

# Protein Displays of the Human Immunoglobulin Heavy, Kappa and Lambda Variable and Joining Regions

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## Key Words

IMGT · Immunoglobulin · Heavy variable and joining regions · Kappa variable and joining regions · Lambda variable and joining regions

## Abstract

'Protein displays of the Human Immunoglobulin Heavy, Kappa and Lambda Variable and Joining Regions', the 6th report of the 'IMGT Locus on Focus' section, comprises 4 figures: (1) 'Protein display of human IGH V-REGIONS'; (2) 'Protein display of human IGK V-REGIONS'; (3) 'Protein display of human IGL V-REGIONS and V-PREB REGION'; (4) 'Protein display of human IGH, IGK and IGL J-REGIONS', and 1 table entitled: 'FR-IMGT and CDR-IMGT length of the human IGHV, IGKV, IGLV and V-PREB genes'. These figures and table are available at the IMGT Marie-Paule page from IMGT, the international ImmunoGeneTics database (<http://imgt.cnusc.fr:8104>) created by Marie-Paule Lefranc, Université Montpellier II, CNRS, France.

'Protein displays of the Human Immunoglobulin Heavy, Kappa and Lambda Variable and Joining Regions' is the 6th report of the 'IMGT Locus on Focus' section launched in the April 1998 issue of *Experimental and Clinical Immunogenetics* [1]. We have previously reported the complete repertoire of human germline IGLV, IGKV and IGHV genes localized at the major IGL (22q11.1-q11.2), IGK (2p12) and IGH (14q32.33) loci, respectively, as well as orphic genes identified in other chromosomal locations. Germ-line gene tables and allele tables have been provided for the human IGLV and IGLJ [2], IGKV and IGKJ [3], IGHV [4], IGHD and IGHJ [5] genes.

**Fig. 1.** Protein display of human IGH V-REGIONS. Only the \*01 allele of each functional or ORF V-REGION is shown. One pseudogene IGHV3-19 whose defects do not affect the V-REGION has been included. Letters in red correspond to amino acids which are polymorphic in the other alleles. IGHV genes are listed, for each subgroup, according to their position from 3' to 5' in the locus.

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IGHV gene	FR1-IMGT (1-26)	CDR1-IMGT (27-38)			FR2-IMGT (39-55)			CDR2-IMGT (56-65)			FR3-IMGT (66-104)			CDR3-IMGT (105-115)		
		1	10	20	30	40	50	60	70	80	90	100	110	111	112	113
X07448, IGHV1-2	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MENVRQAPGGLEWIGR	INPNSGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X62109, IGHV1-3	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MENVRQAPGGLEWIGR	INPNSGEGT...	KYQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
H99537, IGHV1-8	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	INVRQAPGGLEWIGR	MADPSGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
H99641, IGHV1-18	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	INVRQAPGGLEWIGR	ISATGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
H99642, IGHV1-24	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	INVRQAPGGLEWIGR	PDPEGEET...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AT,.....										
X92209, IGHV1-45	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	LINVRQAPGGLEWIGR	INPNSGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X92343, IGHV1-46	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MENVRQAPGGLEWIGR	INPNSGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
H9809, IGHV1-58	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	QYDVLVSGA, EYKPGASVYKVSCKAS	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AA,.....										
I22582, IGHV1-69	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	INVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z18904, IGHV1-6	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	INVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
I22583, IGHV1-7	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	INVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AT,.....										
Z12305, IGHV1-7	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MENVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AT,.....										
X62211, IGHV1-5	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	VGTRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
H99648, IGHV2-26	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	VGTRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
I21969, IGHV2-70	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	VGTRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99649, IGHV3-7	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MSNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99651, IGHV3-9	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MSNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AKD,.....										
M99652, IGHV3-11	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MSNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AKD,.....										
X92217, IGHV3-13	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X92216, IGHV3-15	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99655, IGHV3-16	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99656, IGHV3-19	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99657, IGHV3-20	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z14073, IGHV3-21	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99660, IGHV3-23	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AKD,.....										
M81334, IGHV3-30	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AKD,.....										
X92283, IGHV3-30-3	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X92214, IGHV3-30-3-30-5	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
I06618, IGHV3-33	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99666, IGHV3-35	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99669, IGHV3-38	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99672, IGHV3-43	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z13890, IGHV3-47	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99675, IGHV3-48	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99676, IGHV3-49	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99679, IGHV3-53	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99682, IGHV3-64	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X92218, IGHV3-66	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z118896, IGHV3-72	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z22535, IGHV3-73	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z118898, IGHV3-74	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z229981, IGHV3-7-d	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	MNVRQAPGGLEWIGR	IPFPTGEGT...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X62212, IGHV4-4	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X62206, IGHV4-4-31	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
L10089, IGHV4-30-2	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z14238, IGHV4-30-4	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
L10098, IGHV4-31	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X92278, IGHV4-34	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
L10094, IGHV4-39	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X56355, IGHV4-61	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z12257, IGHV4-b	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
M99686, IGHV5-51	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X92227, IGHV5-a	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
X92224, IGHV6-1	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z12223, IGHV7-4-1	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										
Z27509, IGHV7-81	QYDVLVSGA, EYKPGASVYKVSCKAS	GIFTPSYK...	WGTROPPGGLEWIGR	LYTSGEST...	TAQKEQFQ, GRTFTTDTSYSTAYAMELSLRSSEDAVYTC	AR,.....										

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IGKV gene	FR1-TMGT (1-26)			CDR1-TMGT (27-38)			FR2-TMGT (39-55)			CDR2-TMGT (56-65)			FR3-TMGT (56-104)			CDR3-TMGT (105-115)		
	1	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150		
200001, IGRV1-5	LAVYQOKPGRKPKPLLYCARS	QTSISW	...	LAVYQOKPGRKPKPLLYCARS	QGIRND	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXNSYSP...	...	...	...	...	...	...	...	...	...	
M6458, IGRV1-6	ALIOMTOSPSLSASVGDRVTVTCRAS	CGISSY	...	LAVYQOKPGRKPKPLLYCARS	CGISSY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QDQINYP...	...	...	...	...	...	...	...	...		
200014, IGRV1-8	ALIOMTOSPSLSASVGDRVTVTCRAS	CGISSY	...	LAVYQOKPGRKPKPLLYCARS	CGISSY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQXSP...	...	...	...	...	...	...	...	...		
200015, IGRV1D-8	VIWYQOKPGRKPKPLLYCARS	CGISSY	...	LAVYQOKPGRKPKPLLYCARS	CGISSY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXISFSP...	...	...	...	...	...	...	...	...		
200013, IGRV1-9	DIQLOTFSPSLSASVGDRVTVTCRAS	CGISSY	...	LAVYQOKPGRKPKPLLYCARS	CGISSW	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXANSFP...	...	...	...	...	...	...	...	...		
V01177, IGRV1-12	DIOMTOSPSLSASVGDRVTVTCRAS	CGISSW	...	LAVYQOKPGRKPKPLLYCARS	CGISSW	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXANRNP...	...	...	...	...	...	...	...	...		
X117263, IGRV1D-12	ATOLQDOSPSLSASVGDRVTVTCRAS	CGISSA	...	LAVYQOKPGRKPKPLLYCARS	CGISSA	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXFRNYP...	...	...	...	...	...	...	...	...		
200010, IGRV1-13	ALQLOTFSPSLSASVGDRVTVTCRAS	CGISLA	...	LAVYQOKPGRKPKPLLYCARS	CGISNA	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X117262, IGRV1D-13	ALQLOTFSPSLSASVGDRVTVTCRAS	CGISNA	...	LAVYQOKPGRKPKPLLYCARS	CGISNA	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
J00248, IGRV1-16	DIOMTOSPSLSASVGDRVTVTCRAS	CGISNA	...	LAVYQOKPGRKPKPLLYCARS	CGISNA	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
K01323, IGRV1D-16	DIOMTOSPSLSASVGDRVTVTCRAS	CGISNA	...	LAVYQOKPGRKPKPLLYCARS	CGTRND	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X72088, IGRV1-17	DIOMTOSPSLSASVGDRVTVTCRAS	CGISNY	...	LAVYQOKPGRKPKPLLYCARS	CGISNY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X63392, IGRV1D-17	DIOMTOSPSLSASVGDRVTVTCRAS	CGISNY	...	LAVYQOKPGRKPKPLLYCARS	CGISNY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X63398, IGRV1-27	DIOMTOSPSLSASVGDRVTVTCRAS	CGISNY	...	LAVYQOKPGRKPKPLLYCARS	CGISNY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
M6456, IGRV1-33	DIOMTOSPSLSASVGDRVTVTCRAS	CGISNY	...	LAVYQOKPGRKPKPLLYCARS	CGISNY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X59316, IGRV1D-33	DIOLQDOSPSLSASVGDRVTVTCRAS	CGISNY	...	LAVYQOKPGRKPKPLLYCARS	CGISNY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X71893, IGRV1D-37	DIOLQDOSPSLSASVGDRVTVTCRAS	CGISNY	...	LAVYQOKPGRKPKPLLYCARS	CGISNY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X59415, IGRV1-39	DIOMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X59312, IGRV1D-39	DIOMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X72816, IGRV1D-42	DIOMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X72817, IGRV1D-43	DIOMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X12684, IGRV2-24	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X63401, IGRV2D-24	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X63397, IGRV2D-28	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X12691, IGRV2D-28	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
M31952, IGRV2D-29	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X63403, IGRV2-30	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X63402, IGRV2D-30	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X59314, IGRV2-40	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X59311, IGRV2D-40	DIUMTOSPSLSASVGDRVTVTCRAS	CGISY	...	LAVYQOKPGRKPKPLLYCARS	CGISY	...	SLQSGVP-SRFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X02725, IGRV3-7	BTMVEQSPSLSVGPAETSCRS	QSYSSY	...	LAVYQOKPGRKPKPLLYCARS	QSYSSY	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X72820, IGRV3D-7	BTMVEQSPSLSVGPAETSCRS	QSYSSY	...	LAVYQOKPGRKPKPLLYCARS	QSYSSY	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X01618, IGRV3-11	BTMVEQSPATLSLSVGPAETSCRS	QSYSSN	...	LAVYQOKPGRKPKPLLYCARS	QSYSSN	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
M23090, IGRV3-15	BTMVEQSPATLSLSVGPAETSCRS	QSYSSN	...	LAVYQOKPGRKPKPLLYCARS	QSYSSN	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X72815, IGRV3D-15	BTMVEQSPATLSLSVGPAETSCRS	QSYSSN	...	LAVYQOKPGRKPKPLLYCARS	QSYSSN	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X12686, IGRV3-20	BTMVEQSPATLSLSVGPAETSCRS	QSYSSZ	...	LAVYQOKPGRKPKPLLYCARS	QSYSSZ	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X12687, IGRV3D-20	BTMVEQSPATLSLSVGPAETSCRS	QSYSSZ	...	LAVYQOKPGRKPKPLLYCARS	QSYSSZ	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X02485, IGRV4-1	BTMVEQSPATLSLSVGPAETSCRS	QSYSSZ	...	LAVYQOKPGRKPKPLLYCARS	QSYSSZ	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X63399, IGRV5-2	BTMVEQSPATLSLSVGPAETSCRS	QSYSSZ	...	LAVYQOKPGRKPKPLLYCARS	QSYSSZ	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X12683, IGRV6D-21	BTMVEQSPATLSLSVGPAETSCRS	QSYSSZ	...	LAVYQOKPGRKPKPLLYCARS	QSYSSZ	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X12686, IGRV6D-41	BTMVEQSPATLSLSVGPAETSCRS	QSYSSZ	...	LAVYQOKPGRKPKPLLYCARS	QSYSSZ	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		
X12682, IGRV7-3	BTMVEQSPATLSLSVGPAETSCRS	QSYSSZ	...	LAVYQOKPGRKPKPLLYCARS	QSYSSZ	...	TRATGP-AFSSGS-, SGIDTFUTLISLQDPEPATYC	QXQNFSP...	...	...	...	...	...	...	...	...		

**Fig. 2.** Protein display of human IGK V-REGIONS. Only the \*01 allele of each functional or ORF V-REGION is shown. Three pseudogenes have been included: IGKV1-13 and IGKV2-29 with only one stop codon as a defect, and IGKV7-3, single member of the IGKV7 subgroup, which has no init-codon (ATG replaced by ATA). Letters in red correspond to amino acids which are polymorphic in the other alleles. IGKV genes from the proximal V-CLUSTER are listed for each subgroup, according to their position from 3' to 5' in the locus, whereas genes from the distal V-CLUSTER are listed according to their position from 5' to 3'.

Letters in red correspond to amino acids which are polymorphic in the other alleles. IGKV genes from the proximal V-CLUSTER are listed for each subgroup, according to their position from 3' to 5' in the locus, whereas genes from the distal V-CLUSTER are listed according to their position from 5' to 3'.

IGLV gene	FR1-IMGT (1-26)	CDR1-IMGT (27-38)	FR2-IMGT (39-55)	CDR2-IMGT (56-65)	FR3-IMGT (56-104)		CDR3-IMGT (105-115)								
					10	20	30	40	50	60	70	80	90	100	110
273653, IGLV1-36	QSV <sup>7</sup> TOPPS. VISAAPORVITICSSGS SSENIGNNA. . . . .	VINVOOLQEPAPKLLY YDN. . . . .	LIPSGVY. DREFGSK. . . . .	SETSASATLISQSLQEDADEADYC	AANDDSLSG. . .										
I944116, IGLV1-40	QSV <sup>7</sup> TOPPS. VISAAPORVITICSSGS SSENIGNTA. . . . .	VINVOOLQEPAPKLLY GNS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QYDSSLSG. . .										
I944118, IGLV1-41	QSV <sup>7</sup> TOPPS. VISAAPORVITICSSGS SSENIGNTA. . . . .	VINVOOLQEPAPKLLY ENN. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	LAMDTSPLA. . .										
273654, IGLV1-44	QSV <sup>7</sup> TOPPS. VISAAPORVITICSSGS SSENIGNSL. . . . .	VINVOOLQEPAPKLLY SNN. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	AANDDSLSA. . .										
I944119, IGLV1-47	QSV <sup>7</sup> TOPPS. ASGTPORVITICSSGS SSENIGNST. . . . .	VINVOOLQEPAPKLLY RNN. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	AANDDSLSG. . .										
I944122, IGLV1-50	QSV <sup>7</sup> TOPPS. VISAAPORVITICSSGS SSENIGNTY. . . . .	VINVOOLQEPAPKLLY DNN. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	KANDDSLSA. . .										
273655, IGLV1-51	QSV <sup>7</sup> TOPPS. VISAAPORVITICSSGS SSENIGNTY. . . . .	VINVOOLQEPAPKLLY EVS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	GNDSSLSA. . .										
X97462, IGLV2-8	QSAUTTOPPS. ASGSPQSPSQTICSSCN SSDDGGTYNN. . . . .	VINVOOQEGRGPKMLY DVS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	SYTASGYNE. . .										
273657, IGLV2-11	QSAUTTOPPS. VGSSPQSPSQTICSSCN SSDDGGTYNN. . . . .	VINVOOQEGRGPKMLY EWS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	CYTASGYTE. . .										
273658, IGLV2-14	QSAUTTOPPS. VGSSPQSPSQTICSSCN SSDDGGTYNN. . . . .	VINVOOQEGRGPKMLY FWS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	STASSTSNL. . .										
273659, IGLV2-18	QSAUTTOPPS. VGSSPQSPSQTICSSCN SSDDGGTYNN. . . . .	VINVOOQEGRGPKMLY EGS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	SLXTSSTU. . .										
X14616, IGLV2-23	QSAUTTOPPS. VGSSPQSPSQTICSSCN SSDDGGTYNN. . . . .	VINVOOQEGRGPKMLY NVN. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	CYTASGSTU. . .										
273643, IGLV2-33	QSAUTTOPPS. VGSAPQSPSQTICSSCN SSDDGGYDH. . . . .	ACRYQDPSQSPAPVLYN KLGKRY. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	SYLXYSSTU. . .										
X57826, IGLV3-1	SYELTOPPS. VEVSPQSPSQTICSSCN KIGRN. . . . .	VH70QFQGPQAPVLYN ODS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTDA. . .										
X97473, IGLV3-9	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	VH70QFQGPQAPVLYN RDS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	YSTDSSGN. . .										
273658, IGLV3-10	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	VH70QFQGPQDPVLYN SDS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSSDI. . .										
273658, IGLV3-12	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	VH70QFQGPQDPVLYN KDS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	LRSDSSGN. . .										
273671, IGLV3-16	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	ASVYQDPSQSPAPVLYN GKN. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	NERDSSGN. . .										
X56178, IGLV3-16	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	VH70QFQGPQAPVLYN LEGSSY. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSESD. . .										
273673, IGLV3-19	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	ADW70QFQGPQAPVLYN LEGSSY. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	LGSDGE. . .										
X71966, IGLV3-21	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	AVY70QFQGPQAPVLYN LEGSSY. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTG. . .										
X71966, IGLV3-21	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	AVY70QFQGPQAPVLYN LEGSSY. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	YXNAADDN. . .										
X97474, IGLV3-22	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	AVY70QFQGPQAPVLYN TDS. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTH. . .										
D86394, IGLV3-27	SYELTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	AVY70QFQGPQAPVLYN VKSOSH. . . . .	KRPSPGP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	GESEEDLSQVG. . .										
273695, IGLV3-32	SSGSPPTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	LE70QFQGPSPSPPYK LNSDSSH. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
X57828, IGLV3-3	SSGSPPTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	LE70QFQGPSPSPPYK LNSDSSH. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
273695, IGLV3-32	SSGSPPTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	LE70QFQGPSPSPPYK LNSDSSH. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
X57828, IGLV3-3	SSGSPPTOPPS. VEVSPQSPSQTICSSCN ALPKRY. . . . .	LE70QFQGPSPSPPYK LNSDSSH. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
273667, IGLV4-60	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
273668, IGLV4-69	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
273673, IGLV5-57	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
X14614, IGLV7-43	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
273674, IGLV7-46	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
273676, IGLV8-51	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
273675, IGLV8-49	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QPV70TOPPS. VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
QAG167, VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QAG167, VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	QAG167, VEVSPQSPSQTICSSCN SGHSSYYI. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
D86396, IGLV11-54	REPV70TOPPS. LSASPGATARLPCLTCS SDLSVSGERN. . . . .	REPV70TOPPS. LSASPGATARLPCLTCS SDLSVSGERN. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										
H34927, V-PREB	QPV70TOPPA KSSAALGTTTTRICTER RDHDIGVFS. . . . .	QPV70TOPPA KSSAALGTTTTRICTER RDHDIGVFS. . . . .	KRGDGIP. DREFGSK. . . . .	SETASATLISQSLQEDADEADYC	QWDSSTI. . .										

**Fig. 3.** Protein display of human IGH V-REGIONS and V-PREB REGION. Only the \*01 allele of each functional or ORF V-REGION is shown. Letters in red correspond to amino acids which are polymorphic in the other alleles. IGLV genes are listed, for each sub-group, according to their position from 3' to 5' in the locus. V-PREB region is displayed at the bottom of this table (only a part of the non-Ig-like segment is shown).

**Fig. 4.** Protein display of the human IGH, IGK and IGL J-REGIONS. **a** Overview. Only the \*01 allele of each functional or ORF V-REGION is shown. **b** Detailed protein displays of the different alleles of the human IGK and IGL J-REGIONS with nucleotide sequences. Only one sequence for each allele is shown. This set of sequences is part of the IMGT reference directory. Dashes indicate identical nucleotides. Detailed protein displays of the different alleles of the human IGH D-REGIONS and J-REGIONS with nucleotide sequences have previously been reported [5].

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(For legend see p. 237.)

**Table 1**
**FR-IMGT and CDR-IMGT length of the human IGHV, IGKV, IGLV and V-PREB genes**

IGHV and IGKV subgroups are designed according to IMGT gene tables [3,4] and locus representations [see IMGT repertoire at IMGT Home page, <http://imgt.cnusc.fr:8104>]. Numbers in bold, on the second line at the top of each column, represent the IMGT unique numbering for the FR-IMGT and CDR-IMGT. Numbers between parentheses, on the third line, correspond to the range of FR-IMGT and CDR-IMGT lengths (in number of amino acids) observed for the gene subgroups of the IGHV, IGKV, IGLV and V-PREB tables, respectively. Numbers in the CDR1-IMGT, CDR2-IMGT and CDR3-IMGT columns show the CDR lengths in number of amino acids. Information in the FR1-IMGT, FR2-IMGT and FR3-IMGT columns show the gaps compared to the IMGT numbering: the number of missing amino acids is indicated following the sign "-" with, between parentheses, the position(s) of the missing amino acid(s) compared to the IMGT numbering. Columns are left in blank if there are no gaps.

IGHV subgroups	<b>FR1-IMGT</b> <b>1 to 26</b>	<b>CDR1-IMGT</b> <b>27 to 38</b>	<b>FR2-IMGT</b> <b>39 to 55</b>	<b>CDR2-IMGT</b> <b>56 to 65</b>	<b>FR3-IMGT</b> <b>66 to 104</b>	<b>CDR3-IMGT</b> (germline V-GENE) <b>105 to 115</b>
	(25)	(8 to 10)	(17)	(6 to 10)	(38)	(2,3)
1	-1 (aa 10)	8		8	-1 (aa 73)	2
2	-1 (aa 10)	10		7	-1 (aa 73)	3
3	-1 (aa 10)	8		6,7,8,10	-1 (aa 73)	2,3
4	-1 (aa 10)	8,9,10		7	-1 (aa 73)	2
5	-1 (aa 10)	8		8	-1 (aa 73)	2
6	-1 (aa 10)	10		9	-1 (aa 73)	2
7	-1 (aa 10)	8		8	-1 (aa 73)	2

  

IGKV subgroups	<b>FR1-IMGT</b> <b>1 to 26</b>	<b>CDR1-IMGT</b> <b>27 to 38</b>	<b>FR2-IMGT</b> <b>39 to 55</b>	<b>CDR2-IMGT</b> <b>56 to 65</b>	<b>FR3-IMGT</b> <b>66 to 104</b>	<b>CDR3-IMGT</b> (germline V-GENE) <b>105 to 115</b>
	(26)	(6,7,10,11,12)	(17)	(3)	(36)	(7)
1		6		3	-3 (aa 73,81,82)	7
2		11,12		3	-3 (aa 73,81,82)	7
3		6,7		3	-3 (aa 73,81,82)	7
4		12		3	-3 (aa 73,81,82)	7
5		6		3	-3 (aa 73,81,82)	7
6		6		3	-3 (aa 73,81,82)	7
7		10		3	-3 (aa 73,81,82)	7

  

IGLV subgroups	<b>FR1-IMGT</b> <b>1 to 26</b>	<b>CDR1-IMGT</b> <b>27 to 38</b>	<b>FR2-IMGT</b> <b>39 to 55</b>	<b>CDR2-IMGT</b> <b>56 to 65</b>	<b>FR3-IMGT</b> <b>66 to 104</b>	<b>CDR3-IMGT</b> (germline V-GENE) <b>105 to 115</b>
	(25)	(6 to 9)	(17)	(3,7,8)	(36,38)	(7, 8, 9, 11)
1	-1 (aa 10)	8,9		3	-3 (aa 73,81,82)	9
2	-1 (aa 10)	9		3	-3 (aa 73,81,82)	9
3	-1 (aa 10)	6		3	-3 (aa 73,81,82)	7,8,9
4	-1 (aa 10)	7		7	-3 (aa 73,81,82)	7,11
5	-1 (aa 10)	9		7	-1 (aa 73)	8,9
6	-1 (aa 10)	8		3	-1 (aa 73)	7
7	-1 (aa 10)	9		3	-3 (aa 73,81,82)	8
8	-1 (aa 10)	9		3	-3 (aa 73,81,82)	8
9	-1 (aa 10)	7		8	-3 (aa 73,81,82)	11
10	-1 (aa 10)	8		3	-3 (aa 73,81,82)	9
11	-1 (aa 10)	9		7	-1 (aa 73)	8

  

V-PREB gene	<b>FR1-IMGT</b> <b>1 to 26</b>	<b>CDR1-IMGT</b> <b>27 to 38</b>	<b>FR2-IMGT</b> <b>39 to 55</b>	<b>CDR2-IMGT</b> <b>56 to 65</b>	<b>FR3-IMGT</b> <b>66 to 104</b>	<b>CDR3-IMGT</b> (germline V-GENE) <b>105 to 115</b>
	(25)	(9)	(17)	(7)	(38)	(30 non Ig-like)
V-PREB	-1 (aa 10)	9		7	-1 (aa 73)	30 non Ig-like

This 6th report completes these data by providing the protein displays of the corresponding reference coding regions. It comprises 4 figures: (1) 'Protein display of human IGH V-REGIONS'; (2) 'Protein display of human IGK V-REGIONS'; (3) 'Protein display of human IGL V-REGIONS and V-PREB REGION'; (4) 'Protein display of human IGH, IGK and IGL J-REGIONS'; and 1 table entitled 'FR-IMGT and CDR-IMGT length of the human IGHV, IGKV, IGLV and V-PREB genes'. These figures and table are available at the IMGT Marie-Paule page from **IMGT**, the international ImMunoGeneTics database (<http://imgt.cnusc.fr:8104>) created by Marie-Paule Lefranc, Université Montpellier II, CNRS, France [6–8]. Nucleotide and amino acid numbering of the V-REGION is according to the IMGT unique numbering [1, 9].

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