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One Virus Particle Is Enough To Cause Infectious Disease

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Summary: Can exposure to a single virus particle lead to infection or disease? Until now, solid proof has been lacking. Experimental research with insect larvae has shown that one virus particle is theoretically enough to cause infection and subsequent disease.

FULL STORY

Can exposure to a single virus particle lead to infection or disease? Until now, solid proof has been lacking. Experimental research with insect larvae at Wageningen University and Simon Fraser University in Canada has shown that one virus particle is theoretically enough to cause infection and subsequent disease.

A virus population is usually composed of a collection of variants of virus particles. In order to investigate whether virus particles (virions) can cause an infection independently from each other, and therefore individually, the researchers set up an experiment with two 'marked' virus variants. They exposed a population of hosts (caterpillars) to both variants.

The experiment showed that exposure to a low dosage of virus particles resulted in a small number host infections (20%). The majority of these hosts (86%) turned out to be infected by a single virus genotype. In contrast, exposure to a high dosage of virus particles resulted in virtually all the hosts (99%) becoming infected, where most of the hosts were infected by both types of virus. Only 14% were infected by only one of the two variants.

Based on the assumption that every virus particle operates independently from all other virus particles, the researchers set up a probability model. This model predicts how many virus particles have caused an infection and how many different virus genotypes are present in infected hosts, such as plants, insects or people. The results of the infection experiment with the susceptible insects are in agreement with the model predictions. From this it can be derived that the virus particles have an independent effect, and that a single virus particle can indeed cause infection and/or disease.

If there are few virus particles that lead to an infection, the number of virus particles determines the degree of diversity that can be present within the host. This is an important finding because the interactions between virus variants, such as competition and exchanging genetic information, determine the progression of disease and the evolution of the virus.

Until now, it was unclear whether a virus must be seen as an individual that can infect a host independently, or whether a cloud of viruses 'cooperates' to cause an infection. It is not yet known if the viruses that affect people can also act individually, but this research shows that it is possible.

The researchers recently published this finding in the *Proceedings of the Royal Society B.*

Story Source:

Materials provided by **Wageningen University and Research Centre**. *Note: Content may be edited for style and length.*

Journal Reference:

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