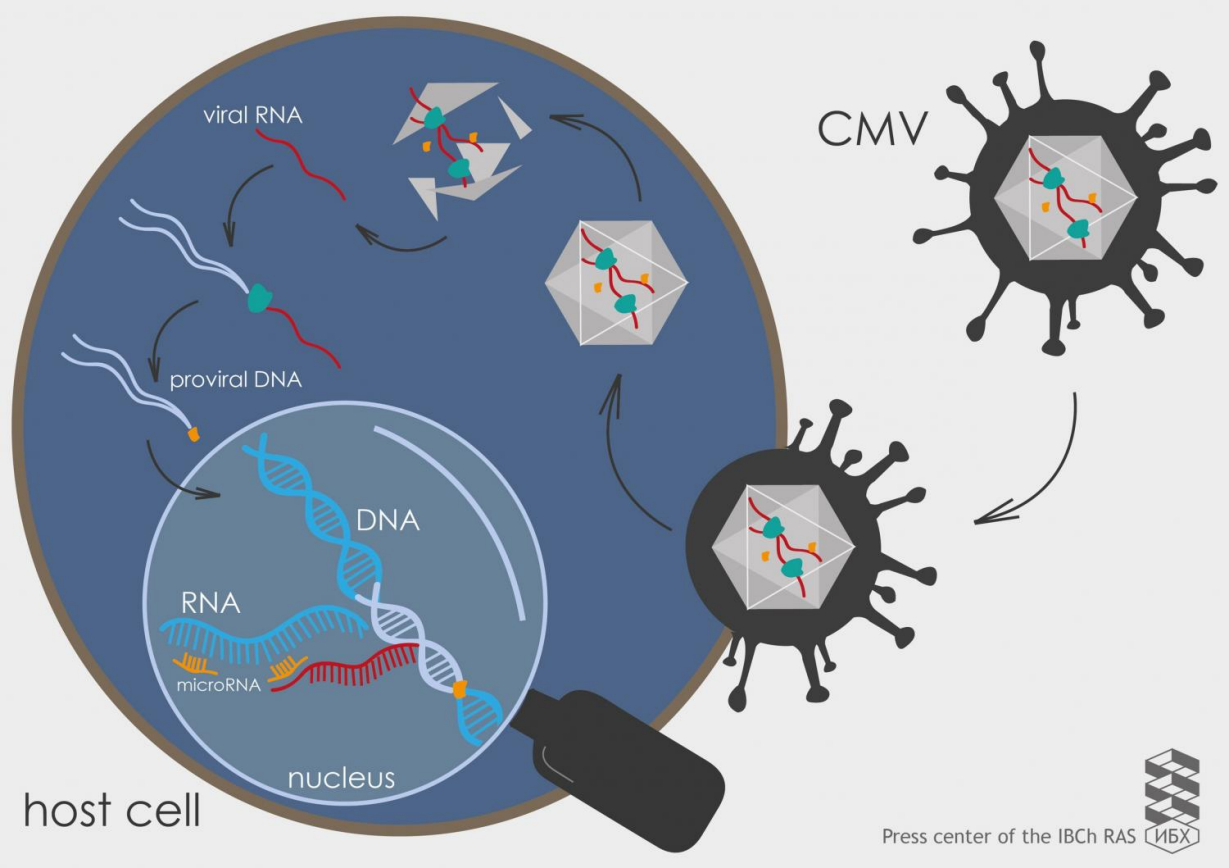
CMV infection 'disarms' the cell, inhibiting microRNA synthesis

December 13 2016



Credit: Institute of Bioorganic Chemistry of the Russian Academy of Sciences

An international research collaborative has discovered that in its early stages, CMV infection "disarms" cells, blocking their protective

mechanisms by inhibiting the synthesis of miRNAs. The results of this study were published in *Cell Cycle*, and may further be used as a basis for creating fundamentally new ways of combating viral Infection.

Cytomegalovirus infection (CMVI) is a viral disease characterized by a variety of clinical symptoms ranging from an asymptomatic latent flow to some severe cases that may be fatal. From the first year of birth, every fifth inhabitant of the planet becomes a carrier of CMV until somewhere near the age of 35. This constitutes about 40 percent of the global population and 90 percent of the demographic group below 59 years of age.

Using the OncoFinder and MiRImpact technologies, the researchers were able to carry out an in-depth study of the development of CMV Infection during the first three hours after infection.

Previously, the OncoFinder program actively assisted researchers in obtaining new knowledge on the development of a particular type of skin cancer – melanoma. OncoFinder allows researchers to quantify the activity of different types of molecular paths – a sequence of molecules that are involved in the transfer of information within a cell. The MiRImpact method can be regarded as a continuation of the OncoFinder technology. It enables both the quantitative and qualitative analysis of the impact of microRNAs on the activation of intracellular signaling pathways. MicroRNAs are short RNA molecules that, instead of encoding proteins, play the role of a particular genetic "censor," regulating genes by suppressing their activity. These "censors' also control foreign RNA capable of inducing viruses into the cell. Thus, microRNA influences all major physiological processes from development and growth to immune response and adaptation to stress.

By utilizing the OncoFinder MiRImpact methods, the scientists were able to detect "traces" of molecular pathways in the profiles of the two

main cell cultures of human fibroblasts (connective tissue cells). The first culture had a high sensitivity to CMV infection, and the second a low one. In the final analysis, both cell types were found to have widely differing paths for regulation the expression process (synthesis) on miRNA levels.

"What was surprising was the fact that in the infected, highly sensitive cells, we observed a 'freeze' of microRNA profile expression compared to the uninfected ones," remarks Anton Buzdin, PhD., of the Russian Academy of Sciences, one of the authors of the article.

These studies not only highlight the new features of the products for CMV infection, but also demonstrate the important role that CMV plays in interrupting microRNA the expression of the 'censor' that activates the protective mechanism of the cell. These findings may further be used as a basis for creating fundamentally new ways of combating viral Infection.

Other viruses have different ways of disarming the cell. For example, influenza virus has nonstructural protein 1, which prevents the maturation of the messenger RNA that inhibits the synthesis of proteins, including interferon.

More information: Anton A. Buzdin et al. Early stage of cytomegalovirus infection suppresses host microRNA expression regulation in human fibroblasts, *Cell Cycle* (2016). DOI: 10.1080/15384101.2016.1241928

Provided by Institute of Bioorganic Chemistry of the Russian Academy of Sciences