both chemistry and biology tasks. However, applicants with other backgrounds will be also considered based on the possible input to the project (e.g. chemists, biologists, physicists, engineers or similar).
Ability to work independently as well as in a group and proficiency in English speaking and writing are required. Successful candidate is expected to contribute to the efficient functioning of the lab by providing help and supervision to junior members of the group and by fulfilling necessary administrative and organizational tasks.