

Culture

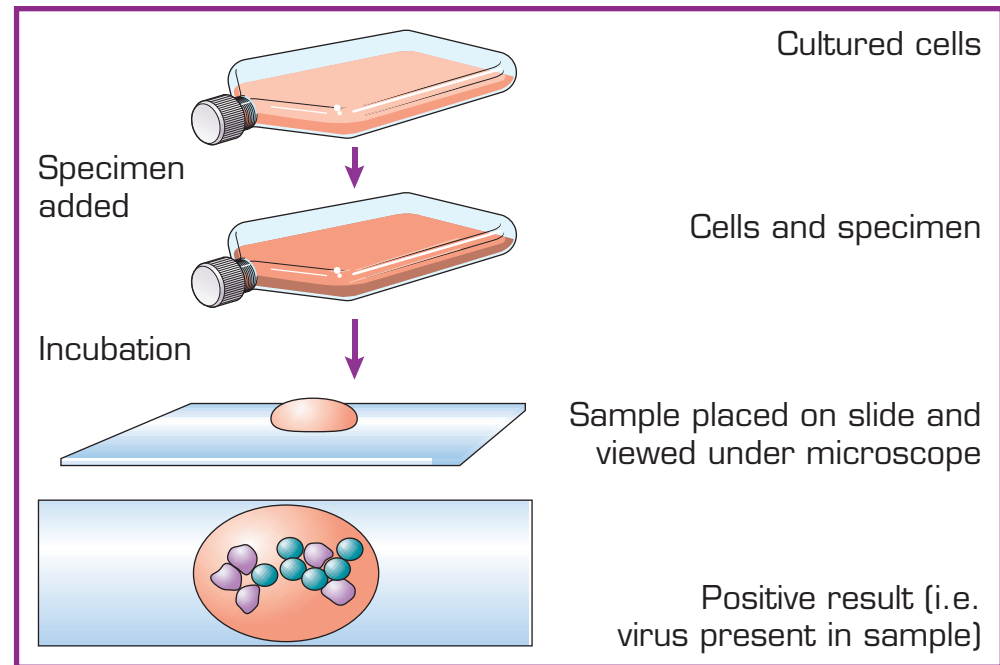
Because viruses are unable to reproduce independently, they must be grown in cell culture.³ Cell culture involves the use of cells, either human or animal, that can be grown in a laboratory. The specific cell type that is used depends on the suspected virus, since different cell lines support the growth of different viruses.²

A specimen of the suspected virus is added to the living cells, which are then examined under a microscope for any cytopathology.² A focus of cytopathology due to the effects of a single virus is called a plaque.² The type of cell line that supports the virus, the pattern of cytopathology and the speed of growth can all help in the preliminary identification of the virus.²

Cell culture can be used to assess the amount of virus present in a specimen by calculating:²

- *TCD₅₀ (tissue culture dose): the dose of the virus that causes cytopathology in 50% of cultured cells*
- *pfu (plaque forming unit) count: the number of infectious viral particles in a specimen assessed by a count of the plaques in serial dilutions of the cell culture.*

Although cell culture can provide useful information, it is not suitable for viruses that replicate very slowly in culture or for those that do not cause any cytopathology.²



Viral macromolecular synthesis continued

For single-stranded RNA viruses, the replication process depends upon the sense, positive or negative, of the RNA strand.

Positive-sense RNA strands act directly as mRNA to synthesise viral proteins.¹ One such protein, RNA polymerase, is able to produce a negative-sense template of the original positive-sense RNA strand, which can be used to generate copies of the viral genome.¹

Some positive-sense RNA viruses, known as retroviruses, are unable to produce RNA polymerase but instead carry an enzyme known as reverse transcriptase into the host cell.² Reverse transcriptase allows DNA to be produced from the mRNA template.² This DNA is integrated into host DNA and transcribed into mRNA copies of the original viral genome using the normal biochemistry of the host cell.²

Negative-sense RNA viruses must carry RNA polymerase into the host cell with their genetic material, since the first step in their replication is to produce mRNA, a function host cells can only perform from DNA, not RNA, templates.¹ Viral RNA polymerase is able to produce a strand of positive-sense mRNA, which can be used both to synthesise viral proteins and as a template to generate copies of the negative-sense genome.¹

Because viral replication differs from human cell replication, steps in these processes can provide useful targets for antiviral therapy. You will learn more about this in unit 3: Identification and eradication of viruses.

Replication of single-stranded RNA viruses

