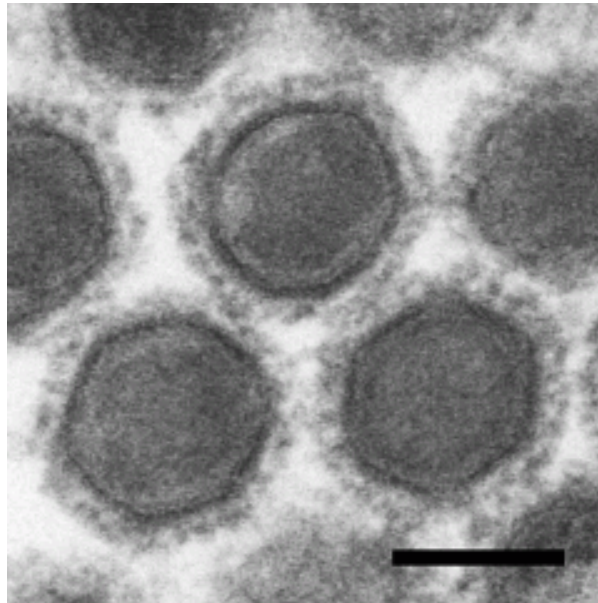


# Iridovirus

## Iridoviridae

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Chilo iridescent virus. ultrathin section of intracellular mature virus particles. Length of bar [nm]: 100.  
[courtesy of Hans R. Gelderblom]

## Virion

Morphology:	icosahedral
Envelope:	no
Diameter [nm]:	120–145
Length [nm]:	-
Structural components:	core, internal lipid membrane, capsid
Buoyant density [g/mL]:	1.26–1.33
Additional information:	a fringe of short fibrils (2.5 nm length) attached to the outer surface of the capsid reported in some isolates

## Genome

Nucleic acid:	DNA
Strandedness:	double-stranded
Polarity:	-
Configuration:	linear
Segments:	1
Size [kb]:	140–209
G+C content [%]:	28.7–31.7
Transcription units:	?
Additional information:	genome is circularly permuted and terminally redundant (12%); one isolate of IIV-1 reported to comprise two genomic components

## Replication Strategy

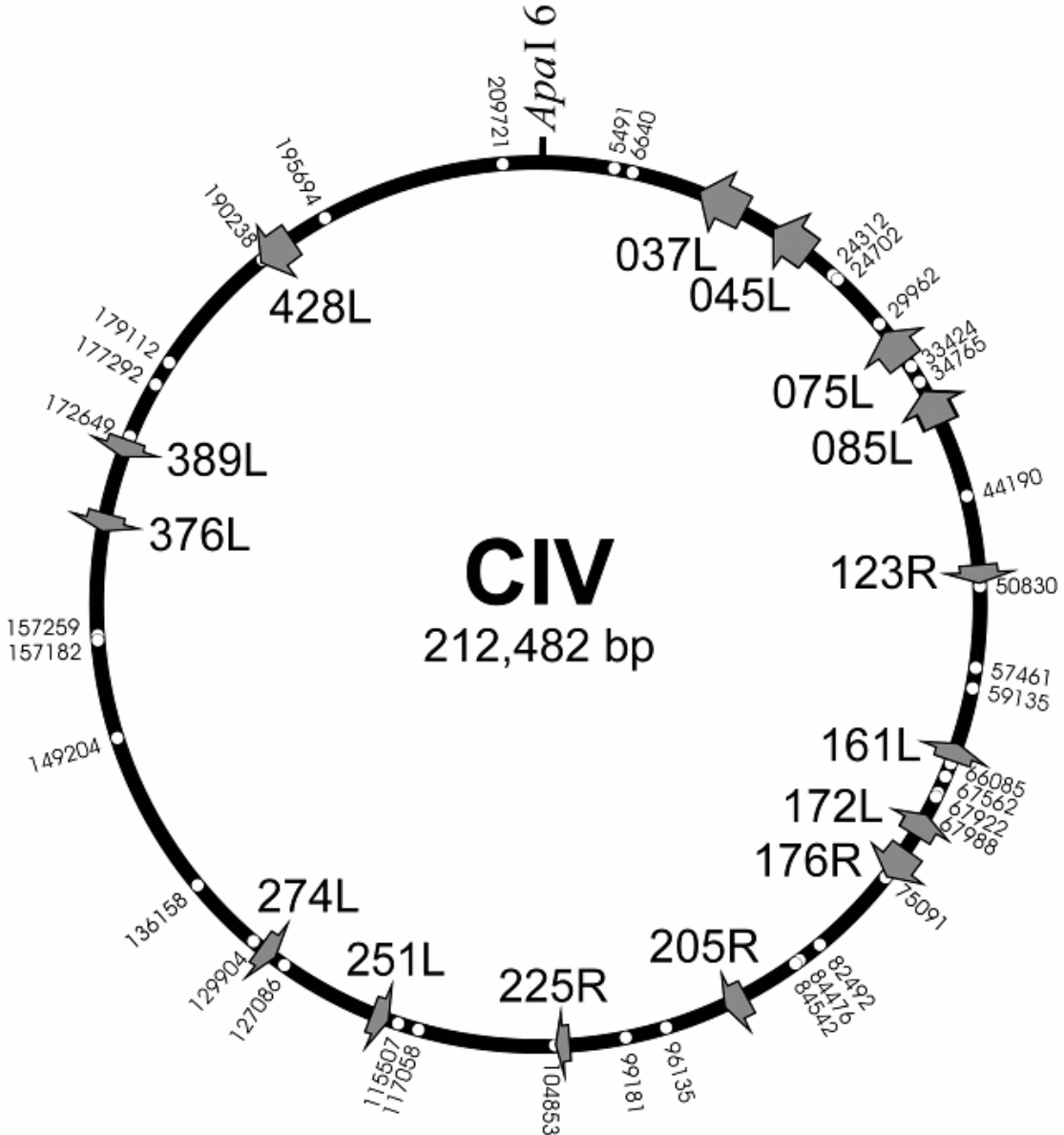
Entry mechanism:	viropexis via pinocytosis
Site of transcription:	nucleus
Transcriptase:	host RNA polymerase I and virus-encoded DNA-dependent RNA polymerase
Site of genome replication:	nucleus
Replicase:	probably by virus-encoded DNA-dependent DNA polymerase
Replication intermediate:	unknown
Site of virion assembly:	virogenic stroma in cytoplasm
Egress mechanism:	exocytosis through extrusion of particles in vacuoles, budding through cell membrane, cell lysis
Additional information:	particles form paracrystalline arrays in host cell cytoplasm

## History

Year	Event/Discovery	Reference
1954	First iridescent virus (IIV-1) infection reported in <i>Tipula paludosa</i> (Diptera) larvae in UK	Xeros N (1954) <i>Nature</i> 174:562–563
1957	Iridescence phenomenon shown to be due to crystalline arrangement of particles in host cells	Williams RC, Smith KM (1957) <i>Nature</i> 179:119–120
1958	Icosahedral particle structure demonstrated by double shadowing	Williams RC, Smith KM (1958) <i>Biochim biophys Acta</i> 28:464–469
1961	IIV-1 shown to have extended host range (by injection) compared to other insect viruses	Smith KM, et al. (1961) <i>Virology</i> 13:233–241
1963	A second iridescent virus (IIV-2) isolated from <i>Sericesthis pruinosa</i> (Coleoptera) in Australia	Steinhaus EA, Leutenegger R (1963) <i>J Insect Pathol</i> 5:266–270
1964	IIV-2 shown to be remarkably infectious by injection	Day MF, Mercer EH (1964) <i>Aust J Biol Sci</i> 17:892–902
1968	Iridescent virus DNA compared with Frog Virus 3 and Poxviruses	Bellett AJD, Fenner F (1968) <i>J Virol</i> 2:1374–1380
1969	Capsid shown to consist of protein subunits arranged in tri- and pentasymmetrons	Wrigley NG (1969) <i>J Gen Virol</i> 5:123–134
1970	System of nomenclature proposed to cope with growing number of reports of iridescent virus infections	Tinsley TW, Kelly DC (1970) <i>J Invertebr Pathol</i> 12:66–68
1971	Complex particle ultrastructure revealed in detailed EM studies	Stoltz DB (1971) <i>J Ultrastruc Res</i> 37:58–74
1973	First detailed laboratory study of transmission routes	Carter JB (1973) <i>J Invertebr Pathol</i> 21:136–143
1979	Serological relationships summarized	Kelly DC, et al. (1979) <i>J Gen Virol</i> 42:95–105
1984	Genome of IIV-6 shown to be circularly permuted and terminally redundant	Delius H, et al. (1984) <i>J Virol</i> 49:609–614
1985	Polypeptide complexity of IIV-6 revealed	Cerutti M, Devauchelle G (1985) <i>Virology</i> 145:123–131
1986	An isolate of IIV-1 shown to contain two DNA components	Tajbakash S, et al. (1986) <i>Biochem Cell Biol</i> 64:495–503
1988	Complex organization of repetitive DNA in genome of IIV-6 reported	Fischer M, et al. (1988) <i>Virology</i> 167:497–506
1990	Complete sequence of IIV-1 major capsid protein gene published	Tajbakash S, et al. (1990) <i>J Virol</i> 64:125–136
1993	Abundant inapparent infections reported in insect populations using PCR and insect bioassay	Williams T (1993) <i>Proc Roy Soc Lond B</i> 251:225–230
1994	Largest subunit of RNA polymerase II detected by DNA sequence analysis of IIV-6	Schnitzler P, et al. (1994) <i>J Gen Virol</i> 75:1557–1567
1994	Comparative genetic study of iridescent viruses performed; new nomenclature proposed	Williams T, Cory JS (1994) <i>J Gen Virol</i> 75:1291–1301
1997	One third of genome of IIV-6 sequenced	Bahr U, et al. (1997) <i>Virus Genes</i> 15:235–245
1998	Capsid protein partial sequences compared among 18 IIV isolates	Webby R, Kalmakoff J (1998) <i>Arch Virol</i> 143:1949–1966
1999	Impact of inapparent infection quantified in mosquitoes infected by IIV-6	Marina CF, et al. (1999) <i>Oecologia</i> 119:383–388
2000	Detailed ultrastructure of IIV-6 revealed	Yan X, et al. (2000) <i>Nat Struct Biol</i> 7:101–103
2001	Complete genome of IIV-6 sequenced	Jakob NJ, et al. (2001) <i>Virology</i> (in press)

## Genus Members

Species	Abbr.	Synonym(s)	Wild-type isolates	Host range	Membership status	Virus Code	
Invertebrate iridescent virus 6	IIV-6	Chilo iridescent virus (CIV)		insects (Lepidoptera)	type species	00.036.0.01.003	
Invertebrate iridescent virus 1	IIV-1	Tipula iridescent virus (TIV)		insects (Diptera)	approved member	00.036.0.01.002	
Invertebrate iridescent virus 2	IIV-2	Sericesthis iridescent virus (SIV)		insects (Coleoptera)	tentative member	00.036.0.81.005	
Invertebrate iridescent virus 9	IIV-9	Wiseana iridescent virus (WIV)	9, 10, 18	insects (Lepidoptera, Coleoptera)	tentative member	00.036.0.81.009	
Invertebrate iridescent virus 16	IIV-16	Costelytra zealandica iridescent virus (CzIV)		insects (Coleoptera)	tentative member	00.036.0.81.010	
Invertebrate iridescent virus 21	IIV-21	Heliiothis armigera iridescent virus (HaIV)	Invertebrate iridescent virus 28 (IIV-28)	insects (Lepidoptera, Hemiptera)	tentative member	00.036.0.81.011	
Invertebrate iridescent virus 22	IIV-22	Simulium iridescent virus (SIV)		insects (Diptera)	tentative member	00.036.0.81.012	
Invertebrate iridescent virus 23	IIV-23	Heteronychus arator iridescent virus (BBIV)		insects (Coleoptera)	tentative member	00.036.0.81.013	
Invertebrate iridescent virus 24	IIV-24	Apis cerana iridescent virus Bee IV		insects (Hymenoptera)	tentative member	00.036.0.81.014	
Invertebrate iridescent virus 29	IIV-29	Tenebrio molitor iridescent virus		insects (Coleoptera)	tentative member	00.036.0.81.015	
Invertebrate iridescent virus 30	IIV-30	Heliiothis zea iridescent virus (HzIV)		insects (Lepidoptera)	tentative member	00.036.0.81.016	
Invertebrate iridescent virus 31	IIV-31	Armadillidium vulgare iridescent virus	Isopod iridescent virus	IIV-31, IIV-32	Crustacea (Isopods)	tentative member	00.036.0.81.017
Anticarsia gemmatalis iridescent virus	AgIV			insects (Lepidoptera)	tentative member	00.036.0.81.004	



Genetic map of Chilo iridescent virus (IIV-6). arrows represent selected genes; numbers of open reading frames and positions of ApalI restriction sites are indicated inside and outside the circular map, respectively.

## Nucleotide Sequences

Genomic region	Virus species	Strain	Nucleotides	Accession number	Reference
complete genome	IIV-6		212482	AF303741	Jakob NJ, et al. (2001) Virology (in press)

## Proteins

Protein	Abbr.	MW [kDa]	Time of expression	Accession numbers	Additional information
DNA polymerase	DPOL, 037L (IIV-6)	147.7		AAD48150	putative protein (IIV-6)
topoisomerase II	TOPO2, 045L (IIV-6)	129.7		AAD48151	putative protein (IIV-6)
ATPase	075L (IIV-6)	30.2		AAB94422	putative protein (IIV-6)
ribonucleoside diphosphate reductase (large sub.)	RDR1, 085L (IIV-6)	108.8		AAB94427	putative protein (IIV-6)
protein-tyrosine phosphatase	123R (IIV-6)	16.4		AAB94448	putative protein (IIV-6)
helicase	161L (IIV-6)	50.8		AAB94470	putative protein (IIV-6)
global transactivator homolog	172L (IIV-6)	69.7		AAB94475	putative protein (IIV-6)
DNA-dependent RNA polymerase 1	DdRP1, 176R (IIV-6)	117.0		AAB94477	putative protein (IIV-6)
DNA ligase	205R (IIV-6)	70.2		AF303741	putative protein (IIV-6)
thymidylate synthase	225R (IIV-6)	34.0		AAD21329	putative protein (IIV-6)
thymidylate kinase	251L (IIV-6)	24.8		AF303741	putative protein (IIV-6)
major capsid protein	MCP, 274L (IIV-6)	49.0–52.0	late	P18162, Q05815, P22166	forms a heterotetramer in IIV-6
ribonucleoside diphosphate reductase (small sub.)	RDR2, 376L (IIV-6)	42.2		AF303741	putative protein (IIV-6)
serine-threonine protein kinase	389L (IIV-6)	47.7		AF303741	putative protein (IIV-6)
DNA-dependent RNA polymerase 2	DdRP2, 428L (IIV-6)	136.1		AF303741	putative protein (IIV-6)
L96 protein	L96	96	late	P22856	may be involved in packaging of IIV-1 genomic DNA

## Biology

Virus species	Permissive cell lines	Tissue tropism	Cytopathic effects	Additional information
IIV-1	Sf-9, Sf-21, C6/36, BTI-EAA	fat body, epidermis, haemocytes, muscle	cell fusion, cytoplasmic stroma, cell blebbing	reported to cause epidermal tumours in <i>Bombyx mori</i>
IIV-6	many insect cell lines	fat body, epidermis, haemocytes, gut, muscle	cell rounding, fusion, cytoplasmic stroma	very broad host range by injection

## Diseases

Disease	Causative agent	Affected organism	Characteristics	Route of transmission	Geographic distribution
patent IIV disease	all genus members	invertebrates, esp. insects	lavender or blue patent colour change followed by death	unknown	world-wide
sublethal IIV disease	IIV-6, IIV-22	Diptera, Ephemeroptera	reduced fecundity, longevity and body size, non-lethal	unknown	UK and Czech Republic

## Key References

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2. Delius H, et al. (1984) DNA analysis of insect iridescent virus 6: evidence for circular permutation and terminal redundancy. *J Virol* 49:609–614
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4. McMillan NAJ, Kalmakoff J (1994) *Virus Res* 32:343–352
5. Ward VK, Kalmakoff J (1991) In: Kurstak E (ed.) *Viruses of Invertebrates*. Marcel Dekker, NY, pp 197–226
6. Webby R, Kalmakoff J (1998) *Arch Virol* 143:1949–1966
7. Webby R, Kalmakoff J (1999) *Virus Res* 59:179–189
8. Williams T (1998) Invertebrate Iridescent Viruses. In: Miller L, Ball A (eds.) *The Insect Viruses*. Plenum Press NY, pp 31–68
9. Williams T, Cory JS (1994) *J Gen Virol* 75:1291–1301