ICTV Virus Taxonomy Profile: Ampullaviridae
David Prangishvili, Mart Krupovic, Ictv Report Consortium

To cite this version:

HAL Id: pasteur-01977340
https://pasteur.hal.science/pasteur-01977340
Submitted on 10 Jan 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution 4.0 International License
ICTV Virus Taxonomy Profile: *Ampullaviridae*

David Prangishvili,* Mart Krupovic* and ICTV Report Consortium

**Abstract**

The family *Ampullaviridae* includes viruses with linear dsDNA genomes that replicate in hyperthermophilic archaea from the genus *Acidianus*. The virions have a unique champagne bottle-shaped morphology and consist of a nucleoprotein filament condensed into a cone-shaped core, which is encased by an envelope, with the base of the ‘bottle’ decorated with a ring of 20 filaments. Genome replication is presumably carried out by the virus-encoded protein-primed family B DNA polymerase. The bottle-shaped morphology is unprecedented among viruses of bacteria and eukaryotes and represents a group of archaea-specific virion morphotypes. This is a summary of the International Committee on Taxonomy of Viruses (ICTV) Report on the taxonomy of the *Ampullaviridae*, which is available at www.ictv.global/report/ampullaviridae.

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

<table>
<thead>
<tr>
<th>Typical member:</th>
<th>Acidianus bottle-shaped virus (EF432053), species Acidianus bottle-shaped virus, genus Ampullavirus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virion</td>
<td>Bottle shaped; 230 nm long, 4–75 nm wide; the flat terminus is decorated with 20 nm-long filaments; the envelope encases a cone-shaped nucleoprotein core</td>
</tr>
<tr>
<td>Genome</td>
<td>Linear, dsDNA (23,814 bp) with 590 bp terminal inverted repeats</td>
</tr>
<tr>
<td>Replication</td>
<td>Virus-encoded protein-primed family B DNA polymerase</td>
</tr>
<tr>
<td>Translation</td>
<td>Not characterized</td>
</tr>
<tr>
<td>Host range</td>
<td>Hyperthermophilic archaea from the genus <em>Acidianus</em>; non-lytic</td>
</tr>
<tr>
<td>Taxonomy</td>
<td>Single genus with a single species; two related genomes have been obtained from metagenomics studies</td>
</tr>
</tbody>
</table>

**VIRION**

The distinctive bottle-shaped virions are 230±20 nm long, and vary in width from 75 nm at the broad end, tapering to 4±1 nm. The twenty thin filaments at the broad end are each 20×3 nm, regularly spaced and interconnected via a basal disc or ring (Table 1, Fig. 1) [1].

A 9 nm-thick virion envelope encases a cone-shaped core formed by a toroidally supercoiled nucleoprotein filament, which is 7 nm in width.

**GENOME**

The genome is a linear double-stranded DNA molecule of 23,814 bp with 590 bp inverted terminal repeats. It has a base composition of 35% GC and is predicted to encode 57 proteins [2] (Fig. 2). Three genes contain...
putative internal start codons with ribosome-binding sites. The genome encodes a DNA polymerase, a putative glycosyltransferase, a thymidylate kinase, a Cas4-like endonuclease and two putative DNA-binding proteins with winged helix–turn–helix and ribbon–helix–helix motifs, respectively. All of these proteins are conserved in two other ampullavirus genomes described from metagenomics studies [3]. The other predicted proteins have no known homologues. The genome also encodes a putative non-coding RNA, hypothesized to be involved in genome packaging [2].

**REPLICATION**

The viral DNA polymerase is homologous to protein-primed family B DNA polymerases and is apparently responsible for genome replication [2]. Virus adsorption appears to occur through the pointed end of the virion [1]. The virions are released without apparent host cell lysis.

**TAXONOMY**

The single genus *Ampullavirus* includes the single species *Acidianus bottle-shaped virus*. Related, unclassified, viruses have been identified by metagenomics studies of material from hot springs in Iceland, Italy and the USA [3]. Protein-primed DNA polymerases homologous to that encoded by Acidianus bottle-shaped virus have also been described in members of the archaeal virus genera *Gammamepolipovirus* (family *Pleolipoviridae*) and *Salterproivirus*, as well as in bacterial and eukaryotic viruses of the families *Tectiviridae*, *Podoviridae* (subfamily *Picovirinae*), *Adenoviridae* and *Lavedaviridae* (genus *Mavir*) [4–6].