

Reproduction of DNA viruses

The Genome of DNA viruses is usually linear ssDNA or dsDNA, or circular dsDNA. The genome of some bacterial viruses is made up of dsDNA with cohesive ends. However, it is linear only in the virion, it closes in the cell by means of cohesive ends and DNA ligase.

File:Schéma genomu SV40.png
Scheme of the SV40 virus genome

File:Schéma exprese
virových genomů 1.png
Scheme of viral DNA gene
expression (adenoviruses,
herpes viruses, poxviruses
- smallpox, papal viruses -
SV-40I)

Reproduction with the help of bacteriophages

Among **bacteriophages**, DNA viruses include e.g. T4 phage, and animal viruses include e.g. **adenoviruses**, some of which cause common respiratory infections, but others are oncogenic viruses. **Herpes viruses** are DNA viruses that cause known cold sores, as well as shingles and chickenpox. Epstein-Barr virus is the cause of infectious mononucleosis in our country, causing malignant Burkitt lymphoma in Africa. **Poxviruses** include smallpox. Some **papovaviruses** cause tumors (monkey virus SV40).

Reproduction programs

Lysis program (permissive cells)

DNA viruses reproduce according to two alternative programs. Virions are formed in so-called **permissive cells**, according to a **lytic** (productive) program. In the early phase of such a process, the proteins needed for replication of the nucleic acid and for regulation of the host proteosynthesis in favor of the virus are synthesized. In the late phase of the host cycle, virion components (coat proteins, viral nucleic acid, and several other molecules) are synthesized and assembled into virions in parallel with their synthesis. The cell filled with virions is then lysed.

- In the **lytic cycle**, half of this genome is active in **the early phase** of infection; a gene for the synthesis of a large protein that stimulates viral DNA replication is transcribed counterclockwise. When splicing mRNA for protein T, the termination codon is removed, but it is retained in the mRNA of the second early protein (small protein t). This is a classic case of alternative splicing and a demonstration of the regulatory significance of such a phenomenon. The other half of the genome is transcribed into RNA in **the later phase** and the coat proteins VP1, VP2 and VP3 are synthesized. The N-terminal sequence of VP3 is identical to the C-terminal sequence of VP2. The gene for VP1 is in the range of 22 nucleotides, it overlaps with the genes for VP2 and VP3, but is read in a different reading frame than the two genes. The SV40 genome is an example of the intensively used space to store genetic information.

Lysogenic program (nonpermissive cells)

In **nonpermissive cells**, virus reproduction is stopped, viral DNA in the host cell persists freely or is integrated into the host genome (latent infection, lysogenic program). Some cells thus infected with an animal virus may transform (*in vitro*), or degenerate into a tumor cell (*in vivo*).

- In **the lysogenic regime** of the SV40 virus, only early genes (T proteins) are expressed. Some of these cells are transformed *in vitro*, they begin to behave like tumor cells (they divide uncontrollably, their adhesion to glass decreases, etc.). Injection of these cells into the animal causes a tumor. The molecular mechanisms of these processes are intensively studied.

An example of a DNA virus is the simian virus SV40 containing circular dsDNA.

Links

Related articles

- Viruses
- Biochemistry of viruses
- DNA viruses
- RNA viruses
- Reproduction of RNA viruses
- Interferons

Template:Stručná biochemie (Štípek)

References

- ŠTÍPEK, Stanislav. *Stručná biochemie : uchování a exprese genetické informace*. 1. edition. Prague : Medprint, 1998. ISBN 80-902036-2-0.

