# Template for Taxonomic Proposal to the ICTV Executive Committee
## To create a new Family

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|---|---|---|
| Code† | **2005.216V.04** | To create a new family* |
| Code† | **2005.217V.04** | To name the new family* ***Picobirnaviridae*** |
| Code† | **2005.218V.04** | To create a new genus in the family * ***Picobirnaviridae*** |
| Code† | **2005.219V.04** | To name the new genus* ***Picobirnavirus*** |
| Code† | **2005.220V.04** | To designate the followings as type species in the genus*: |
| | | ***Human picobirnavirus*** |
| Code† | **2005.221V.04** | To designate the following as species of the new genus*: |
| | | ***Human picobirnavirus***<br>***Rabbit picobirnavirus*** |
| Code† | **2005.222V.04** | To designate the following as unassigned isolates of the new genus*: |
| | | **Pig picobirnavirus**<br>**Guinea pig picobirnavirus**<br>**Rat picobirnavirus**<br>**Chicken picobirnavirus**<br>**Giant anteater picobirnavirus**<br>**Hamster picobirnavirus**<br>**Calf picobirnavirus**<br>**Foal picobirnavirus** |

† Assigned by ICTV officers
° Leave blank is not appropriate
* repeat these lines and the corresponding arguments for each genus created in the family

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## Old Taxonomic Order

**none**

## New Taxonomic Order

| | |
|---|---|
| ***Family*** | ***Picobirnaviridae*** |
| ***Genus*** | ***Picobirnavirus*** |
| ***Type Species*** | ***Human picobirnavirus*** |
| ***Species*** | ***Human picobirnavirus*** |
| | ***Rabbit picobirnavirus*** |
| ***Unassigned isolates*** | **Pig picobirnavirus** |
| | **Guinea pig picobirnavirus** |
| | **Rat picobirnavirus** |
| | **Chicken picobirnavirus** |
| | **Giant anteater picobirnavirus** |
| | **Hamster picobirnavirus** |
| | **Calf picobirnavirus** |
| | **Foal picobirnavirus** |

## ICTV-EC comments and response of the SG

Result: The arguments of this proposal were generally considered to be valuable, however, it should be reconsidered whether picobirnaviruses could not be regarded as a separate genus within the family *Birnaviridae*. There was also some discussion about the name (Arguments: 1. Similarity to name of *Picornaviridae*; 2. As *Picobirnaviridae* are dissimilar to the *Birnaviridae*, the proposed name would be confusing. Suggestion to SG: could a new name for the new genus be considered which would also make the name for the new family?). However, as a whole the proposal was accepted and moved to stage 02.

Response of the SG: We would like to create a new family with the additional following (unpublished) arguments: The capsid maturation and assembly appears to be very different between birna- and picobirna-viruses. The capsid protein gene of picobirnaviruses has been identified as constituted by the second ORF of the larger genomic segment. This ORF encodes a precursor that has no sequence identity with any other viral capsid proteins, and especially with the VP2 capsid protein of birnaviruses. Furthermore, picobirnavirus capsid protein results from a N-terminal self-cleavage of this precursor to give rise to a large peptide and the mature capsid protein. (For birnaviruses, the capsid protein derives from the processing of a polyprotein pVP2-VP4-VP3 that generates pVP2 (the capsid precursor), VP4 (the viral protease) and VP3 (an internal viral protein). The pVP2 is further processed by VP4 at its C-terminus to generate VP2 (the capsid protein), and 3 to 4 structural peptides.)

We would like to stick with the name Picobirnaviridae for the new family for the following reasons: 1- the name of the genus picobirnavirus is well established in the dsRNA virologist community; 2- if we propose another name for this family, that would also signify that we have to rename the unique genus in the new family, that should be very confusing, 3- it is of interest to conserve the “bi-rna” core in the name, 4- the number of publications on picobirnaviruses is very low (38 PubMed publications until now), thus confusion with the Picornaviridae family should not be a problem. Thus, we believe that choosing another name - such as Stenobirnaviruses (steno for small in greec)- should probably create more problems than sticking with the name Picobirnaviridae.

## Argumentation to create a new family:

Members of the picobirnavirus genus infecting humans and rabbits have been recently characterized by nucleotide sequencing. Their genome organization is deeply different from other members of the *Birnaviridae* family. The unique common feature is that all are bisegmented.

There is absolutely no sequence conservation at the nucleotide and amino acid level between the genomes and the encoded proteins of birnaviruses and picobirnaviruses. The two picobirnavirus genomic segments are smaller than those of birnaviruses (1.7kb and 2.5kb) versus (2.8kb and 3.3kb).

All birnaviruses (aqua-, entomo- and avi-) possess a very particular RNA polymerase, predicted as harboring a new 3D-fold, with a unique C-A-B motif arrangement (Gorbalenya et al., 2002). In contrast, picobirnaviruses polymerases contain the ubiquitous palm subdomain comprising the A-B-C motifs sequence found in RNA and DNA polymerases.

The genome organization is different: In picobirnaviruses, two or three ORFs in the large genomic segment are following each other with few or no overlaps, in contrast to all other birnaviruses (aqua-, entomo- and avi-) in which a large ORF (encoding a polyprotein) covers 90% of the segment length.

The structure of the capsid is different. Birnavirus particles have a T=13 *laevo* symmetry with a diameter of 65-70 nm. Picobirnavirus particles have a diameter of 35-40 nm with a triangulation of 1, 3 or 4.

Picobirnaviruses are only isolated in mammals. Birnaviruses (aqua-, entomo- and avi-) are never isolated in mammals. The only vertebrates that are hosts for birnaviruses are fish and two avian species: chicken and turkey.

No function has been assigned to the two proteins encoded by the large genomic segment, the small one encodes the RNA-dependent RNA polymerase.

## Origin of the proposed family name

The *picobirnavirus* genus would define the *Picobirnaviridae* family, a family containing only the *picobirnavirus* genus.

## References


**Picobirnavirus characterization:**

1. Martinez LC, Giordano MO, Isa MB, Alvarado LF, Pavan JV, Rinaldi D, Nates SV. Molecular diversity of partial-length genomic segment 2 of human picobirnavirus. Intervirology. 2003;46(4):207-13.
2. Wakuda M, Pongsuwanna Y, Taniguchi K. Complete nucleotide sequences of two RNA segments of human picobirnavirus. J Virol Methods. 2005 Jun;126(1-2):165-9.
3. Rosen BI, Fang ZY, Glass RI, Monroe SS. Cloning of human picobirnavirus genomic segments and development of an RT-PCR detection assay. Virology. 2000 Nov 25;277(2):316-29.
4. Green J, Gallimore CI, Clewley JP, Brown DW. Genomic characterisation of the large segment of a rabbit picobirnavirus and comparison with the atypical picobirnavirus of Cryptosporidium parvum. Arch Virol. 1999;144(12):2457-65.
5. Ludert JE, Abdul-Latiff L, Liprandi A, Liprandi F. Identification of picobirnavirus, viruses with bisegmented double stranded RNA, in rabbit faeces. Res Vet Sci. 1995 Nov;59(3):222-5.
6. See Wakuda et al., 2005 for the list of picobirnaviruses identified in different species and assigned here as Tentative species.

**Birnaviridae features:**

1. Gorbalenya AE, Pringle FM, Zeddam JL, Luke BT, Cameron CE, Kalmakoff J, Hanzlik TN, Gordon KH, Ward VK. The palm subdomain-based active site is internally permuted in viral RNA-dependent RNA polymerases of an ancient lineage. J Mol Biol. 2002 Nov 15;324(1):47-62.
2. Delmas et al. Birnaviridae In virus Taxonomy, eds Fauquet, Mayo, Maniloff, Desselberger, Ball, pp561-569.
3. Coulibaly F, Chevalier C, Gutsche I, Pous J, Navaza J, Bressanelli S, Delmas B, Rey FA. The birnavirus crystal structure reveals structural relationships among icosahedral viruses. Cell. 2005 Mar 25;120(6):761-72.


## Annexes: