Additional file 11: Table S4. Immunity genes in or near chromosome regions subjected to genetic selection since 1964.

Chr	Selection signature	Gene symbol	Gene name	Documented immunity function
1	12964810-17425222 (3Mb sliding windows)	*NCAM*	neural cell adhesion molecule 1	affects the innate immune system in the lung [1]
1	**63951419-65580210**	*IGSF11*	immunoglobulin superfamily member 11	a novel target for cancer immunotherapy of gastrointestinal and hepatocellular carcinomas [2]
		CD80	cluster of differentiation 80	costimulatory signals for T cell proliferation, cytokine production, and generation of CTL[3]
		GSK3B	glycogen synthase kinase-3 beta	negatively regulate IFN-ß Production by TLR4-stimulated innate immune cells [4]
1	**85294656-88698235** (2Mb sliding windows)	*SOX2*	SRY-box 2	a sequence-specific DNA sensor in neutrophils to initiate innate immunity against microbial infection [5]
		USP13	ubiquitin specific peptidase 13	negatively regulates antiviral responses by deubiquitinating STING [6]
2	79257749-80298164	*STAT1*	signal transducer and activator of transcription 1	targeted disruption of the mouse STAT1 gene results in compromised innate immunity to viral disease [7]
		STAT4	signal transducer and activator of transcription 4	mediated immune mechanisms in protection against plague [8]
2	**84373550-86035295**	*SLC39A10*	solute carrier family 39 member 10	controls humoral immunity by modulating B-cell receptor signal strength [9]
2	**91221891-92326427**	*CD28*	cluster of differentiation 28	promote T cell survival [10]
2	**120914934-121503634**	*TRIM64*	tripartite motif containing 64	Trim62-deficient mice had increased susceptibility to fungal infection [11]
2	128695085-129554709	*GRHL3*	grainyhead like transcription factor 3	A GRHL3-regulated repair pathway suppresses immune-mediated epidermal hyperplasia [12]
		IFNLR1	interferon lambda receptor 1	expression of Ifnlr1 on intestinal epithelial cells is critical to the antiviral effects of interferon lambda against norovirus and reovirus [13]
		IL22RA1	interleukin 22 receptor subunit alpha 1	critical role of IL-22/IL22-RA1 signaling in pneumococcal pneumonia [14]

3	**8685390-9810337**	*CD244* *CD48* *CD84*	cluster of differentiation 244 cluster of differentiation 48 cluster of differentiation 84	long noncoding RNA derived from CD244 signaling epigenetically controls CD8+ T-cell immune responses in tuberculosis infection [15] CD48-deficient mice have a pronounced defect in CD4+ T cell activation [16]
3	11105182-11770282	*IGSF8*	immunoglobulin superfamily member 8	This gene encodes a member the EWI subfamily of the immunoglobulin protein superfamily. Members of this family contain a single transmembrane domain, an EWI (Glu-Trp-Ile)-motif and a variable number of immunoglobulin domains. This protein interacts with the tetraspanins CD81 and CD9 and may regulate their role in certain cellular functions including cell migration and viral infection. [17]
3	**16444546-16881296**	*CRTC2*	CREB regulated transcription coactivator 2	the CREB/CRTC2 pathway modulates autoimmune disease by promoting Th17 differentiation [18]
3	**79282515-80265751**	*PDE4B*	phosphodiesterase 4B	PDE4B gene activation by LPS constitutes a feedback regulation essential for an efficient immune response [19]
4	39012513-39435115	*HGF*	hepatocyte growth factor	key regulator of dendritic cell migration in skin immunity [20]
5	**104116518-105105448**	*CD27* *CD9*	cluster of differentiation 27 cluster of differentiation 9	CD27 is required for generation and long-term maintenance of T cell immunity [21] CD9 tetraspanin is not required for the development of peripheral B cells or for humoral immunity [22]
6	90075383-90188972	*ANKRD17*	ankyrin repeat domain 17	Ankrd17 positively regulates RIG-I-like receptor (RLR)-mediated immune signaling [23]
7	11486814-12752376	*IL-27Ra*	interleukin 27 receptor subunit alpha	IL-27Ra-deficient mice were hypersusceptible to experimental autoimmune encephalomyelitis and generated more IL-17-producing T helper cells [24]
7	**54455147-57844905**	*RNF14* *NDFIP1*	ring finger protein 14 Nedd4 family interacting protein 1	RNF14 is a regulator of mitochondrial and immune function in muscle [25] mediates peripheral tolerance to self and exogenous antigen by inducing cell cycle exit in responding

				CD4+ T cells [26]
8	**37706259-39306605**	*IL33*	interleukin 33	a crucial amplifier of innate rather than acquired immunity [27]
8	108652993-109059409	*TLR4*	toll like receptor 4	links innate immunity and fatty acid–induced insulin resistance [28]
9	**87190233-88964135**	*LATS1*	large tumor suppressor kinase 1	The Hippo pathway kinases LATS1/2 suppress cancer immunity [29]
10	**21516136-22008344** (the gene clusters are at 22.1-25.5 Mb)	135 genes	T-cell receptor alpha, T-cell receptor alpha chain V region and C region	T cell receptors recognize foreign antigens and bound to MHC molecules at the surface of antigen presenting cells [30]
		4 genes	Ig lambda chain V-I region	Immunoglobulins recognize foreign antigens and initiate immune responses such as phagocytosis and the complement system [31]
		3 genes	Ig lambda chain V-II region	
		3 genes	Ig lambda chain V-III region	
		1 gene	Ig lambda chain V-VI region	
		1 gene	Ig kappa chain V-I region	
		18 genes	Ig kappa chain V-III region	
		2 genes	Ig kappa chain V-VI region	
		1 gene	Ig heavy chain V region	
10	**25598535-26289588**	*NDRG2*	NDRG2	one of novel intrinsic factors for regulation of IL-10 production in human myeloid cell [32]
10	**36465813-37290812**	*TYRO3*	TYRO3 protein tyrosine kinase	a negative regulator of type 2 immunity [33]
10	51001410-52033595	*ADAM10*	ADAM metallopeptidase domain 10	regulates the production of multiple secreted factors that contribute to autoimmune reactions [34]
11	6602495-7047686	*MAP4K4*	mitogen-activated protein kinase kinase kinase kinase 4	promotes vascular inflammation and atherosclerosis [35]
		IL1R2	interleukin 1 receptor type 2	The IL-1 family: regulators of immunity [36]
		IL1R1	interleukin 1 receptor type 1	The IL-1 family: regulators of immunity [36]
		IL1RL2	interleukin 1 receptor like 2	The IL-1 family: regulators of immunity [36]
		IL1RL1	interleukin 1 receptor like 1	The IL-1 family: regulators of immunity [36]
		IL18R	interleukin 18 receptor 1	The IL-1 family: regulators of immunity [36]
		IL18RAP	interleukin 18 receptor accessory protein	The IL-1 family: regulators of immunity [36]

11	**15814741-16759475**	*RASGRP3*	RAS, guanyl releasing protein 3	limits inflammatory response [37]
11	**28577854-29495322**	*EPAS1*	endothelial PAS domain protein 1	links DOCK8 deficiency to atopic skin inflammation via IL-31 induction [38]
12	**35886159-37211264**	*LATS2*	large tumor suppressor kinase 2	The Hippo pathway kinases LATS1/2 suppress cancer immunity [29]
18	34794005-35027876	*TRADD*	TNFRSF1A associated via death domain	an essential component of the RIG-like helicase antiviral pathway [39]
18	**50581375-51369666**	*AXL*	AXL receptor tyrosine kinase	required for T cell priming and antiviral immunity [40]
		CEACAM1	carcinoembryonic antigen related cell adhesion molecule 1	a regulatory co-receptor for both lymphoid and myeloid cell types [41]
18	58696066-61421776	33 genes	cationic amino acid transporters	play key roles in the survival and transmission of apicomplexan parasites [42]
		9 genes	sialic acid-binding Ig-like lectin	Sialic acid-binding immunoglobulin-like lectins (SIGLECs) are a family of cell surface proteins belonging to the immunoglobulin superfamily. They mediate protein-carbohydrate interactions by selectively binding to different sialic acid moieties present on glycolipids and glycoproteins. [43]
20	**9919863-10295382**	*NAIP*	NLR family apoptosis inhibitory protein	recognizes bacterial type III secretion needle protein for inflammasome activation [44]
21	**64129449-66380363**	*BCL11B*	B-cell CLL/lymphoma 11B	required for differentiation and survival of αβ T lymphocytes [45]
22	53695239-54103673	*CCR1*	C-C motif chemokine receptor 9	interaction between CCR1 and CCL5 modulates the innate immune response during sepsis [46]
		XCR1	X-C motif chemokine receptor 1	an integral component in the development of efficient cytotoxic immunity in vivo [47]
		CXCR6	C-X-C motif chemokine receptor 6	adaptive immunity to structurally diverse antigens [48]
			C-C motif chemokine	an essential role for CCR9 in the homing of pDC to

		CCR9	receptor 9	the intestine under homeostatic and inflammatory conditions [49]
23	7627089-7874236	*BAK1*	BCL2 antagonist/killer 1	The receptor-like kinase SERK3/BAK1 is a central regulator of innate immunity in plants [50]
23	**25178791-27992880**	MHC	major histocompatibility complex	associated with many diseases [51]
		BTNL2	butyrophilin-like 2 (MHC class II associated)	Inhibit T Cell Activation [52]
		ABHD16A	abhydrolase domain containing 16A	immunomodulatory lysophosphatidylserines are regulated by ABHD16A and ABHD12 interplay [53]
		NFKBIL1	NFKB inhibitor like 1	confers resistance to experimental autoimmune arthritis through the regulation of dendritic cell functions [54]
24	6659975-7838578	*CD226*	cluster of differentiation 226	regulates human T cell function [55]
25	**23825593-26337016**	*IL4R*	interleukin 4 receptor	regulate increased lymphocyte proliferation and survival [56]
		IL21R	interleukin 21 receptor	critical for sustained functionality and control of chronic viral infection [57, 58]
		IL27	interleukin 27	expression of IL-27 in murine carcinoma cells produces antitumor effects and induces protective immunity in inoculated host animals [59]
		LAT	linker for activation of T-cells	essential role in T cell development [60]
		CD19	cluster of differentiation 19	regulates signal transduction thresholds governing humoral immunity and autoimmunity [61]
26	16999066-17465791	*BLNK*	B-cell linker	an essential role in human B cell development [62]
29	**43328607-43839783**	*BATF2*	basic leucine zipper ATF-like transcription factor 2	Batf2/Irf1 induces inflammatory responses in classically activated macrophages, lipopolysaccharides, and mycobacterial infection [63]

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