

Ancient DNA investigation into infectious diseases of medieval Europe

- supplementary material

Chapter 2: Human Leukocyte Antigens (HLA) and leprosy - a genetic association study in medieval Europeans.

Supplementary Data 1 - description of the material from various archaeological sites.

Odense: St. Jørgen (Denmark)

This cemetery was associated with the St. Jørgen leprosorium which housed leprosy-affected individuals between 1270 and 1550 AD (Arentoft, 1999). Relative dating of the remains based on the arm positioning suggests that the majority of individuals were buried between the 13th and 14th centuries AD (Boldsen, 2009). In this study, petrous bones were sampled for DNA extraction from 68 individuals. Additionally, teeth samples were available for four individuals.

Odense: St. Knuuds Plads, Albani Torv, Klosterbakken (Denmark)

This collection of controls from Odense consisted of skeletal remains buried at three parish cemeteries: St. Knuuds Plads (N=2), Albani Torv (N=8) and Klosterbakken (N=1), dating to 1150 - 1550 AD (Boldsen, 2018). From each individual a petrous bone and a tooth were sampled.

Aachen: Melaten (Germany)

Skeletal collection from Aachen located near Cologne (Germany) was excavated from the Melaten cemetery associated with Gut Melaten - a medieval infirmary built in the 8th century AD. In the 13th century, Gut Melaten was transformed into a leprosorium and functioned as such until 1550 AD. It is believed that after 1550, the institution was used as a general hospital. The last burial at the Gut Melaten took place in 1787 AD (Prescher & Wagner, 2016; Schmitz-Cliever, 1972). In this study, metagenomic samples from 69 individuals were analyzed. DNA extracts from a petrous bone and a tooth were available for ten individuals. For 53 individuals, metagenomes obtained from teeth samples were analyzed. DNA from petrous bone only was extracted for six individuals.

Lübeck: St. Jurgen (Germany)

Skeletal remains were uncovered by the St. Jurgen chapel in Lübeck (northern, Germany) associated with the adjacent St. Jurgen hospital. The chapel was likely in use between approximately 1270 and 1550 AD and written historical sources suggested that the hospital might have been used to house leprosy-affected individuals. The oldest burials were archaeologically dated to the mid 14th century AD. This skeletal collection was excavated from eight primary burial contexts and two overlapping burial pits containing mainly partial and commingled skeletal elements (Rieger et al., 2022). DNA was extracted from 40 samples (22 petrous bones, 16 teeth and two postcranial samples) belonging to 34 individuals.

Ribe: Lindegarden (Denmark)

The cemetery by the Ribe Cathedral (Lindegarden) was in use for a long period of time, approximately between the 11th and 18th century AD (Madsen, 2010; Søvsø, 2009). DNA from 28 individuals buried at the site was analyzed in this study. Metagenomic samples were taken from 24 petrous bones, 23 teeth and two postcranial elements.

Tirup (Denmark)

The cemetery in the small medieval village of Tirup was in use between 1150 and 1350 AD (Boldsen, 2005). Petrous bone was sampled for 30 individuals. For four out of these, teeth were also sampled for the analysis. One individual was represented by a single tooth sample.

Sejet: Odekirkegård (Denmark)

Cemetery of the Danish village of Sejet was dated approximately to the period between mid 12th and 16th century AD (Boldsen, 2018). Samples from 32 individuals were analyzed in this study. These included a set of a petrous bone and a tooth for 17 individuals. For the remaining 15, only a tooth (N=6) or a petrous bone (N=9) sample were analyzed.

Horsens: Klosterkirken, Ole Worm Gade (Denmark)

The parish cemetery by Klosterkirken was in use between 1150 and 1350 AD (Boldsen, 2018). Samples were taken from 52 individuals buried at this graveyard. For 16 of them, both petrous bone and tooth were sampled. Twenty-seven individuals were represented by petrous bone only. Postcranial elements were available for analysis from the remaining nine individuals. Ole Worm Gade was used for inhumation starting the early medieval period all the way until 1480 AD. A total of 26 individuals from this cemetery were analyzed. Obtained for DNA extraction samples included a petrous bone and a tooth (for 17 individuals), a petrous bone (for four individuals), a tooth (for three individuals) and a postcranial element (for three individuals).

Viborg: St Trinitatis (St. Drotten), St. Morten, St. Mathias, St Mikkel, Faldborg Kirke, Grabeodre (Denmark)

Skeletal collection from the Danish town of Viborg consisted of individuals buried at six parish cemeteries that were in use between approximately the 12th and mid 17th century (St. Trinitatis (N=15), St. Morten (N=4), St. Mathias (N=3), St. Mikkel (N=12), Grabodre (N=3) and Faldborg Kirke (N=4)) (Boldsen et al., 2015; Boldsen, 2018; Kristensen 1987; Larsen, 2010). Out of a total of 41 skeletons from Viborg, a set comprising a petrous bone and a tooth was available for 32 individuals. For two individuals, a petrous bone was sampled. One individual was represented by a tooth and for the remaining seven individuals, postcranial elements were used for DNA extraction.

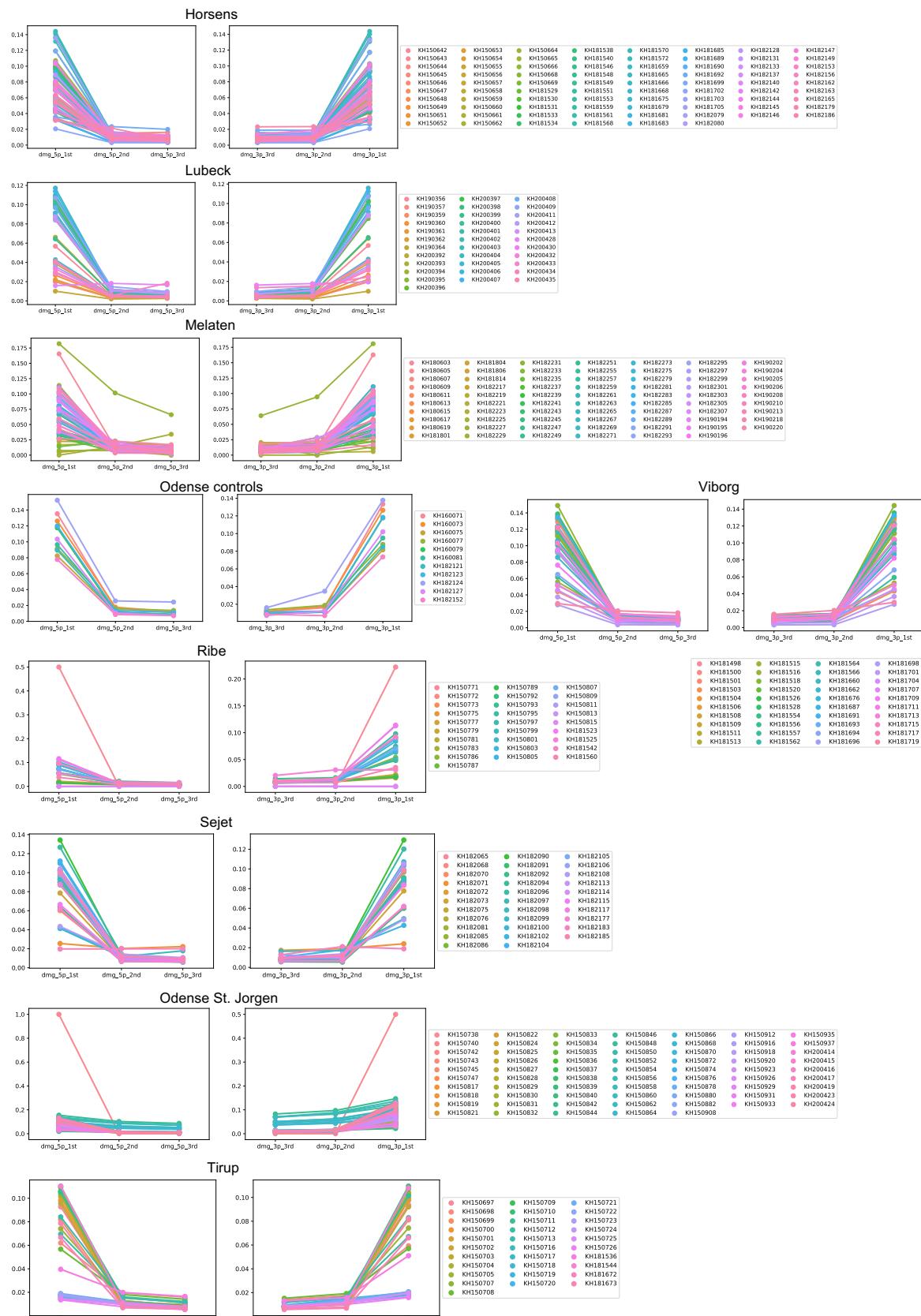


Figure S1. Substitution pattern at the 5' and 3' ends of the aligned sequence reads for analyzed samples (KHnumber) was assessed with DamageProfiler (Neukamm et al., 2020). Corresponding grave numbers can be found in Table S3.

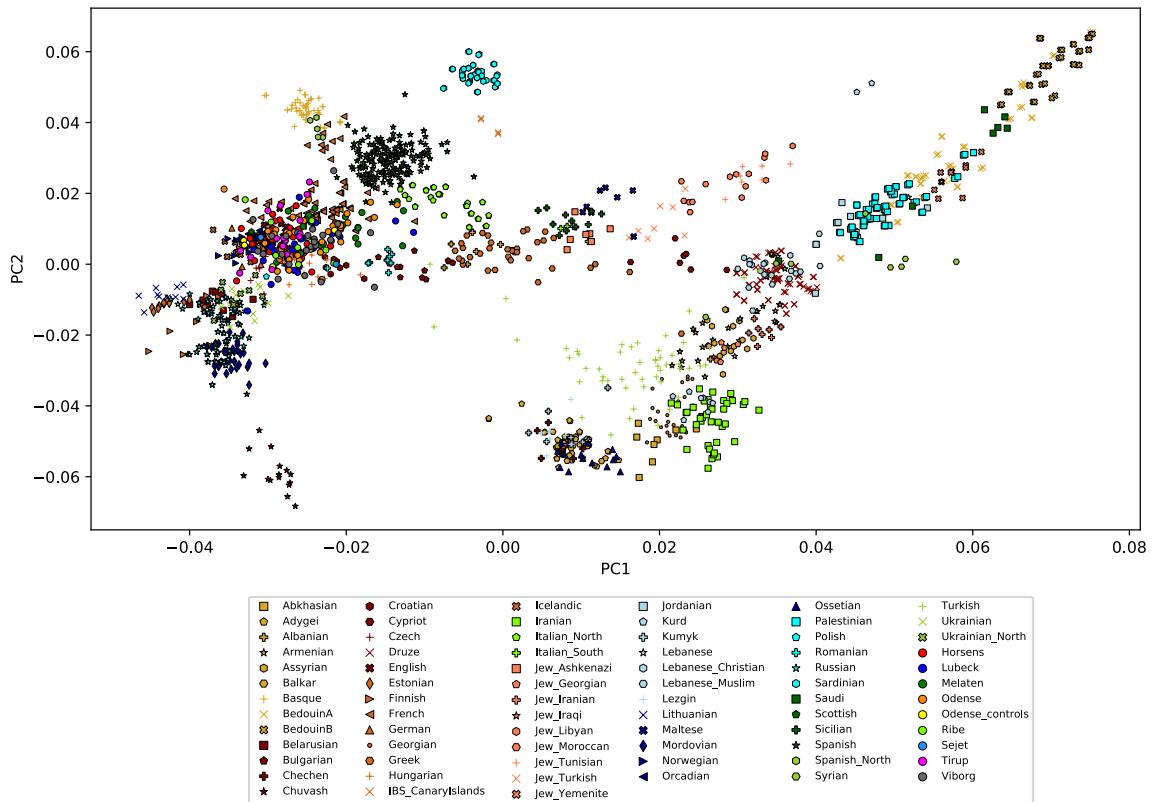


Figure S2. PCA of 182 medieval individuals and 59 present-day West-Eurasian populations.

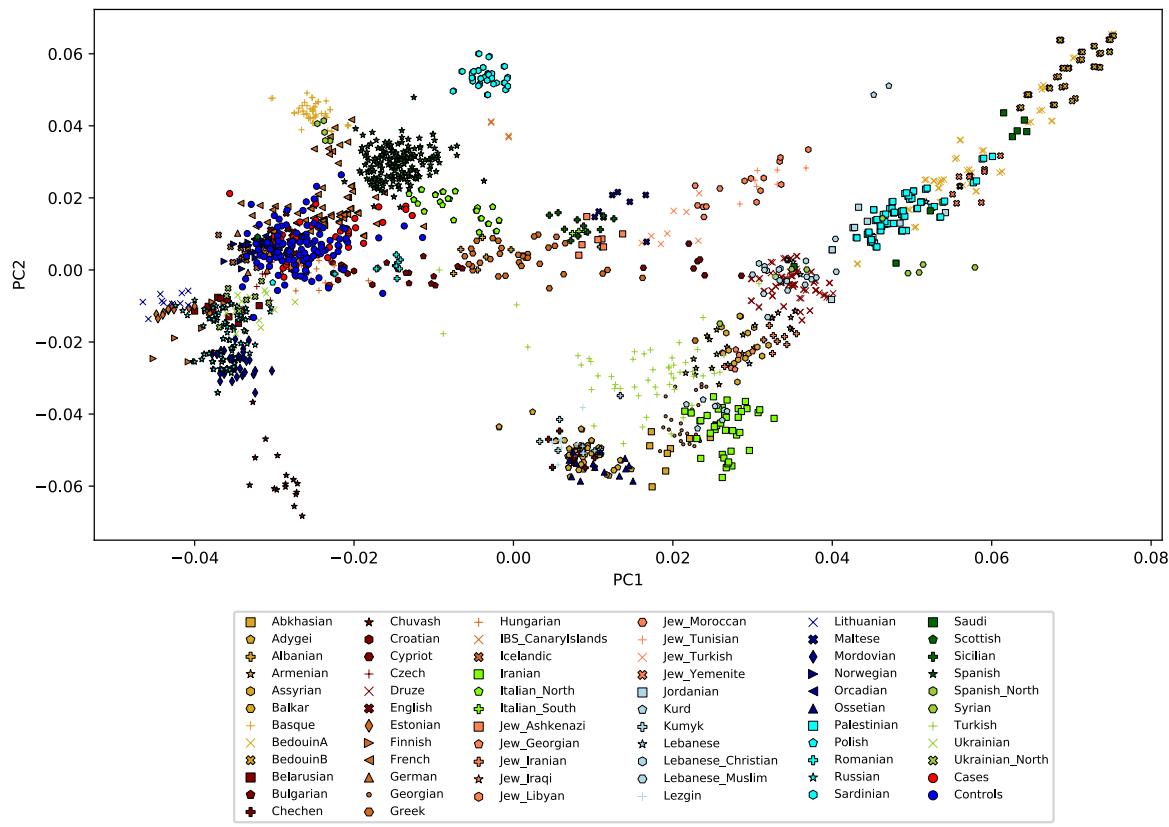


Figure S3. PCA of 76 cases (red circles) and 106 controls (blue circles) and 59 present-day West-Eurasian populations.

Table S1. HLA alleles identified as protection or risk factors for leprosy.

Population	Susceptibility	Phenotype	Protection	Phenotype	Reference
Class I					
Brazilian	A*11 B*38 C*12	<i>per se</i>	C*16	<i>per se</i>	Franceschi et al., 2011
Mexican Mestizo	A*28	<i>per se</i> , LL	-	-	Aguilar-Medina et al., 2017
Southern Chinese	-	-	B*46	MB	Wang et al., 1999
Turkish	A*09 A*10 A*32 B*05 B*21	TT, BT, BL, LL	A*03 B*44 B*49	TT, BT, BL, LL	Kocak et al., 2002
Korean	A*11, A*33	TT, LL	-	-	Kim et al., 1987
Southern Indian	A*02:06, A*11:02, B*51:10, B*18:01	MB	A*01:01	MB	Shankankumar et al., 2004
Indian	A*02:06, A*11:02, B*51:10, C*04:07 C*07:03	<i>per se</i>	C*04:11 C*06:02	<i>per se</i>	Shankankumar et al., 2003
Class II					
Brazilian	DRB1*16 DRB1*09 DRB1*15 DRB1*10	borderline <i>per se</i> , LL, borderline MB, PB	DRB1*04 DRB1*04 DRB1*07 DRB1*12	LL MB, PB	da Silva et al., 2009 Vanderborgh et al., 2007
Mexican Mestizo	DRB1*01	LL	DRB1*08 DQB1*07	<i>per se</i> <i>per se</i> , LL	Escamilla-Tilch et al., 2013 Aguilar-Medina et al., 2017
Mexican	DRB1*03 DRB1*15:01 -	TT, LL -	- - DQB1*07	- - <i>per se</i> , LL	Gorodezky et al., 1987 Gorodezky et al., 2004 Aguilar-Medina et al., 2017
Chinese	DRB1*15	<i>per se</i> , late and early onset	DRB1*09	early onset	Zhang et al., 2009
Indian	DRB1*15:02	TT	-	-	Mehra et al., 1995

	DRB1*15:01	TT	-	-	Zerva et al., 1996
	DRB1*15:02				
	DRB1*14:04				
Vietnamese	DRB1*10	-	DRB1*04	-	Vanderborgh et al., 2007
Indonesian	DRB1*02	LL, BL	DRB1*12	LL, BL, TT, BT	Soebono et al., 1997
Taiwanese	-	-	DRB1*04:0 5	MB	Hsieh et al., 2010
Japanese	DRB1*15:01	LL, BL, MB, BT, TT	DRB1*04:0 5	LL, BL, MB, BT, TT	Joko et al., 2000
Argentinean	-	-	DRB1*04 DRB1*04:0 2	MB, <i>per se</i>	Motta et al., 2007
	DRB1*14:01	<i>per se</i>	DRB1*08:0 8	<i>per se</i>	Borras et al., 2008
	DRB1*14:06				

TT – tuberculoid tuberculoid, LL – lepromatous leprosy, BL – borderline lepromatous, BT – borderline tuberculoid; MB – multibacillary, PB – paucibacillary

Table S2. Total sample set used for analyses.

Location	Site	Individual N	Grave ID	Sample ID	Sample type	osteological sex	genetic sex	age	M. leprae	HLA_calls	PCA_plot
Lubeck, Germany	Lubeck St. Jurgen	1	LueSJ_1_Ma.1i	KH19 0355	T F	F	18-25	no	yes	yes	
	Lubeck St. Jurgen	1	LueSJ_1_SK1.i	KH20 0392	PB			no			
	Lubeck St. Jurgen	2	LueSJ_1_Ma.2	KH19 0356	T M	M	30-35	no	yes	yes	
	Lubeck St. Jurgen	2	LueSJ_1_Ma.4.	KH19 0358	T -	M	24-35	no	yes	yes	
	Lubeck St. Jurgen	3	LueSJ_1_Ma.3	KH19 0357	T -	M	35	no	yes	yes	
	Lubeck St. Jurgen	4	LueSJ_1_Ma.4.	KH19 0358	T -	M	>5	no	yes	yes	
	Lubeck St. Jurgen	4	LueSJ_2_Ot.L.1.	KH20 0400	PB		5	no			
	Lubeck St. Jurgen	5	LueSJ_1_Ma.5	KH19 0359	T -	M	6-9	no	yes	no	
	Lubeck St. Jurgen	6	LueSJ_2_Ma.F.2	KH19 0360	T PF	F	25-35	no	yes	yes	
	Lubeck St. Jurgen	7	LueSJ_2_Ma.F.3	KH19 0361	T PF	M	35-55	no	yes	yes	
	Lubeck St. Jurgen	8	LueSJ_6_Ma.1	KH19 0362	T			no			
	Lubeck St. Jurgen	8	Fsc.FtL.1_q	KH20 0340	foot	-	M	>35	no	yes	yes
	Lubeck St. Jurgen	8	LueSJ_6_Fsc.FtL.1_q	KH20 0426	foot			no			
	Lubeck St. Jurgen	9	LueSJ_16_Ma.001	KH19 0364	T PM	M	16-18	no	yes	yes	
	Lubeck St. Jurgen	9	LueSJ_18_Ot.R	KH20 0410	PB			no			
	Lubeck St. Jurgen	10	LueSJ_1_Ot.R.6	KH20 0397	PB	-	F	>21	no	yes	yes

Lubeck St.		LueSJ_2_	KH20			M	>2				
Jurgen	11	Sk.1	0398	PB	PF		1	no	yes	yes	
Lubeck St.		LueSJ_2_	KH20			F	<2				
Jurgen	12	Sk.3	0399	PB	-		1	no	yes	no	
Lubeck St.		LueSJ_3_	KH20			F	25-				
Jurgen	13	Sk.1	0401	PB	F		35	no	yes	yes	
Lubeck St.		LueSJ_3_	KH20			M	>2				
Jurgen	14	Sk.2	0402	PB	F		1	no	yes	yes	
Lubeck St.		LueSJ_3_	KH20			M	40-				
Jurgen	15	Sk.5	0403	PB	-		58	no	yes	yes	
Lubeck St.		LueSJ_3_	KH20								
Jurgen	16	Ot.R.1	0404	PB	-	M	>2	no	yes	yes	
Lubeck St.		LueSJ_1.2	KH20				1	no			
Jurgen	16	_Ma1	0436	T							
Lubeck St.		LueSJ_9_	KH20			M					
Jurgen	17	Ot.L	0405	PB	-		4-5	no	yes	no	
Lubeck St.		LueSJ_10_	KH20			F	>2				
Jurgen	18	Ot.R.002	0406	PB	PF		1	no	yes	yes	
Lubeck St.		LueSJ_17_	KH20			F	40-				
Jurgen	19	Sk1	0407	PB	F		50	no	yes	yes	
Lubeck St.		LueSJ_18_	KH20			M	38-				
Jurgen	20	Sk.1	0408	PB	F		58	no	yes	yes	
Lubeck St.		LueSJ_18_	KH20			M	>2				
Jurgen	21	Sk.8	0409	PB	PF		1	no	yes	yes	
Lubeck St.		LueSJ_19_	KH20			F					
Jurgen	22	Ot.R.004	0411	PB	-		1-3	no	yes	yes	
Lubeck St.		LueSJ_1.2	KH20			F	>2				
Jurgen	23	_Ot.R	0413	PB	PF		1	no	yes	no	
Lubeck St.		LueSJ_17_	KH20			F	35-				
Jurgen	24	Ma2	0430	T	PF		55	no	yes	yes	
Lubeck St.		LueSJ_17_	KH20			M	>5				
Jurgen	25	Ma3	0432	T	PM		0	no	yes	yes	
							2.5				
Lubeck St.		LueSJ_17_	KH20			M	-				
Jurgen	26	Ma4	0433	T	-		3.5	no	no	no	
Lubeck St.		LueSJ_17_	KH20			F					
Jurgen	27	Ma5	0434	T	-		7-8	no	no	no	
Lubeck St.		LueSJ_20_	KH20			F	8-				
Jurgen	28	Ma	0435	T	-		12	no	no	yes	
Lubeck St.		LueSJ_1_	KH20			M	36-				
Jurgen	29	Sk2	0393	PB	PF		55	no	yes	yes	
Lubeck St.		LueSJ_1_	KH20			M	33-				
Jurgen	30	Sk3	0394	PB	F		57	no	yes	yes	
Lubeck St.		LueSJ_1_	KH20			M	>3				
Jurgen	31	Sk6	0395	PB	-		0	no	yes	yes	
Lubeck St.		LueSJ_1_	KH20			M	>2				
Jurgen	32	Sk11	0396	PB	F		1	no	yes	yes	
Lubeck St.		LueSJ_18_	KH20			M	35-				
Jurgen	33	Sk.2	0412	PB	M		50	no	yes	yes	
Lubeck St.		LueSJ_15_	KH20			-	38-				
Jurgen	34	Ma	0428#	T	F		58	no	no	no	
Tirup, Denmark	Tirup	1	G281	KH15		M	60-				
				0697	PB	M	70	no	yes	no	
	Tirup	2	G316	KH15		M	40-				
				0698	PB	M	50	no	yes	no	
	Tirup	3	G373	KH15		M	55-				
				0699	PB	M	65	no	yes	yes	
				KH15							
	Tirup	4	G371	0700	PB	F	22-				
				KH18		F	24	no	yes	no	
Tirup	4	G371	1670	T							
				KH15		M	35-				
Tirup	5	G187	0701	PB	F		45	no	yes	no	
				KH15		M	27-				
Tirup	6	G544	0702	PB	M		40	no	yes	yes	

Tirup	7	G75	KH15 0703	PB	M	M	26- 33 55- 70	no	yes	yes
Tirup	8	G446	KH15 0704	PB	M	M	23- 25	no	yes	no
Tirup	9	G269	KH15 0705	PB	M	M	38- 52 45-	no	yes	no
Tirup	9	G269	KH15 1671	T			60	no	yes	yes
Tirup	10	G129	KH15 0707	PB	M	M	40	no	yes	yes
Tirup	11	G369	KH15 0708	PB	F	-	27-	no	yes	no
Tirup	12	G89	KH15 0709	PB	M	M	40	no	yes	yes
Tirup	13	G94	KH15 0710	PB	M	M	55- 70	no	yes	no
Tirup	14	G272	KH15 0711	PB	F	M	27- 37	no	yes	yes
Tirup	15	G557	KH15 0712	PB	F	-	35-	no	no	yes
Tirup	16	G414	KH15 0713	PB	F	-	50	no	yes	no
Tirup	17	G196	KH15 0716	PB	M	M	35- 50	no	yes	yes
Tirup	18	G79	KH15 0717	PB	F	F	48	no	yes	yes
Tirup	19	G448	KH15 0718	PB	F	F	30- 40	no	yes	no
Tirup	20	G394	KH15 0719	PB	M	M	45- 55	no	yes	no
Tirup	21	G146	KH15 0720	PB	M	M	30- 40	no	yes	yes
Tirup	22	G236	KH15 0721	PB	M	M	42- 52	no	yes	no
Tirup	23	G130	KH15 0722	PB	F	F	23- 26	no	yes	yes
Tirup	24	G470	KH15 0723	PB	M	M	40- 55	no	yes	yes
Tirup	25	G206	KH15 0724	PB	M	M	24- 26	no	yes	no
Tirup	26	G516	KH15 0725	PB	F	F	28- 40	no	yes	no
Tirup	27	G456	KH15 0726	PB	M	M	26- 36	no	yes	yes
Tirup	28	X514	KH18 1536	PB	F	-	60- 70	no	no	no
Tirup	28	X514	KH18 1537	T			no			
Tirup	29	X232	KH18 1544	PB	F	M	21- 23	no	no	yes
Tirup	29	X232	KH18 1545	T			no			
Tirup	30	X350	KH18 1673	PB	F	F	19- 21	no	yes	yes
Tirup	30	X350	KH18 1674	T			22- 24	no	yes	yes
Horsens, Denmark	31	X292	KH15 X2060	T	F	F	no	yes	yes	yes
	n	1	A2397	0642	PB	-	F	-	yes	no
	n	2	A2485	0643	PB	-	M	-	yes	no
	n	3	A2436	0644	PB	-	M	-	yes	no
	n	3	A2436	X2176	KH15				yes	no

Klosterkirke		X2203	KH15			F	-	no	yes	no
n	4	A2443	0645	PB	-		-	no	yes	no
Klosterkirke		X2216	KH15				-	no	yes	no
n	5	A2447	0646	PB	-		-	no	yes	no
Klosterkirke		X2256	KH15			M	-	no	yes	no
n	6	A2461	0647	PB	-		-	no	yes	no
Klosterkirke		X2291	KH15			M	-	no	yes	no
n	7	A2476	0648	PB	-		-	no	yes	no
Klosterkirke		X2315	KH15			M	-	no	yes	no
n	8	A2485	0649	PB	-		-	no	yes	no
Klosterkirke		X2391	KH15			M	-	no	yes	no
n	9	A2496	0651	PB	-		-	no	yes	no
Klosterkirke		X2397	KH15			M	-	no	yes	no
n	10	A2500	0652	PB	-		-	no	yes	no
Klosterkirke		X2489	KH15			F	-	no	yes	yes
n	11	A2522	0653	PB	-		-	no	yes	yes
Klosterkirke		X2594	KH15			F	-	no	no	yes
n	12	A2548	0654	PB	-		-	no	no	yes
Klosterkirke		X2605	KH15			F	-	no	no	yes
n	13	A2552	0655	PB	-		-	no	no	yes
Klosterkirke		X2605	KH18			F	-	no	no	yes
n	13	A2552	1664	T				no		
Klosterkirke		X2628	KH15			M	-	no	no	yes
n	14	A2577	0656	PB	-		-	no	no	yes
Klosterkirke		X2763	KH15			M	-	no	no	no
n	15	A2659	0657	PB	-		-	no	no	no
Klosterkirke		X2768	KH15			F	-	no	no	yes
n	16	A2663	0658	PB	-		-	no	no	yes
Klosterkirke		X2793	KH15			F	-	no	no	yes
n	17	A2689	0659	PB	-		-	no	no	yes
Klosterkirke		X2795	KH15			F	-	no	yes	yes
n	18	A2690	0660	PB	-		-	no	yes	yes
Klosterkirke		X2825	KH15			F	-	no	yes	yes
n	19	A2699	0661	PB	-		-	no	no	no
Klosterkirke		X2868	KH15			F	-	no	no	yes
n	20	A2715	0662	PB	-		-	no	no	yes
Klosterkirke		X2905	KH15			M	-	no	yes	yes
n	21	A2728	0664	PB	-		-	no	yes	yes
Klosterkirke		X2914	KH15			F	-	no	yes	no
n	22	A2731	0665	PB	-		-	no	yes	no
Klosterkirke		X3001A27	KH15			F	-	no	yes	yes
n	23	54	0666	PB	-		-	no	yes	yes
Klosterkirke		X3097	KH15			F	-	no	yes	no
n	24	A2814	0668	PB	-		-	no	yes	no
Klosterkirke		X3105	KH15			F	-	no	yes	yes
n	25	A2819	0669	PB	-		-	no	yes	yes
Klosterkirke		X1272	KH18			F	-	no	yes	yes
n	26	X2468	1530	T	-		-	no	no	yes
Klosterkirke		X1272	KH18			M	-	no	no	no
n	27	X2146	1532	PB	-					
Klosterkirke		X1272	KH18							
n	27	X2146	1533	T						
Klosterkirke		X1272	KH18							
n	28	X2452	1538	PB	-					
Klosterkirke		X1272	KH18			M	-	no	no	yes
n	28	X2452	1539	T						
Klosterkirke		X1272	KH18							
n	29	X2351	1540	PB	-					
Klosterkirke		X1272	KH18			F	-	no	no	no
n	29	X2351	1541	T						
Klosterkirke		X1272	KH18							
n	30	X2915	1546	PB	-					
Klosterkirke		X1272	KH18			M	-	no	yes	yes
n	30	X2915	1547	T						
Klosterkirke		X1272	KH18							
n	31	X2906	1548	T			F	-	yes	yes

	Klosterkirke		X1272	KH18							
n		32	X2014	1549	PB	-	F	-	no	no	yes
Klosterkirke			X1272	KH18					no		
n		32	X2014	1550	T				no		
Klosterkirke			X1272	KH18							
n		33	X2867	1551	PB	-	M	-	no	no	no
Klosterkirke			X1272	KH18					no		
n		33	X2867	1552	T				no		
Klosterkirke			X1272	KH18							
n		34	X2060	1568	PB	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		34	X2060	1569	T				no		
Klosterkirke			X1272	KH18							
n		35	X2830	1570	PB	-	F	-	no	no	yes
Klosterkirke			X1272	KH18					no		
n		35	X2830	1571	T				no		
Klosterkirke			X1272	KH18							
n		36	X2220	1572	PB	-	M	-	no	no	yes
Klosterkirke			X1272	KH18					no		
n		37	X2339	1683	PB	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		37	X2339	1684	T				no		
Klosterkirke			X1272	KH18							
n		38	X2545	1685	PB	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		38	X2545	1686	T				no		
Klosterkirke			X1272	KH18							
n		39	X3018	1699	PB	-	M	-	no	yes	no
Klosterkirke			X1272	KH18					no		
n		39	X3018	1700	T				no		
Klosterkirke			X1272	KH18							
n		40	X2883	1702	T	-	M	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		41	X2598	1705	PB	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		41	X2598	1706	T				no		
Klosterkirke			X1272	KH18							
n		42	X2654	1679	PB	-	F	-	no	yes	no
Klosterkirke			X1272	KH18					no		
n		42	X2654	1680	T				no		
Klosterkirke			X1272	KH18							
n		43	X2392	1681	PB	-	M	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		43	X2392	1682	T				no		
Klosterkirke			X1272	KH18							
n		44	X2683	1703	foot	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18	sternu				no		
n		45	X3061	1689	m	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		46	X2463	1529	foot	-	M	-	no	no	yes
Klosterkirke			X1272	KH18					no		
n		47	X2884	1553	foot	-	M	-	no	no	no
Klosterkirke			X1272	KH18					no		
n		48	X2593	1559	foot	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		49	X2904	1561	hand	-	F	-	no	yes	no
Klosterkirke			X1272	KH18					no		
n		50	X2429	1675	foot	-	F	-	no	yes	yes
Klosterkirke			X1272	KH18					no		
n		51	X3051	1690	rib	-	M	-	no	no	no
Klosterkirke			X1272	KH18					no		
n		52	X3026	1692	hand	-	M	-	no	no	no
Klosterkirke			X1272	KH18					no		
Aachen, Germany	Melaten	1	grave 6	0603	PB	-			55- 60	no	yes
Melaten		1	grave 6	0604	T				no		

Melaten	2	grave 87	KH18 0605	PB	-	F	>2 1	no	no	yes
Melaten	2	grave 87	KH18 0606	T			no			
Melaten	3	grave 17	KH18 0607	PB	-	F	7- 14	no	no	yes
Melaten	3	grave 17	KH18 0608	T		M	no			
Melaten	4	grave 10	KH18 0609	PB	M		21- 25	no	yes	yes
Melaten	4	grave 10	KH18 0610	T		M	no			
Melaten	5	grave 128	KH18 0611	PB	M		21- 25	no	yes	yes
Melaten	5	grave 128	KH18 0612	T		F	no			
Melaten	6	grave 33	KH18 0613	PB	F		41- 50	no	yes	no
Melaten	6	grave 33	KH18 0614	T		M	no			
Melaten	7	grave 46	KH18 0615	PB	-		0-7	no	no	yes
Melaten	7	grave 46	KH18 0616	T		F	no			
Melaten	8	grave 53	KH18 0617	PB	-		>2 1	no	no	yes
Melaten	8	grave 53	KH18 0618	T		F	no			
Melaten	9	grave 77	KH18 0619	PB	-		7- 14	no	no	yes
Melaten	9	grave 77	KH18 0620	T			no			
Melaten	10	grave 5	KH18 0621	PB	M	F	41- 50	no	no	no
Melaten	10	grave 5	KH18 0622	T			no			
Melaten	11	grave 8	KH18 1801	T	F	F	~6 5	no	no	no
Melaten	12	grave 97	KH18 1804	T	F	F	25- 30	no	yes	no
Melaten	13	grave 129	KH18 1806	T	M	M	51- 60	no	yes	no
Melaten	14	grave 95	KH18 1814	T	F	F	41- 50	no	no	no
Melaten	15	grave 108	KH18 2217	T	M	-	55- 60	no	no	no
Melaten	16	grave 62	KH18 2219#	T	-	-	>2 1	no	no	no
Melaten	17	grave 59	KH18 2221#	T			no			
Melaten	17	grave 59	KH18 2257	T	F	-	51- 60	no	no	no
Melaten	18	grave 86	KH18 2223#	T	M	-	25- 30	no	no	no
Melaten	19	grave 100	KH18 2225#	T	M	-	31- 40	no	no	no
Melaten	20	grave 7	KH18 2227#	T	M	-	41- 70	no	no	no
Melaten	21	grave 101	KH18 2229	T	F	F	51- 70	no	no	no
Melaten	22	grave 82	KH18 2231	T	M	M	41- 60	no	no	no
Melaten	23	grave 69	KH18 2233	T	F	-	21- 40	no	no	no
Melaten	24	grave 47	KH18 2235#	T	-	-	>2 1	no	no	no

Melaten	25	grave 19	KH18 2237	T	F	F	51- 70	yes	yes	yes
Melaten	26	grave 92	KH18 2239	T	F	F	35- 40	no	yes	no
Melaten	27	grave 119	KH18 2241	T	M	M	35- 40	yes	yes	yes
Melaten	28	grave 134	KH18 2243	T	M	M	~5 5	no	no	no
Melaten	29	grave 34	KH18 2245	T	M	M	45- 50	no	no	no
Melaten	30	grave 14	KH18 2247	T	F	F	41- 60	no	no	no
Melaten	31	grave 71	KH18 2249	T	M	F	21- 25	no	yes	no
Melaten	32	grave 35	KH18 2251	T	-	F	~1 5	yes	no	no
Melaten	33	grave 36	KH18 2255	T	M	M	55- 5	no	no	no
Melaten	34	grave 127	KH18 2259	T	F	F	51- 60	no	yes	no
Melaten	35	grave 20	KH18 2261	T	F	F	21- 60	no	no	no
Melaten	36	grave 88	KH18 2263	T	F	F	~2 25	no	no	no
Melaten	37	grave 24	KH18 2265	T	F	M	5 ~2	no	no	no
Melaten	38	grave 29	KH18 2267	T	F	F	21- 5	no	yes	no
Melaten	39	grave 116	KH18 2269	T	M	M	21- 25	no	yes	no
Melaten	40	grave 110	KH18 2271	T	M	M	45- 40	no	no	no
Melaten	41	grave 50	KH18 2273	T	M	M	25- 50	no	yes	no
Melaten	42	grave 65	KH18 2275	T	F	F	61- 30	no	no	yes
Melaten	43	grave 23	KH18 2279	T	F	F	41- 65	no	no	yes
Melaten	44	grave 43	KH18 2281	T	M	M	61- 50	yes	no	no
Melaten	45	grave 18	KH18 2283	T	M	M	55- 70	no	yes	no
Melaten	46	grave 52	KH18 2285	T	M	M	61- 60	no	yes	no
Melaten	47	grave 81	KH18 2287	T	F	F	21- 70	no	yes	yes
Melaten	48	grave 96	KH18 2289	T	F	F	41- 25	yes	yes	yes
Melaten	49	grave 3	KH18 2291	T	F	F	51- 50	no	yes	no
Melaten	50	grave 2	KH18 2293	T	M	M	55- 60	no	no	no
Melaten	51	grave 66	KH18 2295	T	M	M	61- 60	no	yes	no
Melaten	52	grave 45	KH18 2297	T	M	M	31- 65	no	yes	no
Melaten	53	grave 25	KH18 2299	T	M	M	40- 21-	no	no	no
Melaten	54	grave 125	KH18 2301	T	F	M	51- 25	no	yes	no
Melaten	55	grave 16	KH18 2303	T	M	M	31- 55	no	no	no
Melaten	56	grave 102	KH19 2307	T	F	F	40- 55-	no	no	no
Melaten	57	grave 91	0194	PB	F	F	60	yes	yes	yes

Melaten	58	grave 94	KH19 KH19 KH19	0195	T	M	M	41- 60 >2	no	yes	no
Melaten	59	grave 1	0196	PB	-	-	-	1	no	no	no
Melaten	60	grave 117	0202	PB	F	-	M	21- 40 ~6	yes	yes	yes
Melaten	61	grave 137	0204	T	F	-	F	5 ~3	no	no	yes
Melaten	62	grave 26	0205	PB	F	-	F	0 >2	no	yes	yes
Melaten	63	grave 27	0206	T	M	-	F	1 >2	no	no	yes
Melaten	64	grave 38	0208	PB	-	-	F	1 31-	no	no	yes
Melaten	65	grave 4	0210	T	M	-	M	40 21-	no	yes	no
Melaten	66	grave 49	0213	T	F	-	M	25 >2	no	no	no
Melaten	67	grave 67	0218	T	-	-	-	1 21-	yes	no	no
Melaten	68	grave 79	0220	PB	F	-	M	40 35-	yes	no	yes
Melaten	69	grave 104	2277	T	F	-	-	40	no	no	no
Ribe, Denmark	Lindegarden	1	G 13	0772	PB	-	M	-	no	yes	yes
	Lindegarden	2	G 120	0773	PB	-	M	-	no	yes	yes
	Lindegarden	2	G 120	0774	T	-	-	-	no	-	-
	Lindegarden	3	G392	0775	PB	-	F	-	no	yes	yes
	Lindegarden	3	G392	0776	T	-	-	-	no	-	-
	Lindegarden	4	G203	0777	PB	-	F	-	no	yes	yes
	Lindegarden	5	G200	0779	PB	-	M	-	no	yes	no
	Lindegarden	5	G200	0780	T	-	-	-	no	-	-
	Lindegarden	6	G125	0781	PB	-	M	-	no	yes	yes
	Lindegarden	6	G125	0782	T	-	-	-	no	-	-
	Lindegarden	7	G613	0783	PB	-	M	-	no	yes	yes
	Lindegarden	7	G613 G611/G61	0784	T	-	-	-	no	-	-
	Lindegarden	8	2	0787	PB	-	M	-	no	yes	yes
	Lindegarden	8	2	0788	T	-	-	-	no	-	-
	Lindegarden	9	G110	0789	PB	-	M	-	no	yes	yes
	Lindegarden	9	G110	0790	T	-	-	-	no	-	-
	Lindegarden	10	G55	0792	T	-	M	-	no	no	no
	Lindegarden	11	G1149	0793	PB	-	F	-	no	yes	yes
	Lindegarden	11	G1149	0794	T	-	-	-	no	-	-
	Lindegarden	12	G27	0795	PB	-	M	-	no	yes	no
	Lindegarden	12	G27	0796	T	-	-	-	no	-	-

				KH15							
	Lindegarden	13	G887	0797	PB	-	F	-	no	yes	no
	Lindegarden	13	G887	KH15	T				no		
	Lindegarden	14	G1086	0798							
	Lindegarden	14	G1086	KH15	PB	-	F	-	no	yes	no
	Lindegarden	14	G1086	0799					no		
	Lindegarden	15	K1092	KH15	T						
	Lindegarden	15	K1092	0800					no		
	Lindegarden	16	X1114	KH15	PB	-	M	-	no	yes	no
	Lindegarden	16	X1114	0801					no		
	Lindegarden	17	X1365	KH15	T				no		
	Lindegarden	17	X1365	0802					no		
	Lindegarden	18	X1380	KH15	PB	-	M	-	no	no	no
	Lindegarden	18	X1380	0803					no		
	Lindegarden	17	X1365	KH15	T				no		
	Lindegarden	18	X1380	0804					no		
	Lindegarden	19	G1173	KH15	PB	-	F	-	no	no	no
	Lindegarden	19	G1173	0805					no		
	Lindegarden	20	X1352	KH15	T				no		
	Lindegarden	20	X1352	0806					no		
	Lindegarden	21	X252	KH15	PB	-	M	-	no	yes	no
	Lindegarden	21	X252	1523					no		
	Lindegarden	22	X4	KH18	T				no		
	Lindegarden	22	X4	1524					no		
	Lindegarden	22	X4	KH18	PB	-	M	-	no	yes	no
	Lindegarden	23	X418	1542					no		
	Lindegarden	23	X418	KH18	T				no		
	Lindegarden	23	X418	1543					no		
	Lindegarden	24	X134	KH18	hand	-	F	-	no	no	no
	Lindegarden	24	X134	1525					no		
	Lindegarden	25	G124	KH18	hand	-	M	-	no	yes	no
	Lindegarden	25	G124	1560					no		
	Lindegarden	25	G124	KH15	PB	-		-	no	yes	no
	Lindegarden	26	X1052	KH15	0771				no		
	Lindegarden	26	X1052	0813#	PB	-		-	no	no	no
	Lindegarden	26	X1052	KH15	T				no		
	Lindegarden	27	1304	KH15	0814				no		
	Lindegarden	27	1304	0815#	PB	-		-	no	no	no
	Lindegarden	27	1304	KH15	T				no		
	Lindegarden	28	G123	KH15	0816		M	-	no	yes	no
Odense, Denmark	Odense St.	1	G876	KH15	T	-			33-		
	Jurgen	2	G21	KH15	PB	F	F	43	no	yes	yes
	Odense St.	3	G730	KH15	PB	M	M	20-			
	Jurgen	4	G1149	KH15	PB	M	M	23	no	yes	yes
	Odense St.	5	G33	KH15	PB	F	F	30-			
	Jurgen			KH15	PB	M	M	38	yes	yes	yes
	Odense St.			KH15				17-			
	Jurgen			KH15				20	no	yes	yes
	Odense St.			KH15				24-			
	Jurgen			KH15				26	yes	yes	yes

Odense St.			KH15				M	22-				
Jurgen	6	G669	0852	PB	M		M	25	no	yes	yes	
Odense St.			KH15				M	23-				
Jurgen	7	G712	0854	PB	M		M	26	no	yes	yes	
Odense St.			KH15				F	22-				
Jurgen	8	G393	0856	PB	F		F	25	no	yes	yes	
Odense St.			KH15				M	38-				
Jurgen	9	G708	0858	PB	M		M	48	no	yes	yes	
Odense St.			KH15				F	-				
Jurgen	10	G314	0860	PB	-		F	23-	yes	yes	yes	
Odense St.			KH15				F	27	no	yes	yes	
Jurgen	11	G102	0862	PB	F		M	20-				
Odense St.			KH15				F	25	yes	yes	yes	
Jurgen	12	G208	0864	PB	M		F	22-				
Odense St.			KH15				F	24	yes	yes	yes	
Jurgen	13	G1065	0866	PB	F		F	18-				
Odense St.			KH15				M	35-				
Jurgen	14	G300	0868	PB	F		F	22	yes	yes	yes	
Odense St.			KH15				F	45	yes	yes	yes	
Jurgen	15	G973	0870	PB	F		M	22-				
Odense St.			KH15				F	26	no	yes	no	
Jurgen	16	G34	0872	PB	F		M	22-				
Odense St.			KH15				F	24	no	yes	yes	
Jurgen	17	G43	0874	PB	F		M	28-				
Odense St.			KH15				F	38	no	yes	no	
Jurgen	18	G864	0876	PB	M		F	27-				
Odense St.			KH15				F	34	no	yes	no	
Jurgen	19	G750	0878	PB	F		M	30-				
Odense St.			KH15				F	40	no	yes	yes	
Jurgen	20	G870	0880	PB	F		F	30-				
Odense St.			KH15				F	40	yes	yes	no	
Jurgen	21	G119	0882	PB	F		M	40-				
Odense St.			KH15				F	50	no	yes	no	
Jurgen	22	G911	0908	PB	M		M	15-				
Odense St.			KH15				F	18	no	yes	yes	
Jurgen	23	G118	0912	PB	F		M	24-				
Odense St.			KH15				F	26	yes	yes	yes	
Jurgen	24	G164	0916	PB	F		F	30-				
Odense St.			KH15				F	40	yes	yes	no	
Jurgen	25	G165	0918	PB	-		M	30-				
Odense St.			KH15				F	38	yes	yes	no	
Jurgen	26	G942	0920	PB	-		F	18-				
Odense St.			KH15				F	22	yes	yes	yes	
Jurgen	27	G120	0923	PB	F		F	30-				
Odense St.			KH15				F	40	no	yes	no	
Jurgen	28	G397	0926	PB	F		F	18-				
Odense St.			KH15				F	22	yes	yes	yes	
Jurgen	29	G939	0929	PB	F		F	40-				
Odense St.			KH15				M	50	no	yes	no	
Jurgen	30	G24	0931	PB	M		M	22-				
Odense St.			KH15				F	28	no	yes	no	
Jurgen	31	G48	0933	PB	F		M	15-				
Odense St.			KH15				F	18	no	yes	no	
Jurgen	32	G943	0935	PB	M		M	24-				
Odense St.			KH15				F	26	yes	yes	yes	
Jurgen	33	G738	0937	PB	M		M	18-				
Odense St.			KH15				F	22	no	yes	yes	
Jurgen	34	G 692	0817	PB	-		F	-	no	no	no	
Odense St.			KH15				F	-	no	no	no	
Jurgen	35	G 770	0818	PB	-		M	-	no	no	no	
Odense St.			KH15				F	-	no	yes	no	
Jurgen	36	G1020	0819	PB	-		M	-	no	yes	no	
Odense St.			KH15				F	-	no	yes	yes	
Jurgen	37	G311	0822	PB	-		M	-	no	yes	yes	
Odense St.			KH15				F	-	yes	yes	no	
Jurgen	38	G668	0821	PB	-		F	-	yes	yes	no	

Odense St.			KH15									
Jurgen	39	G74	0824	PB	-	M	-	yes	yes	yes	yes	
Odense St.			KH15			M	-	yes	yes	yes	yes	
Jurgen	40	G1148	0825	PB	-							
Odense St.			KH15			M	-	no	yes	no		
Jurgen	41	G1069	0826	PB	-							
Odense St.			KH15			F	-	yes	yes	yes	yes	
Jurgen	42	G291	0827	PB	-							
Odense St.			KH15			M	-	no	no	no	no	
Jurgen	43	G1078	0828	PB	-							
Odense St.			KH15			M	-	yes	yes	no		
Jurgen	44	G670	0829	PB	-							
Odense St.			KH15			M	-	no	yes	no		
Jurgen	45	G759	0830	PB	-							
Odense St.			KH15			F	-	no	no	no	no	
Jurgen	46	G847	0831	PB	-							
Odense St.			KH15			M	-	no	no	no	yes	
Jurgen	47	G782	0832	PB	-							
Odense St.			KH15			F	-	no	yes	no		
Jurgen	48	G1162	0833	PB	-							
Odense St.			KH15			M	-	no	yes	yes	yes	
Jurgen	49	G772	0834	PB	-							
Odense St.			KH15			M	-	no	no	no	yes	
Jurgen	50	G22	0835	PB	-							
Odense St.			KH15			M	-	yes	yes	no		
Jurgen	51	G1043	0836	PB	-							
Odense St.			KH15			M	-	no	yes	no		
Jurgen	52	G220	0837	PB	-							
Odense St.			KH15			M	-	no	yes	no		
Jurgen	53	GH52	0838	PB	-							
Odense St.			KH15			M	-	no	no	no	no	
Jurgen	54	G1027	0839	PB	-							
Odense St.			KH15			F	-	no	no	no	no	
Jurgen	55	G210	0840	PB	-							
Odense St.			KH15			M	-	yes	no	yes		
Jurgen	56	G978	0740	PB		M	M	29-36	no	yes	no	
Odense St.			KH15									
Jurgen	56	G978	0741	T					yes			
Odense St.			KH20									
Jurgen	57	G417	0417	PB		F	F	35-45	no	yes	no	
Odense St.			KH20									
Jurgen	57	G417	0418	T					no			
Odense St.			KH20									
Jurgen	58	G896	0419	PB		M	M	35-45	yes	yes	yes	
Odense St.			KH20									
Jurgen	58	G896	0420	T					yes			
Odense St.			KH20			M						
Jurgen	59	G28	0414	PB	M			18-25	yes	yes	yes	
Odense St.			KH20									
Jurgen	60	G166	0415	PB	F		F	22-25	yes	yes	yes	
Odense St.			KH20									
Jurgen	61	G189	0416	PB	F		F	22-25	yes	yes	yes	
Odense St.			KH20									
Jurgen	62	G914	0423	PB	-		F	21-24	no	yes	yes	
Odense St.			KH20									
Jurgen	63	G1042	0424	PB	F		F	24-29	no	yes	yes	
Odense St.			KH15									
Jurgen	64	G658	0745	T	M		M	23-27	no	yes	no	
Odense St.			KH15									
Jurgen	65	G404	0742	PB	M		F	23-26	yes	yes	yes	
Odense St.			KH15									
Jurgen	66	G427	0743	PB	F		M	22-24	yes	yes	yes	
Odense St.			KH15									
Jurgen	67	G722	0747	PB	M		M	22-32	yes	yes	no	
Odense St.			KH15									
Jurgen	68	G749	0738	PB	F		M	18-22	yes	yes	no	

Sejet, Denmark	Odekirkegar d	1	A196/X19 A196/X19	KH18 KH18	PB T	-	M	-	no	yes
	Odekirkegar d	1	6	2065	PB	-		-	no	no
	Odekirkegar d	1	6	2112	T			-	no	no
	Odekirkegar d	2	A1063/X1 063	KH18 2068	PB	-	F	-	no	yes
	Odekirkegar d	2	A547/X30 02	KH18 2072	PB	-	M	-	yes	no
	Odekirkegar d	3	A547/X30 02	KH18 2074	PB	-			no	no
	Odekirkegar d	3	A565/X30 03	KH18 2073	PB	-	M	-	yes	no
	Odekirkegar d	4	A209/X30 15	KH18 2075	PB	-	F	-	yes	no
	Odekirkegar d	5	A209/X30 15	KH18 2103	PB	-			no	no
	Odekirkegar d	5	A569/X56 9	KH18 2076	PB	-	F	-	yes	no
	Odekirkegar d	6	A569/X56 9	KH18 2067	PB	-			no	no
	Odekirkegar d	6	A209/X20 9	KH18 2081	PB	-	M	-	yes	no
	Odekirkegar d	7	A209/X20 9	KH18 2083	PB	-			no	no
	Odekirkegar d	8	A163/X16 3	KH18 2085	PB	-	M	-	yes	no
	Odekirkegar d	8	A163/X16 3	KH18 2084	PB	-			no	no
	Odekirkegar d	9	A167/X16 7	KH18 2086	PB	-	M	-	yes	no
	Odekirkegar d	9	A167/X16 7	KH18 2089	PB	-			no	no
	Odekirkegar d	10	A555/X55 5	KH18 2090	PB	-	M	-	yes	no
	Odekirkegar d	10	A555/X55 5	KH18 2151	PB	-			no	no
	Odekirkegar d	11	A196/X30 16	KH18 2091	PB	-	M	-	yes	no
	Odekirkegar d	11	A196/X30 16	KH18 2069	PB	-			no	no
	Odekirkegar d	12	A114/X30 10	KH18 2092	PB	-	M	-	yes	no
	Odekirkegar d	13	A146/X14 6	KH18 2094	PB	-	M	-	yes	no
	Odekirkegar d	13	A146/X14 6	KH18 2184	PB	-			no	no
	Odekirkegar d	14	A106/X10 6	KH18 2096	PB	-	M	-	yes	no
	Odekirkegar d	14	A106/X10 6	KH18 2095	PB	-			no	no
	Odekirkegar d	15	A114/X11 4	KH18 2097	PB	-	M	-	yes	no
	Odekirkegar d	16	A106/X30 12	KH18 2099	PB	-	F	-	yes	no
	Odekirkegar d	17	A94/X301 3	KH18 2100	PB	-	M	-	yes	no
	Odekirkegar d	18	A167/X30 06	KH18 2104	PB	-	M	-	yes	no
	Odekirkegar d	18	A167/X30 06	KH18 2101	PB	-			no	no
	Odekirkegar d	19	A94/X94 1	KH18 2105	PB	-	F	-	yes	no
	Odekirkegar d	20	A151/X15 1	KH18 2106	PB	-	F	-	yes	no
	Odekirkegar d	20	A151/X15 1	KH18 2088	PB	-			no	no

Odekirkegar		A407/X40	KH18								
d	21	7	2113	PB	-	F	-	no	yes	no	
Odekirkegar		A407/X40	KH18					no			
d	21	7	2111	T				no			
Odekirkegar		A94/X300	KH18								
d	22	9	2114	PB	-	F	-	no	yes	no	
Odekirkegar		A94/X300	KH18					no			
d	22	9	2116	T				no			
Odekirkegar			KH18			M	-	no	yes	no	
d	23	A2/X2	2115	PB	-			no			
Odekirkegar		A146/X30	KH18								
d	24	11	2117	PB	-	M	-	no	yes	no	
Odekirkegar		A146/X30	KH18					no			
d	24	11	2110	T				no			
Odekirkegar		A5465/X3	KH18			M	-	no	yes	yes	
d	25	003	2070	T	-			no			
Odekirkegar		A547/X30	KH18								
d	26	01	2071 [#]	T	-	-	-	no	no	no	
Odekirkegar		A157/X15	KH18					no			
d	27	7	2185	PB	-	F	-	no	yes	yes	
Odekirkegar		A157/X15	KH18					no			
d	27	7	2082	T				no			
Odekirkegar		A144/X14	KH18			M	-	no	no	no	
d	28	4	2098	T	-			no			
Odekirkegar		A16/X301	KH18			M	-	no	no	no	
d	29	3	2102	T	-			no			
Odekirkegar			KH18								
d	30	A2/X3014	2108	T	-	M	-	no	no	no	
Odekirkegar		A151/X30	KH18					no			
d	31	13	2183 [#]	T	-	-	-	no	no	no	
Odekirkegar		A163/X30	KH18					no			
d	32	07	2177	PB	-	M	-	no	yes	yes	
Horsens, Denmark	Ole Worm		A1519/X1	KH18							
Gade	1	519.2	2128	PB	-	F	-	no	yes	no	
Ole Worm		A1519/X1	KH18					no			
Gade	1	519.2	2129	T				no			
Ole Worm		A1548/X1	KH18								
Gade	2	548.2	2131	PB	-	F	-	no	yes	no	
Ole Worm		A1587/X1	KH18					no			
Gade	3	587.1	2137	PB	-	F	-	no	yes	no	
Ole Worm		A1587/X1	KH18					no			
Gade	3	587.1	2136	T				no			
Ole Worm		A1594/X1	KH18								
Gade	4	594.2	2140	PB	-	F	-	no	yes	no	
Ole Worm		A1594/X1	KH18					no			
Gade	4	594.2	2139	T				no			
Ole Worm		A1189/X1	KH18								
Gade	5	189.2	2142	PB	-	M	-	no	yes	no	
Ole Worm		A1189/X1	KH18					no			
Gade	5	189.2	2118	T				no			
Ole Worm		A1643/X1	KH18								
Gade	6	643.1	2144	PB	-	F	-	no	yes	no	
Ole Worm		A1643/X1	KH18					no			
Gade	6	643.1	2143	T				no			
Ole Worm		A1464/X1	KH18								
Gade	7	464.2	2146	PB	-	F	-	no	yes	yes	
Ole Worm		A1513/X1	KH18					no			
Gade	8	513.2	2147	PB	-	M	-	no	yes	no	
Ole Worm		A1513/X1	KH18					no			
Gade	8	513.2	2150	T				no			
Ole Worm		A1513/X1	KH18								
Gade	9	513.1	2149	PB	-	M	-	no	yes	no	
Ole Worm		A1513/X1	KH18					no			
Gade	9	513.1	2172	T				no			
Ole Worm		A1209/X1	KH18								
Gade	10	209.1	2156	PB	-	M	-	no	yes	no	

Ole Worm		A1209/X1	KH18								
Gade	10	209.1	2157	T					no		
Ole Worm		A1587/X1	KH18								
Gade	11	587.2	2133	PB	-	F	-	no	yes	yes	
Ole Worm		A1587/X1	KH18								
Gade	11	587.2	2134	T				no			
Ole Worm		A1455/X1	KH18			M	-	no	yes	yes	
Gade	12	455.2	2145	T	-			no	yes	yes	
Ole Worm		A1248/X1	KH18								
Gade	13	248.1	2186	PB	-	M	-	no	yes	yes	
Ole Worm		A1248/X1	KH18								
Gade	13	248.1	2107	T				no			
Ole Worm		A1209/X1	KH18								
Gade	14	209.2	2153	T	-	-	-	no	no	no	
Ole Worm		A1190/X1	KH18			F	-	no	yes	no	
Gade	15	190.1	2162	T	-			no	yes	no	
Ole Worm		A1109/X1	KH18								
Gade	16	109.2	2163	PB	-	F	-	no	no	yes	
Ole Worm		A1109/X1	KH18								
Gade	16	109.2	2164	T				no			
Ole Worm		A1109/X1	KH18								
Gade	17	109.1	2165	PB	-	M	-	no	yes	yes	
Ole Worm		A1109/X1	KH18								
Gade	17	109.1	2166	T				no			
Ole Worm		A1063/X1	KH18								
Gade	18	603.2	2179	T	-	F	-	no	no	no	
Ole Worm			KH18								
Gade	19	X1402	1534	PB	-	M	-	no	yes	yes	
Ole Worm			KH18								
Gade	19	X1402	1535	T				no			
Ole Worm			KH18								
Gade	20	X1468	1659	PB	-	M	-	no	yes	yes	
Ole Worm			KH18								
Gade	21	X1424	1666	PB	-	M	-	no	yes	no	
Ole Worm			KH18								
Gade	21	X1424	1667	T				no			
Ole Worm			KH18								
Gade	22	X1017	1668	PB	-	M	-	no	yes	yes	
Ole Worm			KH18								
Gade	22	X1017	1669	T				no			
Ole Worm			KH18								
Gade	23	X1177	1531	foot	-	M	-	no	no	no	
Ole Worm			KH18								
Gade	24	X1477	1665	foot	-	M	-	no	no	no	
Ole Worm			KH18								
Gade	25	305.2	2079	PB	-	M	-	no	no	yes	
Ole Worm			KH18								
Gade	26	063.1	2080	PB	-	F	-	no	yes	no	
Ole Worm			KH18								
Gade	26	063.1	2181	T				no			
Ole Worm			KH18								
Viborg, Denmark	St. Morten	1	G1012	1498	PB	-	M	-	no	yes	yes
	St. Morten	1	G1012	1499	T				no		
	St. Morten	2	G1007	1516	PB	-	M	-	no	yes	yes
	St. Morten	2	G1007	1517	T				no		
	St. Morten	3	G1050	1696	PB	-	F	-	no	yes	yes
	St. Morten	3	G1050	1697	T				no		
	St. Morten	4	G1053	1709	PB	-	M	-	no	yes	yes
	St. Morten	4	G1053	1710	T				no		

St.							F				
Trinitatis/St.			KH18								
Drotten	1	G44	1500	PB	-			-	no	no	yes
St.											
Trinitatis/St.			KH18								
Drotten	2	G11	1501	PB	-		F	-	no	yes	yes
St.											
Trinitatis/St.			KH18						no		
Drotten	2	G11	1502	T							
St.											
Trinitatis/St.			KH18								
Drotten	3	G74	1506	PB	-		F	-	no	yes	yes
St.											
Trinitatis/St.			KH18						no		
Drotten	3	G74	1507	T							
St.											
Trinitatis/St.			KH18								
Drotten	4	G48	1509	PB	-		F	-	no	yes	no
St.											
Trinitatis/St.			KH18						no		
Drotten	4	G48	1510	T							
St.											
Trinitatis/St.			KH18								
Drotten	5	G66	1511	PB	-		M	-	no	yes	no
St.											
Trinitatis/St.			KH18						no		
Drotten	5	G66	1512	T							
St.											
Trinitatis/St.			KH18								
Drotten	6	G10	1513	PB	-		M	-	no	yes	no
St.											
Trinitatis/St.			KH18						no		
Drotten	6	G10	1514	T							
St.											
Trinitatis/St.			KH18								
Drotten	7	G28	1518	PB	-		F	-	no	yes	yes
St.											
Trinitatis/St.			KH18						no		
Drotten	7	G28	1519	T							
St.											
Trinitatis/St.			KH18								
Drotten	8	G12	1520	PB	-		F	-	no	yes	yes
St.											
Trinitatis/St.			KH18								
Drotten	8	G12	1521	T							
St.											
Trinitatis/St.			KH18								
Drotten	9	G52	1687	PB	-		F	-	no	yes	yes
St.											
Trinitatis/St.			KH18						no		
Drotten	9	G52	1688	T							
St.											
Trinitatis/St.			KH18								
Drotten	10	G1	1711	PB	-		M	-	no	yes	no
St.											
Trinitatis/St.			KH18								
Drotten	10	G1	1712	T							
St.											
Trinitatis/St.			KH18								
Drotten	11	G14	1717	PB	-		M	-	no	yes	yes
St.											
Trinitatis/St.			KH18								
Drotten	11	G14	1718	T							
St.											
Trinitatis/St.			KH18								
Drotten	12	G72	1715	PB	-		M	-	no	yes	yes

St.										
Trinitatis/St.			KH18							
Drotten	12	G72	1716	T				no		
St.										
Trinitatis/St.			KH18			M				
Drotten	13	G89	1693	foot	-		-	no	no	no
St.										
Trinitatis/St.			KH18			F		no	yes	no
Drotten	14	G279X926	1504	PB	-		-			
St.										
Trinitatis/St.			KH18			F		no		
Drotten	14	G279X926	1505	T						
St.										
Trinitatis/St.			KH18			F		no	yes	no
Drotten	15	G276X911	1691	PB	-		-			
			KH18			F		no	yes	no
St. Mathias	1	G152	1528	PB	-		-			
			KH18							
St. Mathias	2	G151	1713	PB	-	M	-	no	yes	no
			KH18							
St. Mathias	2	G151	1714	T				no		
			KH18							
St. Mathias	3	G146	1515	hand	-	M	-	no	no	no
			KH18							
Faldborg	1	X202	1522	PB	-	F	-	no	no	no
			KH18							
Faldborg	2	X491	1526	PB	-	F	-	no	yes	no
			KH18							
Faldborg	2	X491	1527	T				no		
			KH18							
Faldborg	3	X133	1660	PB		M		no		yes
			KH18							
Faldborg	3	X133	1661	T	-		-	no	yes	
			KH18							
Faldborg	4	X76	1662	PB	-	F	-	no	yes	yes
			KH18							
Faldborg	4	X76	1663	T				no		
			KH18							
Mikkel	1	X52	1554	PB	-	M	-	no	yes	yes
			KH18							
Mikkel	1	X52	1555	T				no		
			KH18							
Mikkel	2	X83	1556	T	-	F	-	no	yes	yes
			KH18							
Mikkel	3	X205	1557	PB	-	F	-	no		
			KH18							
Mikkel	3	X205	1558	T				no	yes	yes
			KH18							
Mikkel	4	X115	1562	PB	-	M	-	no		
			KH18							
Mikkel	4	X115	1563	T				no	yes	yes
			KH18							
Mikkel	5	X133	1564	PB	-	F	-	no		
			KH18							
Mikkel	5	X133	1565	T				no	yes	yes
			KH18							
Mikkel	6	X106	1566	PB	-	M		no		
			KH18							
Mikkel	6	X106	1567	T	-		-	no	yes	yes
			KH18							
Mikkel	7	X181	1707	PB	-	F	-	no		
			KH18							
Mikkel	7	X181	1708	T				no	yes	yes
			KH18							
Mikkel	8	X254	1676	PB	-	F	-	no		
			KH18							
Mikkel	8	X254	1677	T				no	no	no

			KH18							
Mikkel	9	X88	1694	PB	-	F	-	no		
			KH18							
Mikkel	9	X88	1695	T				no	yes	yes
			KH18							
Mikkel	10	X118	1701	foot	-	F	-	no	yes	no
			KH18							
Mikkel	11	X152	1704	foot	-	M	-	no	yes	no
			KH18							
Mikkel	12	X132	1719 [#]	foot	-	-	-	no	no	no
			KH18							
Grabodre	1	G18	1503	hand	-	M	-	no	yes	no
			KH18							
Grabodre	2	G42	1508	PB	-	F	-	no	yes	yes
			KH18	foot/h		M	-	no	no	yes
Odense, Denmark	3	G26	1698	and	-					
Klosterbakk en	1	x2186	0071	PB	-	M	-	no		
Klosterbakk en	1	x2186	0072	T				no	yes	yes
Skt. Knuuds Plads	1	G547	0073	PB	-	M	-	no		
Skt. Knuuds Plads	1	G547	0074	T				no	yes	yes
Skt. Knuuds Plads	2	G540	0079	PB	-	F	-	no		
Skt. Knuuds Plads	2	G540	0080	T				no	yes	yes
			A156/X24							
Albani Torv	1	4	2121	PB	-	F	-	no		
			A156/X24	KH18						
Albani Torv	1	4	2120	T				no	no	no
			A156/X24	KH18						
Albani Torv	2	2	2123	PB	-	M	-	no		
			A156/X24	KH18						
Albani Torv	2	2	2122	T				no	yes	no
			A156/X24	KH18						
Albani Torv	3	1	2124	PB	-	M	-	no		
			A156/X24	KH18						
Albani Torv	3	1	2125	T				no	no	no
			A156/X24	KH18						
Albani Torv	4	3	2127	PB	-	M	-	no		
			A156/X24	KH18						
Albani Torv	4	3	2126	T				no	yes	no
			A156/X25	KH18						
Albani Torv	5	2	2152	PB	-	M	-	no		
			A156/X25	KH18						
Albani Torv	5	2	2182	T				no	yes	no
			KH16							
Albani Torv	6	AT82/G4	0081	PB	-	M	-	no		
			KH16							
Albani Torv	6	AT82/G4	0082	T				no	yes	yes
			KH16							
Albani Torv	7	G122	0075	PB	-	F	-	no		
			KH16							
Albani Torv	7	G122	0076	T				no	yes	yes
			KH16							
Albani Torv	8	G109	0077	PB	-	F	-	no		
			KH16							
Albani Torv	8	G109	0078	T				no	yes	no

PB – petrous bone; T – tooth, F – female, M – male; PF – probably female; PM – probably male; [#] - contaminated

Table S3. Skeletal features considered for the sex estimation of individuals from Lubeck St. Jurgen. For the score range 1-3, the scores indicate as follows: 1 – female, 3 – indeterminate and 5 – male. For the score range 1-5, the scores are: 1 – female, 2 – probable female, 3 – indeterminate, 4 – probable male and 5 – male.

Skeletal element	Feature	Score range	Score weight
Cranium	nuchal surface	1-3	1
	occipital tuberosity	1-5	2
	mastoid process	1-5	2
	supraorbital margin	1-5	1
	glabella	1-5	2
	frontal eminence	1-3	1
	parietal eminence	1-3	1
	orbital shape	1-5	1
	zygomatic arch	1-3	1
	supraorbital crest	1-5	1
Mandible	frontal slope	1-5	1
	mental eminence	1-5	2
	gonial region	1-3	1
	gonial angle	1-3	1
	condylar process	1-5	1
Pelvis	body height at second molar	1-5	1
	greater sciatic notch	1-5	2
	ventral arch	1-3	2
	subpubic concavity	1-3	2
	ischiopubic ramus	1-3	2
	ischiopubic ratio	1-3	1
	obturator foramen	1-3	1
	auricular rim	1-3	1
	iliac crest	1-3	1

Table S4. HLA calls with TARGT pipeline for 32 individuals from Odense (this study vs. Pierini et al., 2020).

This study (2022)											
Individual ID	Class I HLA						Class II HLA				
	A1	A2	B1	B2	C1	C2	DQB1 1	DQB1 2	DRB1 1	DRB1 2	
G730	x	x	na	na	x	x	x	x	x	x	
G1149	03	na	na	na	x	x	03:01: 01G	na	x	x	
G33	x	x	na	na	07	na	06	na	x	x	
G669	x	x	x	x	05	na	x	x	x	x	
G712	03	02	na	08	07:02: 01G	na	02:01: 01G	06:10: 01	15	03	
G708	x	x	na	na	07	na	03:02	na	x	x	
G102	68	na	08	na	07	na	03	na	x	x	
G43	02	01	07	na	15	07	03	na	15	na	
G864	02	02	x	x	na	na	x	x	13	na	
G119	23	na	x	x	na	na	x	x	x	x	
G911	02	na	44	na	03	na	x	x	x	x	
G118	01	02	27	na	07	02	02:01: 01G	03:02	04	03	
G164	na	na	na	na	x	x	x	x	15	na	
G165	03	na	x	x	x	x	03	na	15	na	
G942	11	31	35	48	04	na	x	x	15	04	
G120	68	na	na	na	03	03	06	06	13	13	
G397	02	29	44:18 :01	na	03	16	x	x	04:33: 01	10	
G939	03	26	15	na	na	na	x	x	x	x	
G24	01	02:123 :01	na	na	07	07	x	x	x	x	
G48	na	na	na	na	06	07	x	x	07	07	
G943	02	na	na	na	03	na	02:01: 01G	03:02: 01G	na	na	
G738	02	03	07	07	07	03	06	03:02: 01G	15	04	
G417	03	03	40	15	03	02	06	03	04:01: 01G	15	
G896	01:01: 01G	02	07	08:01: 01G	07	01:02: 35	02:01: 01G	06	03	15:01: 01G	
G28	68:01: 02G	03:01: 01G	07	44:02: 01G	07:04: 01G	07:02: 01G	05:01: 01G	06:02: 01G	15:01: 01G	01:01: 01G	
G166	11	02	08	51	03	07	03:02: 01G	02:01: 01G	04	03	
G189	x	x	15	na	03	12:04: 01	x	x	04	na	
G914	02	02	x	x	x	x	x	x	07	na	
G1042	74	na	44	na	na	na	x	x	x	x	
G658	23	30:02: 01G	07	18	07	05	02:01: 01G	na	15	03	
G722	na	na	07	na	x	x	x	x	15	na	
G978	02	03	07	na	07	12	06	na	15	na	

Pierini et al., 2020										
Individual ID	Class I HLA						Class II HLA			
	A1	A2	B1	B2	C1	C2	DQB1 1	DQB1 2	DRB1 1	DRB1 2
G730	03:01	02	40:01	51:01	03	02	06:02	05:01	01:01	15:01
G1149	02:01	03:01	07:02	44:02	05:01	07:02	03:01	06:02	04:01	15:01
G33	26:01	68	51:01	07	15	07	06:02	06:03	15	13:01
G669	02:01	26:01	38	44:02	05:01	12:03	06:02	05:02	16:01	15:01
G712	02	03	07:02	08:01	07:01	07:01	02:01	06:02	03:01	15:01
G708	02:01	na	15:01	57:01	03	07:01	03:02	03:02	07	04:01
G102	02	na	18	44	07	03	03:01	03:02	04:03	11
G43	02:01	11:01	51:01	07:02	07	15	06:02	03:02	15:01	04:04
G864	02:01	26	08:01	40:01	03	07	02:01	06:04	13:02	03:01
G119	24:02	24:02	07:02	07:02	07	07	06:02	06:02	15:01	15:01
G911	02:01	na	15	44:02	03	05	03:01	03	04:01	04:01
G118	na	na	na	na	na	na	na	na	na	na
G164	na	na	na	na	na	na	na	na	na	na
G165	03:01	02	15:01	44:03	03	16	06:02	03:02	15	04:01
G942	11	na	35	40:01	04	04	03:10	06:02	15:01	04:03
G120	68	11	na	na	03	na	06:02	06:04	13	15:01
G397	29	02	45	na	na	na	03:02	05:01	04:01	10
G939	03	26	15	na	03	14	na	na	01:01	01:01
G24	01:01	24:02	57:01	39:06	07	06	04	03:03	07:01	08:01
G48	24:02	02:01	39:06	57:01	na	na	05:01	03:03	01:01	07:01
G943	na	na	na	na	na	na	na	na	na	na
G738	02	03	na	na	na	na	03	06	na	na
G417	na	na	na	na	na	na	06	na	na	na
G896	01:01	02	na	na	07	na	02:01	06:02	03:01	15:01
G28	68	na	na	na	na	na	06:02	na	na	na
G166	na	na	na	na	na	na	na	na	na	na
G189	02	01	57:01	na	na	na	na	na	07:01	04
G914	02:06	na	na	na	na	na	05:01	02	na	na
G1042	na	na	na	na	na	na	na	na	na	na
G658	30	24	07	18	07	na	02	06:02	na	na
G722	36	na	na	na	na	na	03	06:02	15	na
G978	na	na	na	na	na	na	na	na	na	na

x – no fasta file produced by TARGT; na – no call possible, **in red** – differences in allele calls

Table S5. HLA statistics for medieval cases (St. Jorgen, Odense).

Location	Site	N of individuals	N of class I HLA alleles			N of class II HLA alleles	
			A	B	C	DQB1	DRB1
Odense, Denmark	St. Jorgen	73	109	106	107	114	109

Table S6. HLA statistics for medieval cases (Melaten).

Location	Site	N of individuals	N of class I HLA alleles			N of class II HLA alleles	
			A	B	C	DQB1	DRB1
Aachen, Germany	Melate n	26	46	35	40	36	38

Table S7. HLA statistics for medieval controls.

Location	Site	N of individuals	N of class I HLA alleles			N of class II HLA alleles	
			A	B	C	DQB1	DRB1
Horsens, Denmark	Ole Worm Gade	20	35	36	36	36	36
Ribe, Denmark	Klosterkirk en	32	56	55	50	50	52
Viborg, Denmark	Lindesgarde n	21	40	36	34	33	36
	St. Drotten	13	24	23	24	21	20
	Faldborg	3	6	4	4	4	3
	Grabodre	2	4	4	4	4	3
	St. Mathias	2	3	1	1	0	0
	Mikkel	10	16	15	16	16	15
	St. Morten	4	8	7	8	8	8
Tirup, Denmark	Tirup	28	41	39	45	38	36
Sejet, Denmark	Odekirkega rd	27	52	52	50	50	50
Lubeck, Germany	Lubeck St.						
Odense, Denmark	Jurgen Klosterbak ken	30	55	56	52	58	57
	Skt. Knuuds Plads	1	2	2	2	2	2
	Albani Torv	2	4	4	4	4	4
		6	12	10	11	11	12

Table S8. Skeletal elements of subadult individuals that contributed to estimation of the minimum number of individuals.

		Age [years]						
		fetus [#]	0-3	3-6	6-12	12-20	3-12	subadult [#]
Skeletal element	femur (R)	-	2	-	2	4	1	-
	femur (L)	-	2	-	2	-	2	-
	tibia (R)	1	2	1	-	-	-	3
	tibia (L)	-	1	1	-	-	2	1
	fibula (R)	-	1	-	-	-	2	1
	humerus (R)	-	-	1	-	1	1	1
	humerus (L)	-	-	1	1	2	2	-
	ulna (L)	-	1	1	-	1	-	-
	clavicle (L)	-	-	-	-	1	-	1
	mandible	-	2	1	1	-	-	-
	cranial fragment	-	-	-	-	-	4	-

R – right; L – left; [#] - age range was not possible to asses;

Table S9. Skeletal elements of adult individuals that contributed to estimation of the minimum number of individuals.

	Bone preservation [%]				Estimated N of individuals	
	76-100	51-75	26-50	0.1-25	Min	Max
tibia (L)	27	4	2	4	31	37
cranial elements	3	7	7	19	10	36
tibia (R)	24	2	3	5	26	34
humerus (L)	22	2	1	2	24	27
femur (L)	12	2	4	5	14	23
femur (R)	17	0	2	3	17	22
fibula (L)	7	1	4	10	8	22
humerus (R)	14	0	5	3	14	22
radius (R)	13	2	2	4	13	21
Skeletal element	fibula (R)	9	3	0	6	12
	ulna (R)	15	1	1	1	16
	scapula (R)	1	3	1	12	4
	ulna (L)	13	1	2	1	14
	pelvis (R)	4	7	2	1	11
	sacrum	3	1	0	10	4
	scapula (L)	3	1	0	10	4
	pelvis (L)	1	6	4	2	7
	clavicle (R)	10	1	0	0	10
	mandible	5	5	0	1	10
	radius (L)	5	1	4	1	6
	clavicle (L)	9	0	0	1	9
						10

R – right; L – left;

Table S10. Skeletal elements used for sex estimation of individuals from Lubeck St. Jurgen.

	Predicted sex				
	F	PF	PM	M	Total
pelvis (R)	3	5	5	2	15
pelvis (L)	2	2	7	1	12
Skeletal element	cranium	12	12	-	27
	mandible	1	5	3	7
	cranial fragments	1	8	0	1
	Total	19	32	15	80

R – right; L – left; F – female, M – male; PF – probably female; PM – probably male;

Table S11. Results of the kinship analysis: individuals for which both softwares (lcMLkin and READ) indicated kinship. Only results based on at least 1000 SNPs were considered reliable.

Individ ual 1	Individ ual 2	lcML kin	k0	k1	k2	pi_HAT	N of SNPs
G272	G557	2nd degree	0.771	0.010	0.219	0.224	54855
G269 R	G557	3rd degree	0.883	0.018	0.099	0.108	16197
G272	G414	4th degree	0.929	0.017	0.054	0.063	14274
G557	G414	2nd degree	0.759	0.021	0.220	0.230	12713
X133	X254	1st degree	0.665	0.041	0.294	0.315	11837
X133	926	G279X 1st degree	0.633	0.004	0.363	0.365	17147
G279X 926	G1	2nd degree	0.749	0.018	0.233	0.242	12244
Individ ual 1	Individ ual 2	REA D	Z upper	Z lower	pairwise mismatch [%]	N of mismatc h	N of SNPs
G272	G557	2nd degree	0.7464117	1.0524880	-	-	1119
G269 R	G557	1st degree	0.4863159	1.1489704	-	38	194
G272	G414	1st degree	1.1273873	0.9346797	-	53	285
G557	G414	1st degree	0.1842182	1.2488252	-	29	146
X133	X254	2nd degree	0.0819222	0.7998730	-	56	250
X133	926	G279X 2nd degree	0.6957713	0.3573318	-	74	336
G279X 926	G1	2nd degree	0.3725589	0.5484830	-	59	399

Table S12. HLA alleles called with TARGT pipeline by two independent observers - reproducibility test. Observer A is more experienced in manual HLA calling relative to observer B. All individuals were from Ribe, Denmark.

Observer A									
Individual ID	G124	G 13	G392	G203	G125	G611/G 612	G110	G1149	G887
HLA-A 1	02:01: 01G	03	03:01: 01G	01	01:01: 01G	32:01:0 1G	32:01: 01G	03:01: 01G	-
HLA-A 2	24:02: 01G	03	03:01: 01G	03	02	24	11	68:01: 02G	-
HLA-B 1	51:01: 01G	27:05: 02G	27:05: 02G	08	48:03: 01	07	57:01: 01G	07:02: 01G	15:01: 01G
HLA-B 2	15:14: 01	44	08	07	07	14:01:0 1G	44	40	40:114 :01
HLA-C 1	15:02: 01G	02:02: 02G	07	07	03	08:02:0 1G	05:01: 01G	07	03:04: 01G
HLA-C 2	03	05	02	07	07	07	06	03:04: 01G	03:04: 01G
HLA-DQB1 1	06:03: 01G	06:04: 01G	03:04: 01G	06	03:03: 02G	02:01:0 1G	03:03: 02G	06:03: 01G	04:02: 01G
HLA-DQB1 2	03:01: 01G	05:01: 01G	05:01: 01G	02:01: 01G	06:02: 01G	05:02:0 1G	06:04: 01G	05:01: 01G	03:02: 01G
HLA-DRB1 1	11:01: 01G	13:02: 01G	03	15	07:01: 01G	16:01:0 1	13:02: 01G	01:01: 01G	-
HLA-DRB1 2	13:01: 01G	01	01:01: 01G	03:01: 01G	15:01: 01G	07:01:0 1G	09	13:01: 01G	-
Observer B									
Individual ID	G124	G 13	G392	G203	G125	G611/G 612	G110	G1149	G887
HLA-A 1	02:01: 01G	03	03:01: 01G	na	01:01: 01G	24	na	03	-
HLA-A 2	24:02: 01G	03	03:01: 01G	na	02	32:01:0 1G	32:01: 01G	68	-
HLA-B 1	15:14: 01	27:05: 02G	27:05: 02G	na	na	07	57:01: 01G	na	15:01: 01G
HLA-B 2	51:01: 01G	44	08	na	na	na	44	na	na
HLA-C 1	03	02:02	02	07	03	07	05	03	03:04: 01G
HLA-C 2	15	05	07	na	07	08	06	07	03:04: 01G
HLA-DQB1 1	06:03: 01G	06	03:04: 01G	02:01: 01G	03:03: 02G	02:01:0 1G	03:03: 02G	05:01: 01G	03:02: 01G
HLA-DQB1 2	03:01: 01G	na	05:01: 01G	na	06:02: 01G	05:02:0 1G	06:04: 01G	06:03: 01G	04:02: 01G
HLA-DRB1 1	11:01: 01G	01	01	03	07:01: 01G	07:01:0 1G	09	01:01: 01G	-
HLA-DRB1 2	13:01: 01G	13:02: 01G	03:23: 01	15	15:01: 01G	16	13:02: 01G	13:01: 01G	-

na – no call possible; “-“ - not included in the test

Table S13. Frequencies of HLA alleles in medieval cases and controls. For each locus, the total number of different alleles called at the first-field resolution is highlighted.

Locus	Allele	Cases (N=155)	Frequency [%]	Controls (N=358)	Frequency [%]
HLA-A	01	20	12,9	65	18,2
	01	9	5,8	42	11,7
	01:01	6	3,9	0	0,0
	01:01:01G	5	3,2	23	6,4
	02	49	31,6	117	32,7
	02	36	23,2	85	23,7
	02:01:01G	0	0	29	8,1
	02:01	11	7,1	2	0,6
	02:02:01G	1	0,6	0	0,0
	02:10:01G	1	0,6	0	0,0
	02:123:01	0	0	0	0,0
	02:30:01	0	0	1	0,3
	03	26	16,8	50	14,0
	03	14	9	22	6,1
	03:01	9	5,8	0	0,0
	03:01:01G	2	1,3	27	7,5
	03:05:01	1	0,6	0	0,0
	03:09:01	0	0	1	0,3
	11	11	7,1	22	6,1
	11	6	3,9	11	3,1
	11:01	1	0,6	0	0,0
	11:01:01G	4	2,6	10	2,8
	11:12:01	0	0	1	0,3
	23	7	4,5	1	0,3
	23	3	1,9	1	0,3
	23:01:01G	4	2,6	0	0,0
	24	10	6,5	33	9,2
	24	6	3,9	17	4,7
	24:02:01G	0	0	11	3,1
	24:01	1	0,6	0	0,0
	24:02	3	1,9	0	0,0
	24:02:06	0	0	1	0,3
	24:02:08	0	0	1	0,3
	24:14:01G	0	0	1	0,3
	24:17:01	0	0	1	0,3
	24:206:1	0	0	1	0,3
	25	0	0	5	1,4
	25:01:01G	0	0	5	1,4
	26	8	5,2	6	1,7
	26	3	1,9	3	0,8

		Cases (N=141)	Frequency [%]	Controls (N=344)	Frequency [%]
HLA-B	Allele	Cases (N=141)	Frequency [%]	Controls (N=344)	Frequency [%]
	26:01:01G	1	0,6	2	0,6
	26:01	3	1,9	1	0,3
	26:08:01	1	0,6	0	0,0
	29	2	1,3	5	1,4
	29	2	1,3	2	0,6
	29:02:01G	0	0	3	0,8
	30	2	1,3	9	2,5
	30	0	0	4	1,1
	30:01:01G	1	0,6	4	1,1
	30:02:01G	1	0,6	1	0,3
	31	3	1,9	9	2,5
	31	2	1,3	4	1,1
	31:01	1	0,6	0	0,0
	31:02:01G	0	0	5	1,4
	32	4	2,6	12	3,4
	32	3	1,9	3	0,8
	32:01:01G	0	0	8	2,2
	32:01	1	0,6	1	0,3
	33	0	0	2	0,6
	33:01:01G	0	0	1	0,3
	33:108:01	0	0	1	0,3
	36	1	0,6	1	0,3
	66	0	0	3	0,8
	66	0	0	1	0,3
	66:01:01G	0	0	2	0,6
	68	10	6,5	17	4,7
	68	7	4,5	8	2,2
	68:01:02G	1	0,6	4	1,1
	68:01:01G	0	0	2	0,6
	68:01	2	1,3	2	0,6
	68:02	0	0	1	0,3
	69	1	0,6	0	0,0
	69:01:01G	1	0,6	0	0,0
	74	1	0,6	1	0,3
<hr/>					
	Allele	Cases (N=141)	Frequency [%]	Controls (N=344)	Frequency [%]
HLA-B	07	26	18,4	49	14,2
	07	12	8,5	25	7,3
	07:02	9	6,4	1	0,3
	07:02:01G	4	2,8	22	6,4
	07:05:01G	1	0,7	0	0,0
	07:42:01	0	0	1	0,3
	08	15	10,6	42	12,2

08	5	3,5	21	6,1
08:01	6	4,3	0	0,0
08:01:01G	2	1,4	20	5,8
08:03:01	1	0,7	0	0,0
08:18:01	1	0,7	0	0,0
08:23:01	0	0	1	0,3
15	21	14,9	41	11,9
15	18	12,8	27	7,8
15:01	3	2,1	0	0,0
15:01:01G	0	0	10	2,9
15:14:01	0	0	1	0,3
15:40:01	0	0	2	0,6
15:42:01	0	0	1	0,3
18	3	2,1	17	4,9
18	3	2,1	9	2,6
18:01:01G	0	0	8	2,3
27	4	2,8	21	6,1
27	1	0,7	9	2,6
27:05	1	0,7	0	0,0
27:05:02G	2	1,4	12	3,5
35	6	4,3	17	4,9
35	3	2,1	8	2,3
35:01	1	0,7	0	0,0
35:01:01G	1	0,7	4	1,2
35:03	1	0,7	0	0,0
35:03:01G	0	0	4	1,2
35:05:01G	0	0	1	0,3
37	1	0,7	8	2,3
37	0	0	2	0,6
37:01:01G	0	0	5	1,5
37:07:01	1	0,7	1	0,3
38	5	3,5	1	0,3
38	3	2,1	1	0,3
38:01:01G	2	1,4	0	0,0
39	2	1,4	12	3,5
39	0	0	2	0,6
39:01:01G	0	0	3	0,9
39:02	0	0	1	0,3
39:06	2	1,4	0	0,0
39:06:02G	0	0	6	1,7
40	14	9,9	32	9,3
40	6	4,3	19	5,5
40:01	6	4,3	1	0,3

40:01:01G	0	0	1	0,3
40:02:01G	0	0	1	0,3
40:07:01	0	0	2	0,6
40:10:01G	0	0	4	1,2
40:30	1	0,7	1	0,3
40:43:01	1	0,7	0	0,0
40:114:01	0	0	3	0,9
41	1	0,7	1	0,3
41:02:01G	1	0,7	1	0,3
42	1	0,7	0	0,0
44	19	13,5	27	7,8
44	8	5,7	17	4,9
44:02	7	5	0	0,0
44:02:01G	1	0,7	7	2,0
44:03	2	1,4	0	0,0
44:03:01G	0	0	2	0,6
44:05:01	0	0	1	0,3
44:18:01	1	0,7	0	0,0
45	1	0,7	1	0,3
45:01	1	0,7	0	0,0
45:04	0	0	1	0,3
48	1	0,7	5	1,5
48	0	0	3	0,9
48:03:01	0	0	2	0,6
48:04:01	1	0,7	0	0,0
50	1	0,7	1	0,3
50:01:01G	1	0,7	1	0,3
51	9	6,4	29	8,4
51	5	3,5	12	3,5
51:01	4	2,8	0	0,0
51:01:01G	0	0	11	3,2
51:01:02	0	0	2	0,6
51:07:01	0	0	1	0,3
51:08:01G	0	0	1	0,3
51:21:01	0	0	2	0,6
52	1	0,7	0	0,0
52:01:01G	1	0,7	0	0,0
55	2	1,4	8	2,3
55	1	0,7	3	0,9
55:01	1	0,7	0	0,0
55:01:01G	0	0	5	1,5
56	1	0,7	2	0,6
56	0	0	2	0,6

56:01	1	0,7	0	0,0
57	7	5	13	3,8
57	2	1,4	0	0,0
57:01	4	2,8	0	0,0
57:01:01G	1	0,7	13	3,8
13	0	0	8	2,3
13	0	0	1	0,3
13:02:01G	0	0	7	2,0
14	0	0	2	0,6
14:01:01G	0	0	2	0,6
49	0	0	2	0,6
49:01:01G	0	0	1	0,3
49:45:01	0	0	1	0,3
58	0	0	4	1,2
58	0	0	1	0,3
58:01:01G	0	0	3	0,9
81	0	0	1	0,3
81:01:01G	0	0	1	0,3

Allele	Cases (N=147)	Frequency [%]	Controls (N=341)	Frequency [%]
HLA-C				
01	5	3,4	4	1,2
01	2	1,4	0	0,0
01:02:01G	2	1,4	4	1,2
01:02:35	1	0,7	0	0,0
02	6	4,1	17	5,0
02	5	3,4	5	1,5
02:02	0	0	4	1,2
02:02:01G	0	0	1	0,3
02:02:02G	1	0,7	7	2,1
03	37	25,2	86	25,2
03	35	23,8	55	16,1
03:02:01G	0	0	1	0,3
03:03:01G	0	0	13	3,8
03:04:01G	0	0	14	4,1
03:07:01	1	0,7	1	0,3
03:01:01	1	0,7	0	0,0
03:14:01G	0	0	1	0,3
03:95:01	0	0	1	0,3
04	11	7,5	21	6,2
04	9	6,1	10	2,9
04:01:01G	2	1,4	11	3,2
05	10	6,8	18	5,3
05	7	4,8	14	4,1

05:01	3	2	0	0,0
05:01:01G	0	0	4	1,2
06	6	4	33	9,7
06	3	2	17	5,0
06:02:01G	3	2	15	4,4
06:27:01	0	0	1	0,3
07	50	34	109	32,0
07	36	24,5	56	16,4
07:01	4	2,7	0	0,0
07:01:01G	1	0,7	25	7,3
07:02	2	1,4	0	0,0
07:02:01G	3	2	20	5,9
07:04:01G	4	2,7	4	1,2
07:07:01	0	0	1	0,3
07:19:01	0	0	1	0,3
07:27:01	0	0	1	0,3
07:46:01	0	0	1	0,3
08	0	0	7	2,1
08	0	0	2	0,6
08:02:01G	0	0	2	0,6
08:04	0	0	1	0,3
08:05:01	0	0	2	0,6
11	0	0	1	0,3
12	10	6,8	15	4,4
12	4	2,7	7	2,1
12:03	1	0,7	0	0,0
12:03:01G	3	2	8	2,3
12:04:01	1	0,7	0	0,0
12:16:01	1	0,7	0	0,0
14	0	0	8	2,3
14	0	0	5	1,5
14:02:01G	0	0	3	0,9
15	6	4	10	2,9
15	5	3,4	5	1,5
15:02:01G	0	0	3	0,9
15:05:01G	1	0,7	0	0,0
15:11:01	0	0	2	0,6
16	5	3,4	10	2,9
16	3	2	3	0,9
16:01:01G	2	1,4	6	1,8
16:02:01G	0	0	1	0,3
17	1	0,7	1	0,3
17:01:01G	1	0,7	1	0,3

	18	0	0	1	0,3
	18:10:01	0	0	1	0,3
	Allele	Cases (N=150)	Frequency [%]	Controls (N=335)	Frequency [%]
HLA-DQB1					
	02	23	15,3	68	20,3
	02	5	3,3	5	1,5
	02:01	8	5,3	0	0,0
	02:01:01G	10	6,7	63	18,8
	03	53	35,3	102	30,4
	03	9	6	8	2,4
	03:01	8	5,3	1	0,3
	03:01:01G	6	4	37	11,0
	03:02:01G	6	4	34	10,1
	03:02	18	12	2	0,6
	03:04:01G	0	0	1	0,3
	03:05:01G	0	0	19	5,7
	03:03	2	1,3	0	0,0
	03:03:02G	2	1,3	0	0,0
	03:05:01G	1	0,7	0	0,0
	03:10	1	0,7	0	0,0
	04	4	2,7	19	5,7
	04	3	2	1	0,3
	04:01:01G	0	0	1	0,3
	04:02:01G	1	0,7	17	5,1
	05	19	12,7	39	11,6
	05	2	1,3	2	0,6
	05:01	7	4,7	0	0,0
	05:01:01G	5	3,3	32	9,6
	05:02	2	1,3	0	0,0
	05:02:01G	0	0	2	0,6
	05:03	1	0,7	0	0,0
	05:03:01G	2	1,3	3	0,9
	06	51	34	107	31,9
	06	15	10	37	11,0
	06:01:01G	1	0,7	0	0,0
	06:02	19	12,7	0	0,0
	06:02:01G	1	0,7	23	6,9
	06:03	4	2,7	0	0,0
	06:03:01G	2	1,3	22	6,6
	06:04	4	2,7	0	0,0
	06:04:01G	1	0,7	21	6,3
	06:09:01G	1	0,7	2	0,6
	06:10:01	3	2	1	0,3

	06:164:01	0	0	1	0,3
	Allele	Cases (N=147)	Frequency [%]	Controls (N=334)	Frequency [%]
HLA-DRB1					
	01	15	10,2	30	9,0
	01	8	5,4	9	2,7
	01:01	7	4,8	0	0
	01:01:01G	0	0	20	6,0
	01:03:01G	0	0	1	0,3
	03	14	9,5	52	15,6
	03	7	4,8	30	9,0
	03:01:01G	1	0,7	20	6,0
	03:01	5	3,4	0	0
	03:07:01G	1	0,7	1	0,3
	03:05:01G	0	0	1	0,3
	04	34	23,1	53	15,9
	04	13	8,8	22	6,6
	04:01:01G	1	0,7	16	4,8
	04:01	13	8,8	0	0
	04:03	2	1,4	0	0
	04:04	2	1,4	0	0
	04:04:01G	1	0,7	7	2,1
	04:06:01G	1	0,7	0	0
	04:33:01	1	0,7	0	0
	04:05:01G	0	0	2	0,6
	04:07:01G	0	0	1	0,3
	04:08:01G	0	0	2	0,6
	04:13:01	0	0	2	0,6
	04:26:01	0	0	1	0,3
	07	16	10,9	30	9,0
	07	8	5,4	4	1,2
	07:01	3	2	0	0,0
	07:01:01G	4	2,7	26	7,8
	07:07:01	1	0,7	0	0
	08	4	2,7	22	6,6
	08	3	2	9	2,7
	08:01	1	0,7	0	0
	08:01:01G	0	0	13	3,9
	09	2	1,4	2	0,6
	09	1	0,7	2	0,6
	09:01	1	0,7	0	0
	10	1	0,7	1	0,3
	10:01:01G	0	0	1	0,3
	11	9	6,1	16	4,8

11	7	4,8	10	3,0
11:03:01G	1	0,7	1	0,3
11:04:01G	1	0,7	1	0,3
11:01:01G	0	0	3	0,9
11:01	0	0	1	0,3
12	0	0	4	1,2
12:01:01G	0	0	4	1,2
13	13	8,8	56	16,8
13	5	3,4	24	7,2
13:01	5	3,4	0	0,0
13:01:01G	0	0	17	5,1
13:02	2	1,4	0	0
13:02:01G	0	0	13	3,9
13:41:01	1	0,7	0	0
13:03	0	0	1	0,3
13:16:01	0	0	1	0,3
14	3	2	8	2,4
14	0	0	3	0,9
14:01	1	0,7	0	0
14:01:01G	2	1,4	2	0,6
14:20:01	0	0	2	0,6
14:13:01	0	0	1	0,3
15	34	23,1	55	16,5
15	16	10,9	29	8,7
15:01	14	9,5	0	0
15:01:01G	4	2,7	26	7,8
15:02:01G	1	0,7	0	0
16	4	2,7	5	1,5
16	1	0,7	1	0,3
16:01:01G	1	0,7	4	1,2
16:01	1	0,7	0	0
16:02	1	0,7	0	0

Table S14. Frequencies of HLA alleles in medieval individuals and modern Germans.

Locus	All ele	Cases (N=155)	Frequen cy [%]	Controls (N=358)	Frequen cy [%]	Modern German pop 8 (N=39689) [%]
HLA-A						
A	01	20	12,9	65	18,2	16
	02	49	31,6	117	32,7	27
	03	26	16,8	50	14,0	15
	11	11	7,1	22	6,1	5,7
	23	7	4,5	1	0,3	2,3
	24	10	6,5	33	9,2	10
	25	0	0	5	1,4	2,4
	26	8	5,2	6	1,7	3,6
	29	2	1,3	5	1,4	2,4
	30	2	1,3	9	2,5	1,6
	31	3	1,9	9	2,5	2,3
	32	4	2,6	12	3,4	3,6
	33	0	0	2	0,6	1,3
	36	1	0,6	1	0,3	<0,5
	66	0	0	3	0,8	<0,5
	68	10	6,5	17	4,7	4,3
	69	1	0,6	0	0,0	<0,5
	74	1	0,6	1	0,3	<0,5
HLA-B						
Locus	All ele	Cases (N=141)	Frequen cy [%]	Controls (N=344)	Frequen cy [%]	Modern German pop 8 (N=39689) [%]
B	07	26	18,4	49	14,2	12,4
	08	15	10,6	42	12,2	9,5
	13	0	0	8	2,3	3,5
	14	0	0	2	0,6	2,5
	15	21	14,9	41	11,9	7,3
	18	3	2,1	17	4,9	5,2
	27	4	2,8	21	6,1	4,1
	35	6	4,3	17	4,9	10,4
	37	1	0,7	8	2,3	1,3
	38	5	3,5	1	0,3	2,5
	39	2	1,4	12	3,5	2,4
	40	14	9,9	32	9,3	6,6
	41	1	0,7	1	0,3	1,1
	42	1	0,7	0	0,0	<0,5
	44	19	13,5	27	7,8	11,5
	45	1	0,7	1	0,3	<0,5
	48	1	0,7	5	1,5	<0,5
	49	0	0	2	0,6	1,6
	50	1	0,7	1	0,3	1,3
	51	9	6,4	29	8,4	6,3

52	1	0,7	0	0,0	1,1
55	2	1,4	8	2,3	1,5
56	1	0,7	2	0,6	0,8
57	7	5	13	3,8	3,1
58	0	0	4	1,2	0,9
81	0	0	1	0,3	<0,5
Locus	All ele	Cases (N=147)	Frequen cy [%]	Controls (N=341)	Frequen cy [%]
HLA-C					Modern German pop 8 (N=39689) [%]
01	5	3,4	4	1,2	3,6
02	6	4,1	17	5,0	5,4
03	37	25,2	86	25,2	13
04	11	7,5	21	6,2	12,5
05	10	6,8	18	5,3	6,4
06	6	4	33	9,7	10
07	50	34	109	32,0	30
08	0	0	7	2,1	2,4
11	0	0	1	0,3	0
12	10	6,8	15	4,4	7,4
14	0	0	8	2,3	1,5
15	6	4	10	2,9	3,1
16	5	3,4	10	2,9	3,2
17	1	0,7	1	0,3	1
18	0	0	1	0,3	<0,5
Locus	All ele	Cases (N=150)	Frequen cy [%]	Controls (N=335)	Frequen cy [%]
HLA-DQB1					Modern German pop 3 (N=111) [%]
02	23	15,3	68	20,3	15,6
03	53	35,3	102	30,4	41,9
04	4	2,7	19	5,7	3,2
05	19	12,7	39	11,6	15
06	51	34	107	31,9	25,6
Locus	All ele	Cases (N=147)	Frequen cy [%]	Controls (N=334)	Frequen cy [%]
HLA-DRB1					Modern German pop 8 (N=39689) [%]
01	15	10,2	30	9,0	10,5
03	14	9,5	52	15,6	10,2
04	34	23,1	53	15,9	12,5
07	16	10,9	30	9,0	12,2
08	4	2,7	22	6,6	2,7
09	2	1,4	2	0,6	0,9
10	1	0,7	1	0,3	1
11	9	6,1	16	4,8	13
12	0	0	4	1,2	1,9

13	13	8,8	56	16,8	13,5
14	3	2	8	2,4	2,9
15	34	23,1	55	16,5	13,8
16	4	2,7	5	1,5	2,8

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