Luminous proteins offer new method to discover viral infections

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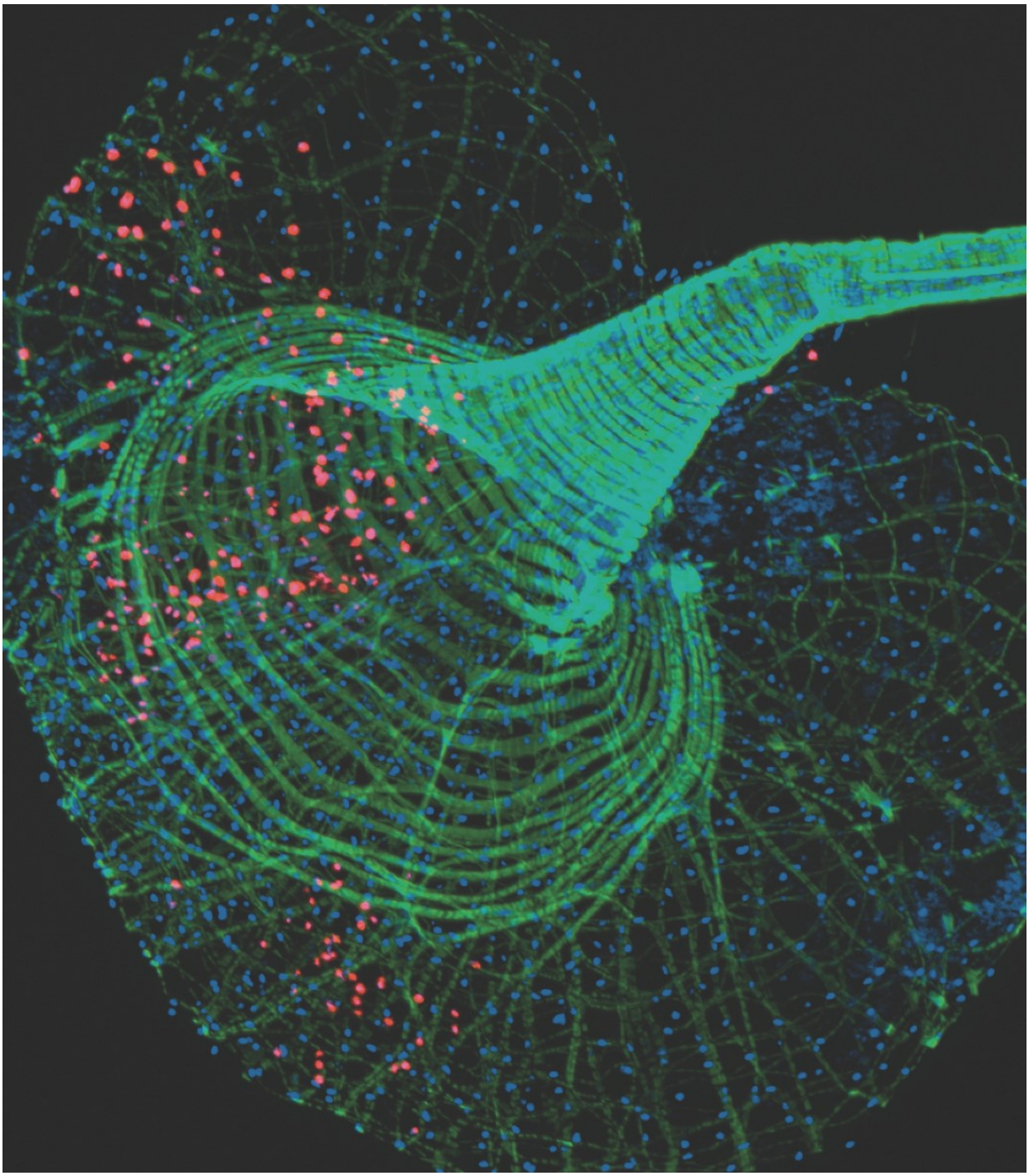

The stomach of a fruit fly infected by the Nora virus. Cell nuclei of virus infected cells are illuminated in red with the use of the new method. Cell nuclei of uninfected cells are blue and muscle cells in green. Credit: Jens-Ola Ekström

Researchers at Umeå University have developed a new method to directly follow viral infections in living organisms. This method can make infected cells produce fluorescent proteins, which means that they light up and become easier to identify. The method, which is described in the journal *Scientific Reports*, also makes it possible to activate other functions in infected cells, for instance to enhance the immune system.

"When a virus multiplies, it produces so-called proteases, which is a type of enzyme needed for the virus to cleave viral proteins into big enough chunks necessary to build new virus particles," says Dan Hultmark, researcher at the Department of Molecular Biology and one of the researchers behind the study. "Using genetic tricks, we are encouraging the virus enzyme into activating other functions in the cell instead."

With the use of this method, described in an article published today in *Scientific Reports*, it is possible to make virus-infected cells produce just about any protein desired. In this way, the researchers have made the infected cells produce a fluorescent protein that is easy to spot in a microscope.

"The method enables us to manipulate cells into producing proteins that are suspected to be involved in the immune system. That's why this method can be used to study in detail exactly what proteins are important for the immune system against viruses," says Jens-Ola Ekström, another researcher behind the discovery.

In order to better understand how viruses and cell proteins collaborate or counteract each other, the research team has studied the Nora virus in fruit flies. The Nora virus is a harmless intestinal virus that only affects fruit flies. But the virus is closely related to picornaviruses, which in humans cause diseases such as polio, intestinal infections, jaundice, eye infections and regular colds. In cattle, some picornaviruses cause foot-and-mouth disease. Knowledge of picornaviruses is therefore of great

importance both to health and economy. (The Nora virus should not be confused with the Norovirus, which causes winter vomiting disease in humans.)

Dan Hultmark, researcher at the Department of Molecular Biology and one of the researchers behind the study. Credit: Elin Berge

"The fruit fly is a well-known model organism used to understand human biology as it, like all other living organisms, has to fend off various viral infections. Even if the method is developed for fruit flies, it can most likely be adopted to other model systems," says Jens-Ola Ekström.

More information: Jens-Ola Ekström et al, A Novel Strategy for Live Detection of Viral Infection in Drosophila melanogaster, *Scientific*

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