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IMGT Locus in Focus

The mouse (*Mus musculus*) T cell receptor alpha (TRA) and delta (TRD) variable genes☆

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Abstract

'The Mouse (*Mus musculus*) T cell receptor alpha (TRA) and delta (TRD) variable genes' 'IMGT Locus in Focus' report provides the first complete list of the mouse TRAV and TRDV genes which span 1550 kb on chromosome 14 at 19.7 cM. The total number of TRAV genes per haploid genome is 98 belonging to 23 subgroups. This includes 10 TRAV/DV genes which belong to seven subgroups. The functional TRAV genomic repertoire comprises 72–82 TRAV (including 9–10 TRAV/DV) belonging to 19 subgroups. The total number of TRDV genes per haploid genome is 16 (including the 10 TRAV/DV) belonging to 12 subgroups. The functional TRDV genomic repertoire comprises 14–15 genes (5 TRDV and 9–10 TRAV/DV) belonging to 11–12 subgroups. The eight tables and three figures of this report are available at the IMGT Marie-Paule page of IMGT. The international ImMunoGeneTics information system® (http://imgt.cines.fr) created by Marie-Paule Lefranc, Université Montpellier II, CNRS, France.
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Keywords: Mouse; IMGT; T cell receptor alpha; T cell receptor delta; Variable gene

1. Introduction

'The mouse (*Mus musculus*) T cell receptor alpha (TRA) and delta (TRD) variable genes' is the 20th 'IMGT Locus in Focus' report [1–20] and the first of a new section of *Developmental and Comparative Immunology*. This report on the mouse (*M. musculus*) T cell receptor alpha and delta variable genes describes the murine germline TRAV and TRDV repertoires, with the same standardized rules of the IMGT Scientific chart [1] which were used for the description of the human germline T cell receptor gene repertoires [8–11,14]. This report comprises eight tables; Table 1: 'mouse (*M. musculus*) germline TRAV genes'; Table 2: 'mouse (*M. musculus*) TRAV alleles'; Table 3:'correspondence between the different mouse (*M. musculus*) TRAV gene nomenclatures'; Table 4: 'number of mouse (*M. musculus*) germline TRAV genes and potential repertoire'; Table 5: 'mouse (*M. musculus*) germline TRDV genes'; Table 6: 'mouse (*M. musculus*) TRDV alleles'; Table 7: 'correspondence between the different mouse (*M. musculus*) TRDV gene nomenclatures'; Table 8: 'number of mouse (*M. musculus*) germline TRDV genes and

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Table 1
Mouse (*M. musculus*) germline TRAV genes on chromosome 14 at 19.7 cM

TRAV subgroup	TRAV gene name	Fct	Alpha			Delta			Positions	Strain	Reference sequences	Accession numbers	Sequences from the literature
			R	T	Pr	R	T	Pr					
TRAV1	TRAV1	F	+	+					72669 -73602(a)	129/SvJ	TRAV1	AF259072/ AE008683 [114]	
		(F)	+	+						B10.A[a]	ValphaA10	M22604 [61]#g	
TRAV2	TRAV2	F	+	+					234790 -235548(a)	129/SvJ	TRAV2	AF259071/ AF259074/ AE008683 [114]	
TRAV3	TRAV3-1	F							246884 -247390(a)	129/SvJ	TRAV3-1	AF259071/ AE008683 [114]	
		(F)	+	+						C3H	Valpha5	AJ311366 [68][b]#c	
	TRAV3D-2	P[c]							136645 -137116(b)	129/SvJ	TRAV3D-2P	AC005402/ AE008684 [114]	
	TRAV3D-3	F							223413 -223914(b)	129/SvJ	TRAV3D-3	AC005402/ AE008684 [114]	
	TRAV3-2	P[d]							163451 -163947(c)	129/SvJ	TRAV3-2P	AC003997/ AE008685 [114]	
	TRAV3-3	F	+	+					261470 -261971(c)	129/SvJ	TRAV3-3	AC003997/ AE008685 [114]	
		(F)	+	+						C57BL/Ka	Valpha5	X02933 [47]#c	
	TRAV3-4	F							380762 -381263(c)	129/SvJ	TRAV3-4	AC003996/ AC005938/ AE008685 [114]	
TRAV4	TRAV4-1	P[e]							267059 -267557(a)	129/SvJ	TRAV4-1P	AF259071/ AE008683 [114]	
	TRAV4D-2	P[f]							365129 -365614(a)	129/SvJ	TRAV4D-2P	AF259073/ AE008683 [114]	
	TRAV4D-3	F	+	+					149025 -149526(b)	129/SvJ	TRAV4D-3	AC005402/ AE008684 [114]	
		(F)	+	+						B10.A	Valpha11	M22603 [61]#g	
		(F)	+	+						A/J	Valpha11.3a	M73265 [82]#c	
		(F)	+	+						C57BL/6	Valpha11	M87844 [86]#g	
		(F)	+	+							Valpha11.3	S81113 [107]#c	
		(F)	+	+						B10.A	Valpha11	U63776 [108][g]#g	
	TRAV4D-4	F	+	+					241062 -241562(b)	129/SvJ	TRAV4D-4	AC005855/ AE008684 [114]	
		(F)	+	+						B10.A	Valpha2B.4	X02968 [48]#c	
		(F)	+	+						B10.A	ValphaB10	X03860 [51]#c	
		(F)	+	+						DBA/2	Valpha11.1d	M73264 [82]#c	
		(F)	+	+						B10.A	Valpha11	U63758 [108][g]#g	

	TRAV4-2	F					366141 -366627(b)	129/SvJ	TRAV4-2	AC004407/ AE008684 [114]
		(F)	+	+				C57BL/6	Valpha11	M87848 [86]#c
	TRAV4-3	F					175856 -176358(c)	129/SvJ	TRAV4-3	AC003997/ AE008685 [114]
		(F)	+	+				BALB/c nu/nu	V2B4	M27351 [52]#c
	TRAV4-4/DV10	F	+	+	+	+	278952 -279455(c)	129/SvJ	TRADV4-4	AC004102/ AE008685 [114]
TRAV5	TRAV5-1	F	+	+			282342 -282858(a)	129/SvJ	TRAV5-1	AF259071/ AE008683 [114]
	TRAV5D-2	P [h]					163273 -163788(b)	129/SvJ	TRAV5D-2P	AC005402/ AE008684 [114]
	TRAV5D-3	P [i]					179278 -179587(b)	129/SvJ	TRAV5D-3P	AC005402/ AE008684 [114]
	TRAV5D-4	ORF [j]	+	+			259064 -259571(b)	129/SvJ	TRAV5D-4	AC005855/ AE008684 [114] [j]
		(F)	+	+				SWR x NZB (F1)	Valpha19	U07877 [96]#c
		(F)	+	+				SWR x NZB (F1)	Valpha19	U07876 [96] [k]#c
		(F)	+	+				NOD		U80816 [109] [l]#c
	TRAV5-2	P [m]					203144 -203644(c)	129/SvJ	TRAV5-2P	AC003997/ AE008685 [114]
	TRAV5-3	P [n]					217253 -217574(c)	129/SvJ	TRAV5-3P	AC003997/ AE008685 [114]
	TRAV5-4	ORF [j]					290091 -290599(c)	129/SvJ	TRAV5-4	AC003995/ AE008685 [114] [j]
TRAV6	TRAV6-1	F	+	+			298270 -298714(a)	129/SvJ	TRAV6-1	AF259071/ AE008683 [114]
		(F)	+	+				C57BL/6	Valpha4	X14387 [71]#c
	TRAV6-2	F					321439 -321892(a)	129/SvJ	TRAV6-2	AF259071/ AE008683 [114]
		(F)	+	+				C57BL/6 x DBA/2 (F1)	ValphaII	X03669 [50]#g
		(F)	+	+				BALB/c	Valpha4.2	U21455 [100] [o]#c
	TRAV6D-3	F	+	+			380537 -382152(a)	129/SvJ	TRAV6D-3	AF259073/ AC005403/ AE008683 [114]
		(F)	+	+				C57BL/6	Valpha4	M16675 [55]#c
	TRAV6D-4	F					4732 -5180(b)	129/SvJ	TRAV6D-4	AC005403/ AE008684 [114]
	TRAV6D-5	F	+	+			39554 -40024(b)	129/SvJ	TRAV6D-5	AC003994/ AE008684 [114]
	TRAV6D-6	F	+	+			64381 -64818(b)	129/SvJ	TRAV6D-6	AC004101/ AE008684 [114]

(*continued on next page*)

Table 1 (*continued*)

TRAV subgroup	TRAV gene name	Fct	Alpha			Delta			Positions	Strain	Reference sequences	Accession numbers	Sequences from the literature
			R	T	Pr	R	T	Pr					
		F	+	+						C57BL/6	Valpha112-2	X05187 [57] [p]	
		(F)	+	+						C57BL/10	Valpha4	M16676 [55]#c	
		(F)	+	+						BALB/c	Valpha4	U21397 [101] [q]#c	
	TRAV6D-7	F							264948 -265414(b)	129/SvJ	TRAV6D-7	AC005855/ AE008684 [114]	
		(F)	+	+						PL x SJL (F1)	Valpha4	M21205 [60]#c	
		(F)	+	+						DBA/2	Valpha4	X55823 [79] [r]#c	
	TRAV6-3	F	+	+					381244 -382887(b)	129/SvJ	TRAV6-3	AC004407/ AE008684 [114]	
	TRAV6-4	F	+	+					8045 -8502(c)	129/SvJ	TRAV6-4	AC004407/ AE008685 [114]	
		(F)	+	+						BALB/c	Valpha4	M84653 [87]#c	
	TRAV6-5	F	+	+					55987 -56459(c)	129/SvJ	TRAV6-5	AC004405/ AE008685 [114]	
		(F)	+	+						BALB/c	Valpha4	M34202 [76] [q]#c	
		(F)	+	+						BALB/cJ	Valpha4	U05046 [109] [s]#c	
	TRAV6-6	F	+	+					87550 -87987(c)	129/SvJ	TRAV6-6	AC005240/ AE008685 [114]	
		(F)	+	+						BALB/c	Valpha4.6	U21448 [100] [s]#c	
		(F)	+	+						C57BL/6	Valpha4.5	U90513 [111] [t]#c	
	TRAV6-7/DV9	F	+	+					295983 -296449(c)	129/SvJ	TRAV6-7	AC003995/ AE008685 [114]	
		(F)	+	+						C57BL/Ka	Valpha4	X02932 [47]#c	
		(F)	+	+						B10.PL	Valpha4.2	M21863 [66]#c	
		(F)				+	+			C57BL/6	Vdelta2.3	X13316 [62] [t]#c	
		(P) [u]	+	+						B10.PL	Valpha4.2	M35492 [72]#c	
		(P) [v]	+	+						C57BL/10	Valpha4	X52448 [80]#c	
		(F)	+	+						BALB/c	Valpha4	U21453 [100] [q]#c	
		(F)	+	+						BALB/c	Valpha4	U21409 [101] [w]#c	
		(F)	+	+						BALB/c x C57BL/6 (F1)	Valpha4	D12899 [92] [x]#c	
TRAV7	TRAV7-1	F	+	+					313424 -313940(a)	129/SvJ	TRAV7-1	AF259071/ AE008683 [114]	
	TRAV7D-2	F							337968 -338476(a)	129/SvJ	TRAV7D-2	AF259071/ AE008683 [114]	
		(F)	+	+						B10.A	Valpha1	M38104 [78]#g	
		(F)	+	+						BALB/c	Valpha1	X83009 [102] [y]#c	
	TRAV7D-3	F	+	+					399727 -400523(a)	C57BL/10	Valpha5H	X02833 [46]	129/SvJ, TRAV7D-3 [AC005403/AE008683] [114]
		(F)	+	+						B10.A x AKR	Valpha11	M26423 [73] [z]#c	

	TRAV7D-4	F	+	+		C57BL/6	Valpha1.1	X56723 [81]
		F	+	+	14121 -14650(b)	129/SvJ	TRAV7D-4	AC003994/ AE008684 [114]
		(F)	+	+		C57BL/Ka	Valpha1	X02928 [47]#c
		(F)	+	+		C57BL/6	Valpha1.1	X56722 [81]#c
	TRAV7D-5	F			84720 -85247(b)	129/SvJ	TRAV7D-5	AC004101/ AE008684 [114]
	TRAV7D-6	F			271489 -272021(b)	129/SvJ	TRAV7D-6	AC005855/ AE008684 [114]
	TRAV7-2	F [aa]			341683 -342196(b)	129/SvJ	TRAV7-2	AC004407/ AE008684 [114] [aa]
	TRAV7-3	F	+	+	394979 -395504(b)	129/SvJ	TRAV7-3	AC004407/ AE008684 [114]
		(F)	+	+		BALB/c	Valpha1	L16803 [96] [x]#c
		(F)	+	+		SJL	Valpha1	AF037038 [115]#c
	TRAV7-4	F	+	+	14951 -15840(c)	129/SvJ	TRAV7-4	AC004407/ AE008685 [114]
	TRAV7-5	F	+	+	107905 -108432(c)	129/SvJ	TRAV7-5	AC004406/ AE008685 [114]
		F				C57BL/6	Valpha1.2	X56724 [81] [ab]
		(F)	+	+		DBA/2	Valpha1	X55825 [79] [ab]#c
		(F)	+	+		C57BL/6	Valpha1	AF034160 [112] [x]#c
	TRAV7-6	F			302286 -302818(c)	129/SvJ	TRAV7-6	AC003995/ AE008685 [114]
		(F)	+	+		C57BL/6	ValphaC5	X63927 [48]#c
TRAV8	TRAV8D-1	F	+	+	22759 -23244(b)	129/SvJ	TRAV8D-1	AC003994/ AE008684 [114]
		(F)	+	+		C57BL/10		X06773 [53] [q]#c
	TRAV8D-2	F			293412 -293875(b)	129/SvJ	TRAV8D-2	AC005855/ AE008684 [114]
		(F)	+	+		B10.BR	Valpha18	U46581 [88]#c
	TRAV8-1	F [ac]	+	+	23478 -23963(c)	129/SvJ	TRAV8-1	AC004407/AC004405/ AE008685 [114] [ac]
		(F)	+	+		C57BL/10		D16605 [93] [ad]#c
	TRAV8-2	F			323696 -324159(c)	129/SvJ	TRAV8-2	AC004096/ AE008685 [114]
TRAV9	TRAV9D-1	F	+	+	36514 -36975(b)	129/SvJ	TRAV9D-1	AC003994/ AE008684 [114]
		(F)	+	+		C57BL/6	Valpha3	M16678 [55]#c
	TRAV9D-2	F				BALB/c	Tcra-V3.2	U31877 [105]
		F			141221 -141655(b)	129/SvJ	TRAV9D-2	AC005402/ AE008684 [114]
		(F) [ae]				BALB/c	Valpha3	M33586 [77] [ae]#c

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Table 1 (*continued*)

TRAV subgroup	TRAV gene name	Fct	Alpha			Delta			Positions	Strain	Reference sequences	Accession numbers	Sequences from the literature
			R	T	Pr	R	T	Pr					
		(P) [af]	+	+						BALB/c	Valpha3	L16799 [96] [af]#c	
	TRAV9D-3	F	+	+					169749 -170183(b)	129/SvJ	TRAV9D-3	AC005402/ AE008684 [114]	
		(F)	+	+						C57BL/10	Valpha3.810	X05732 [54]#c	
	TRAV9D-4	F	+	+					233384 -233818(b)	129/SvJ	TRAV9D-4	AC005855/ AE008684 [114]	
		(F)	+	+						C57BL/6	Valpha3.C9	X05734 [54]#c	
		(F)	+	+						C57BL/6	Valpha3	X56716 [81] [ag]#c	
		(F)	+	+						C57BL/6	Valpha3	M87852 [86]#c	
	TRAV9-1	F							53147 -53608(c)	129/SvJ	TRAV9-1	AC004405/ AE008685 [114]	
	TRAV9-2	F	+	+					168052 -168486(c)	BALB/c	Tcra-V3.1	U26917 [105]	129/SvJ, TRAV9-2 [AC003997/AE008685] [114]
	TRAV9-3	F	+	+					209671 -210105(c)	BALB/c	Tcra-V3.3	U31878 [105]	129/SvJ, TRAV9-3 [AC003997/AE008685] [114]
		(F)	+	+						BALB/c	Valpha3	M34194 [76] [l]#c	
		(F)	+	+						BALB/cJ	Valpha3.4	U05047 [109] [ah]#c	
	TRAV9-4	F	+	+					271478 -271912(c)	BALB/c		X02857 [45]	BALB/c, Tcra-V3.4 [U31879] [105], 129/SvJ, TRAV9-4 [AC003997/ AE008685] [114]
TRAV10	TRAV10D	F [ai]	+	+					53958 -54454(b)	129/SvJ	TRAV10D	AC003994/ AC004101/ AE008684 [114] [ai]	
		(P) [aj]	+	+						C57BL/6	Tcra-22.2	U46077 [106]#g	
	TRAV10	F [ai]	+	+					76501 -76997(c)	129/SvJ	TRAV10	AC005240/ AE008685 [114] [ai]	
		(F)	+	+						C57BL/6	Valpha15	L34678 [103]#c	
		(F)	+	+						C57BL/6	Tcra-V22.1	U47051 [106]#c	
		(P) [aj]	+	+						C57BL/6	Tcra-V22.3	U46078 [106]#g	
		(P) [aj]	+	+						C57BL/6	Tcra-V22.4	U46079 [106]#g	
TRAV11 [ak]	TRAV11D	F [al]	+	+					66780 -67332(b)	129/SvJ	TRAV11D	AC004101/ AE008684 [114] [al]	C57BL/6, Valpha14.2 [D90230] [83]
	TRAV11	F [al]	+	+					89958 -90510(c)	129/SvJ	TRAV11	AC005240/ AE008685 [114] [al]	C57BL/6, Valpha14.2 [D90230] [83]
		F	+	+						C57BL/6	Valpha14.1	D90229 [83] [am]	
TRAV12	TRAV12D-1	F								C57BL/6	ValphaF3.6	X06308 [49]	
		F	+	+					92193 -92665(a)	129/SvJ	TRAV12D-1	AC004101/ AE008684 [114]	
		(F)	+	+						C57BL/Ka	Valpha8	X02936 [47] [an]#c	

		(F)	+	+		C57BL/6	Valpha8	X60320 [85]#g	
		(F)	+	+		C57BL/6	ValphaF3.8	U90515 [111] [l]#c	
	TRAV12D-2	F	+	+		C57BL/6	ValphaF3.2	X04332 [49]	
		F	+	+	164976 -165491(b)	C57BL/6	ValphaF3.4	X06306 [49]	129/SvJ, TRAV12D-2 [AC005402/AE008684] [114]
		(F)	+	+		C57BL/6	ValphaF3.2	X04330 [49]#c	
		(F)	+	+		BALB/c		M15063 [58]#c	
		(F)	+	+		BALB/c	Valpha8	M98569 [90] [q]#c	
	TRAV12D-3	F				C57BL/6	ValphaF3.3	X06305 [49]	
		F			180766 -181258(b)	129/SvJ	TRAV12D-3	AC005402/ AE008684 [114]	
		(F)	+	+		BALB/c	Valpha8	M34210 [76] [l]#c	
		(ORF) [ao]	+	+		C57BL/6	ValphaF3.7	U90514 [111] [ao]#c	
	TRAV12-1	F				C57BL/6	ValphaF3.5	X06307 [49]	
		F				Std:ddY	Valpha8	X17173 [64]	
		ORF [ap]			125175 -125647(c)	129/SvJ	TRAV12-1	AC004406/ AE008685 [114] [ap]	
		(F)	+	+		C57BL/6	Valpha8	M16677 [55]#c	
		(F)	+	+		C57BL/Ka	Valpha8.4	M38680 [65]#c	
	TRAV12-2	F	+	+	204854 -205387(c)	129/SvJ	TRAV12-2	AC003997/ AE008685 [114]	
	TRAV12-3	F	+	+	218750 -219243(c)	129/SvJ	TRAV12-3	AC003997/ AE008685 [114]	
		(F)	+	+		Std:ddY	Valpha8	X17181 [64]#g	
		(F)	+	+		DBA/2	Valpha8	X67432 [84]#g	
		(F)	+	+		BALB/c	Valpha8	U21399 [101] [t]#c	
	TRAV12-4	P [aq]			382085 -382499(c)	129/SvJ	TRAV12-4P	AC005938/ AE008685 [114]	
		P [ar]				C57BL/6	ValphaF3.1psi	X06309 [49]	
TRAV13	TRAV13D-1	F	+	+	99029 -99540(b)	129/SvJ	TRAV13D-1	AC005402/ AE008684 [114]	
		(F)	+	+		B10.S/9R	Valpha10.2	M20875 [63]#c	
		(F)	+	+		BALB/c	Valpha10	M34216 [76] [ag]#c	
	TRAV13D-2	F	+	+	193728 -194239(b)	Std:ddY	Valpha10	X17178 [64]	129/SvJ, TRAV13D-2 [AC005402/AE008684] [114]
		(F)	+	+		BALB/c	Valpha10	U21415 [101] [as]#c	
	TRAV13D-3	F			284816 -285330(b)	129/SvJ	TRAV13D-3	AC005855/ AE008684 [114]	
	TRAV13D-4	F			314380 -316122(b)	129/SvJ	TRAV13D-4	AC005855/ AC004407/ AE008684 [114]	
		(F)	+	+		B10.S/9R	Valpha10.3	M20876 [63]#c	

(*continued on next page*)

Table 1 (*continued*)

TRAV subgroup	TRAV gene name	Fct	Alpha			Delta			Positions	Strain	Reference sequences	Accession numbers	Sequences from the literature
			R	T	Pr	R	T	Pr					
	TRAV13-1	F	+	+					131957 -132468(c)	129/SvJ	TRAV13-1	AC004406/ AE008685 [114]	
	TRAV13-2	F							231729 -232240(c)	129/SvJ	TRAV13-2	AC003997/ AE008685 [114]	
		(F)	+	+						B10.A	Valpha10	M38102 [78]#g	
	TRAV13-3	F							314684 -315198(c)	129/SvJ	TRAV13-3	AC003995/ AC004096/ AE008685 [114]	
		ORF [at]								Std:ddY	Valpha10	X17176 [64] [at]	
	TRAV13 -4/DV7	F	+	+					354062 -354573(c)	129/SvJ	TRADV13-4	AC003996/ AE008685 [114]	
		(F)				+	+			C57BL/6	Vdelta7	M26299 [69]#c	
		(F)	+	+						SWR x NZB (F1)	Valpha10	U07879 [97]#c	
	TRAV13-5	F							2674 -3182(d)	129/SvJ	TRAV13-5	AC005938/ AE008686 [114]	
TRAV14	TRAV14D-1	F	+	+						B10.A	Tcra-V2.2	L77149 [104]	
		ORF [au]	+	+					108054 -108555(b)	BALB/c	Tcra-V2.3	U04623 [95] [au]	129/SvJ, TRAV14D-1 [AC005402/AE008684] [114] [au]
	TRAV14D-2	F [av]	+	+					199520 -200019(b)	BALB/c	Tcra-V2.1	U04312 [95] [av]	129/SvJ, TRAV14D-2 [AC005402/AE008684] [114] [av]
		(F)	+	+						CBA/J	Valpha2	M88352 [91] [aw]#c	
	TRAV14D -3/DV8	F	+	+						B10.A	Tcra-V2.5	L77152 [104]	
		F	+	+						B10.A	Tcra-V2.4	L77151 [104]	
		F	+	+					322095 -322593(b)	BALB/c	Tcra-V2.4	U04624 [95]	129/SvJ, TRADV14D-3 [AC004407/AE008684] [114]
		(F)				+	+			C57BL/10	Vdelta8	U07557 [70] [t]#c	
		(F)	+	+						SWR x NZB (F1)	Valpha2	U07872 [97]#c	
		(F)	+	+						SWR x NZB (F1)	Valpha2	U07875 [97]#c	
		(F)	+	+						C57BL/6 x DBA/2 (F1)	TCRAV2	AF126457 [116]#c	
	TRAV14-1	F	+	+						B10.A	Tcra-V2.3	L77150 [104]	
		F							136454 -136955(c)	BALB/c	Tcra-V2.2	U04622 [95]	129/SvJ, TRAV14-1 [AC004406/AE008685] [114]
		(F)	+	+						BALB/c	Valpha2.2	AJ311368 [70] [b,l]#c	
	TRAV14-2	F	+	+						B10.A	Tcra-V2.1	L77148 [104]	
		F	+	+						B10.A	Tcra-V2.6	L77153 [104]	
		F	+	+					237700 -238201(c)	BALB/c	Tcra-V2.5	U04625 [95]	129/SvJ, TRAV14-2 [AC003997/AE008685] [115]
	TRAV14-3	F	+	+						B10.A	Tcra-V2.7	L77154 [104]	

		F	+	+			359846 -360344(c)	BALB/c	Tcra-V2.6	U04626 [95]	129/SvJ, TRAV14-3 [AC003996/AE008685] [114]
		(F)	+	+				C56BL/6 x DBA/2 (F1)	TCRAV2	AF126459 [116]#c	
TRAV15	TRAV15D -1/DV6D-1	F						BALB/c	delta1	X07878 [67]	
		F			+	+	113676 -114247(b)	129/SvJ	TRADV15D-1	AC005402/ AE008684 [114]	
		(F)	+	+				C57BL/Ka	Valpha7	X02935 [47]#c	
		(F)			+	+		C57BL/6	Vdelta1	X17225 [74]#g	
		(F)			+	+		DBA/2	Vdelta6.4	U66666 [113] [l]#c	
		(F)			+	+		DBA/2	Vdelta6.5	U66667 [113] [l]#c	
		(F)			+	+		DBA/2	Vdelta6.6	U66668 [113] [l]#c	
	TRAV15D -2/DV6D-2	F			+	+	207686 -208258(b)	129/SvJ	TRADV15D-2	AC005402/ AE008684 [114]	
		(F)			+	+		B10.A		AJ271435 [119]#c	
		(F)			+	+		C57BL/6	VDelta 6	AF085009 [120] [ax]#c	
		(F)			+	+		DBA/2	VDelta 6	AF085006 [120] [ax]#c	
		(F)			+	+		DBA/2	VDelta 6	AF085008 [120] [ax]#c	
	TRAV15D-3	P [ay]					326032 -326403(b)	129/SvJ	TRAV15D-3P	AC004407/ AE008684 [114]	
	TRAV15 -1/DV6-1	F	+	+	+	+	142067 -142638(c)	129/SvJ	TRADV15-1	AC004406/ AE008685 [114]	
		(F)			+	+		BALB/c	Vdelta2	X63939 [59]#c	
	TRAV15 -2/DV6-2	F			+	+	245725 -246294(c)	129/SvJ	TRDV15-2	AC003997/ AE008685 [114]	
		(F)			+	+		C57BL/6	VDelta 6	AF085010 [120] [ax]#c	
	TRAV15-3	P [ay]					363363 -363768(c)	129/SvJ	TRAV15-3P	AC003996/ AE008685 [114]	
TRAV16	TRAV16D/ DV11	F	+	+			298506 -299037(b)	129/SvJ	TRADV16D	AC005855/ AE008684 [114]	
		(F)	+	+				C57BL/6		M16118 [56]#c	
		(F)	+	+	+	+		C57BL/6		M16119 [56]#c	
	TRAV16	F	+	+			328553 -329084(c)	129/SvJ	TRAV16	AC004096/ AE008685 [114]	
		(F)	+	+				SWR x NZB (F1)	Valpha16	U07873 [97]#c	
		(F)	+	+				NOD		S69341 [98]#c	
		(F)	+	+				CBA		S73533 [99]#c	
		(F)	+	+				C57BL/6 x DBA/2	Valpha17	AF118105 [117] [ah]#c	
TRAV17	TRAV17	F	+	+			18507 -18983(d)	129/SvJ	TRAV17	AC005938/ AE008686 [114]	

(*continued on next page*)

Table 1 (*continued*)

TRAV subgroup	TRAV gene name	Fct	Alpha			Delta			Positions	Strain	Reference sequences	Accession numbers	Sequences from the literature
			R	T	Pr	R	T	Pr					
		(F)	+	+						C57BL/6		X60319 [85]#g	
TRAV18	TRAV18	ORF [j]							51750 -52475(d)	129/SvJ	TRAV18	AC005938/ AE008686 [114]	
TRAV19	TRAV19	F [az]	+	+					74507 -75012(d)	129/SvJ	TRAV19	AC005938/ AE008686 [114] [az]	BALB/c, Valpha5T [X72906] [91] [az,l]
		P [ba]								BALB/c	Valpha5Tpsi	X72903 [91]	
		(F)	+	+						C57BL/6	AV20S1	AF171639 [118]#c	
TRAV20	TRAV20	P [bb]	+	+					92619 -93170(d)	BALB/c	Valpha16.1	M94080 [94]	129/SvJ, TRAV20P [AC005938/AE008686] [114]bb
		(P) [bb]	+	+						AKR		M29272 [75]#c	
TRAV21	TRAV21/ DV12	F				+	+		106852 -107590(d)	BALB/c	Vdelta3	M94080 [94]	129/SvJ, TRADV21 [AC005938/AE008686] [114]
		(F)	+	+						C57BL/Ka	Valpha6	X02934 [47]#c	
TRAV22	TRAV22	P [bc]							165091 -165399(d)	129/SvJ	TRAV22P	AC004399/ AE008686 [114]	
TRAV23	TRAV23	P [bd]							195682 -196206(d)	129/SvJ	TRAV23P	AC003993/ AE008686 [114]	

Fct, Functionality; F, Functional; P, Pseudogene; ORF, Open Reading Frame; 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. Functionality is shown between parentheses when the accession number refers to rearranged genomic DNA or cDNA and the corresponding germline gene has not yet been isolated. Reference sequences in bold have been mapped: 'mapped' refers to sequences which have been obtained from clones (phages, cosmids, YACs…) either by subcloning or PCR, and does not apply to sequences obtained directly from genomic DNA. In the 'Sequences from the literature' column, names of the sequences are preceded by the designation of the mouse strain. For a given gene name, each horizontal line corresponds to a different allele. For more information, see Alignments of alleles and Tables of alleles (IMGT Repertoire http://imgt.cines.fr). In this table, are reported the 10 TRAV/DV genes identified so far: eight TRAV/DV genes (TRAV4-4/DV10, TRAV6-7/DV9, TRAV13-4/DV7, TRAV14D-3/DV8, TRAV15D-1/DV6D-1, TRAV15-1/DV6-1, TRAV16D/DV11 and TRAV21/DV12) which have been found rearranged to TRAJ genes and to (D)J-GENEs of the TRD locus. TRAV15-2/DV6-2 and TRAV15D-2/DV6D-2, which are assigned to the TRAV15 subgroup on the basis of sequence alignment, although they have not yet been found rearranged to TRAJ genes. If other TRAV genes or alleles are found rearranged to TRDJ genes, a suffix will be added to the gene name: /DV followed by a number for the TRDV subgroup (and eventually a hyphen and a gene number). Clones used for the complete sequencing of the TRA/TRD locus (see IMGT/GeneView, http://imgt.cines.fr, and Accession numbers of the references in this table and in Table 5) were later used to construct four contigs: AE008683 to AE008686. AE008683 (404892 bp) contains TRAV1 to TRAV7D-3. AE008684 (400099 bp) contains TRAV6D-4 to TRAV7-3. AE008685 (400099 bp) contains TRAV6-4 to TRAV12-4. AE008686 (461875 bp) contains TRAV13-5 to TRAV23. #c: rearranged cDNA, #g: rearranged genomic DNA. Positions: limits from INIT-CODON (ATG) to the last nucleotide of V-REGION in the following Accession numbers: (a) AE008683, (b) AE008684, (c) AE008685 and (d) AE008586. (For the four pseudogenes: TRAV5D-3, TRAV5-3, TRAV12-4 and TRAV22 which have no L-PART1, limits are from the first nucleotide to the last nucleotide of V-EXON.)

[a] B10.A is a congenic strain (see MGD for Strain Nomenclature Guidelines), B10 is the abbreviated symbol of C57BL/10.

[b] Sequence submitted to EMBL by IMGT curators (Bosc, N., 21/04/2001).

[c] DELETION of 12 nucleotides in CDR1-IMGT (positions 85–96 in IMGT unique numbering), in frame STOP-CODON at codon 43 in FR2-IMGT (positions 127–129) and INSERTION of 6 nucleotides in CDR2-IMGT (between positions 169/170).

[d] INIT-CODON not conserved in L-PART1: AAG instead of ATG, DELETION of 12 nucleotides in CDR1-IMGT (positions 85–96 in IMGT unique numbering), in frame STOP-CODON at codon 43 in FR2-IMGT (positions 127–129) and INSERTION of 6 nucleotides in CDR2-IMGT (between positions 169/170), no CONSERVED-TRP.

[e] In frame STOP-CODON at codon 6 in FR1-IMGT (positions 16–18 in IMGT unique numbering), INSERTION of 1 nucleotide c in FR1-IMGT (between positions 54 and 55), DELETION of 2 nucleotides in FR3-IMGT (positions 221–222).

[f] In frame STOP-CODON at codon 83 in FR3-IMGT (positions 247–249 in IMGT unique numbering).

[g] INSERTION of 12 nucleotides CCCAGCTGGAGG in FR3-IMGT (between positions 293 and 294 in IMGT unique numbering). This INSERTION is a duplication of positions 280–293 (Bosc, N., IMGT comment, 01/02/2001) and may represent a sequencing error.

[h] In frame STOP-CODONs at codon 58 in CDR2-IMGT (positions 172–174 in IMGT unique numbering), at codons 99 and 104 in FR3-IMGT (positions 295–297 and 310–312), the 2nd-CYS is not conserved.

[i] No L-PART1, in frame STOP-CODON at codon 5 in FR1-IMGT (positions 13–15 in IMGT unique numbering) and DELETION of 1 nucleotide in FR1-IMGT (position 42), DELETION of 6 nucleotides in frame (positions 229–234) and of 16 nucleotides in FR3-IMGT (position 262–277), STOP-CODON at codon 99 in FR3-IMGT (positions 295–297).

[j] ORF because unusual V-HEPTAMER sequence: CACACTG instead of CACAGTG.

[k] V-REGION is partial: AA 1–22 are missing (partial FR1-IMGT).

[l] V-REGION is partial: AA 1 is missing (partial FR1-IMGT).

[m] In frame STOP-CODONs at codon 58 in CDR2-IMGT (positions 172–174 in IMGT unique numbering) and at codon 99 in FR3-IMGT (positions 295–297).

[n] No L-PART1, in frame STOP-CODON at codon 5 in FR1-IMGT (positions 13–15 in IMGT unique numbering) and DELETION of 1 nucleotide in FR1-IMGT (position 42) , DELETION of 6 nucleotides in frame (positions 229–234) and of 4 nucleotides in FR3-IMGT (positions 281–284), STOP-CODON at codon 99 in FR3-IMGT (positions 295–297).

[o] V-REGION is partial: AA 1–15 are missing (partial FR1-IMGT).

[p] V-GENE is partial: partial V-SPACER and no V-NONAMER.

[q] V-REGION is partial: AA 1–10 are missing (partial FR1-IMGT).

[r] V-REGION is partial: AA 1–25 are missing (partial FR1-IMGT).

[s] V-REGION is partial: AA 1–8 are missing (partial FR1-IMGT).

[t] V-REGION is partial: AA 1–9 are missing (partial FR1-IMGT).

[u] DELETION of 1 nucleotide in CDR2-IMGT (position 83 in IMGT unique numbering).

[v] INIT-CODON not conserved in L-PART1: ATC instead of ATG.

[w] V-REGION is partial: AA 1–11 are missing (partial FR1-IMGT).

[x] V-REGION is partial: AA 1–44 are missing (no FR1-IMGT, no CDR1-IMGT, partial FR2-IMGT).

[y] V-REGION is partial: AA 1–69 are missing (no FR1-IMGT, no CDR1-IMGT, no FR2-IMGT, no CDR2-IMG , partial FR3-IMGT).

[z] V-REGION is partial: AA 1–19 are missing (partial FR1-IMGT).

[aa] The TRAV7-2 gene localized in 5′ from TRAV4-5 is in an inverted orientation of transcription compared to the other genes of the TRA locus.

[ab] V-REGION is partial: AA 1–51 are missing (no FR1-IMGT, no CDR1-IMGT and partial FR2-IMGT).

[ac] Although the V-HEPTAMER is unusual (CACAGTA instead of CACAGTG), the gene has been found rearranged and is therefore functional.

[ad] V-REGION is partial: AA 1–56 are missing (no FR1-IMGT, no CDR1-IMGT, no FR2-IMGT and partial CDR2-IMGT).

[ae] Sterile transcript.

[af] DELETION of 1 nucleotide in FR3-IMGT (position 299 in IMGT unique numbering). V-REGION is partial: AA 1–43 are missing (no FR1-IMGT, no CDR1-IMGT and partial FR2-IMGT).

[ag] V-REGION is partial: AA 1–38 are missing (no FR1-IMGT, no CDR1-IMGT and no FR2-IMGT).

[ah] V-REGION is partial: AA 1 and 2 are missing (partial FR1-IMGT).

[ai] Although the V-HEPTAMER is unusual (CACACTG instead of CACAGTG), the gene has been found rearranged and is therefore functional.

[aj] INSERTION of 1 nucleotide leads to a frameshift in L-PART1.

[ak] For the TRAV11 subgroup, sequences of the TRAV11D gene cannot be differentiated from those of the TRAV11 gene. All sequences which are not unambiguously mapped, are therefore described as ‘TRAV11 alleles’ and compared to the allele *01 of TRAV11 (AC005240). However, it is not excluded that some of these ‘alleles’ belong exclusively to the TRAV11D gene.

[al] Although the V-HEPTAMER is unusual (CACCATG instead of CACAGTG), the gene has been found rearranged and is therefore functional.

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[am] V-REGION is partial: AA 1 and 2, 106 and 107 are missing (partial FR1-IMGT and partial CDR3-IMGT). It is not known if this sequence is an allele of TRAV11 or of TRAV11D because the V-REGIONs of these two genes are identical.

[an] V-REGION is partial: AA 1–42 are missing (no FR1-IMGT, no CDR1-IMGT and partial FR3-IMGT), DELETION of 3 nucleotides in frame in FR3-IMGT (positions 279–281 in IMGT unique numbering, S93 is encoded by TCG instead of TCA).

[ao] ORF because the 1st-CYS is not conserved, V-REGION is partial: AA 1 is missing (partial FR1-IMGT).

[ap] ORF because unusual V-HEPTAMER sequence: CACAGCG instead of CACAGTG.

[aq] No L-PART1, V-REGION is partial: AA 1–3 are missing (partial FR1-IMGT), in frame STOP-CODONs at codon 40 in FR2-IMGT (positions 118–120 in IMGT unique numbering) and at codon 91 in FR3-IMGT (positions 271–273), deletion of 9 nucleotides in FR3-IMGT (positions 296–304) leading to a frameshift.

[ar] V-REGION is partial: AA 1–4 are missing (partial FR1-IMGT), in frame STOP-CODON at codon 40 (positions 118–120 in IMGT unique numbering) and DELETION of 1 nucleotide in FR2-IMGT (position 149).

[as] V-REGION is partial: AA 1–17 are missing (partial FR1-IMGT).

[at] ORF because unusual V-HEPTAMER sequence: GAGGGTG instead of CACAGTG.

[au] ORF because no CONSERVED-TRP.

[av] U04312 and AC005402 have the same V-REGION but L-PART1 and L-PART2 are different.

[aw] V-REGION is partial: AA 1–27 are missing (no FR1-IMGT and partial CDR1-IMGT).

[ax] V-GENE is partial (no L-PART1, no L-PART2), and V-REGION is partial: AA 1 is absent (FR1-IMGT is partial).

[ay] DELETION 1 nucleotide in FR1-IMGT (position 32 in IMGT unique numbering), no CONSERVED-TRP, and V-REGION is partial: AA 43–90 are missing (partial FR2-IMGT, no CDR2-IMGT and partial FR3-IMGT).

[az] Although the V-HEPTAMER is unusual (CACGGTA instead of CACAGTG), the gene has been found rearranged and therefore is functional.

[ba] In frame STOP-CODON at codon 2 in FR1-IMGT (positions 4–6 in IMGT unique numbering), DELETION of 11 nucleotides in FR3-IMGT (positions 262–272) , STOP-CODON at codon 104 in FR3-IMGT (positions 310–312).

[bb] In frame STOP-CODONs at codons 4 and 11 in FR1-IMGT (positions 10–12 and 31–33 in IMGT unique numbering).

[bc] No L-PART1 and frameshifts in V-REGION.

[bd] INSERTION of 13 nucleotides in FR3-IMGT (between positions 281/282 in IMGT unique numbering).

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Table 2
Mouse (*M. musculus*) TRAV alleles on chromosome 14 at 19.7 cM

TRAV subgroup	TRAV gene name	Fct	TRAV allele name	Strains	Accession numbers	Conformed by genetics and/or data	Description of mutations
TRAV1	TRAV1	F	TRAV1*01	129/SvJ	AF259072	+	c9 |a26 ,D9 |c30 ,N10 |a42 |t93 |c144 ,H48 |c150 |a243 |
		(F)	TRAV1*02	B10.A	M22604		c9>t|a26>c,D9>A|c30>a,N10>K|a42>g|t93>c|c144>a,H48>Q|c150>t|a243>t|
TRAV2	TRAV2	F	TRAV2*01	129/SvJ	AF259071	+	
TRAV3	TRAV3-1	F	TRAV3-1*01	129/SvJ	AF259071		g55 ,A19 |
		(F)	TRAV3-1*02	C3H	AJ311366		g55>t,A19>S|
	TRAV3D-3	F	TRAV3D-3*01	129/SvJ	AC005402		
	TRAV3-3	F	TRAV3-3*01	129/SvJ	AC003997	+	c65 ,T22 |a145 ,S49 |g257 ,R86 |c302 ,A101 |
		(F)	TRAV3-3*02	C57BL/Ka	X02933		c65>t,T22>I|a145>g,S49>G|g257>a,R86>Q|c302>t,A101>V|
	TRAV3-4	F	TRAV3-4*01	129/SvJ	AC003996	+	
TRAV4	TRAV4D-3	F	TRAV4D-3*01	129/SvJ	AC005402	+	a7 ,K3 |a13 ,K5 |g15 |c22 ,P8 |g45 |a66 |c84 |c153 ,I51 t171 |c172 ,P58 |a244 ,T82 |c249 |a250 ,N84 |t266 ,L89 |c273 |g291 |293
		(F)	TRAV4D-3*02	B10.A	M22603	+	|c84>t|c153>g,I51>M t171>g |a244>g,T82>A|c249>t|a250>g,N84>D| |c273>t|
		(F)	TRAV4D-3*03	A/J	M73265		|c22>g,P8>A| |a66>g| |t266>c,L89>P|
		(F)	TRAV4D-3*04	C57BL/6	M87844	+	|g15>a| |g45>a| |a244>g,T82>A| |a250>g,N84>D|
		(F)	TRAV4D-3*05		S81113		|g45>a| |c153>g,I51>M |g291 |
		(F)	TRAV4D-3*06	B10.A	U63776		a7>c,K3>Q|a13>g,K5>E| |c84>t|c153>g,I51>M t171>g|c172>t,P58>S|a244>g,T82>A|c249>t|a250>g,N84>D| |c273>t| |293^294>ins^cccagctggagg#|
		F	TRAV4D-4*01	129/SvJ	AC005855	+	g43 ,E15 |a52 ,S18 |g78 |c86 ,T29 |a91 ,g92 ,S31 |g128 , R43 |c130 ,Q44 |c162 ,F54 |c235 |g244 ,A82 |t249 |g250 ,

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	TRAV6-6	F	TRAV6-6*01	129/SvJ	AC005240	+	c27 |c28 ,Q10 |c36 |c39 |c77 ,S26 |c92 ,A31 |a253 ,c255 , T85 |a285 |g288 |t312 |
		(F)	TRAV6-6*02	BALB/c	U21448		c27>a|c28>a,Q10>K| |c39>t| | ,c255>g, |a285>g|g288>a|
		(F)	TRAV6-6*03	C57BL/6	U90513		|c36>t| |c77>t,S26>L|c92>g,A31>G|a253>g, , T85>A| |t312>c|
	TRAV6-7/DV9	F	TRAV6-7/DV9*01	129/SvJ	AC003995	+	g3 |t40 ,S14 |c81 |c83 |g94 ,t96 ,A32 |t126 |t128 ,V43 |a141 |g147 |t154 ,F52 |c162 |g234 |c243 |c249 |a250 ,N84 | a251^{B} ,a252^{B} ,E84^{B} |c255 |a269 ,Q90 |c276 |a285 |g288 |g292 ,D98 |t302 ,V101 |
		(F)	TRAV6-7/DV9*02	C57BL/Ka	X02932		g3>a| |t126>c| |g147>t| |c162>t|g234>t|c243>t|c249>t|a250>g, N84>D| a251^{B}>g,a252^{B}>g,E84^{B}>G| |a269>g,Q90>R|
		(F)	TRAV6-7/DV9*03	B10.PL	M21863		g3>a| |c81>a| |t126>c| |g147>t| |c162>t|g234>t|c243>t|c249>t|a250>g, N84>D| a251^{B}>g,a252^{B}>g,E84^{B}>G| |a269>g,Q90>R|
		(F)	TRAV6-7/DV9*04	C57BL/6	X13316		|g94>a,t96>c,A32>T| |t154>c,F52>L|c162>t|g234>t|c243>t|c249>t|a250>g, N84>D| a251^{B}>g,a252^{B}>g,E84^{B}>G| |a269>g,Q90>R|c276>t|
		(P)	TRAV6-7/DV9*05	B10.PL	M35492		g3>a| |c83>del#| |t126>c|t128>a,V43>E |a141>g|g147>t| |c162>t|g234>t|c243>t|c249>t|a250>g, N84>D| a251^{B}>g,a252^{B}>g,E84^{B}>G| |a269>g,Q90>R|
		(P)	TRAV6-7/DV9*06	C57BL/10	X52448		g3>a| |g147>t| |c162>t|g234>t|c243>t|c249>t|a250>g, N84>D| a251^{B}>g,a252^{B}>g,E84^{B}>G| |a269>g,Q90>R|
		(F)	TRAV6-7/DV9*07	BALB/c	U21453		|t40>a,S14>T| |g292>t,D98>Y|
		(F)	TRAV6-7/DV9*08	BALB/c	U21409	+	|t40>a,S14>T| |c255>g| |a285>g|g288>a|
		(F)	TRAV6-7/DV9*09	C57BL/6 x BALB/c (F1)	D12899		|t302>g,V101>G|
TRAV7	TRAV7-1	F	TRAV7-1*01	129/SvJ	AF259071	+	
	TRAV7D-2	F	TRAV7D-2*01	129/SvJ	AF259071		g3 |a243 |a251^{A} ,K84^{A} |c279 ,D93 |c282 |g285 |c301 ,L101 |
		(F)	TRAV7D-2*02	B10.A	M38104		g3>a|a243>t|
		(F)	TRAV7D-2*03	BALB/c	X83009		|a251^{A}>g,K84^{A}>R|c279>g,D93>E|c282>g|g285>a|c301>g,L101>V|
	TRAV7D-3	F	TRAV7D-3*01	C57BL/10	X02833	+	t161 ,M54 |g264 |a267 |
		(F)	TRAV7D-3*02	B10.A x AKR	M26423		t161>c,M54>T|g264>c|a267>g|
	TRAV7D-4	F	TRAV7D-4*01	C57BL/6	X56723	+	g46 ,a48 ,G16 |c96 |g153 |a165 |
		F	TRAV7D-4*02	129/SvJ	AC003994	+	|a165>c|
		(F)	TRAV7D-4*03	C57BL/Ka	X02928	+	g46>a,a48>c,G16>S| |a165>c|
		(F)	TRAV7D-4*04	C57BL/6	X56722		|c96>t|g153>a|a165>c|
	TRAV7D-5	F	TRAV7D-5*01	129/SvJ	AC004101		
	TRAV7D-6	F	TRAV7D-6*01	129/SvJ	AC005855		
	TRAV7-2	F	TRAV7-2*01	129/SvJ	AC004407		
	TRAV7-3	F	TRAV7-3*01	129/SvJ	AC004407	+	a27 ,E9 |g210 |t306 |
		(F)	TRAV7-3*02	BALB/c	L16803		|g210>c|t306>c|
		(F)	TRAV7-3*03	SJL	AF037038		a27>c,E9>D|
	TRAV7-4	F	TRAV7-4*01	129/SvJ	AC004407	+	

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