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ICTV Virus Taxonomy Profile: *Tristromaviridae*

David Prangishvili,^{1,*} Elena Rensen,² Tomohiro Mochizuki,³ Mart Krupovic^{1,*} and ICTV Report Consortium

Abstract

Tristromaviridae is a family of viruses with linear, double-stranded DNA genomes of 16–18 kbp. The flexible, filamentous virions ($400\pm 20\text{ nm}\times 30\pm 3\text{ nm}$) consist of an envelope and an inner core constructed from two structural units: a rod-shaped helical nucleocapsid and a nucleocapsid-encompassing matrix protein layer. Tristromaviruses are lytic and infect hyperthermophilic archaea of the order Thermoproteales. This is a summary of the International Committee on Taxonomy of Viruses (ICTV) Report on the *Tristromaviridae*, which is available at www.ictv.global/report/tristromaviridae.

Table 1. Characteristics of the family *Tristromaviridae*

| Typical member: <i>Pyrobaculum filamentous virus 1</i> (KU307456), species <i>Pyrobaculum filamentous virus 1</i> , genus <i>Alphatristromavirus</i> | |
|--|--|
| Virion | Filamentous, flexible ($400\pm 20\text{ nm}\times 30\pm 3\text{ nm}$) particle consisting of a nucleoprotein core covered by a matrix protein layer and enveloped with a lipid membrane; bundles of thin filaments are attached to both ends |
| Genome | Linear, double-stranded DNA genomes of 16–18 kbp |
| Replication | Viruses are lytic; virions are released by the rupture of the host cell envelope |
| Translation | Not characterized |
| Host range | Hyperthermophilic archaea of the order Thermoproteales |
| Taxonomy | One genus, two species |

VIRION

The virions are filamentous, $400\pm 20\times 32\pm 3\text{ nm}$ (Table 1, Fig. 1), and contain a lipid envelope and an inner core consisting of two structural units: (i) a rod-shaped helical nucleocapsid, formed of two major virion proteins (VP1 and VP2), each with a molecular mass of 14 kDa, and (ii) a nucleocapsid-encompassing protein sheath composed of a single virion protein (VP3) of 18 kDa [1]. The sheath layer is sandwiched between the nucleocapsid and the lipid envelope, akin to the matrix protein layer found in some eukaryotic, negative-sense RNA viruses. The virions also contain at least five minor proteins with molecular masses in the range of 11–30 kDa.

GENOME

The linear dsDNA genome of *Pyrobaculum filamentous virus 1* is 17 714 bp, including 60 bp terminal inverted repeats, and is predicted to encode 39 proteins (Fig. 2), most of which do not show similarities to the sequences in public databases [2]. Nine gene products of *Pyrobaculum filamentous virus 1* share significant sequence similarity

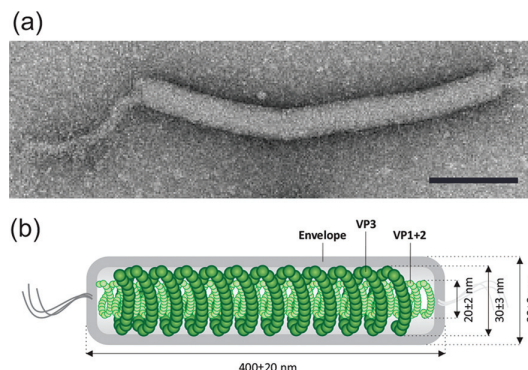


Fig. 1. (a) Electron micrograph of a virion of *Pyrobaculum filamentous virus 1* negatively-stained with 2% uranyl acetate. (b) Schematic of the virion organization with the position of the three major capsid proteins indicated. Modified with permission from [1].

with proteins encoded in the partially sequenced genome of *Thermoproteus tenax virus 1* [3, 4].

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Abbreviation: VP, Virion protein.

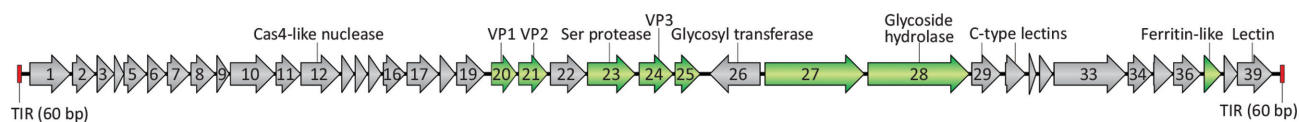


Fig. 2. Genome map of *Pyrobaculum filamentous virus 1* (17714 bp). Arrows indicate ORFs and the direction of transcription. Genes encoding structural proteins are shown in green. Terminal inverted repeats (TIR) are depicted by red rectangles. Modified with permission from [1].

REPLICATION

Virions bind to the host cell via the interaction of terminal protrusions with the host pili-like appendages. The viral genome is present in the host cells in a linear non-integrated form and mature virions assemble in the host cell lumen prior to release. The virus is lytic and virions are released by the rupture of the host cell envelope. The mechanism of genome replication remains unknown [1].

TAXONOMY

The family *Tristromaviridae* comprises a single genus, *Alphatristromavirus*, with two species. *Tristromaviruses* infect members of the hyperthermophilic archaeal order Thermoproteales. *Thermoproteus tenax virus 1* [5] infects members of the genus *Thermoproteus*, and *Pyrobaculum filamentous virus 1* infects members of the genus *Pyrobaculum*. *Thermoproteus tenax virus 1* was formerly classified in the family *Lipothrixviridae* [6].

RESOURCES

Full ICTV Report on the family *Tristromaviridae*: www.ictv.global/report/tristromaviridae.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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