Study reveals mechanisms of fighting pathogenic viruses

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Researchers of the KFU Omics Lab have succeeded in deciphering a Phi29-family virus genome. Junior researcher Raihan Shah Mahmud of Kazan Federal University says, "There is an immense number of viruses in nature, hundreds of times more than bacteria. Simply put, viruses are the most abundant and the least studied life form on Earth. There are viruses which are not dangerous to humans but can kill pathogenic bacteria, such as bacteriophages of the cholera germ or diphtheria. It is known that bacteriophages are very good at fighting pathogens if they have appropriate enzymes or biomolecules. Only sequencing of such non-pathogenic viruses can help us identify new biomolecules that may be of use against infectious bacteria. The importance of such work grows, because of increasing antibiotic resistance."

KFU has been working with such viruses for several years together with Giessen University. Non-pathogenic viruses usually infect bacteria in soil or in water, so it was previously impossible to extract their DNA. Dr. Mahmud says, "We worked on the project to find a unique gene present in all types of viruses, but we couldn't do that because viruses don't have such genes. The only way was to sequence a full genome. We managed to do that in a very laborious process. First, we couldn't fully separate a viral genome from a bacterial genome. The thing is that one small part remaining from other DNA can render the whole work unusable."

"For a year, we cleaned the genome and then successfully sequenced it on the third run. Now, we have the expertise in working with pathogenic viruses. It's a pioneering work in our region."

Giessen University, as a partner institution, gave KFU colleagues an opportunity to work with H1N1 flu, which causes swine flu. During his internship in Giessen Dr. Mahmud confirmed that there is a way to eliminate flu virus in cells in mere hours.

25 publications have been released so far within the project. KFU researchers chose binase as an antiviral agent – a bacterial enzyme which remains active in a human body for a longer time than animal enzymes. It can quickly disrupt viral RNA, which has been proved by Dr. Mahmud's experiments. Such a medication can be created, for instance, in the form of a nasal spray. The lab is also trying to find out if binase is effective in cancer treatment.

More information: Raihan Shah Mahmud et al, Ribonuclease from Bacillus Acts as an Antiviral Agent against Negative- and Positive-Sense Single Stranded Human Respiratory RNA Viruses, *BioMed Research International* (2017). DOI: 10.1155/2017/5279065

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