

SUPPLEMENTARY MATERIAL

MATERIALS AND METHODS

DNA sequencing

We performed amplicon sequencing of *HLA-A* exons 2, 3, and 4 of *HLA-A*, which contain the sequence variations that define (Bjorkman et al., 1987; Parham et al., 1988) in 20 unrelated EUR GV patients, on the 454 Life Science GS FLX as previously described (Bentley et al., 2009; Holcomb et al., 2011), except that the GS GType *HLA* HR primers (Roche Applied Science, Indianapolis) were used. The accompanying protocol for GS Titanium Sequencing was followed, except that 0.5 copies of DNA per bead were used and 70% of the recommended amount of DNA beads was loaded on the PicoTiter Plate™. *HLA* genotypes were assigned using Conexio Assign ATF 454 software v34 (Conexio Genomics, Perth, Australia), customized to include data from intronic sequences and International Immunogenetics Information System (<http://www.imgt.org>) 3.1.0 2010-07-16 references.

We sequenced a total 10.4 kb of the *TYR* region of chromosome 11q14.3 in 114 unrelated EUR GV patients, six of whom were among those sequenced for *HLA-A*, who were probands of multiplex GV families that also segregated other autoimmune diseases. Primers were designed using Primer3 (<http://primer3.sourceforge.net/webif.php>), amplifying 30 PCR products sized 200 to 600 bp (Supplementary Table 5), spanning all five exons: 2375 nt of 5' promoter, exon 1, through 282 nt 3'; a 332 nt internal portion of IVS1; exon 2 flanked by 70 nt 5' and 305 nt 3'; a 401 nt internal portion of IVS2; exon 3 flanked by 165 nt 5' and 229 nt 3'; exon 4 flanked by 110 nt 5' and 250 nt 3'; and exon 5 flanked by 180 nt 5' and 3242 nt 3'. For

each patient, 5 µg genomic DNA was sheared to 2-4 kb, and 1.5 µg was used for microdroplet multiplex PCR utilizing the RDT-1000 (RainDance Technologies). Amplicon DNA was purified, blunt-end concatenated, purified, sonicated, end-repaired, A-tailed, and was ligated to modified Amplicon DNA Illumina Solexa™ adapter oligonucleotides containing unique 7-nt multiplexing barcodes, resistant to two sequencing errors in the barcodes (Hamady *et al.*, 2008). Amplicon DNA fragments were then electrophoresed in 3% agarose-TBE, extracted from a band corresponding to 250-300 bp, amplified by Solexa PCR, and re-purified. Size and concentration of the resultant DNA libraries were analyzed using the Agilent Bioanalyzer DNA 7500 kit before sequencing on an Illumina Genome Analyzer Iix using 69-nt reads (Hittinger *et al.*, 2010).

Bioinformatic analyses

Illumina Pipeline software produced FASTQ sequence files, which were parsed by individual using custom software capable of correcting up to two mutations per barcode. Reads were aligned to human genome build GRCh37.1/hg19 using GSNAP, ver. 2010-07-27 (Wu and Nacu, 2010). Reads that mapped to no more than 10 genomic locations were then aligned to the target sequence with the requirement that they map uniquely. Custom software converted GSNAP output to individual SNP or indel genotypes at locations with $\geq 10X$ coverage. All variants called were submitted to SeattleSeq Annotation (snp.gs.washington.edu/SeattleSeqAnnotation131) and FuncPred (<http://snpinfo.niehs.nih.gov/snpfunc.htm>) to rank potential deleterious effects. PolyPhen-2 (<http://genetics.bwh.harvard.edu/pph2>) and SIFT (<http://sift.jcvi.org>) were

used to further assess non-synonymous SNPs and indels, respectively, and SKIPPY (Woolfe *et al.*, 2010) was used to assess possible effects of variants on RNA splicing. Variants 5' and 3' to the gene were screened for localization to potential regulatory elements using the ENCODE Regulation, ENC DNA methyl, TFBS Conserved, TS miRNA sites, ORegAnno, Vista Enhancers, CD34 DNaseI, and CpG Islands tracks implemented in the UCSC Genome Browser (<http://genome.ucsc.edu/cgi-bin/hgGateway>).

Statistical analyses

Statistical analyses were carried out using data from the previous genomewide screen of 1392 GV cases and 2629 controls (Jin *et al.*, 2010a). We imputed SNP genotypes for a 334 kb region (chr11:88,731,228-89,065,017) spanning the *TYR* gene, from 180 kb upstream and 36 kb downstream, using MaCH (Li *et al.*, 2006), ver.1.0 (<http://www.sph.umich.edu/csg/abecasis/MACH/download/>) based on patterns of haplotype variation in the 1000 Genome Project EUR samples (Release Aug 4, 2010; <http://www.sph.umich.edu/csg/abecasis/MACH/download/1000G-2010-08.html>). We kept the imputed SNPs with $r^2 > 0.3$ for further analyses, which included 651 SNPs with $MAF \geq 0.01$. We also imputed missing genotypes for the 45 genotyped SNPs in the region. Dosage data (posterior genotype probabilities) for each SNP were analyzed by logistic regression analysis implemented in PLINK (Purcell *et al.*, 2007).

To assess the joint effects of S192Y and R402Q on GV susceptibility, we used the corresponding two SNPs, rs1042602 and rs1126809, to define haplotypes and used the E-M Algorithm to estimate the most likely haplotypes for each individual. We

established the best-fit model for the two-SNP haplotypes on the basis of likelihood ratio test statistics by comparing a full model including the additive effects of each haplotype (coded 0, 1 and 2 for the number of copies of each haplotype) and dominance effects (coded 1 for possessing 1 copy of a haplotype, and otherwise 0) with a model including only the additive effects of each haplotype. The additive effect of the ancestral C-G haplotype was used as the reference and thus was not included in the model.

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Supplementary Table 1. HLA-A Genotypes Observed in 20 Unrelated Generalized Vitiligo Probands Selected for rs12206499-GG

Patient	HLA-A		rs12206499	
	Allele1	Allele 2	Allele1	Allele2
1	A*02:01:01:01/02L*	A*02:01:01:01/02L	G	G
2	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
3	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
4	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
5	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
6	A*02:01:01:01/02L	A*02:20:01	G	G
7	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
8	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
9	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
0	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
11	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
12	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
13	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
14	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
15	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
16	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
17	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
18	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
19	A*02:01:01:01/02L	A*02:01:01:01/02L	G	G
20	A*02:06:01	A*02:30	G	G

*The allelic typing system does not distinguish between the common *HLA-A*02:01:01:01* allele and the very rare *HLA-A*02:01:01:02L* allele. Although it is likely all of these are *HLA-A*02:01:01:01*, in the text we discuss these alleles using standard 4-digit (non-synonymous changes) nomenclature, represented as *HLA-A*02:01*.

Supplementary Table 3. Model selection for *TYR* rs1042602-rs1126809 haplotypes

	A_{A-A}^1	A_{C-A}^1	A_{A-G}^1	$D_{A-AD_{C-A}}^2$	$D_{C-AD_{A-G}}^2$	$D_{C-AD_{C-G}}^2$	$D_{A-GD_{C-G}}^2$	df	AIC	Overall <i>P</i>
Model A1										
OR	0.32	0.55	0.84	0.59	1.12	1.12	0.90	7	5120.0	
<i>P</i>	0.011	5.75×10^{-11}	3.28×10^{-3}	0.546	0.353	0.330	0.239			2.66×10^{-15}
Model A2										
OR	0.27	0.61	0.83					3	5115.9	
<i>P</i>	5.82×10^{-4}	2.02×10^{-15}	6.74×10^{-4}							3.76×10^{-17}

1, Additive effect of indicated haplotype.

2, Dominance effect of indicated diploid haplotype pair.

df, degrees of freedom; AIC, Akaike information criterion.

Supplementary Table 4. Association of TYR Region Variants with Generalized Vitiligo

Marker	nt Position	A1	A2	A1 FRQ	A1 OR	P	Type
rs10765819	88731228	A	G	0.52	1.05	2.78E-01	Genotyped
rs4517513	88732591	C	T	0.53	1.06	2.40E-01	Imputed
rs10831546	88732956	C	T	0.49	1.06	2.30E-01	Imputed
rs10765820	88734123	G	A	0.52	1.06	2.56E-01	Imputed
rs10765821	88734948	T	A	0.53	1.06	2.46E-01	Imputed
rs12799808	88736264	C	T	0.98	0.79	1.81E-01	Imputed
rs12283766	88739932	G	A	0.57	1.11	4.04E-02	Imputed
rs7120151	88740379	G	A	0.73	1.32	1.51E-05	Imputed
rs10741298	88740608	G	A	0.58	1.11	3.27E-02	Imputed
rs10765180	88740827	G	T	0.53	1.05	2.88E-01	Imputed
rs10734119	88740896	G	A	0.58	1.11	2.98E-02	Imputed
rs7127754	88741390	C	T	0.58	1.11	3.70E-02	Imputed
rs10765181	88742518	G	A	0.58	1.11	3.27E-02	Imputed
rs10765182	88742578	C	A	0.58	1.11	3.32E-02	Imputed
rs4753209	88743208	A	T	0.58	1.11	3.30E-02	Imputed
rs4753210	88743265	G	C	0.58	1.11	3.34E-02	Imputed
chr11:88743276	88743276	A	G	0.98	0.82	2.35E-01	Imputed
rs4753211	88743356	G	C	0.57	1.11	3.28E-02	Imputed
rs11604416	88743517	G	C	0.42	1.05	4.34E-01	Imputed
chr11:88743700	88743700	A	G	0.98	0.82	2.34E-01	Imputed
rs10909592	88743944	A	G	0.52	1.12	3.54E-02	Imputed
rs10830199	88744035	G	A	0.57	1.11	3.57E-02	Imputed
rs7929619	88744416	G	A	0.58	1.11	3.32E-02	Genotyped
rs7932640	88744425	C	T	0.58	1.11	3.32E-02	Imputed
rs34802390	88745361	G	A	0.98	0.82	2.32E-01	Imputed
chr11:88745416	88745416	C	T	0.97	0.68	4.78E-02	Imputed
rs10830200	88745439	C	T	0.54	1.06	2.41E-01	Genotyped
rs35716680	88745552	T	C	0.98	0.80	1.88E-01	Imputed
rs12420474	88745555	C	T	0.98	0.69	2.30E-02	Imputed
rs10765183	88745739	G	C	0.57	1.11	3.15E-02	Imputed
chr11:88747515	88747515	C	A	0.98	0.82	2.29E-01	Imputed
chr11:88747564	88747564	G	A	0.98	0.70	2.83E-02	Imputed
rs10501696	88748162	G	A	0.45	1.08	1.63E-01	Imputed
rs2226563	88749072	T	C	0.57	1.11	3.32E-02	Imputed
rs16912863	88749303	T	C	0.98	0.71	8.75E-02	Imputed
chr11:88750003	88750003	A	G	0.98	0.70	2.88E-02	Imputed
rs10501697	88750280	C	T	0.98	0.70	2.89E-02	Imputed
rs12365935	88751184	A	C	0.98	0.70	2.61E-02	Imputed
rs35752740	88751464	C	T	0.98	0.80	1.78E-01	Imputed
chr11:88751906	88751906	T	C	0.98	0.72	1.25E-01	Imputed
chr11:88752108	88752108	A	G	0.98	0.80	1.97E-01	Imputed
rs4753212	88752128	T	A	0.55	1.09	7.37E-02	Imputed
rs4370938	88752567	C	G	0.52	1.06	2.62E-01	Imputed
rs7126679	88753845	C	T	0.57	1.11	3.19E-02	Imputed

rs11018428	88754324	C	T	0.98	0.72	3.82E-02	Imputed
rs11018429	88754468	G	A	0.98	0.68	2.13E-02	Imputed
rs11018430	88754563	T	C	0.98	0.72	3.83E-02	Imputed
rs4505064	88755348	A	G	0.57	1.11	3.15E-02	Imputed
rs35516567	88755390	C	A	0.98	0.79	1.91E-01	Imputed
chr11:88756178	88756178	T	C	0.98	0.79	1.90E-01	Imputed
rs59057890	88756334	C	T	0.98	0.70	4.89E-02	Imputed
rs36006427	88756713	G	A	0.61	1.14	9.50E-03	Imputed
rs4497414	88756779	T	C	0.59	1.08	1.04E-01	Imputed
rs10430814	88757597	C	T	0.61	1.14	9.51E-03	Imputed
rs11018432	88757636	T	C	0.98	0.70	4.65E-02	Imputed
rs11018433	88757749	A	G	0.98	0.71	5.18E-02	Imputed
chr11:88757918	88757918	C	T	0.98	0.70	4.99E-02	Imputed
rs7125164	88757950	C	A	0.56	1.07	1.40E-01	Genotyped
rs7121916	88758591	A	G	0.98	0.72	5.88E-02	Imputed
rs7121922	88758601	A	C	0.98	0.72	6.24E-02	Genotyped
chr11:88758673	88758673	G	C	0.94	0.81	8.21E-02	Imputed
rs10430815	88758721	T	G	0.62	1.14	7.36E-03	Imputed
rs7125869	88759089	T	C	0.98	0.72	7.07E-02	Imputed
chr11:88760675	88760675	T	C	0.98	0.72	6.23E-02	Imputed
rs12224116	88760806	G	A	0.62	1.14	8.19E-03	Imputed
rs7114254	88760872	G	A	0.58	1.10	6.36E-02	Imputed
rs10830201	88762042	G	A	0.63	1.15	8.55E-03	Imputed
rs10741299	88762060	C	T	0.59	1.09	9.46E-02	Imputed
rs7108409	88762210	T	C	0.98	0.72	6.23E-02	Imputed
rs7108722	88762668	A	G	0.58	1.09	7.32E-02	Imputed
rs7122674	88762763	G	A	0.97	0.73	2.10E-02	Imputed
chr11:88763786	88763786	C	T	0.99	0.66	7.84E-02	Imputed
rs11018434	88765779	A	G	0.50	1.08	1.22E-01	Imputed
rs10830202	88765884	T	C	0.98	0.67	3.36E-02	Imputed
rs4378401	88766141	T	C	0.90	0.85	4.44E-02	Imputed
rs4611203	88767496	A	G	0.57	1.12	2.31E-02	Imputed
rs4237549	88768276	A	G	0.90	0.85	4.54E-02	Imputed
rs2212333	88768897	T	A	0.57	1.11	2.46E-02	Imputed
rs11018436	88769546	C	A	0.99	0.66	5.52E-02	Imputed
chr11:88770232	88770232	G	A	0.97	1.06	8.14E-01	Imputed
rs4275633	88770434	C	T	0.96	0.90	6.00E-01	Imputed
rs11018439	88775561	T	C	0.33	1.10	1.41E-01	Imputed
rs16924543	88775773	A	C	0.93	0.90	2.25E-01	Genotyped
rs12225194	88776375	C	G	0.99	0.64	3.39E-02	Imputed
rs2226564	88776675	C	T	0.90	0.85	5.32E-02	Imputed
chr11:88777026	88777026	C	G	0.93	0.90	2.43E-01	Imputed
chr11:88777277	88777277	T	A	0.93	0.90	2.47E-01	Imputed
rs12224528	88779636	C	T	0.99	0.61	3.78E-02	Imputed
rs7931721	88779776	T	C	0.69	1.24	4.22E-05	Genotyped
rs10741300	88780154	T	G	0.92	0.90	2.17E-01	Imputed
chr11:88783621	88783621	G	T	0.99	0.65	3.52E-02	Imputed

rs12226642	88784733	C	T	0.99	0.65	3.53E-02	Imputed
rs7115031	88785506	A	G	0.81	0.84	4.46E-03	Imputed
rs7101540	88785851	T	A	0.90	0.86	5.33E-02	Imputed
rs10830203	88786111	G	A	0.98	0.70	7.31E-02	Imputed
rs4438032	88786692	G	C	0.90	0.86	6.70E-02	Imputed
chr11:88786817	88786817	A	G	0.99	0.65	4.71E-02	Imputed
rs11018440	88787070	G	A	0.69	1.23	6.88E-05	Imputed
rs11018441	88787299	G	C	0.69	1.23	5.22E-05	Imputed
rs10830204	88787544	A	G	0.50	1.07	1.24E-01	Genotyped
rs11018442	88787777	A	T	0.90	0.86	6.10E-02	Imputed
rs11018443	88787788	C	A	0.81	0.84	5.21E-03	Imputed
rs10830205	88788074	G	T	0.90	0.84	3.24E-02	Imputed
rs11018445	88788880	C	G	0.69	1.23	5.11E-05	Imputed
rs16912842	88789368	C	T	0.93	0.89	2.07E-01	Imputed
rs4592422	88790456	T	C	0.90	0.86	6.45E-02	Imputed
rs13328847	88790998	A	G	0.98	0.64	2.86E-02	Imputed
rs1892879	88791259	C	A	0.81	0.83	2.41E-03	Genotyped
rs7118021	88791508	G	A	0.77	1.45	8.31E-09	Imputed
rs1942483	88792114	C	T	0.82	0.83	2.59E-03	Imputed
rs7108305	88792473	A	T	0.98	0.68	4.79E-02	Imputed
rs563012	88792586	C	T	0.93	0.90	2.58E-01	Imputed
rs4753001	88792601	C	A	0.83	0.85	1.23E-02	Imputed
rs540084	88792799	A	G	0.93	0.91	2.67E-01	Imputed
rs11018448	88793319	C	A	0.99	0.64	3.20E-02	Imputed
rs35950576	88793485	T	C	0.69	1.26	1.17E-05	Imputed
rs495695	88794180	C	A	0.91	0.83	3.20E-02	Imputed
rs4466834	88794824	T	C	0.82	0.83	2.16E-03	Imputed
chr11:88795395	88795395	G	T	0.99	0.64	3.15E-02	Imputed
chr11:88795782	88795782	G	A	0.99	0.64	3.14E-02	Imputed
chr11:88795958	88795958	G	C	0.99	0.63	3.39E-02	Imputed
chr11:88796933	88796933	G	A	0.99	0.64	3.11E-02	Imputed
chr11:88797167	88797167	C	T	0.98	0.69	6.48E-02	Imputed
rs11018449	88797386	C	T	0.69	1.24	4.36E-05	Imputed
rs8181526	88797521	C	T	0.99	0.64	3.09E-02	Imputed
chr11:88798185	88798185	G	A	0.69	1.26	1.03E-05	Imputed
rs3017240	88799281	G	T	0.90	0.86	5.22E-02	Imputed
rs12577012	88799517	G	C	0.69	1.24	3.74E-05	Imputed
rs34749698	88799731	T	C	0.76	1.38	3.59E-07	Imputed
chr11:88800094	88800094	G	T	0.99	0.63	2.91E-02	Imputed
rs485477	88800253	T	C	0.90	0.86	5.23E-02	Imputed
chr11:88800419	88800419	T	C	0.99	0.63	2.90E-02	Imputed
rs477424	88802281	A	G	0.58	1.11	2.89E-02	Genotyped
rs12421020	88802470	T	A	0.99	0.63	2.90E-02	Imputed
rs11018451	88802593	T	G	0.99	0.63	2.90E-02	Imputed
rs11018452	88804060	T	C	0.99	0.67	6.61E-02	Imputed
rs7929744	88804684	C	A	0.50	1.08	1.19E-01	Imputed
rs7933118	88804981	A	T	0.93	0.89	2.02E-01	Imputed

rs12365909	88805066	T	C	0.69	1.25	1.68E-05	Imputed
rs12797605	88805228	C	G	0.98	1.07	7.66E-01	Imputed
chr11:88806219	88806219	C	A	0.99	0.62	3.89E-02	Imputed
rs11018454	88809423	G	A	0.99	0.67	6.60E-02	Imputed
rs11018455	88809554	G	A	0.99	0.67	6.00E-02	Imputed
rs61903387	88809812	T	C	0.43	1.06	2.75E-01	Imputed
chr11:88810147	88810147	G	A	0.99	0.62	3.96E-02	Imputed
rs12790541	88813292	G	C	0.93	0.91	3.26E-01	Imputed
chr11:88813676	88813676	T	C	0.98	0.71	5.33E-02	Imputed
rs6482998	88814687	T	A	0.93	0.88	1.95E-01	Imputed
rs7127487	88814870	A	G	0.66	1.16	3.43E-03	Imputed
rs11018458	88815760	A	G	0.69	1.24	3.94E-05	Imputed
rs10830206	88816137	T	A	0.71	1.15	1.65E-02	Imputed
rs11018459	88816403	G	T	0.99	0.59	4.07E-02	Imputed
rs4121738	88816538	C	T	0.65	1.16	3.60E-03	Imputed
rs11018462	88818673	G	A	0.99	0.64	3.33E-02	Imputed
rs11018463	88819742	G	C	0.69	1.23	5.09E-05	Imputed
chr11:88819981	88819981	T	C	0.96	0.91	5.44E-01	Imputed
rs7950833	88820022	T	C	0.98	0.72	5.36E-02	Imputed
rs10830207	88820601	G	T	0.98	0.72	5.38E-02	Imputed
rs11018464	88821114	G	C	0.69	1.24	4.96E-05	Imputed
rs11018465	88822199	T	C	0.69	1.18	2.32E-03	Imputed
chr11:88822286	88822286	G	T	0.99	0.65	1.25E-01	Imputed
rs11018466	88822368	G	A	0.67	1.19	5.70E-04	Imputed
chr11:88822958	88822958	T	A	0.98	0.73	6.93E-02	Imputed
rs9633800	88823096	A	G	0.99	0.64	3.44E-02	Imputed
rs1942490	88824176	C	T	0.67	1.17	1.73E-03	Imputed
rs11018467	88825663	G	T	0.66	1.16	3.65E-03	Imputed
rs3921012	88826343	G	A	0.68	1.20	3.76E-04	Imputed
rs11018468	88826626	A	C	0.71	1.28	7.27E-06	Imputed
rs10765184	88826813	T	C	0.66	1.16	2.92E-03	Imputed
rs59676330	88827132	T	C	0.98	0.72	5.41E-02	Imputed
rs10765185	88828091	G	A	0.93	0.88	1.70E-01	Imputed
rs10830208	88828356	C	T	0.51	1.08	1.13E-01	Imputed
rs61903389	88828429	A	T	0.35	1.03	6.43E-01	Imputed
rs11018469	88829395	G	A	0.98	0.72	5.43E-02	Imputed
chr11:88830069	88830069	C	A	0.98	0.85	4.84E-01	Imputed
rs7944714	88830495	T	C	0.68	1.21	2.68E-04	Imputed
rs7941957	88830751	A	G	0.66	1.16	3.57E-03	Imputed
rs11018471	88831103	G	A	0.68	1.19	5.99E-04	Imputed
rs10765186	88831337	T	A	0.51	1.08	1.09E-01	Imputed
rs11018472	88832339	C	G	0.98	0.72	5.45E-02	Imputed
rs11018473	88833108	C	A	0.98	0.72	5.45E-02	Genotyped
rs11018474	88833685	A	T	0.98	0.71	5.09E-02	Imputed
rs34374613	88833832	T	C	0.93	0.91	3.14E-01	Imputed
rs9665831	88834157	G	T	0.66	1.16	3.55E-03	Genotyped
rs9665832	88834258	G	A	0.68	1.23	8.14E-05	Imputed

rs11018475	88834293	C	T	0.98	0.71	4.52E-02	Imputed
rs7930291	88835202	A	G	0.98	0.71	4.52E-02	Imputed
rs7936205	88835427	T	C	0.98	0.71	4.51E-02	Imputed
rs12801693	88835692	G	A	0.93	0.90	2.91E-01	Imputed
chr11:88836023	88836023	G	A	0.98	0.71	4.44E-02	Imputed
rs4121733	88836328	C	T	0.69	1.23	8.71E-05	Imputed
rs11018477	88837987	A	G	0.98	0.71	4.68E-02	Imputed
rs7945986	88838798	G	C	0.98	0.71	4.40E-02	Imputed
rs10830209	88838984	G	A	0.51	1.08	1.04E-01	Imputed
chr11:88839606	88839606	T	C	0.98	0.71	4.26E-02	Imputed
chr11:88840594	88840594	G	C	0.99	0.67	6.27E-02	Imputed
rs11018478	88840872	A	G	0.99	0.67	6.30E-02	Imputed
rs1942496	88840925	A	G	0.51	1.08	1.01E-01	Imputed
rs10830210	88841257	T	C	0.98	0.71	4.81E-02	Imputed
rs10830211	88841421	A	G	0.98	0.71	4.20E-02	Imputed
rs1942497	88841459	T	C	0.67	1.20	3.87E-04	Genotyped
rs61475088	88841994	T	C	0.98	0.71	4.19E-02	Imputed
rs12804807	88842024	T	C	0.69	1.23	7.46E-05	Imputed
rs59688726	88842636	T	C	0.98	0.71	4.20E-02	Imputed
rs7115357	88843515	G	A	0.98	0.71	4.81E-02	Imputed
rs7928253	88844127	T	G	0.98	0.71	4.22E-02	Imputed
rs7938978	88844224	C	A	0.98	0.71	4.23E-02	Imputed
rs10765187	88844343	C	A	0.67	1.20	4.80E-04	Imputed
rs11018479	88845435	C	A	0.66	1.16	3.37E-03	Imputed
rs12222165	88845542	G	T	0.67	1.19	5.90E-04	Imputed
chr11:88845698	88845698	T	G	0.99	0.65	6.77E-02	Imputed
chr11:88845892	88845892	C	T	0.51	1.08	1.02E-01	Imputed
chr11:88845920	88845920	C	T	0.67	1.20	4.68E-04	Imputed
chr11:88846298	88846298	A	G	0.99	0.66	5.92E-02	Imputed
rs59797255	88847020	T	A	0.98	0.71	4.30E-02	Imputed
rs7926601	88848729	T	C	0.98	0.71	4.32E-02	Imputed
rs7936308	88848731	G	A	0.98	0.71	4.40E-02	Imputed
rs2156123	88848859	G	A	0.66	1.16	3.54E-03	Imputed
chr11:88849315	88849315	C	T	0.94	1.01	9.30E-01	Imputed
rs7930256	88849434	T	C	0.68	1.21	2.63E-04	Imputed
chr11:88849859	88849859	G	C	0.88	1.80	1.02E-06	Imputed
chr11:88850348	88850348	C	G	0.98	0.71	4.49E-02	Imputed
rs4420272	88850382	A	T	0.67	1.20	4.91E-04	Imputed
rs10830212	88851105	G	T	0.67	1.19	5.46E-04	Imputed
rs11018481	88851200	C	T	0.99	0.64	4.41E-02	Imputed
rs7480884	88851967	A	G	0.67	1.19	4.80E-04	Imputed
rs10830214	88852920	T	C	0.99	0.64	4.34E-02	Imputed
rs34066282	88853407	C	T	0.99	0.64	4.32E-02	Imputed
chr11:88853552	88853552	G	A	0.98	0.71	4.69E-02	Imputed
rs59961091	88854321	C	G	0.98	0.71	4.70E-02	Imputed
rs10830215	88854535	A	G	0.65	1.15	4.64E-03	Imputed
rs10741302	88854981	C	T	0.93	0.86	1.12E-01	Imputed

chr11:88855386	88855386	C	G	0.94	0.85	9.10E-02	Imputed
rs1942484	88855628	G	A	0.67	1.19	6.22E-04	Imputed
rs12363323	88856292	G	A	0.69	1.23	8.98E-05	Imputed
chr11:88856384	88856384	C	G	0.98	0.71	4.77E-02	Imputed
rs12363640	88856423	G	C	0.68	1.23	8.81E-05	Imputed
rs1942485	88856444	G	A	0.93	0.86	1.12E-01	Imputed
rs1942486	88856782	T	G	0.69	1.22	9.54E-05	Imputed
rs7104917	88857081	A	G	0.98	0.71	4.81E-02	Imputed
rs11018483	88857428	C	A	0.98	0.71	4.83E-02	Imputed
rs11018484	88857653	G	A	0.69	1.22	1.25E-04	Imputed
rs11018485	88857793	T	C	0.99	0.64	4.60E-02	Imputed
rs10830216	88858397	G	A	0.66	1.15	5.65E-03	Genotyped
rs10765188	88858479	C	T	0.93	0.86	1.12E-01	Genotyped
chr11:88859112	88859112	G	T	0.98	0.71	4.83E-02	Imputed
rs1942489	88859485	G	T	0.99	0.68	8.16E-02	Imputed
rs7125167	88859853	A	G	0.98	0.71	4.43E-02	Imputed
chr11:88860440	88860440	A	T	0.98	0.71	4.41E-02	Imputed
rs4121730	88860739	T	C	0.98	0.70	4.22E-02	Imputed
rs7925346	88860927	T	C	0.66	1.15	5.70E-03	Imputed
chr11:88861387	88861387	T	C	0.98	0.71	4.35E-02	Imputed
rs11018488	88861590	T	A	0.34	1.05	4.62E-01	Imputed
rs17792911	88862822	A	T	0.68	1.23	7.88E-05	Imputed
rs4121729	88863140	G	T	0.65	1.15	5.47E-03	Genotyped
rs12225438	88864588	G	A	0.99	0.61	2.88E-02	Imputed
rs12363510	88865114	A	G	0.68	1.23	8.70E-05	Imputed
rs11018490	88865741	T	C	0.98	0.70	4.26E-02	Imputed
rs56201508	88866026	C	T	0.67	1.19	6.01E-04	Imputed
rs11018491	88866193	T	C	0.98	0.70	4.24E-02	Imputed
rs11018492	88866539	T	C	0.98	0.70	4.23E-02	Imputed
rs12421072	88867940	T	C	0.99	0.62	3.29E-02	Imputed
rs11018493	88867979	G	T	0.98	0.70	4.21E-02	Imputed
rs11018494	88868156	A	G	0.98	0.70	4.03E-02	Imputed
rs11018495	88868174	A	G	0.98	0.70	4.02E-02	Imputed
rs11018496	88868192	A	C	0.98	0.70	4.03E-02	Imputed
rs11018497	88868510	T	C	0.98	0.70	4.19E-02	Imputed
rs28437494	88868611	G	A	0.65	1.15	4.85E-03	Imputed
chr11:88868752	88868752	T	C	0.94	0.91	3.82E-01	Imputed
rs10830217	88869323	C	G	0.68	1.23	9.24E-05	Imputed
rs11018499	88869457	A	T	0.98	0.69	3.93E-02	Imputed
rs12363361	88869948	A	C	0.98	0.69	3.92E-02	Imputed
rs11018503	88870925	C	G	0.98	0.69	3.90E-02	Imputed
rs7122757	88871075	T	C	0.98	0.69	3.76E-02	Imputed
rs7103137	88871260	G	C	0.68	1.23	8.70E-05	Imputed
rs7107139	88872014	G	A	0.98	0.67	2.98E-02	Imputed
rs10830218	88872164	G	A	0.69	1.25	4.18E-05	Imputed
rs10830219	88872509	A	T	0.69	1.25	4.15E-05	Imputed
rs11018505	88872727	A	C	0.98	0.68	3.11E-02	Imputed

rs35486674	88873294	C	G	0.68	1.23	8.89E-05	Imputed
rs11018506	88873421	T	C	0.69	1.23	1.44E-04	Imputed
rs10830220	88874152	C	G	0.52	1.08	9.80E-02	Imputed
chr11:88874754	88874754	C	G	0.94	0.75	5.64E-03	Imputed
rs7119848	88874854	A	G	0.92	0.83	3.44E-02	Imputed
rs10765189	88874884	C	T	0.68	1.30	6.66E-07	Imputed
rs4121745	88874930	G	A	0.73	0.71	1.78E-06	Imputed
rs4121744	88874969	C	T	0.53	1.08	9.32E-02	Imputed
rs7342208	88876845	G	A	0.52	1.08	9.26E-02	Imputed
rs10830221	88877463	G	A	0.53	1.09	8.12E-02	Imputed
rs11018508	88877686	G	A	0.68	1.30	4.39E-07	Imputed
rs4315072	88878052	T	A	0.53	1.09	8.85E-02	Imputed
rs1942492	88878204	T	C	0.85	0.77	4.56E-05	Genotyped
rs12808722	88879071	G	C	0.94	0.76	6.20E-03	Imputed
rs11018509	88879205	T	A	0.68	1.29	6.74E-07	Imputed
rs4519092	88880402	A	G	0.53	1.08	1.27E-01	Imputed
rs12805021	88881929	G	T	0.94	0.76	5.86E-03	Imputed
rs7127310	88881951	C	G	0.85	0.76	3.38E-05	Imputed
rs10765190	88882425	T	C	0.53	1.08	9.92E-02	Imputed
rs10765191	88882550	A	G	0.53	1.08	9.50E-02	Imputed
rs10830222	88882962	A	T	0.68	1.29	7.28E-07	Imputed
rs10741304	88882995	T	C	0.92	0.83	2.34E-02	Imputed
rs11018510	88883499	G	A	0.53	1.08	1.00E-01	Imputed
rs11018511	88883648	A	C	0.54	1.09	8.91E-02	Imputed
rs10830223	88883885	G	A	0.52	1.08	9.48E-02	Imputed
rs10830224	88884079	C	T	0.54	1.08	1.01E-01	Imputed
rs10765192	88884329	A	G	0.85	0.76	2.58E-05	Imputed
rs4255542	88885187	T	C	0.54	1.08	1.05E-01	Imputed
rs4397857	88885480	T	C	0.53	1.08	9.48E-02	Imputed
rs10830225	88885945	A	G	0.54	1.09	8.29E-02	Imputed
rs4309163	88886767	T	A	0.54	1.08	9.67E-02	Imputed
rs10765193	88887848	G	C	0.73	1.34	9.29E-07	Imputed
rs11018513	88889350	G	A	0.68	1.29	7.93E-07	Imputed
rs10830226	88889412	A	G	0.91	0.78	2.00E-03	Imputed
rs12799122	88889765	A	G	0.91	0.77	1.59E-03	Imputed
rs61903411	88889868	T	C	0.59	1.15	4.43E-03	Imputed
rs35016324	88889886	T	C	0.59	1.15	4.45E-03	Imputed
rs61903412	88890451	A	G	0.54	1.08	1.15E-01	Imputed
rs10830227	88890822	A	G	0.59	1.15	4.82E-03	Imputed
rs4146871	88891023	T	A	0.92	0.81	1.42E-02	Imputed
rs10830228	88891114	G	A	0.60	1.15	4.65E-03	Genotyped
rs10830229	88891267	G	A	0.91	0.77	1.78E-03	Imputed
rs4081455	88891543	T	C	0.60	1.15	4.04E-03	Imputed
rs4998767	88891876	A	T	0.60	1.15	3.16E-03	Imputed
chr11:88893001	88893001	C	T	0.74	1.43	1.32E-09	Imputed
rs10830230	88894537	T	C	0.60	1.15	3.20E-03	Imputed
rs11018515	88894768	G	A	0.60	1.15	4.05E-03	Imputed

rs2212751	88894922	G	A	0.59	1.15	3.28E-03	Imputed
rs12792766	88895059	T	C	0.94	0.75	4.51E-03	Imputed
rs10830231	88895388	T	C	0.60	1.15	3.16E-03	Imputed
rs61903413	88895962	T	A	0.52	1.18	2.90E-03	Imputed
rs62858761	88895963	C	A	0.52	1.18	2.89E-03	Imputed
rs7108473	88896425	T	C	0.60	1.15	2.87E-03	Imputed
rs7127661	88896609	G	T	0.60	1.15	3.45E-03	Imputed
rs7124483	88896664	G	A	0.60	1.15	3.44E-03	Imputed
rs10765194	88897000	C	G	0.68	1.29	6.80E-07	Imputed
rs10830234	88897444	G	A	0.55	1.09	6.95E-02	Imputed
rs11018518	88898079	G	C	0.69	1.30	7.50E-07	Imputed
rs7947287	88899362	T	C	0.60	1.15	3.28E-03	Imputed
rs7950415	88899605	T	C	0.54	1.08	1.16E-01	Imputed
rs1942481	88899728	A	G	0.60	1.15	3.13E-03	Imputed
rs10830236	88900816	C	T	0.69	1.29	6.84E-07	Genotyped
rs10765195	88901170	C	T	0.53	1.08	1.12E-01	Imputed
rs11018519	88901570	A	G	0.53	1.08	1.11E-01	Imputed
rs10830237	88902144	T	C	0.60	1.15	3.20E-03	Imputed
rs949538	88902404	G	A	0.91	0.79	3.81E-03	Genotyped
rs949539	88902724	T	A	0.60	1.17	1.64E-03	Imputed
rs949537	88902830	C	T	0.60	1.15	3.16E-03	Imputed
rs11018520	88903115	T	C	0.68	1.29	6.30E-07	Imputed
rs7934747	88903273	T	C	0.92	0.82	2.49E-02	Imputed
rs1942498	88903317	A	G	0.60	1.16	2.08E-03	Imputed
chr11:88904461	88904461	A	G	0.94	0.75	4.38E-03	Imputed
rs12421727	88904971	A	T	0.60	1.16	2.03E-03	Imputed
rs12795279	88905261	T	C	0.60	1.16	2.42E-03	Imputed
rs7949856	88906392	C	G	0.68	1.29	6.74E-07	Imputed
rs7949891	88907162	A	G	0.60	1.16	2.11E-03	Imputed
rs35537664	88907293	A	C	0.68	1.29	6.73E-07	Imputed
rs7924925	88907621	A	G	0.91	0.79	3.90E-03	Imputed
rs7925404	88907996	G	A	0.69	1.29	7.16E-07	Imputed
rs5021654	88910589	G	C	0.61	1.16	2.01E-03	Imputed
rs4547091	88910821	C	T	0.61	1.16	2.08E-03	Imputed
rs1799989	88910923	C	A	0.89	0.80	2.93E-03	Imputed
rs1042602	88911696	A	C	0.37	0.98	6.33E-01	Genotyped
rs12270717	88912190	T	C	0.74	1.40	2.10E-09	Imputed
rs11820635	88912691	T	C	0.94	0.89	2.62E-01	Genotyped
rs621313	88913663	A	G	0.53	1.08	8.56E-02	Genotyped
rs6482999	88914331	T	C	0.62	1.18	7.61E-04	Imputed
rs11018522	88914415	C	T	0.74	1.39	5.06E-09	Imputed
rs7129973	88915570	A	G	0.61	1.16	1.89E-03	Genotyped
rs35464565	88915611	G	A	0.95	0.75	8.19E-03	Imputed
rs12416719	88916063	C	G	0.89	0.82	8.41E-03	Imputed
rs34202080	88916646	G	A	0.88	0.80	1.27E-03	Imputed
rs35518533	88917784	C	T	0.88	0.80	1.27E-03	Imputed
rs12805221	88918084	T	C	0.95	0.75	8.76E-03	Imputed

rs12417182	88918514	A	G	0.88	0.80	1.27E-03	Imputed
rs3793976	88919067	C	A	0.88	0.79	9.56E-04	Imputed
rs11018524	88919816	C	T	0.74	1.38	5.13E-09	Imputed
rs12799137	88919870	G	C	0.89	0.80	1.69E-03	Imputed
rs11018525	88919905	T	C	0.64	1.21	1.30E-04	Imputed
rs12806466	88919952	T	G	0.90	0.82	1.04E-02	Imputed
rs12799347	88919969	G	A	0.90	0.82	1.04E-02	Imputed
rs12799349	88919972	G	C	0.90	0.82	1.04E-02	Imputed
rs12799516	88920016	G	C	0.88	0.80	1.24E-03	Imputed
chr11:88920079	88920079	C	T	0.94	0.89	2.41E-01	Imputed
rs1942493	88920675	C	T	0.88	0.80	1.24E-03	Imputed
rs58426148	88921059	T	G	0.94	0.89	2.41E-01	Imputed
chr11:88921277	88921277	C	G	0.94	0.89	2.41E-01	Imputed
rs17793678	88921524	C	T	0.74	1.40	4.41E-09	Imputed
rs594647	88921557	C	T	0.60	1.15	6.72E-03	Imputed
chr11:88921572	88921572	C	A	0.75	1.45	3.15E-10	Imputed
rs59533128	88921896	G	A	0.94	0.89	2.41E-01	Imputed
rs7117190	88922008	G	T	0.88	0.80	1.15E-03	Genotyped
rs7117213	88922068	G	A	0.88	0.80	1.25E-03	Imputed
rs12418383	88922081	A	T	0.88	0.80	1.26E-03	Imputed
rs12419949	88922463	G	A	0.88	0.80	1.27E-03	Imputed
chr11:88922531	88922531	A	G	0.98	0.82	3.39E-01	Imputed
rs17793750	88922709	T	C	0.96	0.78	6.28E-02	Imputed
rs10765196	88925242	G	C	0.72	1.35	2.71E-08	Imputed
rs10765197	88925328	A	C	0.61	1.16	2.13E-03	Imputed
rs12792959	88925417	A	T	0.89	0.80	2.18E-03	Imputed
rs12420237	88925800	T	C	0.89	0.80	2.22E-03	Imputed
rs7123654	88925955	T	C	0.61	1.16	2.08E-03	Imputed
rs1939258	88926481	G	A	0.89	0.80	2.28E-03	Genotyped
rs12419262	88927408	C	A	0.89	0.80	2.05E-03	Imputed
rs12420674	88927499	A	G	0.89	0.80	2.05E-03	Imputed
chr11:88927587	88927587	C	T	0.98	0.46	1.77E-03	Imputed
rs12419341	88928132	C	T	0.89	0.80	1.78E-03	Imputed
chr11:88928148	88928148	G	A	0.94	0.81	4.48E-02	Imputed
rs12419364	88928354	C	T	0.89	0.80	2.07E-03	Imputed
rs35801536	88928390	A	T	0.94	0.78	1.22E-02	Imputed
chr11:88928406	88928406	C	T	0.95	0.91	4.01E-01	Imputed
rs1432447	88928905	A	G	0.92	0.82	2.64E-02	Genotyped
rs12419071	88929153	A	T	0.90	0.83	1.37E-02	Imputed
rs12420348	88929278	G	A	0.89	0.80	2.27E-03	Imputed
rs12808283	88929485	A	T	0.89	0.80	2.16E-03	Imputed
rs12807810	88929624	C	T	0.89	0.80	2.50E-03	Genotyped
rs12789834	88929631	T	C	0.95	0.77	1.39E-02	Imputed
rs12808785	88930106	C	T	0.89	0.80	2.78E-03	Imputed
rs11018528	88930377	A	G	0.72	1.35	2.67E-08	Genotyped
rs12791412	88930581	A	G	0.72	1.35	2.67E-08	Imputed
rs7925468	88930900	G	A	0.89	0.80	2.05E-03	Imputed

rs7929991	88931636	C	T	0.89	0.80	2.33E-03	Genotyped
rs12804213	88931984	T	G	0.90	0.78	2.34E-03	Imputed
rs12421505	88932104	G	C	0.89	0.80	2.49E-03	Imputed
rs12420864	88932390	T	C	0.90	0.83	1.39E-02	Imputed
rs574028	88933250	C	T	0.53	1.09	7.74E-02	Imputed
rs11018530	88933629	C	G	0.89	0.80	2.35E-03	Imputed
rs7105390	88934334	T	C	0.89	0.80	2.54E-03	Imputed
chr11:88935031	88935031	C	T	0.95	0.88	2.31E-01	Imputed
rs12421402	88935032	A	G	0.89	0.80	2.16E-03	Genotyped
rs12417166	88935096	G	T	0.89	0.80	2.53E-03	Imputed
chr11:88935188	88935188	G	A	0.95	0.74	7.43E-02	Imputed
rs12799768	88935820	G	C	0.89	0.80	2.48E-03	Imputed
rs2000554	88935941	T	C	0.61	1.16	1.99E-03	Imputed
rs2000553	88936007	T	C	0.61	1.17	1.35E-03	Imputed
rs12098971	88936133	G	A	0.88	0.81	1.84E-03	Imputed
rs10830238	88936512	G	A	0.61	1.16	2.00E-03	Imputed
chr11:88937516	88937516	G	A	0.88	0.81	1.87E-03	Imputed
rs10830239	88937602	T	C	0.54	1.09	5.61E-02	Imputed
chr11:88937636	88937636	A	G	0.88	0.81	1.86E-03	Imputed
rs11018532	88938018	T	G	0.88	0.80	1.80E-03	Imputed
rs10830240	88938356	A	G	0.73	1.38	7.89E-09	Imputed
rs4290229	88938471	T	C	0.88	0.80	1.63E-03	Imputed
rs4399330	88938571	A	T	0.88	0.80	1.54E-03	Imputed
rs12286618	88938933	G	C	0.74	1.39	3.70E-09	Imputed
rs7945829	88938979	C	T	0.88	0.80	1.77E-03	Imputed
rs12280693	88939008	A	G	0.61	1.16	2.11E-03	Imputed
rs57639254	88939047	A	T	0.89	0.80	2.27E-03	Imputed
rs12807511	88940226	C	A	0.89	0.80	2.27E-03	Imputed
rs35434176	88940460	A	C	0.88	0.80	1.76E-03	Imputed
rs7925659	88941174	C	T	0.88	0.80	1.64E-03	Imputed
rs7924913	88941264	G	A	0.90	0.78	1.13E-03	Imputed
rs35905469	88941836	G	C	0.98	0.80	2.64E-01	Imputed
rs35300336	88941950	G	A	0.88	0.80	1.74E-03	Imputed
rs12421397	88942018	G	A	0.88	0.80	1.74E-03	Imputed
rs10830241	88942313	T	C	0.61	1.16	2.18E-03	Imputed
rs35457014	88942803	G	A	0.89	0.79	1.69E-03	Imputed
chr11:88943035	88943035	T	C	0.76	1.45	1.29E-09	Imputed
rs11018534	88943630	G	A	0.74	1.38	9.62E-09	Imputed
rs61138184	88943818	C	A	0.91	0.84	4.22E-02	Imputed
chr11:88944367	88944367	A	G	0.88	0.80	1.68E-03	Imputed
rs12417026	88944751	G	A	0.89	0.80	2.30E-03	Imputed
rs12417077	88945118	G	A	0.88	0.80	1.43E-03	Imputed
rs9736253	88945586	C	T	0.88	0.80	1.43E-03	Imputed
rs34175287	88945920	G	A	0.88	0.80	1.42E-03	Imputed
rs7116589	88946742	T	C	0.88	0.80	2.41E-03	Imputed
rs12418178	88947924	G	T	0.88	0.80	1.42E-03	Imputed
rs7117973	88948006	A	T	0.88	0.80	1.63E-03	Imputed

rs11828731	88948621	G	A	0.88	0.81	2.25E-03	Imputed
rs12808381	88949104	C	T	0.88	0.80	1.62E-03	Imputed
rs12421155	88949549	A	G	0.88	0.80	1.35E-03	Imputed
rs7117255	88949729	G	C	0.88	0.80	1.35E-03	Imputed
rs7123206	88951332	C	T	0.88	0.80	1.60E-03	Imputed
rs7115568	88951878	T	C	0.88	0.80	1.60E-03	Imputed
rs7112373	88952032	A	G	0.88	0.80	1.61E-03	Imputed
rs34661861	88952253	C	T	0.88	0.80	1.52E-03	Imputed
rs11018535	88952347	T	C	0.92	0.82	2.52E-02	Imputed
rs16912259	88952419	T	C	0.88	0.80	1.59E-03	Imputed
rs12786274	88952456	C	T	0.88	0.80	1.59E-03	Imputed
rs34857319	88952916	C	T	0.88	0.80	1.49E-03	Imputed
rs11018536	88953846	T	C	0.75	1.39	9.92E-09	Imputed
rs6483000	88953990	T	C	0.88	0.80	1.35E-03	Imputed
rs6483001	88954197	A	C	0.88	0.80	1.40E-03	Imputed
rs6483002	88954339	C	T	0.88	0.80	1.34E-03	Imputed
rs7108676	88955005	G	T	0.88	0.80	1.39E-03	Imputed
rs6483003	88955147	T	A	0.89	0.81	3.02E-03	Imputed
rs6483004	88955234	C	T	0.88	0.80	1.39E-03	Imputed
rs7934646	88955676	G	A	0.88	0.80	1.34E-03	Imputed
rs34469199	88956493	A	G	0.88	0.80	1.33E-03	Imputed
rs17191474	88957047	G	A	0.94	0.77	9.72E-03	Genotyped
rs11824837	88957190	G	A	0.88	0.80	1.32E-03	Imputed
rs11820797	88957385	C	T	0.88	0.80	1.30E-03	Imputed
rs6483006	88957961	A	G	0.88	0.80	1.39E-03	Imputed
rs28625370	88959289	G	A	0.88	0.80	1.30E-03	Imputed
rs12803764	88959428	T	C	0.89	0.79	1.53E-03	Imputed
rs12803765	88959432	T	C	0.89	0.79	1.53E-03	Imputed
rs11018541	88960147	G	A	0.62	1.16	2.54E-03	Genotyped
rs12804012	88960790	G	A	0.88	0.79	7.39E-04	Imputed
rs3793975	88961188	G	A	0.88	0.80	1.50E-03	Genotyped
rs3793974	88961521	A	T	0.88	0.80	1.26E-03	Imputed
rs11018542	88962090	C	T	0.92	0.82	2.48E-02	Genotyped
rs7941532	88962579	G	T	0.88	0.80	1.26E-03	Imputed
rs12793071	88962605	G	A	0.94	0.77	9.61E-03	Imputed
rs12795158	88962931	C	G	0.88	0.79	1.14E-03	Imputed
rs12795171	88962954	C	T	0.88	0.79	1.14E-03	Imputed
rs11018543	88962962	C	T	0.92	0.82	2.47E-02	Imputed
chr11:88963132	88963132	C	G	0.94	0.84	5.56E-02	Imputed
rs35105852	88963353	T	C	0.88	0.79	1.19E-03	Imputed
rs7935604	88963619	T	C	0.88	0.80	1.19E-03	Imputed
chr11:88964199	88964199	G	C	0.88	0.80	2.08E-03	Imputed
rs12808354	88964262	T	C	0.89	0.79	1.56E-03	Imputed
rs4418813	88965926	T	C	0.70	1.33	2.32E-07	Imputed
rs4512823	88966584	A	G	0.70	1.32	2.66E-07	Imputed
rs4429061	88966648	C	T	0.70	1.32	2.81E-07	Imputed
rs1074304	88966798	C	T	0.71	1.33	3.15E-07	Imputed

rs1074303	88966821	T	C	0.71	1.33	3.16E-07	Imputed
rs4512825	88966851	A	C	0.71	1.33	3.18E-07	Imputed
rs2155149	88967990	T	C	0.61	1.15	3.91E-03	Imputed
rs4753214	88969066	C	T	0.53	1.08	1.03E-01	Imputed
rs10765198	88969774	T	C	0.73	1.36	2.50E-08	Genotyped
rs11018544	88970006	A	T	0.53	1.08	1.04E-01	Imputed
rs7358418	88970138	T	G	0.73	1.32	2.94E-07	Imputed
rs7939929	88971035	A	G	0.73	1.32	5.00E-07	Imputed
rs12365043	88971134	G	A	0.74	1.38	9.71E-09	Imputed
rs11018545	88971269	C	T	0.74	1.39	1.28E-08	Imputed
rs7940368	88971373	A	G	0.73	1.32	2.72E-07	Imputed
rs34486762	88971478	G	C	0.94	0.76	6.68E-03	Imputed
rs10765199	88971638	T	A	0.76	1.38	3.07E-07	Imputed
rs10765200	88971684	C	T	0.74	1.35	1.44E-07	Imputed
rs10765201	88971704	G	C	0.73	1.33	3.86E-07	Imputed
rs35937494	88971820	C	G	0.94	0.76	6.70E-03	Imputed
rs7358330	88972118	C	A	0.73	1.38	9.00E-09	Imputed
rs6415994	88972346	C	T	0.73	1.34	1.06E-07	Imputed
rs1939262	88972562	G	A	0.73	1.35	6.16E-08	Imputed
rs1939263	88972956	A	C	0.62	1.16	3.09E-03	Imputed
rs7933594	88973201	C	T	0.73	1.34	1.03E-07	Imputed
rs11018546	88973361	G	A	0.73	1.38	5.15E-09	Imputed
rs2866556	88973610	A	G	0.89	0.79	1.41E-03	Imputed
rs10830243	88974707	A	G	0.61	1.15	4.25E-03	Imputed
rs2000555	88975107	C	T	0.62	1.16	3.23E-03	Imputed
rs3936992	88975416	T	C	0.61	1.15	4.02E-03	Imputed
chr11:88975475	88975475	A	C	0.96	0.71	5.59E-03	Imputed
rs7934212	88975667	T	C	0.63	1.17	2.33E-03	Imputed
rs4396293	88976113	T	C	0.62	1.17	1.71E-03	Imputed
rs12295166	88976157	T	C	0.62	1.00	9.39E-01	Imputed
rs2186640	88976163	C	G	0.62	1.17	1.71E-03	Imputed
rs2155148	88976283	G	A	0.62	1.17	1.70E-03	Imputed
rs10830244	88976933	T	C	0.67	1.20	1.46E-03	Imputed
rs12288824	88977169	C	T	0.62	1.17	2.21E-03	Imputed
rs10501698	88977364	G	A	0.75	1.41	6.41E-09	Imputed
rs11018549	88977433	A	C	0.65	1.16	5.08E-03	Imputed
rs10830245	88977461	C	G	0.66	1.19	1.55E-03	Imputed
rs10830246	88977497	C	T	0.70	1.19	4.08E-03	Imputed
rs10830247	88977515	T	C	0.70	1.20	2.69E-03	Imputed
rs10830248	88977572	C	T	0.64	1.16	5.80E-03	Imputed
rs10830249	88977586	C	A	0.64	1.15	6.85E-03	Imputed
rs10830250	88977607	C	G	0.64	1.20	5.96E-04	Imputed
chr11:88977676	88977676	A	C	0.96	0.66	3.15E-03	Imputed
rs7924589	88978308	G	A	0.63	1.20	2.72E-04	Imputed
rs4601783	88978545	A	G	0.54	1.11	3.42E-02	Imputed
chr11:88978627	88978627	T	C	0.95	0.84	1.32E-01	Imputed
rs17174064	88979491	T	C	0.93	0.78	1.22E-02	Imputed

rs4121401	88979846	T	C	0.64	1.28	1.47E-06	Imputed
chr11:88979955	88979955	T	C	0.95	0.80	3.89E-02	Imputed
rs7117826	88980260	G	A	0.94	0.80	3.01E-02	Imputed
rs7936840	88981503	T	C	0.97	0.81	9.94E-02	Imputed
rs10741305	88982718	T	C	0.52	1.15	2.79E-03	Imputed
rs35963892	88983003	T	C	0.97	0.81	9.90E-02	Imputed
rs34003066	88983632	C	T	0.97	0.81	9.85E-02	Imputed
rs12421746	88984984	C	T	0.97	0.81	9.82E-02	Genotyped
chr11:88985354	88985354	G	T	0.97	0.79	1.41E-01	Imputed
rs34947445	88985940	C	T	0.91	0.78	3.76E-03	Imputed
rs12808219	88986019	A	C	0.98	0.81	2.49E-01	Imputed
chr11:88987541	88987541	C	T	0.94	0.81	4.70E-02	Imputed
chr11:88987580	88987580	G	C	0.94	0.82	6.19E-02	Imputed
rs11018555	88987673	G	T	0.39	0.83	1.56E-04	Imputed
rs3936623	88990049	T	C	0.89	0.75	4.53E-04	Imputed
chr11:88990380	88990380	G	A	0.97	0.79	9.73E-02	Imputed
chr11:88990643	88990643	T	C	0.95	0.82	6.02E-02	Imputed
rs11828655	88990786	C	T	0.97	0.79	9.75E-02	Imputed
rs35029283	88990974	C	T	0.97	0.79	9.57E-02	Imputed
rs12420278	88993648	G	A	0.97	0.79	9.88E-02	Imputed
chr11:88996152	88996152	G	C	0.97	0.79	9.89E-02	Imputed
chr11:88996779	88996779	C	T	0.98	0.50	1.69E-03	Imputed
rs7127196	88997520	A	C	0.97	0.82	1.04E-01	Imputed
rs58429491	88997896	A	C	0.94	0.85	1.12E-01	Imputed
chr11:88998400	88998400	T	G	0.97	0.82	1.12E-01	Imputed
rs6483008	88999996	A	T	0.97	0.78	1.19E-01	Imputed
rs4087499	89001126	G	C	0.71	1.42	6.98E-11	Imputed
rs7927996	89001621	G	T	0.97	0.81	1.01E-01	Imputed
rs591260	89002566	A	C	0.53	1.15	3.05E-03	Imputed
rs2298458	89003604	C	A	0.97	0.81	1.02E-01	Genotyped
rs34739346	89003953	A	G	0.99	0.75	2.17E-01	Imputed
rs645592	89004894	T	C	0.53	1.15	2.72E-03	Imputed
chr11:89005089	89005089	A	C	0.98	0.87	4.69E-01	Imputed
rs1847134	89005253	A	C	0.71	1.42	7.00E-11	Genotyped
chr11:89006917	89006917	A	G	0.91	0.81	1.25E-02	Imputed
chr11:89007019	89007019	T	C	0.91	0.81	1.25E-02	Imputed
rs12421030	89007579	C	T	0.92	0.80	1.13E-02	Imputed
rs7101897	89007922	C	T	0.71	1.42	6.02E-11	Imputed
rs12574987	89008008	G	A	0.97	0.78	1.03E-01	Imputed
rs12419351	89008816	C	G	0.93	0.77	7.07E-03	Imputed
rs12416958	89010200	G	A	0.98	0.75	1.75E-01	Imputed
rs58893107	89010668	C	G	0.94	0.82	3.53E-02	Imputed
rs1393350	89011046	G	A	0.76	1.54	1.21E-13	Genotyped
rs1939255	89012085	C	T	0.94	0.82	3.36E-02	Genotyped
chr11:89012215	89012215	A	G	0.98	0.81	2.47E-01	Imputed
chr11:89012398	89012398	C	T	0.94	0.82	3.37E-02	Imputed
chr11:89012983	89012983	T	C	0.98	0.81	2.47E-01	Imputed

rs11018559	89013386	G	A	0.92	0.79	9.51E-03	Imputed
chr11:89013797	89013797	T	C	0.91	0.80	1.05E-02	Imputed
chr11:89013806	89013806	T	C	0.98	0.81	2.47E-01	Imputed
rs12273884	89014355	T	C	0.63	1.27	8.40E-07	Imputed
rs11018560	89016625	C	A	0.92	0.80	1.15E-02	Imputed
rs1126809	89017961	A	G	0.26	0.64	1.37E-14	Imputed
rs1827430	89018440	A	G	0.63	1.28	6.80E-07	Imputed
chr11:89018458	89018458	T	C	0.96	0.67	2.63E-02	Imputed
chr11:89018710	89018710	T	A	0.98	0.81	2.47E-01	Imputed
rs34373463	89019374	A	G	0.98	0.77	1.25E-01	Imputed
chr11:89019719	89019719	C	T	0.94	0.81	3.04E-02	Imputed
rs598769	89019737	C	T	0.54	1.18	4.99E-04	Imputed
rs16913104	89020498	T	C	0.94	0.82	3.43E-02	Imputed
rs9919559	89020590	T	C	0.63	1.27	8.73E-07	Imputed
rs3900053	89021065	T	C	0.71	1.46	5.41E-12	Imputed
rs1847142	89021574	G	A	0.71	1.47	5.23E-12	Imputed
chr11:89022127	89022127	A	G	0.98	0.82	2.86E-01	Imputed
rs12363772	89022446	G	A	0.71	1.46	6.00E-12	Imputed
rs16913107	89023060	T	C	0.94	0.82	3.51E-02	Genotyped
rs2002720	89023533	G	A	0.99	0.76	2.12E-01	Imputed
chr11:89023577	89023577	G	A	0.98	0.82	2.86E-01	Imputed
rs877072	89023840	G	A	0.91	0.81	1.28E-02	Imputed
rs4542415	89023892	C	T	0.96	0.77	2.90E-02	Imputed
rs4121403	89024455	A	G	0.71	1.46	5.93E-12	Imputed
chr11:89025838	89025838	T	A	0.94	0.82	3.57E-02	Imputed
rs7947262	89026407	T	A	0.64	1.30	2.29E-07	Imputed
rs7929045	89026617	G	T	0.94	0.82	3.58E-02	Imputed
rs34899701	89026670	A	G	0.98	0.82	2.86E-01	Imputed
rs10830253	89028043	T	G	0.71	1.46	4.40E-12	Imputed
rs28521275	89028969	C	T	0.54	1.18	5.29E-04	Imputed
rs56295826	89029304	C	T	0.98	0.77	1.91E-01	Imputed
rs4121404	89029931	T	C	0.54	1.19	3.17E-04	Imputed
chr11:89030364	89030364	T	C	0.95	0.77	2.69E-02	Imputed
rs7951935	89030399	G	T	0.65	1.32	2.37E-08	Imputed
chr11:89030491	89030491	G	A	0.95	0.80	4.22E-02	Imputed
rs7924538	89030529	C	A	0.65	1.32	3.19E-08	Imputed
chr11:89032699	89032699	T	C	0.95	0.83	6.75E-02	Imputed
rs1954771	89033227	G	A	0.55	1.19	2.41E-04	Imputed
rs1954772	89033269	C	T	0.71	1.46	4.19E-12	Imputed
rs16913119	89033483	A	C	0.95	0.81	3.74E-02	Imputed
chr11:89033801	89033801	C	T	0.95	0.81	3.74E-02	Imputed
chr11:89034197	89034197	G	C	0.95	0.81	3.76E-02	Imputed
rs11018564	89035134	T	C	0.64	1.28	4.75E-07	Imputed
rs57347863	89035476	C	T	0.71	1.44	1.84E-11	Imputed
rs1502259	89036245	G	T	0.56	1.20	8.93E-05	Genotyped
rs1847140	89037064	A	G	0.70	1.44	1.47E-11	Imputed
chr11:89037297	89037297	C	T	0.99	0.76	2.49E-01	Imputed

rs1806319	89037936	T	C	0.65	1.32	3.32E-08	Genotyped
rs11018566	89040226	G	A	0.97	0.80	1.39E-01	Imputed
rs10830254	89040251	A	G	0.67	1.33	7.99E-08	Imputed
rs4106039	89041143	A	C	0.98	0.79	2.25E-01	Imputed
rs35399452	89041701	G	T	0.98	0.78	2.22E-01	Imputed
rs11018567	89042883	A	C	0.68	1.35	7.11E-08	Imputed
chr11:89043171	89043171	C	T	0.98	0.78	2.15E-01	Imputed
rs7112446	89043474	G	C	0.76	1.37	5.11E-06	Imputed
rs7129117	89043557	A	G	0.59	1.21	3.99E-04	Imputed
rs7129131	89043574	A	C	0.60	1.20	7.98E-04	Imputed
rs3907665	89043946	A	G	0.67	1.34	1.36E-07	Imputed
rs12788372	89044441	G	A	0.98	0.77	2.01E-01	Imputed
rs10830255	89044525	A	C	0.67	1.34	1.34E-07	Imputed
rs11018569	89044911	A	G	0.66	1.31	8.63E-07	Imputed
rs655108	89045079	T	G	0.53	1.20	3.64E-04	Imputed
chr11:89045165	89045165	C	T	0.94	0.81	6.82E-02	Imputed
rs10830256	89045556	G	T	0.55	1.22	7.36E-05	Imputed
rs34993346	89046097	A	G	0.72	1.51	1.44E-11	Imputed
rs10830259	89052162	G	C	0.90	1.23	1.14E-01	Imputed
rs12576761	89052255	C	G	0.73	1.51	1.57E-11	Imputed
chr11:89053002	89053002	A	T	0.98	0.76	1.88E-01	Imputed
rs34177771	89053190	G	A	0.98	0.76	1.87E-01	Imputed
rs7950615	89053302	G	A	0.73	1.54	6.20E-12	Imputed
rs7943603	89053387	T	C	0.67	1.35	6.60E-08	Imputed
rs11018573	89053879	A	C	0.94	0.82	7.94E-02	Imputed
rs1967203	89055293	A	G	0.55	1.21	1.92E-04	Imputed
rs7101579	89056614	A	G	0.67	1.35	5.30E-08	Imputed
rs3750923	89057130	T	G	0.67	1.36	7.20E-08	Imputed
rs3829229	89057348	G	A	0.73	1.54	5.86E-12	Imputed
rs11018578	89058101	T	C	0.72	1.51	1.90E-11	Imputed
rs28517716	89060002	G	A	0.96	0.81	1.46E-01	Imputed
rs10501701	89060635	A	T	0.95	0.82	8.79E-02	Imputed
rs11018581	89061622	C	T	0.83	0.81	3.95E-03	Imputed
rs11018582	89061647	G	A	0.88	0.83	2.79E-02	Imputed
chr11:89061858	89061858	G	A	0.88	0.82	2.48E-02	Imputed
chr11:89061878	89061878	T	C	0.95	0.81	9.01E-02	Imputed
chr11:89061988	89061988	T	C	0.95	0.81	8.94E-02	Imputed
rs3897708	89062444	C	T	0.83	0.81	5.38E-03	Imputed
chr11:89063384	89063384	G	T	0.98	0.72	1.48E-01	Imputed
chr11:89063913	89063913	A	G	0.96	0.79	1.16E-01	Imputed
rs11821838	89065017	C	T	0.94	0.87	1.62E-01	Genotyped

A1, allele 1; A2, allele 2; A1 FRQ, allele 1 frequency; A1 OR, allele 1 odds ratio.

Supplementary Table 5. Amplicons and PCR Primers used in *TYR* Sequencing

Chr	Amplicon start	Amplicon end	Forward primer sequence	Reverse primer sequence
11	88908244	88908761	CTTGAAATGTCACTTCTCCC	CTACACGTGTTGTAGTCTTC
11	88908642	88909141	CCCACAACCTGAAGATACCTA	GCCACAAAGAGATTAACACA
11	88908983	88909568	GCAAGTGTAAGGCAAAATTC	TAGTCAAATCAAAGTTGCC
11	88909122	88909711	TGTGTTAATCTCTTTGTGGC	TCATCTATCAAGTTGGAGCA
11	88909549	88909990	GGGCAACTTTGATTTGACTA	ATAGTGAGCTAGGGAAACTG
11	88909872	88910461	GCCCACAATAACATCTCTTC	CTTTGATAACTGGGCGATTT
11	88910155	88910620	ACAATATGGCTACAGCATTG	ATGCAGAGAGAGATTGTCTT
11	88910465	88910961	GCTATCCTTAGGAGTTGTCA	TTTCATCCTCTGAAAAGCAC
11	88910746	88911221	TTTGCAAGGTCAAATCATCA	CCTTCTCCATCAGGTTCTTA
11	88911062	88911602	AGAGAAATCTGTGACTCCAA	TTTTCATTTGGCCATAGGTC
11	88911202	88911796	TAAGAACCTGATGGAGAAGG	CAGCTTCTGGATTTCTTGTT
11	88911664	88912222	TTATGTGTCAATGGATGCAC	AAGGCACCATACTATGTTCT
11	88921529	88921860	GTTTGAAAAGCAGCAACAAT	ATATTCAGCCTTACCCACTT
11	88924300	88924891	AACATTTCTGCCTTCTCCTA	CAGTGACACAATCATAGCTC
11	88930598	88930998	TGTTAGCTGTCATCACCATA	CTAGGACAAAAACAAGGACC
11	88960825	88961367	CACTGGGTATCCAGAATGTA	TTTGTATCCTGCCTAATCCA
11	89017830	89018372	TCTTTCCATGTCTCCAGATT	TGATTCTACTGCTCTTCACA
11	89028130	89028586	ATGAAGAAACTGAGGCTTTG	TTGAGTTAGAGTGAGGTCAG
11	89028222	89028791	TACTCCAAAGGACTGTGAAA	GTTCCCTCATTACCAAATAGCA
11	89028720	89029131	CACTCAGCCCTTTAACATT	AGCTGGATGTGTTATAGACG
11	89029043	89029468	AGAACCTTTAGCTCTTTCCT	TAActTCTTCCCACTGATCC
11	89029308	89029777	TCCATTTTCCTCGCCTATTA	GCTGAAAGAAAGAATGGTGA
11	89029456	89030039	TGGGAAGAAGTTATAGTGGG	GTGTCTCGTCTTAActTACCT
11	89029758	89030323	TCACCATTCTTTCTTTCAGC	CAAATGTGTGGTTAGGACA
11	89030020	89030605	AGGTAGTTAAGACGAGACAC	GCTGGTTATGTAActGAGTTG
11	89030488	89030981	ACTGACTGCAGGAAAATCTA	CTCCCTCTCAGTAACAATGA
11	89030739	89031269	TCTGAAGAAGGAATAACGGT	GCAGAAGCATAAAAATGAAGC
11	89031132	89031615	TGGTTTTCTCAATATGGCAC	AAACAAGCTCACAATAGGTG
11	89031250	89031827	GCTTCATTTTATGCTTCTGC	GGTGAACAATTTGAAAGCTC
11	89031596	89032148	CACCTATTGTGAGCTTGTTT	TGTTGGTAACATGTCGATTG