

Template for Taxonomic Proposal to the ICTV Executive Committee

Creating Species in an existing genus

Code[†] To designate the following as species in the genus:

belonging to the family[°] :

Pheasant coronavirus
Goose coronavirus
Pigeon coronavirus
Duck coronavirus

[†] Assigned by ICTV officers

[°] leave blank if inappropriate or in the case of an unassigned genus

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Old Taxonomic Order

Order *Nidovirales*
Family *Coronaviridae*
Genus *Coronavirus*
Type Species *Infectious bronchitis virus*

Species in the Genus

Group 1 coronaviruses: transmissible gastroenteritis virus; canine coronavirus; feline coronavirus; human coronavirus 229E; human coronavirus NL63; porcine epidemic diarrhoea virus; bat coronavirus.

Group 2 coronaviruses: murine hepatitis virus; bovine coronavirus; canine respiratory coronavirus; porcine haemagglutinating encephalomyelitis virus; human coronavirus OC43; SARS-coronavirus.

Group 3 coronaviruses: avian infectious bronchitis virus; turkey coronavirus.

Tentative Species in the Genus

Unassigned Species in the family

New Taxonomic Order

Order *Nidovirales*
Family *Coronaviridae*
Genus *Coronavirus*
Type Species *Infectious bronchitis virus*

Species in the Genus

Group 3 coronaviruses: avian infectious bronchitis virus; turkey coronavirus; pheasant coronavirus; goose coronavirus; pigeon coronavirus; duck coronavirus.

Tentative Species in the Genus

Unassigned Species in the family

ICTV-EC comments and response of the SG

Species demarcation criteria in the genus

Currently all coronaviruses are within one genus, *Coronavirus*, which is divided into three Groups, 1, 2 and 3. The structural proteins of the species of one Group have <40% amino acid identity with the corresponding structural proteins of species in other Groups.

Species demarcation criteria within the genus have never been defined by the Study Group. In retrospect one can see that a coronavirus has been recognized as being a species on the basis of its known natural host e.g. porcine transmissible gastroenteritis virus (TGEV), feline coronavirus (FCoV) and canine coronavirus (CCoV). Subsequent research has shown that host ranges can be wider than implied by the virus' name. E.g. FCoV and CCoV can replicate in pigs, and sometimes cause pathology – although much less than classical infections by TGEV. Notwithstanding, these viruses remain recognized as individual species (within subgroup 1a of Group 1).

Argumentation to justify the designation of new species in the genus

The four avian coronaviruses of this proposal are clearly not only coronaviruses, but are also Group 3 coronaviruses. This is on the basis of sequence analyses.

In the case of *Pheasant coronavirus* (PhCoV), the sequences are of the genes encoding the spike protein, accessory proteins of genes 3 and 5, and the 3' untranslated region. These proteins of the pheasant virus have >80% amino acid identity with the corresponding proteins of *Infectious bronchitis virus* (IBV; of the domestic fowl – chicken) and (with the exception of the spike protein, the most variable protein) with the corresponding proteins of *Turkey coronavirus* (TCoV). Experimentally PhCoV can infect chickens, though without causing disease.

In the case of *Goose coronavirus*, *Pigeon coronavirus* and *Duck coronavirus* the sequences are of part of gene 1 (polymerase gene), nucleocapsid protein gene, and the 3' untranslated region. Phylogenetic analysis of the polymerase and nucleocapsid protein sequences has clearly shown that these three viruses are in Group 3. Indeed, the degree of identity for these two genes amongst the Group 3 viruses i.e. including the new proposed species, is greater than exhibited by Group 1 coronaviruses. These three avian coronaviruses also have high sequence identity in the 3' UTR when compared with each other and with IBV, TCoV and PhCoV, whereas none of the Group 3 viruses have any identity in the 3' UTR with the corresponding region of Group 1 and 2 coronaviruses. The *Goose coronavirus*, *Pigeon coronavirus* and *Duck coronavirus* are clearly distinct species from IBV, TCoV and PhCoV because they have one or two small unique ORFs between the nucleocapsid protein gene and the 3' UTR, unlike for IBV, TCoV and PhCoV, which have no such ORFs. The ORFs in question are each associated with a transcription associated sequence i.e. a messenger RNA would be made for each of them, resulting in translation; their presence would be expected to be biologically significant. None of the goose, pigeon or duck viruses could be propagated by inoculation of embryonated chicken eggs (allantoic cavity), further emphasizing that they are distinct from IBV and PhCoV.

List of created Species in the genus

Pheasant coronavirus

Goose coronavirus

Pigeon coronavirus

Duck coronavirus

Infectious bronchitis virus (already officially recognized within the genus)

Turkey coronavirus (already officially recognized within the genus)

References

Cavanagh et al., 2002, *Avian Pathology*, 31, 81-93, in respect of *Pheasant coronavirus*: sequence relationships with IBV and TCoV.

Jonassen et al. 2005, *Journal of General Virology*, 86, 1597-1607, in respect of the coronaviruses of goose, duck and pigeon: sequence relationships with representatives of all three coronavirus Groups.

Annexes:

None.