

# Template for Taxonomic Proposal to the ICTV Executive Committee To create a new Genus in an existing Family

Code<sup>†</sup>  To create a new genus in the family\*

Code<sup>†</sup>  To name the new genus\*

Code<sup>†</sup>  To remove from the list of unassigned in family *Myoviridae*  
*Pseudomonas phage φKZ*

Code<sup>†</sup>  To create as type species in the new genus the species named\*

Code<sup>†</sup>  To designate the following as species of the new genus\*:

Code<sup>†</sup>  To designate the following as tentative species in the new genus\*:

<sup>†</sup> Assigned by ICTV officers

\* repeat these lines and the corresponding arguments for each genus created in the family

## Author(s) with email address(es) of the Taxonomic Proposal

Krylov, Viktor N., MD  
State Research Institute of Genetics and Selection of Industrial Microorganisms, Moscow 117345,  
Russia, krylov@genetika.ru  
Ackermann, Hans-W., MD  
Department of Medical Biology, Faculty of Medicine, Laval University, Quebec, QC, G1K 7P4,  
Canada, ackermann@mcb.ulaval.ca

Family

Genus

Type Species

Species in the Genus

Tentative Species in the Genus

Unassigned Species in the family

## New Taxonomic Order

**Order**  
**Family**  
**Genus**  
**Type Species**  
**Species in the Genus**  
**Tentative Species in the Genus**  
**Unassigned Species in the family**

### **ICTV-EC comments and response of the SG**

Accepted. Move to 02. Before next consideration need to amend proposal to create and name phiKZ as a species in the newly created genus. Also need to change all instances of “ø” to “phi” as ICTV no longer recognizes Greek characters (rationale include that Genbank does not recognize Greek characters, and ascii characters for Greek characters not always fully compatible with different computer platforms/software). Proposal 2005.165B.01 should be removed as ICTV does not recognize isolates below species level. Of course, *Pseudomonas* phage 201-phi2-1 can be accepted as a species if appropriate.

### **Argumentation to choose the type species in the genus**

Phage phiZ is the best-known species of the genus.

### **Species demarcation criteria in the genus**

Species differ in DNA homology, restriction endonuclease patterns, and N-terminal sequences of the major capsid protein.

### **List of Species in the created genus**

*Pseudomonas* phage phiKZ  
*Pseudomonas* phage Lin68  
*Pseudomonas* phage EL

### **List of Tentative Species in the created genus**

--



## Argumentation to create a new genus:

Virions are very large (heads 120 nm in diameter, tails 184 nm long) and have tails surrounded by fibers. Heads contain a proteinic inner body and a genome of 280 kb with 306 ORFs, that differs from any bacteriophage genome known.

## Origin of the proposed genus name

Name of type species

## References

- Ackermann H-W, Cartier C, Slopek S, Vieu J-F. 1988. Morphology of *Pseudomonas aeruginosa* typing phages of the Lindberg set. *Ann Inst Pasteur/Virol* 139:389-404
- Bourkaltseva MV, Krylov VN, Pleteneva EA, Shaburova OV, Krylov SV, Volkart G, Sykilinda NN, Kurochkina LP, Mesyanzhinov VV. 2002. Phenogenetic characterization of a group of giant  $\phi$ KZ-like bacteriophages of *Pseudomonas aeruginosa*. *Genetika* 38:1470-1479; *Russ J Genet* 1242-1250
- Campbell JIA, Albrechtsen M, Sørensen J. 1995. Large *Pseudomonas* phages isolated from barley rhizosphere. *FEMS Microbial Ecol* 18:63-74
- Krylov VN, Smirnova TA, Minenkova IB, Plotnikova TG, Zhazikov IZ, Khrenova EA. 1984. *Pseudomonas* bacteriophage  $\phi$ KZ contains an inner body in its capsid. *Can J Microbiol* 30:758-762
- Krylov VN, Tolmachova TO, Akhverdyan VZ. 1993. DNA homology in species of bacteriophages active on *Pseudomonas aeruginosa*. *Arch Virol* 131:141-151
- Mesyanzhinov VV, Robben J, Grymonprez B, Kostyuchenko VA, Bourkaltseva MV, Sykilinda NN, Krylov VN, Volckaert G. 2002. The genome of bacteriophage  $\phi$ KZ of *Pseudomonas aeruginosa*. *J Mol Biol* 317:1-10

## Annexes:

# PhiKZ (original name $\phi$ KZ)

## Background

The *Myoviridae* family of tailed phages has 6 genera named after their type species: P1, P2, Mu, T4 (enterics), SPO1 (*Bacillus*), phiH1 (*Halobacterium*). These phages comprise no more than a small part of the known myoviruses and differ in every respect from phiKZ. In turn, phiKZ and its relatives do not resemble any other tailed phages (except very superficially in size).

## Proposals

1. To establish a new genus within the family *Myoviridae*.
2. To name this genus 'phiKZ-like viruses.'
3. To designate *Pseudomonas* phage phiK as the type species of this genus.
4. To designate *Pseudomonas* phage phiKZ as the type virus of this species.
5. To establish two more species, named Lin68 and EL, within the genus.
6. To designate *Pseudomonas* phages Lin68 and EL as type viruses of these species.

# **GENUS**        "**phiKZ-LIKE VIRUSES**"

*Type Species*        *Pseudomonas phage phiKZ*

## **Distinguishing Features**

Virions are very large and have tails surrounded by fibers. Heads contain a proteinic inner body and a genome of 280 kb that differs from any myovirus genome known.

## **Virion Properties**

### **Morphology**

Heads are icosahedra of 120 nm in diameter. Extended tails measure 184 x 20 nm and have a large collar, a base plate, and a fibrous network extending from the base plate and wrapped around the tail sheath. Heads contain a spring-like protein cylinder in addition to DNA.

### **Physicochemical and Physical Properties**

Infectivity is chloroform-resistant.

### **Nucleic Acid**

Genomes are ~280,000 bp in size, have a G+C content of 37%, and consist of 306 ORFs and 6 tRNAs. Unusual bases are absent. The genome of phage phiKZ has been fully sequenced. It contains many elements from other bacteriophages, eukaryote viruses, bacteria, and eukaryotic organisms.

### **Proteins**

Virions contain at least 40 proteins, five of which are strongly homologous collagen.

Lipids                      None known.

Carbohydrates None known.

## **Genome Organization and Replication**

Genomes are circularly permuted and terminally redundant and have a mosaic structure.

**Antigenic Properties**        **No group antigens are reported.**

## **Biological Properties**

Phages are virulent general transductants and specific for *Pseudomonas* bacteria. Most were isolated from soil. Plaques are extremely small (0.1 mm in diameter). Representatives have been found in many countries (USA, Russia, Georgia, Iran, Philippines).

## **List of Species Demarkation Criteria in the Genus**

Species differ in DNA homology, restriction endonuclease patterns, and N-terminal sequences of the major capsid protein. Species LU11 has spiral fibers laying along the tail shaft and particles sometimes present a double collar.

Official virus species names are in italics. Tentative virus species names, alternative names (), strains, or serotypes are not italicized. Virus names, genome sequence accession numbers [], and assigned abbreviations are:

#### SPECIES IN THE GENUS

<i>Pseudomonas phage phiKZ</i>		
Pseudomonas phage phiKZ	[AF399001]	(phiKZ)
Pseudomonas phage Lin21		
Pseudomonas phage NN		
Pseudomonas phage PTB80		
<i>Pseudomonas phage Lin68</i>		
Pseudomonas phage Lin68		(Lin68)
Pseudomonas phage LBG22		
<i>Pseudomonas phage EL</i>		
Pseudomonas phage EL	[AJ697969]	(EL)
Pseudomonas phage RU		

Similarity to Other Taxa            **Not reported.**

#### References

- Ackermann H-W, Cartier C, Slopek S, Vieu J-F. 1988. Morphology of *Pseudomonas aeruginosa* typing phages of the Lindberg set. *Ann Inst Pasteur/Virol* 139:389-404
- Bourkaltseva MV, Krylov VN, Pleteneva EA, Shaburova OV, Krylov SV, Volkart G, Sykilinda NN, Kurochkina LP, Mesyanzhinov VV. 2002. Phenogenetic characterization of a group of giant  $\phi$ KZ-like bacteriophages of *Pseudomonas aeruginosa*. *Genetika* 38:1470-1479; *Russ J Genet* 1242–1250
- Campbell JIA, Albrechtsen M, Sørensen J. 1995. Large *Pseudomonas* phages isolated from barley rhizosphere. *FEMS Microbiol Ecol* 18:63-74
- Krylov VN, Dela Cruz DM, Hertveldt K, Ackermann H-W. 2007. " $\phi$ KZ-like viruses, a proposed new genus of myovirus bacteriophages. *Arch Virol* DOI 10.1007/s00705-1037-7
- Krylov VN, Smirnova TA, Minenkova IB, Plotnikova TG, Zhazikov IZ, Khrenova EA. 1984. *Pseudomonas* bacteriophage  $\phi$ KZ contains an inner body in its capsid. *Can J Microbiol* 30:758-762
- Krylov VN, Tolmachova TO, Akhverdyan VZ. 1993. DNA homology in species of bacteriophages active on *Pseudomonas aeruginosa*. *Arch Virol* 131:141–151
- Mesyanzhinov VV, Robben J, Grymonprez B, Kostyuchenko VA, Bourkaltseva MV, Sykilinda NN, Krylov VN, Volckaert G. 2002. The genome of bacteriophage  $\phi$ KZ of *Pseudomonas aeruginosa*. *J Mol Biol* 317:1-19
- Serwer P, Hayes SJ, Zaman S, Lieman K, Rolando M, Hardies SC. 2004. Improved isolation of undersampled bacteriophages: finding of distant terminase genes. *Virology* 239:412-424

## COMMENTS

1. A G+C content of 48% that was reported in early work (1978 and 1980). This has been superseded by sequence data and is not cited.
2. I do not mention  $\phi$ KZ-like phages that were mentioned somewhere in the literature and then disappeared ( $\phi$ NZ, PMN17, see refs. Krylov et al., 1993; Sharibjanova, 1992; Sharibjanova et al., 1992) or which are as yet unpublished (phage 1615 or Ph-1615; Shaburova et al.).
3. The group was already called a genus (Bourkaltseva et al., 2002; Krylov et al., 2003)

## SUPPORTING MATERIAL

### Dimensions

References	Phage	Head, nm	Tail, nm
Ackermann 1988	21, 68	124	184 x 19
Krylov 1984	$\phi$ KZ	120	180 x 20
Krylov 1978	$\phi$ KZ	120	180 x 20
Adamia 1999	$\phi$ ST-1	140	240 x 30
Campbell 1995	Psp3	130	197
Serwer	201 $\phi$ 2-1	140?	200?

### References not to be cited in the Report:

Ackermann H-W. 2000.

*Myoviridae*. In: Classification and Nomenclature of Viruses. Seventh Report of the International Committee on Taxonomy of Viruses, 69-84. Eds. MHV van Regenmortel, CM Fauquet, DHL Bishop, E Carstens, MK Estes, S Lemon, J Maniloff, MA Mayo, DJ McGeoch, CR Pringle, R Wickner. Academic Press, San Diego, CA

Adamia R. 1999.

General mechanisms of phage-host bacterial cells' genomes interactions. PhD thesis, Academy of Sciences of Georgia, Tbilisi

Dela Cruz DM. 2004.

Comparative virulence and host range of phages of enterobacteria and related organisms. MSc thesis, University of Santo Tomas, Espana, Manila, Philippines

Krylov VN, Bourkaltseva MV, Sykilinda NN, Pleteneva EA, Shaburova OV, Kadykov VA, Miller S, Biebl M. 2004.

Comparisons of the genomes of new giant phages isolated from environmental *Pseudomonas aeruginosa* strains of different regions. Russian J Genet 40:363-368. Transl. from Genetika 40:462-468, 2004

Krylov V, Pleteneva E, Bourkaltseva M, Shaburova O, Volckaert G, Sykilinda N, Kurochkina L, Mesyanzhinov V. 2003.

*Myoviridae* bacteriophages of *Pseudomonas aeruginosa*: a long and complex evolutionary pathway. Res Microbiol 154:269-275

Krylov VN, Smirnova TA, Rebentish BA, Minenkova IB. 1978.

The structure of  $\phi$ KZ bacteriophage particle. Vop Virusol 1978 (5):568-571

Krylov VN, Zhazikov IZh. 1977.

*Pseudomonas* bacteriophage  $\phi$ KZ as a model for studying genetic control of morphogenesis. Genetika 14:678-685

Shaburova OV, dela Cruz DM, Krylov SV, Pleteneva EA, Bourkaltseva MV, Krylov VN, Ackermann H-W.

Comparison of giant bacteriophages specific for soil pseudomonads with *Pseudomonas aeruginosa* of the  $\phi$ KZ superfamily. In preparation.

Sharibjanova TO. 1992.

Investigation of *Pseudomonas aeruginosa* bacteriophages in view of their classification and the establishment of evolutionary relationships. Thesis, Moscow, Institute of Genetics and Selection of Industrial Microorganisms, Moscow

Sharibjanova TO, Akhverdyan VZ, Krylov NV. 1992.

A comparative study of DNA homology and morphology of *Pseudomonas aeruginosa* bacteriophages to reveal phylogenetic relationships. Genetika 28:24-32

Tyaglov BV, Krylov VN, Plotnikova TG, Minaev VE, Permogorov VI. 1980.

Some physicochemical properties of bacteriophage  $\phi$ KZ. Mol Biol (SSSR) 14:802-805 (transl.)