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Title: ICTV Virus Taxonomy Profile: Cystoviridae

Year: 2017

Version:

Please cite the original version:

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ICTV Virus Taxonomy Profile: *Cystoviridae*

Minna M. Poranen, 1,* Sari Mäntynen 2 and ICTV Report Consortium

**Abstract**

The family *Cystoviridae* includes enveloped viruses with a tri-segmented dsRNA genome and a double-layered protein capsid. The innermost protein shell is a polymerase complex responsible for genome packaging, replication and transcription. Cystoviruses infect Gram-negative bacteria, primarily plant-pathogenic *Pseudomonas syringae* strains. This is a summary of the International Committee on Taxonomy of Viruses (ICTV) Report on the taxonomy of the *Cystoviridae*, which is available at [http://www.ictv.global/report/cystoviridae](http://www.ictv.global/report/cystoviridae).

**Table 1. Characteristics of the family Cystoviridae**

<table>
<thead>
<tr>
<th>Typical member: Pseudomonas phage phi6 (Segment S, M12921; Segment M, M17462; Segment L, M17461), species Pseudomonas virus phi6, genus Cystovirus</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Virion</strong></td>
<td>Enveloped virions (~85 nm) with two concentric, icosahedrally symmetric protein layers: the nucleocapsid surface shell (T=13) and the polymerase complex core (T=1). Spikes protrude from the virion surface</td>
</tr>
<tr>
<td><strong>Genome</strong></td>
<td>Three segments of linear, double-stranded RNA, totaling 13.4 kbp, encoding 13 genes</td>
</tr>
<tr>
<td><strong>Replication</strong></td>
<td>Single-stranded genomic precursor molecules are packaged into the viral polymerase complex. The packaged RNA molecules are replicated and transcribed within the particle</td>
</tr>
<tr>
<td><strong>Translation</strong></td>
<td>Viral proteins are translated from polycistronic messenger RNA molecules</td>
</tr>
<tr>
<td><strong>Host range</strong></td>
<td>Gram-negative bacteria, mostly <em>Pseudomonas</em> species</td>
</tr>
<tr>
<td><strong>Taxonomy</strong></td>
<td>One genus (Cystovirus) and one species (Pseudomonas virus phi6)</td>
</tr>
</tbody>
</table>

**VIRION**

The spherical virion of a cystovirus has three structural layers (Fig. 1 and Table 1). The outermost layer is the lipid bilayer envelope, consisting of host-derived phospholipids [1] and four virally encoded integral membrane proteins (P6, P9, P10, P13). Host attachment spikes (formed by P3) are anchored to the envelope via fusogenic protein P6 (2). The envelope encloses the nucleocapsid, consisting of two concentric protein layers: the nucleocapsid surface shell and the polymerase complex (PC) core [2]. The nucleocapsid surface shell contains 200 copies of protein P8 trimers arranged into a T=13 icosahedral lattice [3]. The internal PC core consists of four protein species: the major structural protein P1, the RNA-dependent RNA polymerase P2 [4], the hexameric packaging NTPase P4 [5] and the assembly cofactor P7 [6]. The structural framework of the PC core is formed by 120 copies of protein P1, arranged as asymmetric dimers on a T=1 icosahedral lattice.

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Keywords: Cystoviridae; ICTV; taxonomy; Pseudomonas phage phi6.

Abbreviation: PC, polymerase complex.
loses the nucleocapsid and spikes attach on the virion genome-containing polymerase complex [6]. Finally, the assembly [2]. The nucleocapsid surface shell assembles on that direct the production of late proteins needed in virion ing in the predominant production of S and M transcripts ing the negative-strand synthesis within the core [6]. After form empty PC cores [6]. One copy of each type of tran- early proteins translated from the L transcript assemble to molecules are produced from each genome segment. The is semi-conservative [10] and produces full-length, polycis- transcription commences. Transcription is semi-conservative [10] and produces full-length, polycis- tronic copies of the genome segments (Table 1). Early in the infection approximately equal amounts of messenger RNA molecules are produced from each genome segment. The early proteins translated from the L transcript assemble to form empty PC cores [6]. One copy of each type of tran- script is packaged into an empty PC core, ultimately triggering the negative-strand synthesis within the core [6]. After replication, a second round of transcription initiates, resulting in the predominant production of S and M transcripts that direct the production of late proteins needed in virion assembly [2]. The nucleocapsid surface shell assembles on the genome-containing polymerase complex [6]. Finally, the envelope derived from the host plasma membrane [1] encloses the nucleocapsid and spikes attach on the virion surface. Ultimately, mature virions are released upon virus-induced host cell lysis [7].

**TAXONOMY**


**RESOURCES**


**Funding information**

The authors acknowledge funding from the Academy of Finland Fin-SynBio programme (grant 272507) and Finnish Centre of Excellence Program (the CoE in Biological Interactions, grant 252411). Production of this summary, the online chapter and associated resources was funded by a grant from the Wellcome Trust (WT108418AIA).

**Acknowledgements**

The authors acknowledge Professor Dennis Bamford, who has contributed to the description of the *Cystoviridae* family in the previous ICTV Reports. Members of the ICTV Report Consortium are Elliott J. Lefkovitz, Andrew J. Davison, Stuart G. Siddell, Peter Simmonds, Michael J. Adams, Donald B. Smith, Richard J. Orton and Andrew Kropinski.

**Conflicts of interest**

The authors declare that there are no conflicts of interest.

**References**