Names for JK (ISBT 009) Blood Group Alleles

Intro

General Description:	The Kidd blood group system consists of 3 antigens carried on a multipass type 3 membrane glycoprotein that functions as the primary urea transporter on RBCs. It consists of 389 amino acids and has 10 membrane-spanning domains.
Gene name:	*SLC14A1*
Number of exons:	10
Initiation codon:	Exon 3 at c.179
Stop codon:	Exon 10 at c.1348
Entrez Gene ID:	6563
LRG:	LRG 802
LRG sequence	NG_011775.4 (genomic) NM_015865.7 (transcript)
Reference allele:	*JK*01* (shaded) Acceptable: *JK*A* or Jk^a if inferred by hemagglutination
Reference allele *JK*01* encodes:	JK1, JK3
Antithetical antigens:	[JK1 JK2]

Phenotype	Allele name	Nucleotide change	Exon Intron	Predicted amino acid change	(Reference No.) PMID	Accession number	rs number
JK:1 or Jk(a+)	***JK*01* or *JK*A***	c.838G			PMID: 8647271	NG_011775.4	
JK:2 or Jk(b+)	***JK*02* or *JK*B***	c.838G>A	8	p.Asp280Asn	PMID: 8647271	n.a.	rs1058396
Weak *JK*01* phenotypes							
Jk(a+^{W})	***JK*01W.01***	c.130G>A	3	p.Glu44Lys	PMID: 21309779	MG601100	rs2298720
Jk(a+^{W})	***JK*01W.02***	c.511T>C	6	p.Trp171Arg	(1), Abstract	n.a.	rs9948825
Jk(a+^{W})	***JK*01W.03***	c.28G>A	3	p.Val10Met	(2), Abstract	n.a.	rs113578396
Jk(a+^{W})	***JK*01W.04***	c.226G>A	4	p.Val76Ile	(2), Abstract	n.a.	rs113029149
Jk(a+^{W})	***JK*01W.05***	c.742G>A	7	p.Ala248Thr	(3), Abstract (4), Abstract	JN410949	rs763095261
Jk(a+w)	***JK*01W.06***	c.130G>A c.588A>G	3 6	p.Glu44Lys p.Pro196Pro	PMID: 21309779	n.a.	rs2298720 rs2298718
Jk(a+^{W})	***JK*01W.07***	c.486T>A	6	p.Ser162Arg	(5), Abstract	n.a.	rs753809770
Jk(a+^{W})	***JK*01W.08***	c.814C>T	8	p.Leu272Phe	(6), Abstract	n.a.	rs757895930
Jk(a+^{W})	***JK*01W.09***	c.134T>C	3	p.Leu45Pro	(7), Abstract	n.a.	rs537028614
Jk(a+^{W})	***JK*01W.10***	c.350T>C	5	p.Ile117Thr	(7), Abstract	n.a.	rs374022751
Jk(a+^{W})	***JK*01W.11***	c.28G>A c.226G>A	3 4	p.Val10Met p.Val76Ile	PMID: 27834480	n.a.	rs113578396 rs113029149
Jk(a+^{W})	***JK*01W.12***	c.130G>A c.1068insA	3 10	p.Glu44Lys p.Asp356Lysfs*11	(15), Abstract	n.a.	rs2298720 rs756548295
Weak *JK*02* phenotypes							
Jk(b+^{W})	***JK*02W.01***	c.548C>T c.838G>A	6 8	p.Ala183Val p.Asp280Asn	(1), Abstract	n.a.	rs367901541 rs1058396

Phenotype	Allele name	Nucleotide change	Exon Intron	Predicted amino acid change	(Reference No.) PMID	Accession number	rs number
Jk(b+^{W})	***JK*02W.02***	c.718T>A c.838G>A	7 8	p.Trp240Arg p.Asp280Asn	(9), Abstract	n.a.	rs760579000 rs1058396
Jk(b+w)	***JK*02W.03***	c.130G>A c.588A>G c.838G>A	3 6 8	p.Glu44Lys p.Pro196Pro p.Asp280Asn	PMID: 23225053	n.a.	rs2298720 rs2298718 rs1058396
Jk(b+^{W})	***JK*02W.04***	c.130G>A c.838G>A	3 8	p.Glu44Lys p.Asp280Asn	(10), Abstract	n.a.	rs2298720 rs1058396
Jk(b+^{W})	***JK*02W.05***	c.277G>A c.838G>A	4 8	p.Ala93Thr p.Asp280Asn	(11), Abstract	MF588960	n.a. rs1058396
Jk(b+^{W})	***JK*02W.06***	c.838G>A c.998T>A c.1095T>C	8 10 10	p.Asp280Asn p.VAl333Asp p.Ser365Ser	(12), Abstract	LK391765	rs1058396 rs774982134 rs28898897
Null phenotypes, *JK*01 alleles*							
JK:–3 or Jk(a–b–)	***JK*01N.01***	c.1_341del	3 - 4	p.0	PMID:11807016	AF328892	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.02***	c.202C>T	4	p.Gln68Ter	PMID:18028269	EF571316	rs142529927
JK:–3 or Jk(a–b–)	***JK*01N.03***	c.582C>G	6	p.Tyr194Ter	PMID:11841450	AF328890	rs34756616
JK:–3 or Jk(a–b–)	***JK*01N.04***	c.956C>T	9	p.Thr319Met	PMID:18028269	EF571318	rs565898944
JK:–3 or Jk(a–b–)	***JK*01N.05***	c.561C>A	6	p.Tyr187Ter	PMID:22023394	JN104323	rs778172038
JK:–3 or Jk(a–b–)	***JK*01N.06***	c.342-1G>A	i4	p.Arg114Ter	PMID:10924622	n.a.	rs78937798
JK:–3 or Jk(a–b–)	***JK*01N.07***	c.723delA	7	p.Gly243Alafs*20	(13), Abstract	n.a.	rs759505281
JK:–3 or Jk(a–b–)	***JK*01N.08***	c.866A>G	8	p.Asn289Ser	(14), Abstract	n.a.	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.09***	c.27_50del	3	p.Val10_Arg17del	(15), Abstract	n.a.	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.10***	c.811+5G>A	i7	p.Leu272Glufs*29	PMID: 22738189	HQ709264	rs1414947682
JK:–3 or Jk(a–b–)	***JK*01N.11***	Obsolete					
JK:–3 or Jk(a–b–)	***JK*01N.12***	c.516_530del	6	pVal175_Pro179	(12), Abstract	n.a.	rs772726215

Phenotype	Allele name	Nucleotide change	Exon Intron	Predicted amino acid change	(Reference No.) PMID	Accession number	rs number
JK:–3 or Jk(a–b–)	***JK*01N.13***	c.327delG	4	p.Leu109Phefs*8	PMID: 24877238	AB845711	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.14***	c.432G>A	5	p.Gly298Glu	PMID: 24877238	AB845712	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.15***	c.757_759delTCC	7	p.Ser253del	PMID: 24877238	AB845716	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.16***	c.893G>A	8	p.Gly298Glu	PMID: 24877238	AB845717	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.17***	c.118G>A c.499A>G	3 6	p.Gly40Ser p.Met167Val	(16), Abstract	n.a.	rs145283450 rs2298719
JK:–3 or Jk(a–b–)	***JK*01N.18***	c.190C>T	4	p.Arg64Trp	(13), Abstract	n.a.	rs552191196
JK:–3 or Jk(a–b–)	***JK*01N.19***	c.810G>A	7	p.Ala270Ala	(17), Abstract PMID: 36818776	n.a.	rs17675299
JK:–3 or Jk(a–b–)	***JK*01N.20***	c.28G>A c.226G>A c.303G>A c.588A>G	3 4 4 6	p.Val10Met p.Val76Ile pVal101Val p.Pro196Pro	(18), Abstract	n.a.	rs113578396 rs113029149 rs28994287 rs2298718
JK:–3 or Jk(a–b–)	***JK*01N.21***	c.130G>A c.220A>G	3 4	p.Glu44Lys p.Asn74Asp	PMID: 26969102	n.a.	rs2298720 n.a.
JK:–3 or Jk(a–b–)	***JK*01N.22***	c.737T>G	7	p.Leu246Arg	PMID: 25807964	n.a.	n.a.
JK:–3 or Jk(a–b–)	***JK*01N.23***	c.996+5G>C	9	p.Ala313Glyfs*34	PMID: 30964549	n.a.	rs1568049596
JK:–3 or Jk(a–b–)	***JK*01N.24***	c.267delC	4	p.Trp91Glyfs*15	PMID: 33539287	n.a.	rs766335775
JK:–3 or Jk(a–b–)	***JK*01N.25***	c.28G>A c.757T>C	3 7	p.Val10Met p.Ser253Pro	PMID: 34591379	n.a.	rs113578396 rs371769347
JK:–3 or Jk(a–b–)	***JK*01N.26***	c.812G>T	7	p.Gly271Val	PMID: 33231305	n.a.	rs372299852
Null phenotypes, *JK*02 alleles*							
JK:–3 or Jk(a–b–)	***JK*02N.01***	c.342-1G>A c.838G>A	i4 8	p.Arg114Ter p.Asp280Asn	PMID: 9582331 PMID: 10644814	n.a.	rs78937798 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.02***	c.342-1G>C c.838G>A	i4 8	p.Arg114Ter p.Asp280Asn	PMID: 16483143	n.a.	rs78937798 rs1058396

Phenotype	Allele name	Nucleotide change	Exon Intron	Predicted amino acid change	(Reference No.) PMID	Accession number	rs number
JK:–3 or Jk(a–b–)	***JK*02N.03***	c.222C>A c.838G>A	4 8	p.Asn74Lys p.Asp280Asn	PMID: 18980618 PMID: 23225053	HQ834248	rs749037771 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.04***	c.663+1G>T c.838G>A	i6 8	p.Leu222Valfs*46 p.Asp280Asn	PMID: 9582331	n.a.	rs77744921 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.05***	c.723delA c.838G>A	7 8	p.Gly243Alafs*20 p.Asp280Asn	PMID: 18028269	EF571317	rs759505281 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.06***	c.838G>A c.871T>C	8 8	p.Asp280Asn p.Ser291Pro	PMID: 10942407	n.a.	rs1058396 rs78242949
JK:–3 or Jk(a–b–)	***JK*02N.07***	c.838G>A c.896G>A	8 8	p.Asp280Asn p.Gly299Glu	PMID: 18980618 PMID: 23225053	HQ729920	rs1058396 rs538368217
JK:–3 or Jk(a–b–)	***JK*02N.08***	c.838G>A c.956C>T	8 9	p.Asp280Asn p.Thr319Met	PMID: 18028269	EF571318	rs1058396 rs565898944
JK:–3 or Jk(a–b–)	***JK*02N.09***	c.191G>A c.838G>A	4 8	p.Arg64Gln p.Asp280Asn	PMID: 24689685	JN104324	rs114362217 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.10***	c.194G>A c.838G>A	4 8	p.Gly65Asp p.Asp280Asn	PMID: 23710545		rs778150490 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.11***	c.499A>G c.512G>A c.838G>A	6 6 8	p.Met167Val p.Trp171* p.Asp280Asn	PMID: 22738189	HQ729921	rs2298719 n.a. rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.12***	c.437T>C c.499A>G c.838G>A	5 6 8	p.Leu146Pro p.Met167Val p.Asp280Asn	PMID: 22738189	HQ834246	n.a. rs2298719 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.13***	c.499A>G c.536C>G c.838G>A	6 6 8	p.Met167Val p.Pro179Arg p.Asp280Asn	PMID: 22738189	HQ834247	rs2298719 rs201612170 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.14***	c.838G>A c.1038delG	8 10	p.Asp280Asn p.Leu347Tyrfs*6	PMID: 27834480	n.a.	rs1058396 rs746265611
JK:–3 or Jk(a–b–)	***JK*02N.15***	c.838G>A c.160insC	8 4	p.Asp280Asn p.Val54Argfs*7	(15), Abstract	n.a.	rs1058396 rs377124382

Phenotype	Allele name	Nucleotide change	Exon Intron	Predicted amino acid change	(Reference No.) PMID	Accession number	rs number
JK:–3 or Jk(a–b–)	***JK*02N.16***	c.838G>A c.856delT	8 8	p.Asp280Asn p.Trp286Glyfs*67	(11), Abstract	n.a.	rs1058396 rs1444093504
JK:–3 or Jk(a–b–)	***JK*02N.17***	c.810G>A c.838G>A	7 8	p.Ala270Ala p.Asp280Asn	(12), Abstract PMID: 36818776	n.a.	rs17675299 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.18***	c.561C>A c.838G>A	6 8	p.Tyr187Ter p.Asp280Asn	PMID: 24877238	AB845713	rs778172038 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.19***	c.719G>A c.838G>A	7 8	p.Trp240Ter p.Asp280Asn	PMID: 24877238	AB845715	n.a. rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.20***	c.647_648delAC c.838G>A	6 8	p.Asp216Alafs*21 p.Asp280Asn	PMID: 24877238	AB845714	rs1223735153 rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.21***	c.118G>A c.838G>A	3 8	p.Gly40Ser p.Asp280Asn	PMID: 27834480	n.a.	n.a. rs1058396
JK:–3 or Jk(a–b–)	***JK*02N.22***	c.157_166del c.838G>A	4 8	Pro53Serfs*25 p.Asp280Asn	PMID: 33539287	n.a.	rs750167058 rs1058396

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Track of changes

			from	to
1	**Version**		**v8.0 31-MAR-2022**	**v8.1 31-JUL-2023**
2	Author	created:	Greg Denomme, March 2022	Greg Denomme, July 2023
3	Reviewer	reviewed:	Nuria Nogues, March 2022	Nuria Nogues, July 2023
4	Allele table	Reference added	JK*02N.04 unknown	*JK*02M.04* PMID: 9582331
5	Updated allele	JK*01N.23	splice site	Predicted amino acid change due to splice site
6	Allele table	Reference added		PMID: 36818776 reports that c.810G>A in *JK*01N.19* and *JK*02N.17* does not result in a null phenotype
7	New allele	Antigen/allele added		*JK*01N.24* PMID: 33539287 reports the nucleotide change as c.267. With the stretch of 4 C nucleotides (c.267 to c.270), the 3-prime rule applies to the predicted amino acid change
8	New allele	Antigen/allele added		*JK*01N.24* PMID: 33539287 added
9	New allele	Antigen/allele added		*JK*01N.25* PMID: 34591379 added
10	New allele	Antigen/allele added		*JK*01N.26* PMID: 33231305 added
11	New allele	Antigen/allele added		*JK*02N.25* PMID: 33539287 added
12	**End Version**			**v8.1 31-JUL-2023**

Track of changes

			from	to
1	**Version**		**v7.0 29-JUN-2021**	**v8.0 31-MAR-2022**
2	Author	created:	Greg Denomme Feb. 2020	Greg Denomme, March 2022
3	Reviewer	reviewed:	Nuria Nogues, June 2021	Nuria Nogues, March 2022
3		*JK*01W.06* updated *JK*02W.03* updated		c.588G has been observed in *cis* with c.130A in either *JK*A* (Ref 2,19) or *JK*B* (Ref 13). *JK*01W.06* and *JK*02W.03* have been updated to reflect the two SNVs. The presence of c.588G without c.130A has not been reported as a Jk(a+w) nor a Jk(b+w) phenotype.
4	Allele table	*JK*01N.11* removed		The *JK*01N.11* allele was reported to have a Jk(a+^{w}) phenotype, which might be due to the insertion of an incomplete JK glycoprotein into the RBC membrane since the c.1068insA occurs in exon 10. The *JK*01N.11* 'null' allele has been made obsolete and a *JK*01W.12* 'weak' allele added.
5	Allele table	Antigen/allele added:		*JK*01W.12*
6	Allele table	Antigen/allele added:		*JK*01N.22* (Reference PMID: 25807964)
7	Allele table	Antigen/allele added:		*JK*02N.23* (Reference PMID: 28608429)
8	Allele table	Antigen/allele added:		*JK*02N.24* (Reference PMID: 29399811)
9	Allele table	Antigen/allele added:		*JK*01N.23* (Reference PMID: 30964549)
10	References	numbering changed		Abstract 3. to (1)
11	References	numbering changed		Abstract 4. to (2)
12	References	numbering changed		Abstract 5. to (3)
13	References	numbering changed		Abstract 6. to (4)
14	References	numbering changed		Abstract 8. to (5)
15	References	numbering changed		Abstract 9. to (6)
16	References	numbering changed		Abstract 10. to (7)
17	References	numbering changed		Abstract 11. to (8)
18	References	numbering changed		Abstract 12. to (9)
19	References	numbering changed		Abstract 14. to (10)
20	References	numbering changed		Abstract 15. to (11)

Track of changes

			from	to
1	**Version**		**v7.0 29-JUN-2021**	**v8.0 31-MAR-2022**
21	References	numbering changed		Abstract 16. to (12)
22	References	numbering changed		Abstract 22. to (13)
23	References	numbering changed		Abstract 23. to (14)
24	References	numbering changed		Abstract 24. to (15)
25	References	numbering changed		Abstract 27. to (16)
26	References	numbering changed		Abstract 28. to (17)
27	References	numbering changed		Abstract 29. to (18)
28	Allele table	added specific mutuation		added *JK*02* -specific mutation c.838G>A and rs1058396 to all *JK*02* derivatives
29	**End Version**		**v7.0 30-JUN-2021**	**v8.0 31-MAR-2022**

Track of changes

			from	to
1	**Version**		**v6.0 25-FEB-2020**	**v7.0 30-JUN-2021**
2	Author	created:	Greg Denomme, v5.1 190123	Greg Denomme February 15, 2020
3	Reviewer	reviewed:	n.a.	Nuria Nogues, June 2021
4	Typo	corrected		LU*A changed to JK*A on the front page
5	Allele	changed		Jk(a+w) changed to Jk(a+^{w})
6	Allele	changed		Jk(b+w) changed to Jk(b+^{w})
7	Reference	changed		Reference for *JK*01W.6* corrected to reference 2 (PMID: 21309779)
8	Reference	changed		Reference 13 removed from *JK*02W.03*
9	Reference	changed		Reference for *JK*01N.03* corrected
10	Allele	renumbered		Duplicate *JK*02N.20* renumbered
11	Allele	added		Second allele from reference 11 (new (8)) added
12	**End Version**		**v6.0 25-FEB-2020**	**v7.0 30-JUN-2021**

Track of changes

			from	to
1	**Version**		**v5.1 190123**	**v6.0 25-FEB-2020**
2	Author	created:	Greg Denomme, v5.1 190123	Greg Denomme February 15, 2020
3	Reviewer	reviewed:	n.a.	Peter Ligthart, February 2020
4	General		Last word version publiced on ISBT website	First Excel map version. Spread-sheets "Intro", "Allele Table", "References", and "Versioning" created.
5	Intro	Text changed	The Kidd blood group system consists of 3 antigens carried on a multipass type 3 membrane glycoprotein that functions as the primary urea transporter on RBCs. It consists of 389 amino acids and has 10 membrane-spanning domains.	The Kidd blood group system consists of 3 antigens carried on a multipass type 3 membrane glycoprotein that functions as the primary urea transporter on RBCs. It consists of 389 amino acids and has 10 membrane-spanning domains.
6	Intro	LRG ID line added:	n.a.	LRG_802
7	Intro	Reference allele line moved from Allele Table to Intro:	n.a.	Reference allele JK*01 encodes JK1, JK3
8	Intro	Antithetical Antigens line created in Intro:	n.a.	Antithetical antigens: [JK1, JK2]
9	Allele Table			Table columns "(Reference No.) PMID", "Accession number" and "rs-number" added, content added.
10	Allele Table	Text change: Line moved to Intro:	n.a.	see above
11	Allele Table	Text change:	JK*01 made the reference allele to coincide with LRG; exons changed to match LRG	Added to Table: *JK*01W.06 - JK*01W.11; JK*02W.03 - JK*02W.06; JK*01N.11 - JK*01N.21; JK*02N.15 - JK*02N.20*

Track of changes

			from	to
1	**Version**		**v5.1 190123**	**v6.0 25-FEB-2020**
12	Reference	Renumbered References:	Original numbering: 1. Whorley T et al. Transfusion 2009;49(Suppl):48A. 2. Deal, T et al. Transfusion 011;51(Suppl):24-25A 3. St-Louis, M et al Transfusion 2012 :52(Suppl) :160-161A . 4. Crews, WS et al. Transfusion 2013;53(Suppl):164A 5. Moulds JM. Personal communication 2012-08-22	New numbering: 3. Whorley T et al. Transfusion 2009;49(Suppl):48A. 4. Deal, T et al. Transfusion 011;51(Suppl):24-25A 12. St-Louis, M et al Transfusion 2012 :52(Suppl) :160-161A . 22. Crews, WS et al. Transfusion 2013;53(Suppl):164A 23. Moulds JM. Personal communication 2012-08-22
13	Allele Table	Antigen/allele added:	n.a. n.a.	JK1 weak phenotypes: *JK*01W.06* to *JK*01W.11* **References:** 7 - 11
14	Allele Table	Antigen/allele added:	n.a. n.a.	JK2 weak phenotypes: *JK*02W.03* to *JK*02W.06* **References:** 2, 13 - 16
15	Allele Table	Antigen/allele added:	n.a. n.a.	JK1 null phenotypes: *JK*01N.11* to *JK*01N.21* **References:** 16, 22, 24, 26 - 30
16	Allele Table	Antigen/allele added:	n.a. n.a.	JK2 null phenotypes: *JK*02N.15* to *JK*02N.20* **References:** 11, 15, 16, 24, 26
17		New References:	n.a.	New references added see above
18	**End Version**		**v5.1 190123**	**v6.0 25-FEB-2020**