

Lab diagnosis of viral infection

In the diagnostic laboratory virus infections can be confirmed by a multitude of methods.

1. Nucleic acid-based methods

Molecular techniques are the **most specific and sensitive** diagnostic tests. They are capable of detecting either the whole viral genome or parts of the viral genome.

A. Polymerase chain reaction (PCR)

Detection of viral RNA and DNA genomes can be performed using polymerase chain reaction. This technique makes many copies of the virus genome using virus-specific probes. Variations of PCR such as nested reverse transcriptase PCR and real time PCR can also be used to determine viral loads in patient serum. This is often used to monitor treatment success in HIV cases.

B. Sequencing

Sequencing is the only diagnostic method that will provide the full sequence of a virus genome. Hence, it provides the most information about very small differences between two viruses that would look the same using other diagnostic tests. Currently it is only used when this depth of information is required.

2. Microscopy based methods

A. Immunofluorescence or immunoperoxidase

Immunofluorescence or immunoperoxidase assays are commonly used to detect whether a virus is present in a tissue sample. These tests are based on the principle that if the tissue is infected with a virus, an antibody specific to that virus will be able to bind to it. To do this, antibodies that are specific to different types of viruses are mixed with the tissue sample.

After the tissue is exposed to a specific wavelength of light or a chemical that allows the antibody to be visualized.

B. Electron microscopy

Electron microscopy is a method that can take a picture of a whole virus and can reveal its shape and structure. It is not typically used as a routine diagnostic test as it requires a highly specialized type of sample preparation, microscope and technical expertise.

3. Host antibody detection

A person who has recently been infected by a virus will produce antibodies in their bloodstream that specifically recognize that virus. This is called humoral immunity. Two types of antibodies are important. The first called IgM is highly effective at neutralizing viruses but is only produced by the cells of the immune system for a few weeks. The second, called, IgG is produced indefinitely. Therefore, the presence of IgM in the blood of the host is used to test for acute infection, whereas IgG indicates an infection sometime in the past. Both types of antibodies are measured when tests for immunity are carried out.

Antibody testing has become widely available. It can be done for individual viruses (e.g. using an ELISA assay) but in automated panels that can screen for many viruses at once are becoming increasingly common.

4. Hemagglutination assay

Some viruses attach to molecules present on the surface of red blood cells, for example, influenza virus. A consequence of this is that – at certain concentrations – a viral suspension may bind together (agglutinate) the red blood cells thus preventing them from settling out of suspension.