

# **Supplementary Materials for**

## **Innate and adaptive immune genes associated with MERS-CoV infection in dromedaries**

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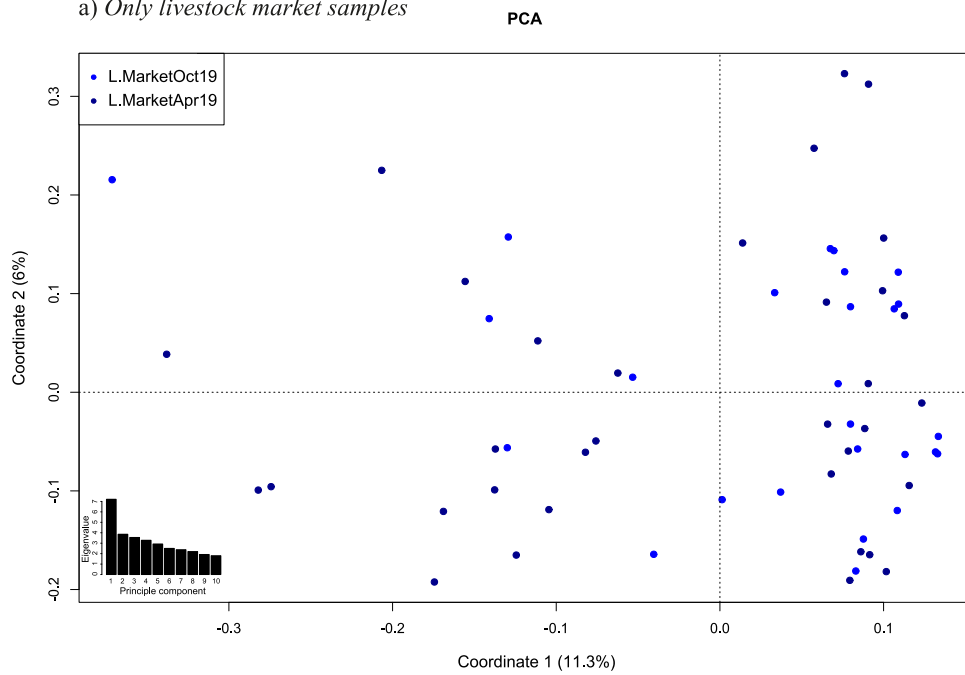
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### **This PDF file includes:**

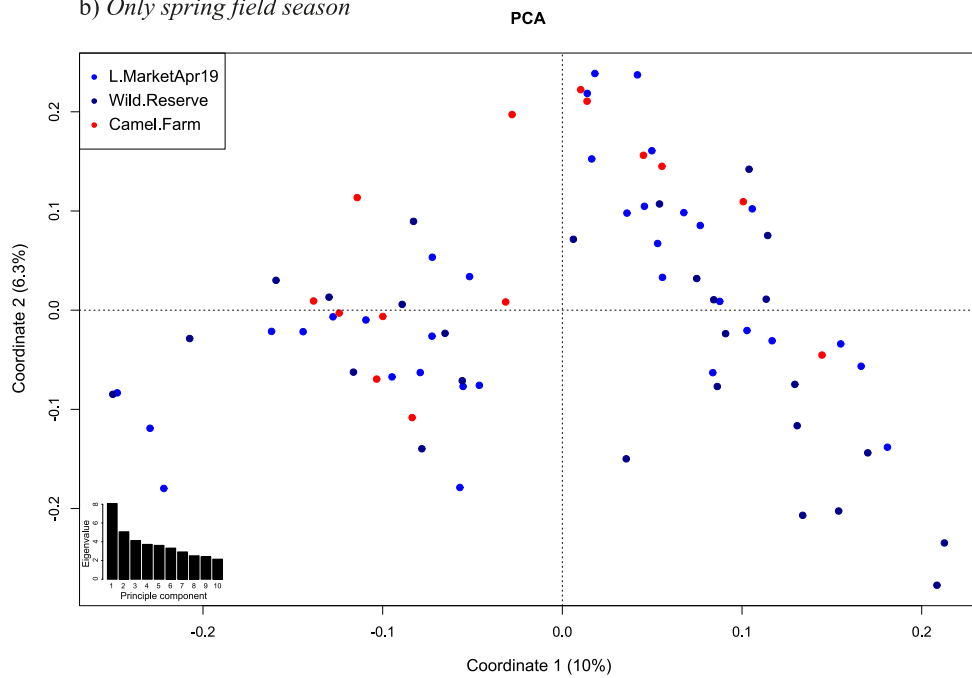
Figures S1 and S2

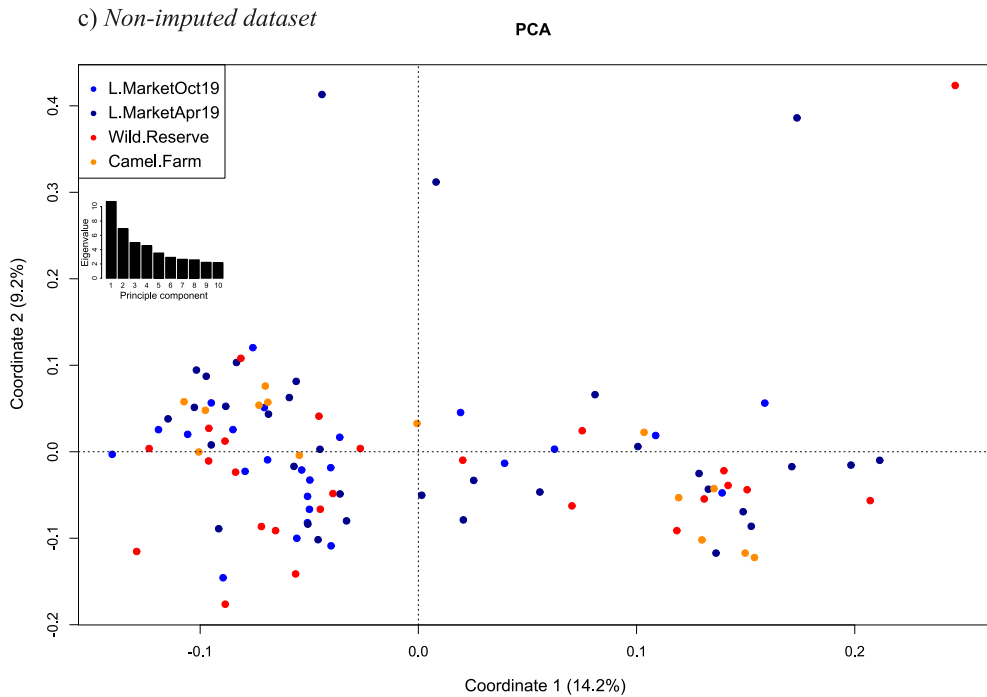
Tables S1 to S7

a) *Only livestock market samples*



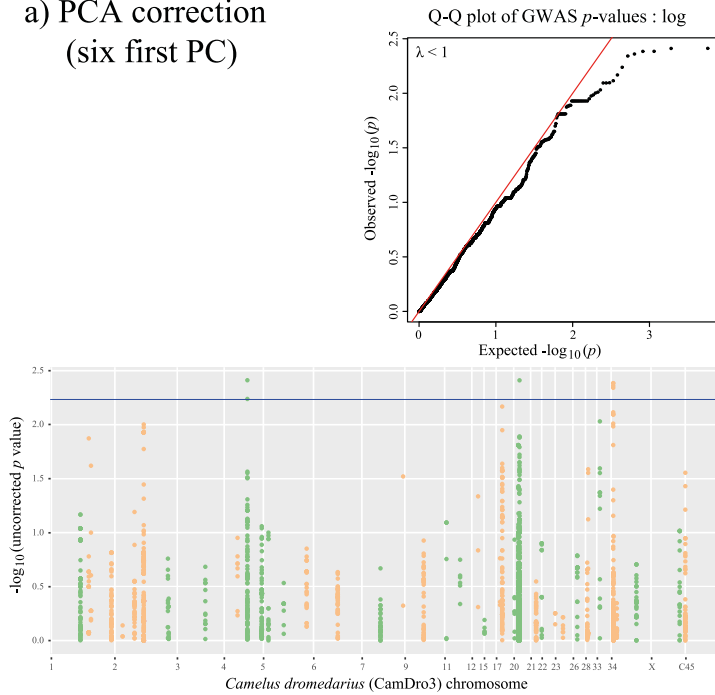
b) *Only spring field season*





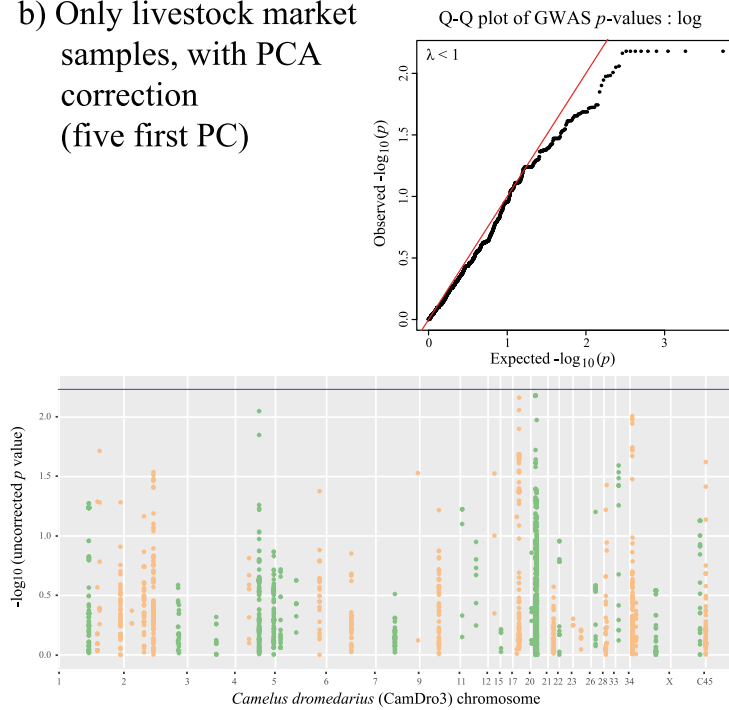
**Figure S1. Principal Component Analysis of the population structure at three collection sites over two sampling periods.** Variation explained by PC1 and PC2 are depicted in percentages. Individual animals are plotted on the first two principal components, colored by sampling site (livestock market [“L. Market”], over two sampling periods (April and October 2019, dark and light blue, respectively); Dubai Desert Conservation Reserve [“Wild. Reserve”], dark red; and a Bedouin camel farm [“Camel. Farm”], pink). The inset shows a barplot of the eigenvalues for the first 10 principal components. a) Only livestock market samples; b) Only spring field season: c) Non-imputed dataset.

a) PCA correction  
(six first PC)



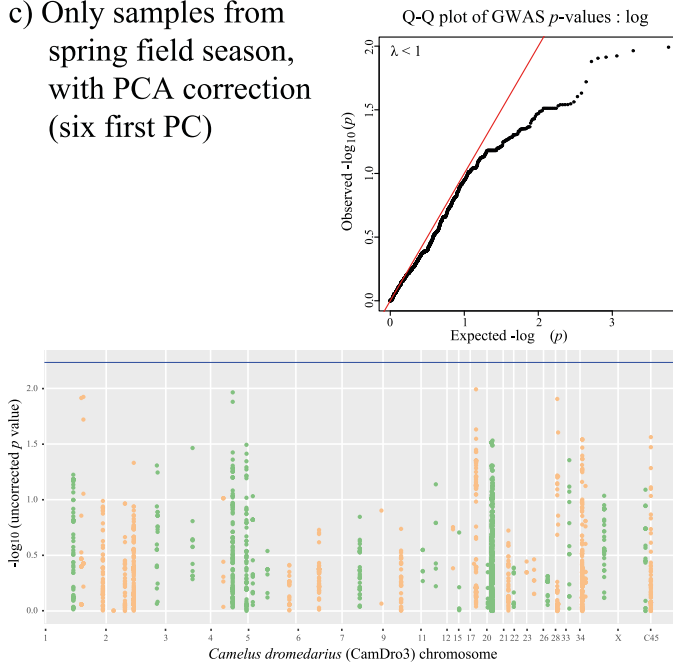
Chr	Position	Gene	$p$ - value
5	8508361	<i>PTPN4</i>	0.0039
20	23100696	<i>HLA-A-24</i>	0.0039
34	15362634	<i>MAGOHB</i>	0.0041
34	15363451	<i>MAGOHB</i>	0.0041
34	15367780	INTERGENIC	0.0044
34	15361800	<i>MAGOHB</i>	0.0046
5	8506434	<i>PTPN4</i>	0.0058
17	23840747	<i>DNAH7</i>	0.0068
34	15371299	INTERGENIC	0.0077
34	15363470	<i>MAGOHB</i>	0.0080
34	15369030	INTERGENIC	0.0080
34	15371264	INTERGENIC	0.0080
33	12210072	<i>IL10RA</i>	0.0093
34	15370956	INTERGENIC	0.0098
2	113136710	<i>CC2D2A</i>	0.0099
34	15371123	INTERGENIC	0.0104

b) Only livestock market  
samples, with PCA  
correction  
(five first PC)



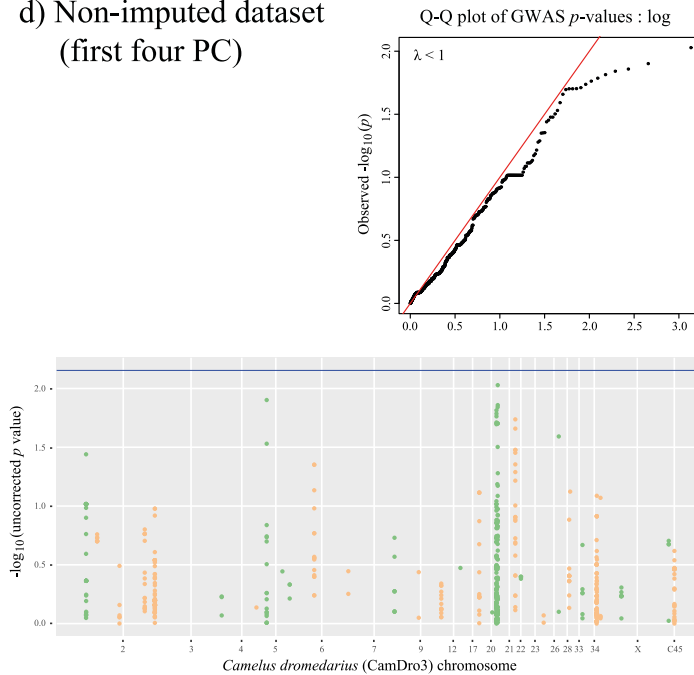
Chr	Position	Gene	$p$ - value
20	20676706	<i>HLA-DPB1</i>	0.0066
20	20677126	<i>HLA-DPB1</i>	0.0066
20	20678240	<i>HLA-DPB1</i>	0.0066
20	20679052	<i>HLA-DPB1</i>	0.0066
20	20679884	<i>HLA-DPB1</i>	0.0066
20	20680467	<i>HLA-DPB1</i>	0.0066
20	20680474	<i>HLA-DPB1</i>	0.0066
20	20680741	<i>HLA-DPB1</i>	0.0066
20	20681619	<i>HLA-DPB1</i>	0.0066
17	23963829	<i>DNAH7</i>	0.0069
17	23948208	<i>DNAH7</i>	0.0087
5	8508361	<i>PTPN4</i>	0.0089
34	15363451	<i>MAGOHB</i>	0.0098
34	15362634	<i>MAGOHB</i>	0.0104
34	15367780	INTERGENIC	0.0105
20	23100696	<i>HLA-A-24</i>	0.0106

c) Only samples from spring field season, with PCA correction (six first PC)



Chr	Position	Gene	$p$ - value
17	23840747	<b>DNAH7</b>	0.0102
5	8552273	<b>PTPN4</b>	0.0109
2	9866197	<i>RNF175</i>	0.0119
2	5565157	<i>SUCLG1</i>	0.0122
28	8848388	<i>IL1B</i>	0.0124
5	8544538	<b>PTPN4</b>	0.0132
2	9865226	<i>RNF175</i>	0.0191
17	23938277	<b>DNAH7</b>	0.0234
28	10593199	<i>NKL</i>	0.0249
Contig45	334608	<i>DDX58</i>	0.0274
17	23963829	<b>DNAH7</b>	0.0284
34	15833750	<i>KLRF1</i>	0.0288
34	15837599	<i>KLRF1</i>	0.0288
34	15829311	<i>KLRF1</i>	0.0288
34	15833105	<i>KLRF1</i>	0.0288
20	23100696	<b>HLA-A-24</b>	0.0294

d) Non-imputed dataset (first four PC)



Chr	Position	Gene	$p$ -value
20	23270291	<i>HLA-A-30</i>	0.0094
5	8543352	<b>PTPN4</b>	0.0125
20	23268649	<i>HLA-A-30</i>	0.0139
20	23101810	<b>HLA-A-24</b>	0.0144
20	20959362	<i>RT1-Bb</i>	0.0153
20	20959332	<i>RT1-Bb</i>	0.0164
20	20959331	<i>RT1-Bb</i>	0.0173
21	21448206	<i>FCRL3</i>	0.0183
20	20959361	<i>RT1-Bb</i>	0.0195
20	20959358	<i>RT1-Bb</i>	0.0198
20	23270314	<i>HLA-A-30</i>	0.0199
20	23270316	<i>HLA-A-30</i>	0.0199
20	20866612	<i>DLA</i>	0.0201
21	21453272	<i>FCRL3</i>	0.0220
26	17219376	<i>TLR3</i>	0.0256
5	8542959	<b>PTPN4</b>	0.0295

**Figure S2. Manhattan and QQ plot.** Highlighted in bold are the four genes that are common in all analyses (*HLA-A-like*, *PTPN4*, *MAGOHB* and

*DNAH7*). FDR corrected thresholds are represented in blue. a) Total dataset; b) only livestock market samples; c) only spring field samples; d) non-imputed dataset. C45 corresponds to Contig45, an unplaced scaffold.

## Supplementary tables

**Table S1. Sample information assessment of virus presence (swabs) and antibody prevalence (sera).**

No	Phenotype	Original code	Lab code	Sampling site & date	Sex (M/F)	Age (yr)	Chip ID	Farm location (UAE)	Nasal Swabs	Camel serum samples			Samples used in the association tests
									MERS CoV ORF1a RT-qPCR (ct value)	MERS CoV ORF1a RT-qPCR	Anti-MERS CoV ELISA (extinction ratio)	Anti-MERS-CoV-IIFT (antibody titer)	
1	V- AB-	51	Drom1508	Livestock market, Oct 19	F	2	985007841357609	Marmoom	neg.	neg.	borderline 1.1	1:100	
2	V- AB-	88	Drom1545	Livestock market, Oct 19		6 m	NO CHIP INFO		neg.	neg.	borderline 0.9	1:100	
3	V- AB-	NSB14	Drom1831	Livestock market, April 19	M	2	900111881038113	Al Saad	neg.	neg..	borderline 1.02	≥ 1:1,000	
4	V- AB-	M12	Drom1940	Bedouin farm, Al Mazrooei, March 19	M	2 m	NO CHIP INFO		neg.	neg.	borderline 1.00	1:1,000	
5	V- AB-	NSw53	Drom1903	Wildlife Reserve, ArabAdv, April 19	F	2	NO CHIP INFO		neg.	neg.	neg. 0.07	neg.	
6	V- AB-	NSw54	Drom1904	Wildlife Reserve, ArabAdv, April 19	M	6	NO CHIP INFO		neg.	neg.	borderline 1.09	1:100	
7	V- AB-	NSw57	Drom1907	Wildlife Reserve, DesertStar, April 19	M	8-9	NO CHIP INFO		neg.	neg.	neg. 0.64	1:100	
8	V- AB+	13	Drom1470	Livestock market, Oct 19	F	1	784010050046584	Abu Samra	doubtful 39.6	neg.	pos. 4.0	≥ 1:1,000	
9	V- AB+	14	Drom1471	Livestock market, Oct 19	F	6	992001000331305		neg.	neg.	pos. 3.4	≥ 1:1,000	X
10	V- AB+	25	Drom1482	Livestock market, Oct 19	F	3	900057600121775	Dubai	doubtful 40.4	neg.	pos. 2.5	≥ 1:1,000	
11	V- AB+	31	Drom1488	Livestock market, Oct 19	M	2	908182001493742		neg.	neg.	pos. 4.7	≥ 1:1,000	X
12	V- AB+	35	Drom1492	Livestock market, Oct 19	F	6	900057600126791	Malaghat	neg.	neg.	pos. 4.8	≥ 1:1,000	X
13	V- AB+	37	Drom1494	Livestock market, Oct 19	F	5	968000002916753		neg.	neg.	pos. 4.5	≥ 1:1,000	X
14	V- AB+	38	Drom1495	Livestock market, Oct 19	M	6	985007841229562	Al Wagan	neg.	neg.	pos. 5.9	≥ 1:1,000	X
15	V- AB+	39	Drom1496	Livestock market, Oct 19	F	6	784010050348103		neg.	neg.	pos. 4.1	≥ 1:1,000	X
16	V- AB+	42	Drom1499	Livestock market, Oct 19	F	3	784019000006947	Sweihan	neg.	neg.	pos. 3.5	≥ 1:1,000	X
17	V- AB+	43	Drom1500	Livestock market, Oct 19	F	6	985007841219484	Marmoom	neg.	neg.	pos. 4.8	≥ 1:1,000	X
18	V- AB+	47	Drom1504	Livestock market, Oct 19	F	6	784010050073661	Marakh	neg.	neg.	pos. 5.1	≥ 1:1,000	X

19	V- AB+	48	Drom1505	Livestock market, Oct 19	F	5	784019000006158	Mezyad	neg.	neg.	pos. 3.2	1:1,000	X
20	V- AB+	69	Drom1526	Livestock market, Oct 19	F	6	784010050079111		neg.	neg.	pos. 4.6	≥ 1:1,000	X
21	V- AB+	72	Drom1529	Livestock market, Oct 19			991001001739927		neg.	neg.	pos. 4.2	≥ 1:1,000	
22	V- AB+	79	Drom1536	Livestock market, Oct 19	F	6	784010050079139		neg.	neg.	pos. 4.4	≥ 1:1,000	X
23	V- AB+	85	Drom1542	Livestock market, Oct 19	F	4	784010050140963	Dubai	doubtful 39.8	neg.	pos. 3.5	≥ 1:1,000	
24	V- AB+	NSB5	Drom1823	Livestock market, April 19	M	2	900111881038114	Al Saad	neg.	neg..	pos. 2.39	1:1,000	X
25	V- AB+	NSB8	Drom1826	Livestock market, April 19	M	2	900111881038106	Al Saad	neg.	neg..	pos. 1.74	1:1,000	X
26	V- AB+	NSB12	Drom1829	Livestock market, April 19			NO CHIP INFO		neg.	neg..	pos. 2.02	1:1,000	
27	V- AB+	NSB13	Drom1830	Livestock market, April 19	F	4	784010050423283	Bida Bint Saud / Bad' Bint Sa'oud	neg.	neg..	pos. 3.49	≥ 1:1,000	X
28	V- AB+	NSB16	Drom1833	Livestock market, April 19	F	4-5	634078000075327	Sweihaan	neg.	neg..	pos. 3.14	≥ 1:1,000	X
29	V- AB+	NSB17	Drom1834	Livestock market, April 19	F	8	784010050077291	Bida Bint Saud / Bad' Bint Sa'oud	neg.	neg..	pos. 4.09	≥ 1:1,000	X
30	V- AB+	NSB18	Drom1835	Livestock market, April 19	F	2	900182001414799	Al Jabeeb	neg.	neg..	pos. 3.01	≥ 1:1,000	X
31	V- AB+	NSB19	Drom1836	Livestock market, April 19	M	1	991001002575031	Marakh	neg.	neg..	pos. 5.10	≥ 1:1,000	X
32	V- AB+	NSB20	Drom1837	Livestock market, April 19	M	2	900111880935178	Marakh	neg.	neg..	pos. 3.67	≥ 1:1,000	X
33	V- AB+	NSB21	Drom1838	Livestock market, April 19	M	3	985007841400429	Zaid	neg.	neg..	pos. 1.61	≥ 1:1,000	X
34	V- AB+	NSB41	Drom1858	Livestock market, April 19	F	4	985007841359958		neg.	neg..	pos. 3.61	1:1,000	X
35	V- AB+	NSB42	Drom1859	Livestock market, April 19	F	4	784010050067053	Al Kowah	neg.	neg..	pos. 4.14	≥ 1:1,000	X
36	V- AB+	NSB46	Drom1863	Livestock market, April 19	F	6	991001002575819	Mulakat	neg.	neg..	pos. 4.46	≥ 1:1,000	X
37	V- AB+	M1	Drom1929	Bedouin farm, Al Mazrooei, March 19	F	4	NO CHIP INFO		neg.	neg.	pos. 3.84	≥ 1:1,000	X
38	V- AB+	M2	Drom1930	Bedouin farm, Al Mazrooei, March 19	F	4	NO CHIP INFO		neg.	neg.	pos. 3.96	≥ 1:1,000	X
39	V- AB+	M3	Drom1931	Bedouin farm, Al Mazrooei, March 19	F	4	NO CHIP INFO		neg.	neg.	pos. 2.01	1:1,000	X
40	V- AB+	M4	Drom1932	Bedouin farm, Al Mazrooei, March 19	F	15	NO CHIP INFO		neg.	neg.	pos. 1.35	1:1,000	X
41	V- AB+	M5	Drom1933	Bedouin farm, Al Mazrooei, March 19	F	8	NO CHIP INFO		neg.	neg.	pos. 4.06	≥ 1:1,000	X



42	V- AB+	M6	Drom1934	Bedouin farm, Al Mazrooei, March 19	F	25-30	NO CHIP INFO		neg.	neg.	pos. 3.89	≥ 1:1,000	X
43	V- AB+	M7	Drom1935	Bedouin farm, Al Mazrooei, March 19	F	5	NO CHIP INFO		neg.	neg.	pos. 4.17	≥ 1:1,000	X
44	V- AB+	M8	Drom1936	Bedouin farm, Al Mazrooei, March 19	F	12	NO CHIP INFO		neg.	neg.	pos. 4.03	≥ 1:1,000	X
45	V- AB+	M9	Drom1937	Bedouin farm, Al Mazrooei, March 19	F	12	NO CHIP INFO		neg.	neg.	pos. 2.89	1:1,000	X
46	V- AB+	M10	Drom1938	Bedouin farm, Al Mazrooei, March 19	F	12	NO CHIP INFO		neg.	neg.	pos. 2.96	≥ 1:1,000	X
47	V- AB+	M11	Drom1939	Bedouin farm, Al Mazrooei, March 19	F	14	NO CHIP INFO		neg.	neg.	pos. 2.91	1:1,000	X
48	V- AB+	M13	Drom1941	Bedouin farm, Al Mazrooei, March 19	M	10	NO CHIP INFO		neg.	neg.	pos. 4.04	≥ 1:1,000	X
49	V- AB+	M14	Drom1942	Bedouin farm, Al Mazrooei, March 19	M	14	NO CHIP INFO		neg.	neg.	pos. 4.11	≥ 1:1,000	X
50	V- AB+	M15	Drom1943	Bedouin farm, Al Mazrooei, March 19	F	10	NO CHIP INFO		neg.	neg.	pos. 2.90	≥ 1:1,000	X
51	V- AB+	NSw20	Drom1872	Wildlife Reserve, Al Maha, April 19	M	15	NO CHIP INFO		neg.	neg.	pos. 2.67	1:1,000	X
52	V- AB+	NSw21	Drom1873	Wildlife Reserve, Al Maha, April 19	M	13	NO CHIP INFO		neg.	neg.	pos. 3.54	≥ 1:1,000	X
53	V- AB+	NSw22	Drom1874	Wildlife Reserve, Al Maha, April 19	M	17	NO CHIP INFO		neg.	neg.	pos. 3.09	1:1,000	X
54	V- AB+	NSw23	Drom1875	Wildlife Reserve, Al Maha, April 19	F	14	NO CHIP INFO		neg.	neg.	pos. 3.40	1:1,000	X
55	V- AB+	NSw25	Drom1877	Wildlife Reserve, Al Maha, April 19	M	9	NO CHIP INFO		neg.	neg.	pos. 3.25	1:1,000	X
56	V- AB+	NSw26	Drom1878	Wildlife Reserve, Al Maha, April 19	M	7	NO CHIP INFO		neg.	neg.	pos. 2.19	≥ 1:1,000	X
57	V- AB+	NSw27	Drom1879	Wildlife Reserve, Al Maha, April 19	F	5	NO CHIP INFO		neg.	neg.	pos. 2.12	1:1,000	X
58	V- AB+	NSw30	Drom1882	Wildlife Reserve, Al Maha, April 19	F	14	NO CHIP INFO		neg.	neg.	pos. 4.26	≥ 1:1,000	X
59	V- AB+	NSw32	Drom1884	Wildlife Reserve, Al Maha, April 19	M	12	NO CHIP INFO		neg.	neg.	pos. 3.95	≥ 1:1,000	X
60	V- AB+	NSw34	Drom1886	Wildlife Reserve, Al Maha, April 19	M	7	NO CHIP INFO		neg.	neg.	pos. 3.01	1:100	X
61	V- AB+	NSw35	Drom1887	Wildlife Reserve, Al Maha, April 19	M	2 y 1 m	NO CHIP INFO		neg.	neg.	pos. 1.87	1:1,000	X
62	V- AB+	NSw38	Drom1890	Wildlife Reserve, Alpha, April 19	M	15	NO CHIP INFO		neg.	neg.	pos. 3.89	1:1,000	X
63	V- AB+	NSw40	Drom1892	Wildlife Reserve, Travco, April 19	M	12	NO CHIP INFO		neg.	neg.	pos. 4.58	≥ 1:1,000	X
64	V- AB+	NSw42	Drom1893	Wildlife Reserve, Travco, April 19	M	9	NO CHIP INFO		neg.	neg.	pos. 2.86	1:100	X
65	V- AB+	NSw43	Drom1894	Wildlife Reserve, ArabAdv, April 19	F	16	NO CHIP INFO		neg.	neg.	pos. 4.42	≥ 1:1,000	X
66	V- AB+	NSw46	Drom1897	Wildlife Reserve, ArabAdv, April 19	M	16	NO CHIP INFO		neg.	neg.	pos. 3.26	≥ 1:1,000	X

67	V- AB+	NSw48	Drom1899	Wildlife Reserve, ArabAdv, April 19	M	12	NO CHIP INFO		neg.	neg.	pos. 4.55	≥ 1:1,000	X
68	V- AB+	NSw51	Drom1901	Wildlife Reserve, ArabAdv, April 19	F	16	NO CHIP INFO		neg.	neg.	pos. 2.76	≥ 1:1,000	X
69	V- AB+	NSw52	Drom1902	Wildlife Reserve, ArabAdv, April 19	M	11	NO CHIP INFO		neg.	neg.	pos. 3.24	1:1,000	X
70	V- AB+	NSw55	Drom1905	Wildlife Reserve, ArabAdv, April 19	F	18	NO CHIP INFO		neg.	neg.	pos. 3.37	≥ 1:1,000	X
71	V- AB+	NSw56	Drom1906	Wildlife Reserve, ArabAdv, April 19	F	6 m	NO CHIP INFO		neg.	neg.	pos. 1.28	1:100	X
72	V- AB+	NSw59	Drom1909	Wildlife Reserve, DesertStar, April 19	M	5	NO CHIP INFO		neg.	neg.	pos. 2.13	1:1,000	X
73	V- AB+	NSw60	Drom1910	Wildlife Reserve, DesertStar, April 19	M	5	NO CHIP INFO		neg.	neg.	pos. 3.10	1:1,000	X
74	V- AB+	NSw63	Drom1913	Wildlife Reserve, DesertStar, April 19	M	15	NO CHIP INFO		neg.	neg.	pos. 2.35	1:1,000	X
75	V- AB+	NSw67	Drom1917	Wildlife Reserve, DesertStar, April 19	M	18	NO CHIP INFO		neg.	neg.	pos. 3.02	1:1,000	X
76	V- AB+	NSw69	Drom1919	Wildlife Reserve, DesertStar, April 19	M	18	NO CHIP INFO		neg.	neg.	pos. 3.34	≥ 1:1,000	X
77	V- AB+	NSw79	Drom1928	Wildlife Reserve, DesertStar, April 19	M	7	NO CHIP INFO		neg.	neg.	pos. 3.42	1:1,000	X
78	V+ AB-	2	Drom1459	Livestock market, Oct 19	M	4 m	NO CHIP INFO		pos. 29.3	neg.	neg. 0.1	neg.	
79	V+ AB-	5	Drom1462	Livestock market, Oct 19	M	1	900057600126219	Marakh	pos. 19.9	neg.	neg. 0.1	neg.	
80	V+ AB-	6	Drom1463	Livestock market, Oct 19	M	3 m	NO CHIP INFO		pos. 25.1	neg.	neg. 0.1	neg.	
81	V+ AB-	7	Drom1464	Livestock market, Oct 19	M	2 m	NO CHIP INFO		pos. 34.2	neg.	neg. 0.5	1:100	
82	V+ AB-	54	Drom1511	Livestock market, Oct 19	M	2	900057600121585		pos. 33.4	neg.	borderline 0.9	1:1,000	
83	V+ AB-	87	Drom1544	Livestock market, Oct 19	M	1	900057600121595		Pos. 39.2	neg.	neg. 0.3	1:100	
84	V+ AB-	NSB40	Drom1857	Livestock market, April 19		2 m	NO CHIP INFO		pos. 26.1	neg..	neg. 0.33	1:100	
85	V+ AB+	1	Drom1458	Livestock market, Oct 19	M	2	900182001697895		pos. 34.8	neg.	pos. 3.6	≥ 1:1,000	X
86	V+ AB+	3	Drom1460	Livestock market, Oct 19	M	2	900215000003532		pos. 30.3	neg.	pos. 4.1	≥ 1:1,000	X
87	V+ AB+	4	Drom1461	Livestock market, Oct 19			90011881027297		pos. 36.7	neg.	pos. 1.9	1:1,000	
88	V+ AB+	8	Drom1465	Livestock market, Oct 19	F	3	900057600122200	Abu Dhabi	pos. 36.2	neg.	pos. 5.0	≥ 1:1,000	X
89	V+ AB+	9	Drom1466	Livestock market, Oct 19	F	3	900215000005008	Abu Dhabi	pos. 36.8	neg.	pos. 5.3	≥ 1:1,000	X
90	V+ AB+	10	Drom1467	Livestock market, Oct 19	F	5	985007841277728	Marakh	pos. 37.1	neg.	pos. 2.6	≥ 1:1,000	X
91	V+ AB+	11	Drom1468	Livestock market, Oct 19	F	6	784010050031772	Mulakat	pos. 36.3	neg.	pos. 4.8	≥ 1:1,000	X

92	V+ AB+	23	Drom1480	Livestock market, Oct 19	F	6	784010050267117		pos. 36.9	neg.	pos. 4.5	≥ 1:1,000	X
93	V+ AB+	27	Drom1484	Livestock market, Oct 19	F	6m	784010050465212	Al Yahar	pos. 35.1	neg.	pos. 5.0	≥ 1:1,000	X
94	V+ AB+	28	Drom1485	Livestock market, Oct 19	M	5 m	NO CHIP INFO		pos. 27.2	neg.	pos. 4.5	≥ 1:1,000	X
95	V+ AB+	29	Drom1486	Livestock market, Oct 19	M	6 m	NO CHIP INFO		pos. 35.4	neg.	pos. 1.8	≥ 1:1,000	X
96	V+ AB+	32	Drom1489	Livestock market, Oct 19	M	2	991001002574519		pos. 38.6	neg.	pos. 4.0	≥ 1:1,000	X
97	V+ AB+	45	Drom1502	Livestock market, Oct 19	M	5	985007841209387	Khushaba	pos. 38.0	neg.	pos. 4.6	≥ 1:1,000	X
98	V+ AB+	56	Drom1513	Livestock market, Oct 19	F	2	784010050551133	Jabib	pos. 36.1	neg.	pos. 4.2	≥ 1:1,000	X
99	V+ AB+	90	Drom1547	Livestock market, Oct 19	F	6	784010050294118	Marakh	pos. 35.8	neg.	pos. 4.3	≥ 1:1,000	X
100	V+ AB+	NSB10	Drom1827	Livestock market, April 19	F	2	784010050550508	Seih Sabra/Sih Sabra/Seeh Sabra	pos. 38.2	neg.	pos. 1.87	1:1,000	X
101	V+ AB+	NSB11	Drom1828	Livestock market, April 19	M	2	784010050550691	Mezyad	pos. 34.9	neg.	pos. 2.73	1:1,000	X
102	V+ AB+	NSB23	Drom1840	Livestock market, April 19	M	1	991001002570111		pos. 32.6	neg.	pos. 4.34	≥ 1:1,000	X
103	V+ AB+	NSB30	Drom1847	Livestock market, April 19	F	4	784010050229794	Badr Zaid	pos. 39.5	neg.	pos. 1.96	1:1,000	X
104	V+ AB+	NSB31	Drom1848	Livestock market, April 19	F	6	784010050243508		pos. 39.0	neg.	pos. 4.69	≥ 1:1,000	X
105	V+ AB+	NSB33	Drom1850	Livestock market, April 19	M	1-2	992001000330620	Malaqāt	pos. 32.3	neg.	pos. 4.67	≥ 1:1,000	X
106	V+ AB+	NSB34	Drom1851	Livestock market, April 19	F	2	991001002575035		pos. 35.1	neg.	pos. 4.44	1:1,000	X
107	V+ AB+	NSB35	Drom1852	Livestock market, April 19	F	3	991001002574462	Sweihaan	pos. 33.4	neg.	pos. 1.37	1:100	X
108	V+ AB+	NSB36	Drom1853	Livestock market, April 19	M	3	991001002575745	Jebayeb	pos. 35.4	neg.	pos. 1.33	1:100	X
109	V+ AB+	NSB37	Drom1854	Livestock market, April 19	M	2-3	992001000330472	Al Saad	pos. 34.1	neg.	pos. 1.84	1:100	X
110	V+ AB+	NSB38	Drom1855	Livestock market, April 19	M	3	991001002575920		pos. 37.5	neg.	pos. 4.02	≥ 1:1,000	X
111	V+ AB+	NSB39	Drom1856	Livestock market, April 19	F	6	784010050365484	RAK	pos. 33.5	neg.	pos. 4.67	≥ 1:1,000	X
112	V+ AB+	NSB43	Drom1860	Livestock market, April 19	M	1-2	992001000330719	Marakh	pos. 37.4	neg.	pos. 2.40	1:100	X
113	V+ AB+	NSB44	Drom1861	Livestock market, April 19	F	6	784010050516433		pos. 37.5	neg.	pos. 4.82	≥ 1:1,000	X
114	V+ AB+	NSB45	Drom1862	Livestock market, April 19	F	3	784010050028578	Jabib – Al Faqa	pos. 38.9	neg.	pos. 3.53	≥ 1:1,000	X
115	V+ AB+	NSB47	Drom1864	Livestock market, April 19	M	3	991001002575899	Marmoon	pos. 35.2	neg.	pos. 1.76	1:1,000	X
116	V+ AB+	NSB48	Drom1865	Livestock market, April 19	M	1-2	990001000053606	Sweihaan	pos. 33.7	neg.	pos. 4.82	≥ 1:1,000	X

117	V+ AB+	NSB49	Drom1866	Livestock market, April 19	F	3	900111881038306		pos. 36.1	neg.	pos. 5.47	≥ 1:1,000	X
118	V+ AB+	NSB50	Drom1867	Livestock market, April 19		2m	NO CHIP INFO		pos. 38.5	neg.	pos. 3.17	1:1,000	X
119	V+ AB+	NSB51	Drom1868	Livestock market, April 19	M	2	991001002574752	RAK	pos. 30.0	neg.	pos. 2.04	1:1,000	X
120	V+ AB+	NSB52	Drom1869	Livestock market, April 19	M	1-2	900074001585559	Shabiah	pos. 39.3	neg.	pos. 4.91	≥ 1:1,000	X
121	V+ AB+	NSB54	Drom1871	Livestock market, April 19	F	5	784010050359111		pos. 36.3	neg.	pos. 3.89	1:1,000	X

**Table S2. Scheme showing how IIFT antibody titers were determined according to the fluorescence of the different sample dilutions.**

Sample dilutions / Fluorescent signal			Antibody Titer
1:10	1:100	1:1,000	
weak	negative	negative	1:10
moderate	negative	negative	1:10
strong	weak	negative	1:100
strong	moderate	negative	1:100
strong	strong	weak	1:1,000
strong	strong	moderate	$\geq 1:1,000$
strong	strong	strong	$\geq 1:1,000$

**Table S3. Observed ( $H_O$ ) and expected ( $H_E$ ) heterozygosity values depicted in immune response gene groups. Identified candidate genes *MAGOHB*, *HLA-A-24*-like, *HLA-DPBI*-like, *DNAH7* and *PTPN4* are highlighted in bold.**

Gene ID	Genes- No.SNPs	Genes- $H_O$	Genes- $H_E$	Exons- No.SNPs	Exons- $H_O$	Exons- $H_E$	Introns- No.SNPs	Introns- $H_O$	Introns- $H_E$	Name	Description
<b>Granzyme</b>											
Cadr_00004168	4	0.272	0.329	0	NA	NA	4	0.272	0.329	<i>GZMA</i>	Granzyme A (Bos taurus OX=9913)
Cadr_00004169	1	NA	NA	0	NA	NA	1	NA	NA	<i>GZMA</i>	Granzyme A (Homo sapiens OX=9606)
Cadr_00005822	0	NA	NA	0	NA	NA	0	NA	NA	<i>GZMB</i>	Granzyme B (Homo sapiens OX=9606)
Cadr_00005823	22	0.24	0.246	1	NA	NA	22	0.24	0.246	<i>GZMB</i>	Granzyme B (Homo sapiens OX=9606)
Cadr_00005821	5	0.411	0.38	0	NA	NA	5	0.411	0.38	<i>GZMH</i>	Granzyme H (Homo sapiens OX=9606)
Cadr_00004167	6	0.29	0.343	1	NA	NA	5	0.27	0.32	<i>GZMK</i>	Granzyme K (Homo sapiens OX=9606)
Cadr_00025032	16	0.246	0.255	3	0.056	0.066	13	0.289	0.299	<i>GZMM</i>	Granzyme M (Homo sapiens OX=9606)
<b>Mean</b>		<b>0.29</b>	<b>0.31</b>		<b>0.06</b>	<b>0.07</b>		<b>0.30</b>	<b>0.31</b>		
<b>Interleukin</b>											
Cadr_00001885	3	0.423	0.484	0	NA	NA	3	0.423	0.484	<i>CXCL8</i>	Interleukin-8 (Canis lupus familiaris OX=9615)
Cadr_00023412	7	0.197	0.197	2	0.158	0.146	5	0.213	0.217	<i>IL10</i>	Interleukin-10 (Lama glama OX=9844)
Cadr_00028914	14	0.201	0.228	11	0.187	0.22	9	0.246	0.278	<i>IL10RA</i>	Interleukin-10 receptor subunit alpha (Homo sapiens OX=9606)
Cadr_00001098	61	0.165	0.168	1	NA	NA	61	0.165	0.168	<i>IL10RB</i>	Interleukin-10 receptor subunit alpha (Homo sapiens OX=9606)
Cadr_00029940	16	0.32	0.318	5	0.19	0.188	11	0.379	0.377	<i>IL1A</i>	Interleukin-1 alpha (Lama glama OX=9844)
Cadr_00029941	20	0.285	0.308	2	0.306	0.317	18	0.283	0.307	<i>IL1B</i>	Interleukin-1 beta (Lama glama OX=9844)
<b>Mean</b>		<b>0.27</b>	<b>0.28</b>		<b>0.21</b>	<b>0.22</b>		<b>0.28</b>	<b>0.31</b>		
<b>Killer cell</b>											
Cadr_00029273	19	0.277	0.295	3	0.169	0.179	16	0.297	0.317	<i>Klra2</i>	Killer cell lectin-like receptor 2 (Mus musculus OX=10090)
Cadr_00029303	4	0.229	0.22	0	NA	NA	4	0.229	0.22	<i>KLRB1</i>	Killer cell lectin-like receptor subfamily B member 1 (Homo sapiens OX=9606)
Cadr_00029300	2	0.448	0.399	2	0.448	0.399	0	NA	NA	<i>Klrb1b</i>	Killer cell lectin-like receptor subfamily B member 1B allele A (Camelus bactrianus XP_010944886.1)
Cadr_00029489	18	0.348	0.389	1	NA	NA	17	0.344	0.382	<i>KLRC2</i>	NKG2-C type II integral membrane protein (Homo sapiens OX= 9606)
Cadr_00029281	10	0.315	0.349	8	0.289	0.323	7	0.312	0.34	<i>KLRD1</i>	Natural killer cells antigen CD94 (Bos taurus OX=9913)
Cadr_00029283	13	0.345	0.35	1	NA	NA	12	0.341	0.347	<i>Klre1</i>	Killer cell lectin-like receptor subfamily E member 1 (Mus musculus OX=10090)
Cadr_00029297	73	0.458	0.435	3	0.374	0.367	70	0.462	0.438	<i>KLRF1</i>	Killer cell lectin-like receptor subfamily F member 1 (Macaca fascicularis OX=9541)
Cadr_00029295	48	0.266	0.244	3	0.294	0.261	47	0.266	0.244	<i>KLRF2</i>	Killer cell lectin-like receptor subfamily F member 2 (Homo sapiens OX=9606)
Cadr_00008447	42	0.352	0.354	11	0.414	0.411	31	0.33	0.334	<i>Klrg2</i>	Killer cell lectin-like receptor subfamily G member 2 (Mus musculus OX=10090)
Cadr_00029277	28	0.369	0.403	1	NA	NA	28	0.369	0.403	<i>Klri1</i>	Killer cell lectin-like receptor subfamily I member 1 (Mus musculus OX=10090)
Cadr_00029276	11	0.406	0.419	1	NA	NA	11	0.406	0.419	<i>KLRK1</i>	NKG2-D type II integral membrane protein (Pongo Pygmaeus OX=9600)
Cadr_00029279	14	0.244	0.251	4	0.248	0.254	10	0.242	0.249	<i>KLRK1</i>	NKG2-D type II integral membrane protein (Sus scrofa OX=9823)
<b>Mean</b>		<b>0.34</b>	<b>0.34</b>		<b>0.32</b>	<b>0.31</b>		<b>0.33</b>	<b>0.34</b>		
<b>MHC Class I</b>											
Cadr_00022140	112	0.09	0.116	15	0.061	0.067	97	0.094	0.124	<b><i>HLA-A-24-like</i></b>	HLA class I histocompatibility antigen, A-24 alpha chain (Homo sapiens OX=9606)

Cadr_00022145	30	0.276	0.273	8	0.318	0.322	22	0.261	0.256	<i>HLA-A-11</i>	HLA class I histocompatibility antigen, A-11 alpha chain (Homo sapiens OX=9606)
Cadr_00022149	14	0.216	0.279	12	0.22	0.285	5	0.181	0.215	<i>HLA-A-69</i>	HLA class I histocompatibility antigen, A-69 alpha chain (Homo sapiens OX=9606)
Cadr_00022150	134	0.191	0.263	29	0.196	0.288	116	0.191	0.261	<i>HLA-A-30</i>	HLA class I histocompatibility antigen, A-30 alpha chain (Homo sapiens OX=9606)
Cadr_00022148	20	0.225	0.329	10	0.21	0.301	10	0.241	0.357	<i>HLA-C</i>	HLA class I histocompatibility antigen, Cw-6 alpha chain (Homo sapiens OX=9606)
Cadr_00022156	4	0.028	0.038	2	0.026	0.045	2	0.031	0.03	<i>Patr</i>	class I histocompatibility B-1 alpha chain (Fragment) (Pan troglodytes OX=9598)
Cadr_00022105	18	0.197	0.187	10	0.203	0.188	8	0.191	0.184	<i>Patr-A</i>	Patr class I histocompatibility antigen, A-126 alpha chain (Pan troglodytes OX=9598)
Cadr_00022139	67	0.315	0.318	3	0.239	0.241	64	0.318	0.322	<i>Patr-A</i>	Patr class I histocompatibility antigen, A-126 alpha chain (Pan troglodytes OX=9598)
Cadr_00022147	5	0.02	0.032	4	0.025	0.035	1	NA	NA	<i>Patr-A</i>	Patr class I histocompatibility antigen, A-126 alpha chain (Pan troglodytes OX=9598)
Cadr_00022160	31	0.047	0.09	3	0.048	0.075	28	0.047	0.092	<i>Patr-A</i>	Patr class I histocompatibility antigen, A-126 alpha chain (Pan troglodytes OX=9598)
Cadr_00022155	0	NA	NA	0	NA	NA	0	NA	NA	<i>Popy</i>	class I histocompatibility antigen A-1 alpha chain (Pongo pygmaeus OX=9600)
<b>Mean</b>		<b>0.16</b>	<b>0.19</b>		<b>0.15</b>	<b>0.18</b>		<b>0.17</b>	<b>0.20</b>		
<b>MHC Class II</b>											
Cadr_00022027	28	0.35	0.343	2	0.48	0.45	26	0.339	0.334	<i>BoLA-DQB</i>	BoLa class II histocompatibility antigen, DQB*0101 beta chain (Bos taurus OX=9913)
Cadr_00004894	11	0.324	0.299	2	0.397	0.378	9	0.307	0.281	<i>CD74</i>	HLA class II histocompatibility antigen gamma chain (Homo sapiens OX=9606)
Cadr_00022030	95	0.412	0.402	37	0.437	0.416	58	0.396	0.393	<i>DLA</i>	class II histocompatibility antigen, DR-1 beta chain (Canis lupus familiaris OX=9615)
Cadr_00022020	5	0.27	0.307	2	0.21	0.245	3	0.31	0.348	<i>HLA-DMA</i>	HLA class II histocompatibility antigen, DM alpha chain (Homo sapiens OX=9606)
Cadr_00022021	33	0.287	0.319	8	0.292	0.335	25	0.285	0.314	<i>HLA-DMB</i>	HLA class II histocompatibility antigen, DM alpha chain (Homo sapiens OX=9606)
Cadr_00022018	25	0.27	0.295	17	0.268	0.293	8	0.274	0.3	<i>HLA-DOA</i>	HLA class II histocompatibility antigen, DO alpha chain (Homo sapiens OX=9606)
Cadr_00022026	72	0.328	0.328	10	0.245	0.267	62	0.342	0.338	<i>HLA-DOB</i>	HLA class II histocompatibility antigen, DO alpha chain (Homo sapiens OX=9606)
Cadr_00022017	32	0.274	0.296	5	0.253	0.274	27	0.278	0.3	<i>HLA-DPA1</i>	HLA class II histocompatibility antigen, DP alpha chain (Homo sapiens OX=9606)
Cadr_00022016	41	0.273	0.331	9	0.253	0.307	32	0.279	0.338	<i>HLA-DPB1-like</i>	HLA class II histocompatibility antigen, DP alpha chain (Homo sapiens OX=9606)
Cadr_00022036	89	0.304	0.372	13	0.245	0.386	76	0.314	0.369	<i>HLA-DRB1</i>	HLA class II histocompatibility antigen, DRB1-4 alpha chain (Homo sapiens OX=9606)
Cadr_00022037	63	0.414	0.43	6	0.32	0.318	57	0.424	0.442	<i>HLA-DRB1</i>	HLA class II histocompatibility antigen, DRB1-1 alpha chain (Homo sapiens OX=9606)
Cadr_00022038	34	0.219	0.236	13	0.241	0.26	21	0.206	0.221	<i>Mamu-DRA</i>	Mamu class II histocompatibility antigen, DR alpha chain (Macaca mulatta OX=9544)
Cadr_00022032	7	0.048	0.101	2	0	0.022	5	0.067	0.133	<i>RT1-Bb</i>	Rano class II histocompatibility antigen, B-1 beta chain (Rattus norvegicus OX=10116)
Cadr_00022034	36	0.172	0.202	2	0.304	0.266	34	0.164	0.198	<i>RT1-Bb</i>	Rano class II histocompatibility antigen, B-1 beta chain (Rattus norvegicus OX=10116)
Cadr_00022028	15	0.423	0.378	9	0.426	0.383	6	0.417	0.372	<i>SLA</i>	class II histocompatibility antigen, DQ haplotype D alpha chain (Sus scrofa =X=9823)
Cadr_00022033	6	0.003	0.023	0	NA	NA	6	0.003	0.023	<i>SLA</i>	class II histocompatibility antigen, DQ haplotype D alpha chain (Sus scrofa =X=9823)
Cadr_00022035	4	0.012	0.047	3	0.013	0.046	1	NA	NA	<i>SLA</i>	class II histocompatibility antigen, DQ haplotype D alpha chain (Sus scrofa =X=9823)
<b>Mean</b>		<b>0.26</b>	<b>0.28</b>		<b>0.27</b>	<b>0.29</b>		<b>0.28</b>	<b>0.29</b>		
<b>TLR</b>											
Cadr_00002152	5	0.192	0.19	5	0.192	0.19	0	NA	NA	<i>TLR1</i>	Toll-like receptor 1 (Homo sapiens OX=9606)
Cadr_00002153	23	0.274	0.304	16	0.291	0.317	9	0.222	0.256	<i>TLR10</i>	Toll-like receptor 10 (Bos taurus OX=9913)
Cadr_00001385	10	0.398	0.437	10	0.398	0.437	3	0.355	0.363	<i>TLR2</i>	Toll-like receptor 2 (Equus caballus OX=9796)
Cadr_00026583	31	0.384	0.398	6	0.24	0.253	25	0.419	0.433	<i>TLR3</i>	Toll-like receptor 3 (Boselaphus tragocamelus OX=9917)
Cadr_00016120	8	0.222	0.21	1	NA	NA	7	0.224	0.213	<i>TLR4</i>	Toll-like receptor 4 (Sus scrofa OX=9823)
Cadr_00023195	4	0.453	0.46	4	0.453	0.46	0	NA	NA	<i>TLR5</i>	Toll-like receptor 5 (Homo sapiens OX=9606)
Cadr_00002151	15	0.195	0.217	2	0.112	0.124	13	0.208	0.231	<i>TLR6</i>	Toll-like receptor 6 (Homo sapiens OX=9606)
Cadr_00003728	18	0.186	0.376	1	NA	NA	17	0.186	0.37	<i>TLR7</i>	Toll-like receptor 7 (Homo sapiens OX=9606)
Cadr_00003726	7	0.166	0.302	7	0.166	0.302	0	NA	NA	<i>TLR8</i>	Toll-like receptor 8 (Homo sapiens OX=9606)
Cadr_00020415	3	0.088	0.083	3	0.088	0.083	0	NA	NA	<i>TLR9</i>	Toll-like receptor 9 (Sus scrofa OX=9823)

Other IR											
Cadr_00030052	11	0.278	0.295	11	0.278	0.295	7	0.293	0.309	<i>ACO1</i>	Cytoplasmic aconitate hydratase (Bos taurus OX=9913)
Cadr_00020478	5	0.127	0.135	5	0.127	0.135	5	0.127	0.135	<i>APPL1</i>	DCC-interacting protein 13-alpha (Homo sapiens OX=9606)
Cadr_00002239	297	0.17	0.171	66	0.248	0.251	239	0.149	0.15	<i>CC2D2A</i>	Coiled-coil and C2 domain-containing protein 2A (Homo sapiens OX=9606)
Cadr_00029296	27	0.335	0.316	2	0.319	0.284	27	0.335	0.316	<i>CLEC2B</i>	C-type lectin domain family 2 member B (Homo sapiens OX=9606)
Cadr_00007342	11	0.226	0.215	4	0.282	0.267	7	0.194	0.184	<i>CXCR2</i>	C-X-C chemokine receptor type 2 (Bos taurus OX=9913)
Cadr_00030053	90	0.284	0.312	11	0.278	0.295	86	0.286	0.314	<i>DDX58</i>	Probable ATP-dependent RNA helicase DDX58 (Sus scrofa OX=9823)
Cadr_00020479	129	0.269	0.28	15	0.251	0.261	120	0.264	0.276	<i>DNAH7</i>	Dynein heavy chain 7 axonemal (Homo sapiens OX=9607)
Cadr_00006877	64	0.169	0.176	1	NA	NA	63	0.169	0.176	<i>DPP4</i>	Dipeptidyl peptidase 4 (Bos taurus OX=9913)
Cadr_00012213	12	0.352	0.352	4	0.425	0.443	8	0.316	0.307	<i>FCAR</i>	Immunoglobulin alpha Fc receptor (Homo sapiens OX=9606)
Cadr_00024638	47	0.292	0.306	16	0.319	0.343	36	0.296	0.31	<i>FCRL3</i>	Fc receptor-like protein 3 (Homo sapiens OX=9606)
Cadr_00011189	2	0.291	0.275	1	NA	NA	1	NA	NA	<i>HP</i>	Haptoglobin (Sus scrofa OX=9823)
Cadr_00006880	29	0.17	0.201	1	NA	NA	28	0.162	0.193	<i>IFIH1</i>	Interferon-induced helicase C domain-containing protein 1 (Homo sapiens OX=9606)
Cadr_00015578	0	NA	NA	0	NA	NA	0	NA	NA	<i>IFNB2</i>	Interferon beta-2 (Bos taurus OX=9913)
Cadr_00017035	3	0.177	0.205	0	NA	NA	3	0.177	0.205	<i>IFNG</i>	Interferon gamma (Camelus bactrianus OX=9837)
Cadr_00001103	50	0.279	0.258	0	NA	NA	50	0.279	0.258	<i>IFNGR2</i>	Interferon gamma receptor 2 (Homo sapiens OX=9606)
Cadr_00029272	12	0.26	0.279	4	0.126	0.129	8	0.327	0.355	<i>MAGOHB</i>	Protein mago nashi homolog 2 (Bos taurus OX=9913)
Cadr_00004186	13	0.241	0.256	3	0.293	0.316	10	0.226	0.238	<i>MAP3K1</i>	Mitogen-activated protein kinase kinase kinase 1 (Homo sapiens OX=9606)
Cadr_00005819	1	NA	NA	0	NA	NA	1	NA	NA	<i>Mast</i>	cell protease 3 (Ovis aries OX=9940)
Cadr_00012215	15	0.306	0.354	3	0.334	0.391	12	0.299	0.345	<i>NCR1</i>	Natural cytotoxicity triggering receptor 1 (Bos taurus OX=9913)
Cadr_00021869	9	0.174	0.186	3	0.099	0.095	6	0.212	0.232	<i>NCR2</i>	Natural cytotoxicity triggering receptor 2 (Homo sapiens OX=9606)
Cadr_00001692	77	0.266	0.254	2	0.243	0.248	75	0.267	0.254	<i>NFKB1</i>	Nuclear factor NF-kappa-B p105 subunit (Canis lupus familiaris OX=9615)
Cadr_00009474	6	0.273	0.27	2	0.352	0.34	4	0.234	0.235	<i>NFKB2</i>	Nuclear factor NF-kappa-B p100 subunit (Homo sapiens OX=9606)
Cadr_00029278	15	0.426	0.47	2	0.45	0.503	13	0.422	0.465	<i>NKG2A</i>	NKG2-A/NKG2-B type II integral membrane protein (Macaca mulatta OX=9544)
Cadr_00029993	12	0.087	0.098	1	NA	NA	11	0.093	0.102	<i>NKL</i>	Antimicrobial peptide NK-lysin (Fragment) (Sus scrofa OX=9823)
Cadr_00009139	6	0.371	0.378	5	0.348	0.357	1	NA	NA	<i>PRF1</i>	Perforin-1 (Homo sapiens OX=9606)
Cadr_00007027	22	0.243	0.239	3	0.272	0.273	20	0.244	0.238	<i>PRKRA</i>	Interferon-inducible double-stranded RNA dependent protein kinase activator A (Homo sapiens OX=9606)
Cadr_00009475	0	NA	NA	0	NA	NA	0	NA	NA	<i>Psd</i>	PH and SEC7 domain-containing protein 1 (Mus musculus OX=10090)
Cadr_00024639	2	0.399	0.432	2	0.399	0.432	2	0.399	0.432	<i>PTMA</i>	Prothymosin alpha (Pongo abelii OX=9601)
Cadr_00006681	163	0.213	0.222	17	0.299	0.318	153	0.207	0.215	<i>PTPN4</i>	Tyrosine-protein phosphatase non-receptor type 4 (Homo sapiens OX=9606)
Cadr_00001384	10	0.398	0.437	10	0.398	0.437	3	0.355	0.363	<i>RNF175</i>	RING finger protein 175 (Homo sapiens OX=9606)
Cadr_00004895	4	0.333	0.3	0	NA	NA	4	0.333	0.3	<i>Rps14</i>	40S ribosomal protein S14 (Mus musculus OX=10090)
Cadr_00017710	6	0.41	0.45	2	0.335	0.386	4	0.448	0.481	<i>Rps7</i>	40S ribosomal protein S7 (Rattus norvegicus OX=10116)
Cadr_00001327	32	0.275	0.273	14	0.26	0.259	18	0.287	0.284	<i>Suclg1</i>	Succinate--CoA ligase [ADP/GDP-forming] subunit alpha, mitochondrial (Mus musculus OX=10090)
Cadr_00002785	18	0.132	0.265	1	NA	NA	17	0.131	0.261	<i>Tmem255a</i>	Transmembrane protein 255A (Mus musculus OX=10090)
Cadr_00022101	7	0.188	0.178	4	0.226	0.211	3	0.138	0.134	<i>TNF</i>	Tumor necrosis factor (Camelus bactrianus OX=9837)
Cadr_00006503	45	0.372	0.4	19	0.365	0.393	29	0.377	0.407	<i>Traf3</i>	TNF receptor-associated factor 3 (Mus musculus OX=10090)
Cadr_00011190	1	NA	NA	1	NA	NA	0	NA	NA	<i>TXNL4B</i>	Thioredoxin-like protein 4B (Homo sapiens OX=9606)
<b>Mean</b>		<b>0.27</b>	<b>0.28</b>		<b>0.29</b>	<b>0.31</b>		<b>0.26</b>	<b>0.27</b>		



**Table S4. Read-based imputation performance.** nAncestralHaplotypes (k) = number of ancestral haplotypes; nGen = number of generations ago, controls recombination rate; nDiff\_from\_non-imputed = number of genotypes that were not the same between imputed and non-imputed samples; nMatch\_from\_non-imputed = number of genotypes that were the same between imputed and non-imputed sample; nMissing\_from\_non-imputed = these are SNPs and hence genotypes that are missing because that SNP failed QC for imputation; nAdditional\_SNPs\_with\_called\_genotypes\_from\_non-imputed = these are genotypes newly added by imputation).

nAncestralHaplotypes	nGen	nDiff_from_non-imputed	nMatch_from_non-imputed	nMissing_from_non-imputed	nAdditional_SNPs_with_called_genotypes_from_non-imputed
14	100000	36	1767	356	3057
8	1000	52	1765	342	3015
8	10000	37	1765	357	3010
8	100000	33	1757	369	2977
10	100000	35	1753	371	3013
10	10000	35	1752	372	3035
14	1000	41	1748	370	3077
10	1000	43	1741	375	3060
12	10000	39	1741	379	3052
14	10000	46	1739	374	3044
12	100000	34	1722	403	3041
6	100000	48	1721	390	2903
12	1000	48	1715	396	3092
14	100	46	1707	406	3197
6	1000	43	1698	418	2977
10	100	48	1693	418	3102
6	10000	42	1685	432	2952

6	100	65	1683	411	3031
8	100	53	1673	433	3079
12	100	53	1671	435	3122
4	1000	58	1659	442	2742
4	10000	69	1630	460	2772
4	100	103	1615	441	2776
4	100000	71	1581	507	2715

**Table S5 Statistical analysis of observed heterozygosity ( $H_o$ ) for immune response gene groups in genes, exons and introns.** Means and standard deviations are shown for genes, exon and introns separately. Results are only presented for gene, intron and exon  $H_o$  as only these showed significance for both ANOVA and posthoc correction with Benjamini-Hochberg (BH). Gene groups with different letters ('a' and 'b') indicate groups that had significantly different means whilst the same letters indicate non-significant different means.

**Gene  $H_o$**

Granzyme	Interleukin	Killer_Cell	MHC_I	MHC_II	TLR	Other_IR
ab	ab	a	b	ab	ab	ab

	Group	$H_o$ mean	St. Deviation
1	Granzyme	0.292	0.070
2	Interleukin	0.265	0.097
3	Killer_Cell	0.338	0.075
4	MHC_I	0.161	0.106
5	MHC_II	0.258	0.131
6	TLR	0.256	0.118
7	Other_IR	0.266	0.088

**Exon  $H_o$**

Granzyme	Interleukin	Killer_Cell	MHC_I	MHC_II	TLR	Other_IR
ab	ab	a	b	ab	ab	b

	Group	$H_o$ mean	St. Deviation
1	Granzyme	0.056	NA
2	Interleukin	0.210	0.065
3	Killer_Cell	0.319	0.098
4	MHC_I	0.155	0.105
5	MHC_II	0.274	0.132
6	TLR	0.243	0.131
7	Other_IR	0.293	0.088

**Intron  
 $H_o$**

Granzyme	Interleukin	Killer_Cell	MHC_I	MHC_II	TLR	Other_IR
ab	ab	a	b	ab	ab	ab

	Group	$H_o$ mean	St. Deviation
1	Granzyme	0.296	0.066
2	Interleukin	0.285	0.099
3	Killer_Cell	0.327	0.070
4	MHC_I	0.173	0.098
5	MHC_II	0.275	0.117
6	TLR	0.269	0.095
7	Other_IR	0.260	0.092

**Table S6. Observed ( $H_O$ ) and expected ( $H_E$ ) heterozygosity in genes, exons and introns in MERS-CoV positive (n = 36) and negative (n = 65) individuals.  $P$ -values of mean differences were calculated with Welch  $t$  test.**

	<b>Genes_<math>H_O</math></b>	<b>Genes_<math>H_E</math></b>	<b>Exons_<math>H_O</math></b>	<b>Exons_<math>H_E</math></b>	<b>Introns_<math>H_O</math></b>	<b>Introns_<math>H_E</math></b>
<b>Negative</b>	0.26	0.28	0.25	0.27	0.26	0.29
<b>Positive</b>	0.27	0.28	0.27	0.27	0.28	0.28
<b><math>p</math>-value</b>	0.50	0.79	0.58	0.96	0.42	0.78
<b>Welch <math>t</math></b>	-0.68	0.27	-0.55	0.05	-0.80	0.28
<b>df</b>	180.29	183.97	137.67	139.77	162.80	165.79

**Table S7. Linkage Disequilibrium-based haplotype (gene-set) test showing 20 genes with significant SNPs at  $p < 0.05$ .** Identified candidate genes *MAGOHB*, *HLA-A-24*-like, *HLA-DPBI*-like, *DNAH7* and *PTPN4* are highlighted in bold. *HLA-A-24*-like and *MAGOHB* were nominally significant ( $p < 0.05$ ) indicated with an asterisk. NSNP - Number of SNPs in set; NSIG - Total number of SNPs below  $p$ -value threshold; ISIG - Number of significant SNPs also passing LD-criterion; STAT - Average test statistic based on ISIG SNPs; EMP1 - Empirical set-based  $p$ -value; SNPs - positions of SNPs in the set.

SET	NSNP	NSIG	ISIG	EMP1	SNPs	Name	Description
Cadr_00029272	12	5	1	0.008*	chr34:15362634	<b>MAGOHB</b>	Protein mago nashi homolog 2 (Bos taurus OX=9913)
Cadr_00022140	112	14	2	0.031*	chr20:23100696   23100503	<b>HLA-A-24-like</b>	HLA class I histocompatibility antigen, A-24 alpha chain (Homo sapiens OX=9606)
Cadr_00001327	32	1	1	0.032*	chr2:5565157	<i>Suc1g1</i>	Succinate--CoA ligase [ADP/GDP-forming] subunit alpha, mitochondrial (Mus musculus OX=10090)
Cadr_00022016	41	9	1	0.058	chr20:20681619	<b>HLA-DPBI-like</b>	HLA class II histocompatibility antigen, DP alpha chain (Homo sapiens OX=9606)
Cadr_00028914	14	7	2	0.060	chr33:12210072   12210460	<i>IL10RA</i>	Interleukin-10 receptor subunit alpha (Homo sapiens OX=9606)
Cadr_00011189	2	1	1	0.063	chr9:33578918	<i>HP</i>	Haptoglobin (Sus scrofa OX=9823)
Cadr_00029993	12	2	2	0.085	chr28:10593199   10591217	<i>NKL</i>	Antimicrobial peptide NK-lysin (Fragment) (Sus scrofa OX=9823)
Cadr_00001384	10	1	1	0.093	chr2:9866197	<i>RNF175</i>	RING finger protein 175 (Homo sapiens OX=9606)
Cadr_00001385	10	1	1	0.093	chr2:9866197	<i>TLR2</i>	Toll-like receptor 2 (Equus caballus OX=9796)
Cadr_00017035	3	1	1	0.095	chr12:24456808	<i>IFNG</i>	Interferon gamma (Camelus bactrianus OX=9837)
Cadr_00020479	129	21	4	0.117	chr:1723840747   23963829   23948208   23854332	<b>DNAH7</b>	Dynein heavy chain 7 axonemal (Homo sapiens OX=9607)
Cadr_00006681	163	8	3	0.163	chr5:8508361   8569590   8531515	<b>PTPN4</b>	Tyrosine-protein phosphatase non-receptor type 4 (Homo sapiens OX=9606)
Cadr_00022139	67	6	2	0.188	chr20:23039666   23044464	<i>Patr-A</i>	Patr class I histocompatibility antigen, A-126 alpha chain (Pan troglodytes OX=9598)
Cadr_00022038	34	1	1	0.220	chr20:21059892	<i>Mamu-DRA</i>	Mamu class II histocompatibility antigen, DR alpha chain (Macac mulata OX=9544)
Cadr_00022027	28	1	1	0.260	chr20:20837533	<i>BoLA-DQB</i>	BoLa class II histocompatibility antigen, DQB*0101 beta chain (Bos taurus OX=9913)
Cadr_00029273	19	1	1	0.278	chr34:15371765	<i>Klra2</i>	Killer cell lectin-like receptor 2 (Mus musculus OX=10090)

Cadr_00022145	30	2	1	0.314	chr20:23134732	<i>HLA-A-11-like</i>	HLA class I histocompatibility antigen, A-11 alpha chain (Homo sapiens OX=9606)
Cadr_00022026	72	3	1	0.345	chr20:20830433	<i>HLA-DOB</i>	HLA class II histocompatibility antigen, DO alpha chain (Homo sapiens OX=9606)
Cadr_00030053	90	2	2	0.427	Contig45:329958   334608	<i>DDX58</i>	Probable ATP-dependent RNA helicase DDX58 (Sus scrofa OX=9823)
Cadr_00002239	297	17	3	0.427	chr2:113136710   113141381   113168889	<i>CC2D2A</i>	Coiled-coil and C2 domain-containing protein 2A (Homo sapiens OX=9606)