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The Telostei Immunoglobulin Light IGL1 and IGL2 V, J and C Genes

Sylvaine Artéro Marie-Paule Lefranc

Laboratoire d'ImmunoGénétique Moléculaire, CNRS, Université Montpellier II, Montpellier, France

Key Words
Teleostei · IMGT · Immunglobulin · Light variable genes · Light joining genes · Light constant genes

Abstract
'Teleostei Immunoglobulin Light IGL1 and IGL2 V, J and C Genes', the 12th report of the 'IMGT Locus in Focus' section, comprises 8 tables: (1) 'Teleostei IGL1V genes'; (2) 'Teleostei germline IGL1J genes'; (3) 'Teleostei IGL1C genes and alleles'; (4) 'Teleostei IGL2V genes'; (5) 'Teleostei germline IGL2J genes'; (6) 'Teleostei IGL2C genes and alleles'; (7) 'FR-IMGT and CDR-IMGT length of the Teleostei IGL1V genes', and (8) 'FR-IMGT and CDR-IMGT length of the Teleostei IGL2V genes'. These tables are available on the IMGT Marie-Paule page from **IMGT,** the international ImMunoGeneTics database (**http://imgt.cines.fr:8104**) created in 1989 by Marie-Paule Lefranc, Université Montpellier II, CNRS, France.

Introduction

'Teleostei Immunoglobulin Light IGL1 and IGL2 V, J and C Genes' is the 12th report of the 'IMGT Locus in Focus' section launched in the April 1998 issue of *Experimental and Clinical Immunogenetics* [1]. We have previously reported the complete repertoire of the human germline V and J genes of the immunoglobulin IGK and IGL and of the T cell receptor TRA loci [2–6], and that of the human germline V, D and J genes of the immunoglobulin IGH and of the T cell receptor TRB loci [6–10]. This 12th report on teleostei immunoglobulin light IGL1 and IGL2 V, J and C genes describes the current data for 5 species of teleosts and comprises 8 tables: (1) 'Teleostei IGL1V genes'; (2) 'Teleostei germline IGL1J genes'; (3) 'Teleostei IGL1C genes and alleles'; (4) 'Teleostei IGL2V genes'; (5) 'Teleostei germline IGL2J genes'; (6) 'Teleostei IGL2C genes and alleles'; (7) 'FR-IMGT and CDR-IMGT length of the Teleostei IGL1V genes', and (8) 'FR-IMGT and CDR-IMGT length of the Teleostei IGL2V genes'. These tables are available on the IMGT Marie-Paule page from **IMGT**, the international ImMuno GeneTics database (**http://imgt.cines.fr:8104**) created in 1989 by Marie-Paule Lefranc, Université Montpellier II, CNRS, France [11, 12]. Teleostei IGL1 and IGL2 genes have a temporary designation based on the IMGT gene name nomenclature rules for the unmapped genes, the incomplete loci, or the cDNAs in the absence of germline genes. Descriptions of functionality (functional, open reading frame, pseudogene) are according to the IMGT Scientific chart [11, 12], available on the IMGT Marie-Paule page.

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Prof. Marie-Paule Lefranc, Université Montpellier II
Lab. d'ImmunoGénétique Moléculaire, LIGM, UPR CNRS 1142, IGH
141, rue de la Cardonille, F–34396 Montpellier Cedex 5 (France)
Tel. +33 4 99 61 99 65, Fax +33 4 99 61 99 01
E-Mail lefranc@ligm.igh.cnrs.fr, IMGT: http://imgt.cines.fr:8104

Table 1. Teleostei IGL1V genes

Fct: FUNCTIONALITY **P**: Pseudogene **vg**: Vestigial **T**: Transcribed
F: Functional **ORF**: Open Reading Frame **R**: Rearranged **Pr**: Translated into protein

"+" or "-" indicates if the gene sequences have been found (+) or not been found (-) rearranged (R), transcribed (T), and/or translated into protein (Pr).
There are two light chain types in Channel catfish (*Ictalurus punctatus*). By homology, there are probably two light chain types in the other Teleostei, the corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL1V subgroup	IGL1V gene name (1)	Fct	R	T	Pr	Reference sequences	Accession numbers	Sequences from the literature
Channel catfish	1	IGL1V1S1	(F)	+	+		PF12	U25703 [3](4) #c	
(Ictalurus punctatus) (2)		IGL1V1S2	P(3)	+	+		PF17	U25704 [3] #c	
		IGL1V1S3	(F)	+	+		PF8	U25705 [3] #c	
Common carp	1	IGL1V1S1	(F)	+	+			AB015897 [4](5) #c	
(Cyprinus carpio)		IGL1V1S2	(F)	+	+		Cpa2	AB015898 [4] #c	
		IGL1V1S3	(F)	+	+		Cpa3	AB015899 [4] #c	
		IGL1V1S4	(F)	+	+		Cpa4	AB015900 [4] #c	
		IGL1V1S5	(F)	+	+		Cpa5	AB015901 [4] #c	
Rainbow trout	1	IGL1V1S1	(F)	+	+		rtSg E	X65260 [1] #c	
(Oncorhynchus mykiss)		IGL1V2S1	(F)	+	+		rtSg 10	X68517 [1] #c	
		IGL1V3S1	(F)	+	+		rtSg 3	X68519 [1] #c	
		n.a. (6)	(F)	+	+		rtSg 6	X68521 [1](6) #c	
Spotted wolffish	1	IGL1V1S1	(F)	+	+		c1	AF137397 [2] #c	
(Anarhichas minor)	2	IGL1V2S1	(F)	+	+		c10	AF137398 [2] #c	

#c: Rearranged cDNA.
n.a.: Not assigned

IMGT notes:

(1) Teleostei variable genes are designated by the locus three letter root, followed by the number 1 or 2 for the chain type, followed by the letter V, the subgroup number, the letter S and a number.
Except if indicated, there is no correspondence between IGL1V subgroups and IGL1V gene names between taxons.
(2) The IGL1 and IGL2 light chain types in IMGT correspond to the light chains designated as G and F, respectively in [3].
(3) In frame STOP-CODON in the FR3-IMGT.
(4) Partial V-REGION: partial FR1-IMGT in 5' (AA 1 to 11 are absent).
(5) Insertion of 1 amino acid between position 32 and 33 in CDR1-IMGT (32 A)
(6) Partial V-REGION: Partial in 5', FR1-IMGT, CDR1-IMGT and FR2-IMGT are missing.

References:

[1] Daggfeldt, A. et al., Immunogenetics, 38, 199-209 (1993).
[2] Espelid, S. et al., unpublished (1999).
[3] Seyed, H. et al., J. Immunol., 159, 250-258 (1997).
[4] Tomana, M. et al., unpublished (1998).

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Table 2. Teleostei germline IGL1J genes

Fct: FUNCTIONALITY
F: Functional
P: Pseudogene

ORF: Open Reading Frame
vg: Vestigial
R: Rearranged
T: Transcribed
Pr: Translated into protein

"+" or "-" indicates if the gene sequences have been found (+) or not been found (-) rearranged (R), transcribed (T), and/or translated into protein (Pr).
Arbitrarily that information is shown on the first line of each gene when the data have been confirmed by several studies.
There are two light chain types in Teleostei (teleost fishes). The corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL1J name	Fct	R	T	Pr	Reference sequences	Accession numbers	Sequences from the literature
Channel catfish *(Ictalurus punctatus)* (2)	IGL1J1	F				FW15	U25699 [2](1)	
	IGL1J2	F				FWS2	U25700 [2](1)	FWS26[U25702][2](1)
	IGL1J3	F				FWS20	U25701 [2](1)	
Rainbow trout *(Oncorhynchus mykiss)*	IGL1J1	F				rtSg 4	X68520[1](1)	rtSg 9[X68522][1]

IMGT notes:

(1) "Germline transcript".
(2) The IGL1 and IGL2 light chain types in IMGT correspond to the light chains designated as G and F, respectively in [2].

References:

[1] Daggfeldt, A. et al., Immunogenetics, 38, 199-209 (1993).
[2] Seyed, H. et al., J. Immunol., 159, 250-258 (1997).

Table 3. Teleostei IGL1C genes and alleles

FUNCTIONALITY
F: Functional
P: Pseudogene
ORF: Open Reading Frame

There are two light chain types in Teleostei (teleost fishes). The corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL1C gene name (1)	Fct	Reference sequences	Accession numbers	Sequences from the literature
Atlantic cod ***(Gadhus morhua)***	IGL1C1S1	F	cHg L5	X68514 [1]	
	IGL1C1S2	F	cSg L2A	X68515 [1] c	
	IGL1C1S3	F	cSg L6L	X68516 [1] c	
	IGL1C1S4	F	cSg L16V	X76517 [1] c	
	IGL1C1S5	F	cHg 1.1	X68511 [1](3) c	
	IGL1C1S6	F	cHg L10	X68512 [1](4) c	
	IGL1C1S7	F	cHg L2L	X68513 [1](5) c	
Channel catfish ***(Ictalurus punctatus)*** (2)	IGL1C1S1	F	FWS15	U35999 [3](9) c	
	IGL1C1S2	F	PF17	U35704 [3] c	
	IGL1C1S3	F	PF8	U35705 [3] c	
	IGL1C1S4	F	FWS2	U35700 [3](9) c	
	IGL1C1S5	F	FWS20	U35703 [3](9) c	
	IGL1C1S6	F	PF12	U35709 [3](9) c	
	IGL1C1S7	P(10)	FWS26	U35703 [3](9) c	
Common carp ***(Cyprinus carpio)***	IGL1C1S1	F	Cpb1	AB015902 [4] c	[AB015697][4](6) c
	IGL1C1S2	F	Cpb2	AB015903 [4] c	
	IGL1C1S3	F	Cpb3	AB015904 [4] c	Cpa6[AB015696][4](6) c
	IGL1C1S4	F	Cpb4	AB015905 [4] c	
	IGL1C1S5	F	Cpa3	AB015899 [4] c	Cpa4[AB015900][4](6) c, Cpa5[AB015901][4](6) c

Table 3 (continued)

Rainbow trout ***(Oncorhynchus mykiss)***	IGL1C1S1	F	rtSg 9	X68522 [1](9)	
	IGL1C1S2	F	rtSg 4	X68520 [1](9)(7)	
	IGL1C1S3	F	rtSg E	X65260 [1] c	
	IGL1C1S4	F	rtSg 10	X68517 [1] c	
	IGL1C1S5	F	rtSg 2	X68518 [1](8) c	
	IGL1C1S6	F	rtSg 3	X68519 [1] c	
	IGL1C1S7	F	rtSg 6	X68521 [1] c	
Spotted wolffish ***(Anarhichas minor)***	IGL1C1S1	F	c1	AF137397 [2] c	
	IGL1C1S2	F	c10	AF137398 [2] c	

c: cDNA sequence.

IMGT notes:

(1) Teleostei constant genes are designated by the locus three letter root, followed by the number 1 or 2 for the chain type, followed by the letter C, the subgroup number, the letter S and a number.
Except if indicated there is no correspondence between IGL1C genes names between taxons.
Present data do not permit to determine if the sequence comes from different genes, or from different alleles of the same gene.
(2) The IGL1 and IGL2 light chain types in IMGT correspond to the light chains designated as F and G, respectively in [1].
(3) Partial C-REGION: 22 nucleotides are missing in 5'.
(4) Partial C-REGION: 175 nucleotides are missing in 5'.
(5) Partial C-REGION: 49 nucleotides are missing in 5'.
(6) Partial C-REGION: 132 nucleotides are missing in 3'.
(7) Partial C-REGION: 117 nucleotides are missing in 3'.
(8) Partial C-REGION: 55 nucleotides are missing in 5'.
(9) "Germline transcript".
(10) In frame STOP-CODON.

References:

[1] Daggfeldt, A. et al., Immunogenetics, 38, 199-209 (1993).
[2] Espelid, S. et al., unpublished (1999).
[3] Seyed, H. et al., J. Immunol., 159, 250-258 (1997).
[4] Tomana, M. et al., unpublished (1998).

Table 4. Teleostei IGL2V genes

Fct: FUNCTIONALITY
F: Functional
P: Pseudogene
ORF: Open Reading Frame
vg: Vestigial
R: Rearranged
T: Transcribed
Pr: Translated into protein

"+" or "-" indicates if the gene sequences have been found (+) or not been found (-) rearranged (R), transcribed (T), and/or translated into protein (Pr).
There are two light chain types in teleost fishes (Teleostei). The corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL2V subgroup	IGL2V gene name (1)	Fct	R	T	Pr	Reference sequences	Accession numbers	Sequences from the literature
Channel catfish ***(Ictalurus punctatus)*** (2)	**1**	IGL2V1S1	(F)	+	+		PG4	L25533 [3] #c	
		IGL2V1S2	(F)	+	+		PG26	L25539 [3](3) #c	
		IGL2V1S3	(F)	+	+		PG27	L25540 [3](3) #c	
Rainbow trout ***(Oncorhynchus mykiss)***	**1**	IGL2V1S1	(F)	+	+		VL2a	U69987 [1](4) #c	
		IGL2V1S2	(F)	+	+		VL2b	U69988 [1] #c	
		IGL2V1S3	(F)	+	+		VL2c	U69989 [1] #c	
		IGL2V1S4	(F)	+	+		VL2d	U69990 [1] #c	

#c: Rearranged cDNA.

IMGT notes:

(1) Teleostei variable genes are designated by the locus three letter root, followed by the number 1 or 2 for the chain type, followed by the letter V, the subgroup number, the letter S and a number.
Except if indicated, there is no correspondence between IGL2V subgroups and IGL2V gene names between taxons.
Present data do not permit to determine if the sequence comes from different genes or from different alleles of the same gene.
(2) The IGL1 and IGL2 light chain types in IMGT correspond to the light chains designated as G and F, respectively in [2].
(3) Partial V-REGION: FR1-IMGT and CDR1-IMGT are missing. Partial FR2-IMGT in 5' (AA 39 and 40 are absent).
(4) Insertion of 5 amino acids between positions 60 and 61 in CDR2-IMGT (60A, 60B, 60C, 60D and 60E).

References:

[1] Partula, S., et al., Immunogenetics, 45, 44-51 (1996).
[2] Seyed, H. et al., J. Immunol., 159, 250-258 (1997).
[3] Seyed, H. et al., J. Immunol., 151, 6900-6912 (1993).

Table 5. Teleostei germline IGL2J genes

Fct: FUNCTIONALITY
F: Functional
P: Pseudogene
ORF: Open Reading Frame
vg: Vestigial
R: Rearranged
T: Transcribed
Pr: Translated into protein

"+" or "-" indicates if the gene sequences have been found (+) or not been found (-) rearranged (R), transcribed (T), and/or translated into protein (Pr).
There are two light chain types in Teleostei (teleost fishes). The corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL2J name	Fct	R	T	Pr	Reference sequences	Accession numbers	Sequences from the literature
Channel catfish *(Ictalurus punctatus)*	IGL2J1	F				PG1	L25530 [2](1)	
	IGL2J2	F				PG2	L25531 [2](1)	

IMGT notes:

(1) "Germline transcript".
(2) The IGL1 and IGL2 light chain types in IMGT correspond to the light chains designated as F and G, respectively in [1].

References:

[1] Seyed, H. et al., J. Immunol., 159, 250-258 (1997).
[2] Seyed, H. et al., J. Immunol., 151, 6900-6912 (1993).

Table 6. Teleostei IGL2C genes and alleles

Fct: FUNCTIONALITY
F: Functional
P: Pseudogene
ORF: Open Reading Frame

"+" or "-" indicates if the gene sequences have been found (+) or not been found (-) rearranged (R), transcribed (T), and/or translated into protein (Pr).
Arbitrarily that information is shown on the first line of each gene when the data have been confirm by several studies.
There are two light chain types in Teleostei (teleost fishes). The corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL2C gene name (1)	Fct	Reference sequences	Accession numbers	Sequences from the literature
Channel catfish *(Ictalurus punctatus)*	IGL2C1S1	F	PG3	L25532 [3](3) c	
	IGL2C1S2	F	PG5	L25534 [3](3) c	
	IGL2C1S3	F	PG1	L25530 [3](3) c	
	IGL2C1S4	F	PG2	L25531 [3](3) c	
	IGL2C1S5	F	PG4	L25533 [3] c	
	IGL2C1S6	F	PG6	L25535 [3](3) c	
	IGL2C1S7	F	PG7	L25536 [3](3) c	
	IGL2C1S8	F	PG8	L25537 [3](3) c	
	IGL2C1S9	F	PG9	L25538 [3](3) c	
	IGL2C1S10	F	PG26	L25539 [3] c	
	IGL2C1S11	F	PG27	L25540 [3] c	
Rainbow trout (*Oncorhynchus mykiss*)	IGL2C1S1	F	VL2a	U69987 [1] c	

c: cDNA sequence.

IMGT notes:

(1) Teleostei constant genes are designated by the locus three letter root, followed by the number 1 or 2 for the chain type, followed by the letter C, the subgroup number, the letter S and a number.
Except if indicated there is no correspondence between IGL2C gene names between taxons.
Present data do not permit to determine if the sequence comes from different genes or from different alleles of the same gene.
(2) The IGL1 and IGL2 light chain types in IMGT correspond to the light chains designated as F and G, respectively in [2].
(3) "Germline transcript".

References:

[1] Partula, S., et al., Immunogenetics, 45, 44-51 (1996).
[2] Seyed, H. et al., J. Immunol., 159, 250-258 (1997).
[3] Seyed, H. et al., J. Immunol., 151, 6900-6912 (1993).

Table 7. FR-IMGT and CDR-IMGT length of the Teleostei IGL1V genes

Only FUNCTIONAL and ORF V-GENEs are shown.
There are two light chain types in Teleostei (teleost fishes). The corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL1V genes [1]	FR1-IMGT 1 to 26	CDR1-IMGT 27 to 38	FR2-IMGT 39 to 55	CDR2-IMGT 56 to 65	FR3-IMGT 66 to 104	CDR3-IMGT 105 to 115
		(26)	(6)	(17)	(3)	(36)	(7) [2]
Channel catfish (*Ictalurus punctatus*)	IGL1V1S1, IGL1V1S3		6		3	-3 (aa 73, 81, 82)	7 [2]
Common carp *(Cyprinus carpio)*		(25)	(5,10,11,13)	(17)	(3)	(36,38)	(7) [2]
	IGL1V1S1	-1 (aa 10)	13 [3]		3	-1 (aa 82)	7 [2]
	IGL1V1S2	-1 (aa 10)	10		3	-3 (aa 73, 81, 82)	7 [2]
	IGL1V1S3	-1 (aa 10)	5		3	-3 (aa 73, 81, 82)	7 [2]
	IGL1V2S4	-1 (aa 10)	10		3	-3 (aa 73, 81, 82)	7 [2]
	IGL1V1S5	-1 (aa 10)	11		3	-3 (aa 73, 81, 82)	7 [2]
Rainbow trout *(Oncorhynchus mykiss)*		(26)	(8,9,11)	(17)	(3)	(36)	(7) [2]
	IGL1V1S1		9		3	-3 (aa 73, 81, 82)	7 [2]
	IGL1V2S1		8		3	-3 (aa 73, 81, 82)	7 [2]
	IGL1V3S1		11		3	-3 (aa 73, 81, 82)	7 [2]
Spotted wolffish *(Anarhichas minor)*		(25)	(11,12)	(17)	(3)	(36)	(7) [2]
	IGL1V1S1	-1 (aa 10)	11		3	-3 (aa 73, 81, 82)	7 [2]
	IGL1V2S1	-1 (aa 10)	12		3	-3 (aa 73, 81, 82)	7 [2]

IMGT notes:

[1] Teleostei variable genes are designated by the locus three letter root, followed by the number 1 or 2 for the chain type, followed by the letter V, the subgroup number, the letter S and a number.
Except if indicated, there is no correspondence between IGL1V subgroups and IGL1V gene names between taxons.

[2] Probable CDR3-IMGT length, but needs to be confirmed with germline sequences.

[3] Insertion of 1 amino acid between position 32 and 33 in CDR1-IMGT (32A).

Table 8. FR-IMGT and CDR-IMGT length of the Teleostei IGL2V genes.

Only FUNCTIONAL and ORF V-GENEs are shown.
There are two light chain types in Teleostei (teleost fishes). The corresponding loci are designated as IGL1 and IGL2, respectively.

Taxon	IGL2V genes [1]	FR1-IMGT 1 to 26	CDR1-IMGT 27 to 38	FR2-IMGT 39 to 55	CDR2-IMGT 56 to 65	FR3-IMGT 66 to 104	CDR3-IMGT 105 to 115
		(26)	(6)	(17)	(3)	(36)	(7) [2]
Channel catfish	IGL2V1S1		6		3	-3 (aa 73, 81, 82)	(7) [2]
(Ictalurus punctatus)	IGL2V1S2, IGL2V1S3	[3]	[3]	[3]	3	-3 (aa 73, 81, 82)	(7) [2]
Rainbow trout		(26)	(6)	(17)	(10,15)	(37)	(10) [2]
(Oncorhynchus mykiss)	IGL2V1S1		6		15 [4]	-2 (aa 73, 81)	(10) [2]
	IGL2V1S2		6		10	-2 (aa 73, 81)	(10) [2]
	IGL2V1S3		6		10	-2 (aa 73, 81)	(10) [2]
	IGL2V1S4		6		10	-2 (aa 73, 81)	(10) [2]

IMGT notes:

[1] Teleostei variable genes are designated by the locus three letter root, followed by the number 1 or 2 for the chain type, followed by the letter V, the subgroup number, the letter S and a number.
Except if indicated, there is no correspondence between IGL2V subgroups and IGL2V gene names between taxons.
[2] Probable CDR3-IMGT length, but needs to be confirmed with germline sequences.
[3] Partial V-REGION: FR1-IMGT and CDR1-IMGT are missing. Partial FR2-IMGT in 5' (AA 39 and 40 are absent).
[4] Insertion of 5 amino acids between positions 60 and 61 in CDR2-IMGT (60A, 60B, 60C, 60D and 60E).

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