

Baltimore Classification of DNA Viruses

Mustafa Gulum*

Department of Microbiology, Kahramanmaraş Sutcu Imam University, Kahramanmaraş, Turkey

DESCRIPTION

A DNA virus is one with a Deoxyribonucleic Acid (DNA) genome that is replicated by a DNA polymerase. They are split into two types: those with two strands of DNA in their genome, known as Double-Stranded DNA (dsDNA) viruses, and those with only one strand, known as Single-Stranded DNA (ssDNA) viruses. The most common kingdoms for dsDNA viruses are Duplodnaviria and Varidnaviria, whereas ssDNA viruses are nearly always assigned to Monodnaviria, which also includes dsDNA viruses. Many DNA viruses have no higher taxonomic classification. Viruses with a DNA genome that is replicated by a reverse transcriptase via an RNA intermediary are classified as reverse transcribing viruses and belong to the kingdom Pararnavirae in the realm Riboviria. The Baltimore classification system is used to categorise viruses together depending on how they synthesise Messenger RNA (mRNA), and it's frequently used in conjunction with traditional virus taxonomy, which is based on evolutionary history. There are two types of DNA viruses based on Baltimore, Double-stranded DNA viruses and single-stranded DNA viruses.

Double-stranded DNA viruses

The first type of DNA viruses are found in Baltimore is one with a double-stranded DNA genome. The mRNA of all dsDNA viruses is produced in a three-step process. A transcription preinitiation complex attaches to the DNA upstream of the transcription start site, allowing a host RNA polymerase to be recruited. The second step is, once the RNA polymerase has been recruited, it uses the negative strand as a template to create mRNA strands. Finally, when the RNA polymerase reaches a specific signal, such as a polyadenylation site, it stops

transcription. Several strategies are used by dsDNA viruses to copy their genome. Bidirectional replication is commonly used, in which two replication forks are created at a replication origin site and move in opposite directions. It's also usual to use a rolling circle mechanism to generate linear strands while proceeding in a loop around the circular genome. Finally, some dsDNA viruses multiply through a mechanism known as replicative transposition, which involves the replication of a viral genome in a host cell's DNA to another portion of the host genome.

Single-stranded DNA viruses

The second type of DNA viruses are found in Baltimore is single-stranded DNA genome. The transcription of ssDNA viruses is similar to that of dsDNA viruses. When a single-stranded genome enters a host cell, a DNA polymerase transforms it to a double-stranded form. After that, the double-stranded form is used to create mRNA. ssDNA viruses can form their double-stranded form either soon after entering a cell or during viral genome replication. The circular genomes of most ssDNA viruses are replicated by Rolling Circle Replication (RCR). An endonuclease binds to the positive strand and cleaves it, allowing the negative strand to be used as a template for replication by a DNA polymerase. By expanding the 3'-end of the positive strand, the endonuclease cleaves the positive strand again to generate a standalone genome that is ligated into a circular loop, replication progresses in a loop around the genome, displacing the prior positive strand. The newly synthesised ssDNA can be packaged into virions or replicated into a double-stranded form by a DNA polymerase, which can then be used for transcription or the replication cycle to continue.

Correspondence to: Mustafa Gulum, Department of Microbiology, Kahramanmaraş Sutcu Imam University, Kahramanmaraş, Turkey, E-mail: mgam12@gmail.com

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