

Supplemental Table 1 - Strain effects on peripheral blood lymphocyte immunophenotypes.

STRAIN	%CD3	%CD79	LN T:B	%CD4	%CD8	LN CD4:CD8	LN MHCII Density
BXD6	56.1 ± 3.4	36.3 ± 3.1	0.44 ± 0.15	30.5 ± 3.2	26.4 ± 3.4	0.16 ± 0.14	3.86 ± 0.09
BXD11	40.8 ± 5.1	52.7 ± 5.4	-0.28 ± 0.24	22.7 ± 2.9	18.0 ± 2.8	0.26 ± 0.15	3.94 ± 0.10
BXD12	29.9 ± 4.5	62.2 ± 5.0	-0.79 ± 0.23	19.3 ± 4.1	11.7 ± 1.5	0.44 ± 0.14	3.71 ± 0.24
BXD13	21.4 ± 3.9	68.1 ± 4.6	-1.25 ± 0.24	9.7 ± 0.7	8.8 ± 1.5	0.16 ± 0.14	3.28 ± 0.07
BXD14	14.3 ± 1.5	75.9 ± 1.5	-1.71 ± 0.13	10.7 ± 1.6	4.4 ± 0.5	0.85 ± 0.17	3.12 ± 0.06
BXD16	46.2 ± 4.6	47.9 ± 4.9	-0.04 ± 0.21	23.3 ± 1.2	19.6 ± 2.5	0.20 ± 0.10	4.01 ± 0.09
BXD18	40.8 ± 5.4	48.4 ± 6.0	-0.17 ± 0.26	22.2 ± 2.6	17.3 ± 1.9	0.26 ± 0.11	3.75 ± 0.16
BXD19	22.7 ± 1.1	70.4 ± 1.5	-1.16 ± 0.06	13.5 ± 1.4	8.9 ± 0.8	0.41 ± 0.17	3.42 ± 0.07
BXD21	27.8 ± 2.3	63.7 ± 3.7	-0.84 ± 0.12	17.3 ± 2.1	10.7 ± 1.7	0.53 ± 0.17	3.75 ± 0.11
BXD24	49.0 ± 4.1	45.4 ± 3.5	0.08 ± 0.16	33.9 ± 3.7	19.4 ± 2.3	0.56 ± 0.18	4.15 ± 0.21
BXD27	31.8 ± 6.2	64.5 ± 6.5	-0.83 ± 0.36	19.2 ± 4.0	13.3 ± 2.7	0.33 ± 0.17	3.54 ± 0.06
BXD28	37.3 ± 5.3	54.1 ± 5.4	-0.30 ± 0.23	25.7 ± 6.4	10.8 ± 1.8	0.79 ± 0.21	3.76 ± 0.15
BXD29	24.3 ± 2.4	70.0 ± 2.2	-1.08 ± 0.12	12.8 ± 1.2	11.3 ± 1.0	0.12 ± 0.11	3.39 ± 0.07
BXD31	25.4 ± 4.4	67.6 ± 5.0	-1.02 ± 0.24	13.0 ± 3.0	7.8 ± 1.7	0.50 ± 0.08	3.61 ± 0.08
BXD32	33.7 ± 2.5	55.8 ± 4.2	-0.50 ± 0.15	20.1 ± 2.2	12.3 ± 1.9	0.53 ± 0.09	3.95 ± 0.04

BXD33	47.6 ± 5.5	43.9 ± 5.3	0.08 ± 0.25	35.6 ± 4.4	13.2 ± 1.0	0.95 ± 0.12	3.53 ± 0.15
BXD34	27.2 ± 2.0	64.4 ± 1.8	-0.88 ± 0.10	18.2 ± 1.6	9.6 ± 1.0	0.65 ± 0.16	3.82 ± 0.11
BXD36	34.0 ± 2.0	62.5 ± 2.1	-0.62 ± 0.10	22.6 ± 1.7	11.8 ± 1.4	0.67 ± 0.19	4.06 ± 0.12
BXD38	37.2 ± 3.0	56.6 ± 1.9	-0.44 ± 0.12	22.8 ± 1.9	15.8 ± 1.3	0.36 ± 0.09	3.73 ± 0.09
BXD39	24.0 ± 2.1	62.6 ± 3.3	-0.98 ± 0.10	15.7 ± 2.4	9.6 ± 1.6	0.50 ± 0.23	3.43 ± 0.10
BXD40	42.8 ± 4.3	46.6 ± 3.8	-0.10 ± 0.15	29.4 ± 3.8	15.8 ± 1.1	0.59 ± 0.10	3.97 ± 0.13
BXD42	33.2 ± 2.1	60.7 ± 3.2	-0.61 ± 0.12	23.0 ± 1.5	12.5 ± 2.4	0.73 ± 0.17	3.68 ± 0.12
BXD43	22.4 ± 1.3	72.8 ± 1.0	-1.19 ± 0.07	13.1 ± 1.0	4.6 ± 0.4	1.11 ± 0.11	3.62 ± 0.09
BXD44	37.1 ± 3.2	53.8 ± 3.1	-0.39 ± 0.14	25.0 ± 2.5	8.4 ± 1.5	1.15 ± 0.09	3.45 ± 0.16
BXD45	24.5 ± 2.0	68.1 ± 1.6	-1.04 ± 0.11	13.0 ± 1.8	10.3 ± 0.9	0.20 ± 0.11	3.19 ± 0.11
BXD48	26.7 ± 4.2	65.5 ± 5.2	-0.93 ± 0.21	19.4 ± 3.3	10.2 ± 2.1	0.71 ± 0.22	3.45 ± 0.09
BXD50	27.0 ± 0.8	65.8 ± 3.1	-0.89 ± 0.06	15.6 ± 1.3	9.8 ± 0.7	0.48 ± 0.08	3.79 ± 0.06
BXD51	33.1 ± 4.4	60.6 ± 4.6	-0.66 ± 0.22	22.9 ± 3.6	9.3 ± 1.0	0.84 ± 0.14	3.42 ± 0.13
BXD55	23.8 ± 3.1	67.3 ± 2.2	-1.07 ± 0.14	14.4 ± 1.5	7.1 ± 1.2	0.76 ± 0.19	3.43 ± 0.08
BXD60	25.6 ± 3.0	66.2 ± 2.3	-0.98 ± 0.16	16.2 ± 2.7	7.2 ± 0.8	0.78 ± 0.22	3.17 ± 0.10
BXD61	30.5 ± 7.5	61.7 ± 6.9	-0.80 ± 0.36	19.9 ± 6.7	9.6 ± 0.9	0.50 ± 0.31	3.13 ± 0.21
BXD62	54.9 ± 4.2	38.3 ± 3.2	0.36 ± 0.16	29.5 ± 3.3	24.1 ± 2.1	0.19 ± 0.06	4.03 ± 0.09

BXD65	24.1 ± 2.0	64.8 ± 2.7	-1.00 ± 0.12	13.4 ± 1.3	10.2 ± 1.6	0.30 ± 0.11	3.02 ± 0.08
BXD66	36.0 ± 1.7	56.1 ± 1.3	-0.45 ± 0.06	23.2 ± 1.9	15.6 ± 1.8	0.41 ± 0.16	3.76 ± 0.14
BXD68	34.1 ± 5.8	50.3 ± 5.8	-0.42 ± 0.25	18.3 ± 3.1	17.6 ± 1.8	0.01 ± 0.13	3.80 ± 0.09
BXD69	36.2 ± 2.8	55.5 ± 3.5	-0.45 ± 0.15	18.3 ± 1.8	11.5 ± 1.2	0.47 ± 0.11	3.60 ± 0.06
BXD73	33.7 ± 3.1	60.3 ± 2.6	-0.59 ± 0.14	19.3 ± 3.2	14.2 ± 0.6	0.28 ± 0.19	3.91 ± 0.05
BXD77	23.8 ± 6.1	67.2 ± 6.8	-1.22 ± 0.44	15.7 ± 3.5	7.4 ± 1.1	0.64 ± 0.16	3.42 ± 0.06
BXD96	19.6 ± 1.7	73.1 ± 2.1	-1.33 ± 0.12	10.4 ± 1.6	7.6 ± 0.7	0.28 ± 0.10	3.18 ± 0.03
BXD98	10.3 ± 1.2	82.0 ± 2.5	-2.11 ± 0.14	5.6 ± 1.6	5.2 ± 0.7	0.01 ± 0.21	3.64 ± 0.04
BXD100	20.5 ± 2.0	74.5 ± 1.6	-1.24 ± 0.10	11.0 ± 0.6	8.9 ± 0.5	0.21 ± 0.05	3.35 ± 0.10
C57BL/6J	32.1 ± 1.0	61.4 ± 1.0	-0.65 ± 0.03	23.8 ± 1.6	8.0 ± 0.6	1.10 ± 0.10	3.53 ± 0.16
DBA/2J	35.6 ± 2.2	53.9 ± 2.7	-0.42 ± 0.09	31.6 ± 2.4	6.5 ± 0.5	1.58 ± 0.07	4.31 ± 0.08

Supplemental Table 2 - Transcripts included in each of the bicliques depicted in Fig. 3.

CD3 (n=84)	LN T:B (n=132)	CD4 (n=80)	CD8 (n=60)	LN CD4:CD8 (n=30)	CD3, LN T:B (n=80)	CD3, CD4 (n=46)
AA388235	AA388235	AA388235	ABCC5	C1GALT1	AA388235	AA388235
ABCC5	ABCC5	ABCD1	ABCD4	CACNB2	ABCC5	ABHD12
ABHD12	ABHD12	ABHD12	AMPD1	CBY1	ABHD12	AYTL1
AP1M1	ANKRD40	AI317223	ARPC4	CCDC44	AP1M1	BAT5
ARPC4	AP1M1	ANKRD40	AU016693	CST3	ARPC4	BGN
AYTL1	ARPC4	ATP10D	BAT1A	D1BWG0212E	AYTL1	CD79B
BAT1A	AU016693	AYTL1	BAT5	D230046F09RIK	BAT1A	CIAPIN1
BAT5	AYTL1	BAT5	C030040A15RIK	FBXO8	BAT5	DDR1
BGN	BAT1A	BGN	CECR5	LIP1	BGN	DNASE1L3
CD79B	BAT5	C030014I23RIK	CNR2	LOC100042902	CD79B	ENPP1
CIAPIN1	BGN	CD79B	DNAHC8	LOC100048316	DDAH2	ENPP5
DDAH2	CACNG3	CIAPIN1	E530004K11RIK	LOC640524	DDR1	ETV5
DDR1	CD79B	DDIT3	E530018O14RIK	NEDL2	DNAHC8	FHL2
DNAHC8	DDAH2	DDR1	FOXP4	OLFR586	DNASE1L3	FUT4
DNASE1L3	DDR1	DNASE1L3	FUT4	POLR2D	ENPP1	GNG12
ENPP1	DGCR2	E130306I01RIK	GABBR1	PTPRK	ENPP5	GPR116
ENPP5	DNAHC8	EML1	GGNBP1	SCL0002312.1_1	ETV5	H2-AA
ETV5	DNASE1L3	ENPP1	GPR116	SCL0003152.1_82	FOXP4	H2-AB1
FHL2	DNM2	ENPP5	H2-AB1	SLIT3	FUT4	H2-EA
FOXP4	ENPP1	EPSTI1	H2-EA	STK32C	GABBR1	H2-K1
FUT4	ENPP5	ETV5	H2-K1	STXBP4	GGNBP1	H2-OA
GABBR1	ENSMUSG00000043795	F830021D11RIK	H2-OA	TMEM170	GLO1	H2-OB
GGNBP1	EPSTI1	FHL2	H2-OB	YTHDF2	GNG12	HELB
GLO1	ETV5	FUT4	H2-T10	1700095J19RIK	GPR116	HIC1
GNG12	EXOSC7	GLT25D1	HERPUD1	5730492I20RIK	GZMM	LOC100038888
GPR116	FOXP4	GNG12	IGHV1S30	5730507A11RIK	H2-AA	LOC100045158
GZMM	FSTL1	GPR116	INSIG1	6720474J12RIK	H2-AB1	LOC100046081
H2-AA	FUT4	H2-AA	LOC100046081	A730009E18RIK	H2-EA	LOC677216
H2-AB1	G430095P16RIK	H2-AB1	LOC100046457	C030018P15RIK	H2-EB2	MANEA
H2-EA	GABBR1	H2-EA	LOC383196	C130045F17RIK	H2-K1	MFN1
H2-EB2	GGNBP1	H2-K1	LOC677216		H2-OA	NG23
H2-K1	GLO1	H2-OA	LRP1		H2-OB	NOTCH4
H2-OA	GLT25D1	H2-OB	MEN1		H2-Q7	PARP8
H2-OB	GNG12	HELB	NOTCH2		H2-T10	PLD1
H2-Q7	GPATCH4	HIC1	NOTCH4		HELB	PPT2

H2-T10	GPR116	LAD1	OS9	HERPUD1	PSMB9
HELB	GZMM	LOC100038888	PLEKHO1	HIC1	RAPGEF5
HERPUD1	H2-AA	LOC100045158	PSEN1	IGHV15S1	SOD3
HIC1	H2-AB1	LOC100046081	PSMB9	LOC100038888	TMEM176A
IGHV15S1	H2-EA	LOC100047815	PTAFR	LOC100042270	TSPAN2
LOC100038888	H2-EB2	LOC677216	RIN2	LOC100045158	WDR46
LOC100042270	H2-K1	LY6E	SEC13	LOC100046081	ZBTB22
LOC100045158	H2-OA	MANEA	SMYD4	LOC383196	2310007G05RIK
LOC100046081	H2-OB	MFN1	SPNR	LOC677216	3110070M22RIK
LOC383196	H2-Q7	MYO1C	TRIM26	LRP1	4930565O14
LOC677216	H2-T10	NG23	TSPAN15	MANEA	5830417110RIK
LRP1	HELB	NOTCH4	UQCRB	MEN1	
MANEA	HERPUD1	PARP8	WDR46	MFN1	
MEN1	HIC1	PLD1	ZFP101	NEK9	
MFN1	HTRA1	PPT2	ZFP41	NG23	
NEK9	IGH-V15	PSMB9	1500031H01RIK	NOTCH4	
NG23	IGHV15S1	RAPGEF5	2900045G02RIK	PARP8	
NOTCH4	IGHV1S56	RARA	5033405K12RIK	PLD1	
OS9	IL1A	SCL0002050.1_27	5830406C17RIK	PPT2	
PARP8	IL33	SLCO2A1	5830417110RIK	PSMB9	
PLD1	KIFC2	SOD3	6430548O12RIK	PYGB	
PPT2	LAD1	TGFB111	6720418B01RIK	RAPGEF5	
PSMB9	LHFP	TMEM166	7330423F06RIK	SKIV2L	
PYGB	LOC100038888	TMEM176A	9530065M15RIK	SOD3	
RAPGEF5	LOC100042270	TMEM181	A930026L03RIK	SUV420H2	
SKIV2L	LOC100045158	TSPAN2		TMEM128	
SOD3	LOC100046081	TTC30B		TMEM176A	
SUV420H2	LOC100046457	TTC7B		TPST1	
SYNGR2	LOC100047815	WDR20A		TSPAN15	
TMEM128	LOC100048413	WDR46		TSPAN2	
TMEM176A	LOC383196	ZBTB22		WDR46	
TPST1	LOC640696	ZC3H12A		ZBTB22	
TSPAN15	LOC641240	ZFPM2		ZFP101	
TSPAN2	LOC677216	2310007G05RIK		1110033M05RIK	
WDR46	LRP1	2310061J03RIK		1500031H01RIK	
ZBTB22	MANEA	2610020H08RIK		2310007G05RIK	
ZFP101	MARCKSL1	2610208M17RIK		3110070M22RIK	
1110033M05RIK	MEN1	3110070M22RIK		4930565O14	
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3110070M22RIK	NAIP2	5430432H19RIK		6430548O12RIK	

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NEK9
NG23
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NOTCH4
NRF1
PARP8
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PPT2
PQLC3
PSMB9
PYGB
RAPGEF5
RASA4
SH3BGRL
SH3BGRL2
SKIV2L
SLC25A10
SLC35E1
SMYD4
SOD3
SRPRB
STAC2
SUV420H2
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TMEM115
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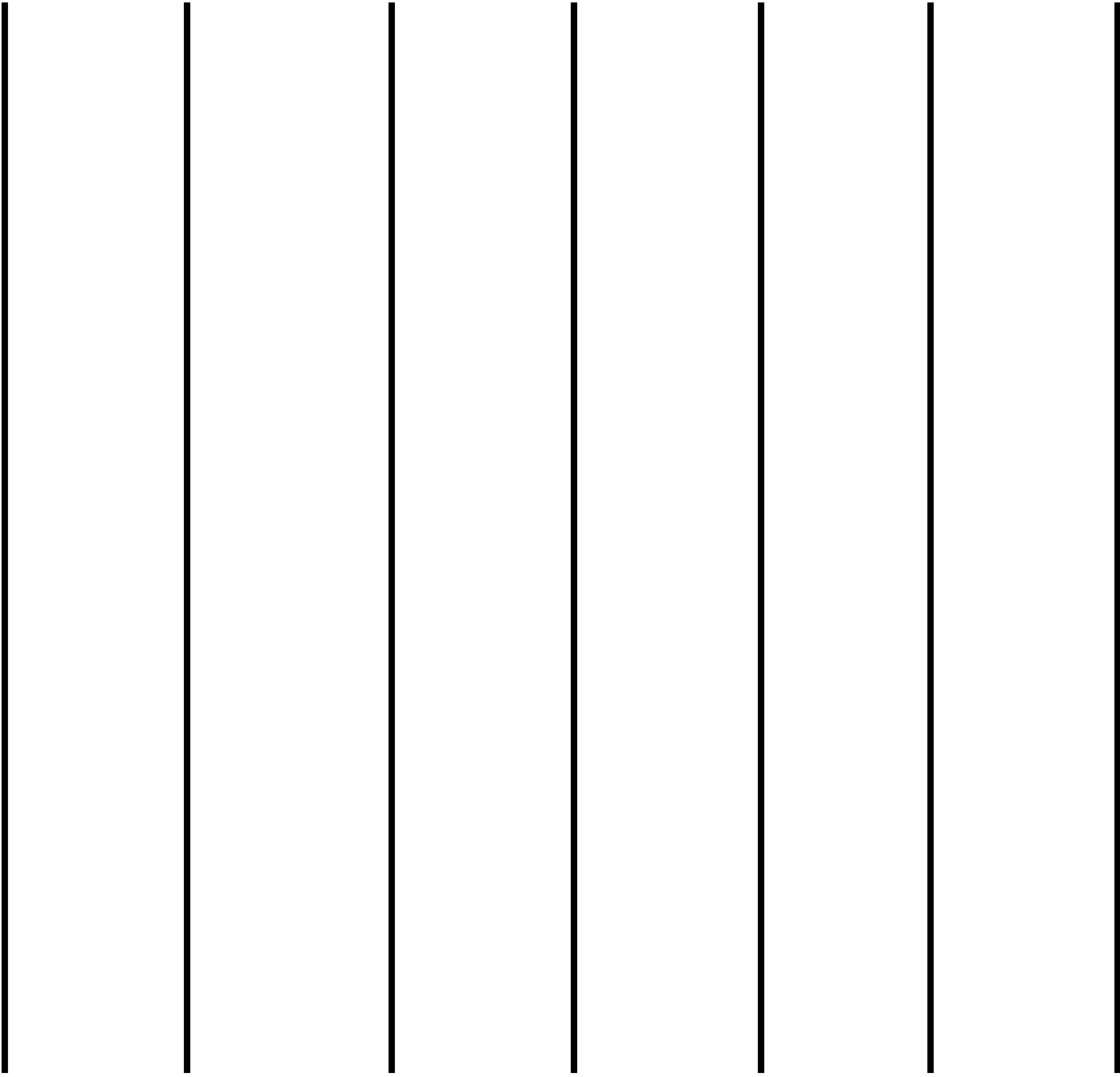
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CD3, CD8 (n=32)	LN T:B, CD4 (n=51)	LN T:B, CD8 (n=34)	CD3, CD4, LN T:B (n=44)	CD3, CD4, CD8, LN T:B (n=14)	CD3, CD8, LN T:B (n=31)
ABCC5	AA388235	ABCC5	AA388235	BAT5	ABCC5
ARPC4	ABHD12	ARPC4	ABHD12	FUT4	ARPC4
BAT1A	ANKRD40	AU016693	AYTL1	GPR116	BAT1A
BAT5	AYTL1	BAT1A	BAT5	H2-AB1	BAT5
DNAHC8	BAT5	BAT5	BGN	H2-EA	DNAHC8
FOXP4	BGN	DNAHC8	CD79B	H2-K1	FOXP4
FUT4	CD79B	FOXP4	DDR1	H2-OA	FUT4
GABBR1	DDR1	FUT4	DNASE1L3	H2-OB	GABBR1
GGNBP1	DNASE1L3	GABBR1	ENPP1	LOC100046081	GGNBP1
GPR116	ENPP1	GGNBP1	ENPP5	LOC677216	GPR116
H2-AB1	ENPP5	GPR116	ETV5	NOTCH4	H2-AB1
H2-EA	EPSTI1	H2-AB1	FUT4	PSMB9	H2-EA
H2-K1	ETV5	H2-EA	GNG12	WDR46	H2-K1
H2-OA	FUT4	H2-K1	GPR116	5830417110RIK	H2-OA
H2-OB	GLT25D1	H2-OA	H2-AA		H2-OB
H2-T10	GNG12	H2-OB	H2-AB1		H2-T10
HERPUD1	GPR116	H2-T10	H2-EA		HERPUD1
LOC100046081	H2-AA	HERPUD1	H2-K1		LOC100046081
LOC383196	H2-AB1	LOC100046081	H2-OA		LOC383196
LOC677216	H2-EA	LOC100046457	H2-OB		LOC677216
LRP1	H2-K1	LOC383196	HELB		LRP1
MEN1	H2-OA	LOC677216	HIC1		MEN1
NOTCH4	H2-OB	LRP1	LOC100038888		NOTCH4
OS9	HELB	MEN1	LOC100045158		PSMB9
PSMB9	HIC1	NOTCH4	LOC100046081		TSPAN15
TSPAN15	LAD1	PSMB9	LOC677216		WDR46
WDR46	LOC100038888	SMYD4	MANEA		ZFP101
ZFP101	LOC100045158	TSPAN15	MFN1		1500031H01RIK
1500031H01RIK	LOC100046081	WDR46	NG23		5033405K12RIK
5033405K12RIK	LOC100047815	ZFP101	NOTCH4		5830417110RIK
5830417110RIK	LOC677216	1500031H01RIK	PARP8		6430548O12RIK
6430548O12RIK	MANEA	5033405K12RIK	PLD1		
	MFN1	5830417110RIK	PPT2		
	NG23	6430548O12RIK	PSMB9		
	NOTCH4		RAPGEF5		

PARP8
PLD1
PPT2
PSMB9
RAPGEF5
SOD3
TMEM176A
TSPAN2
TTC30B
WDR46
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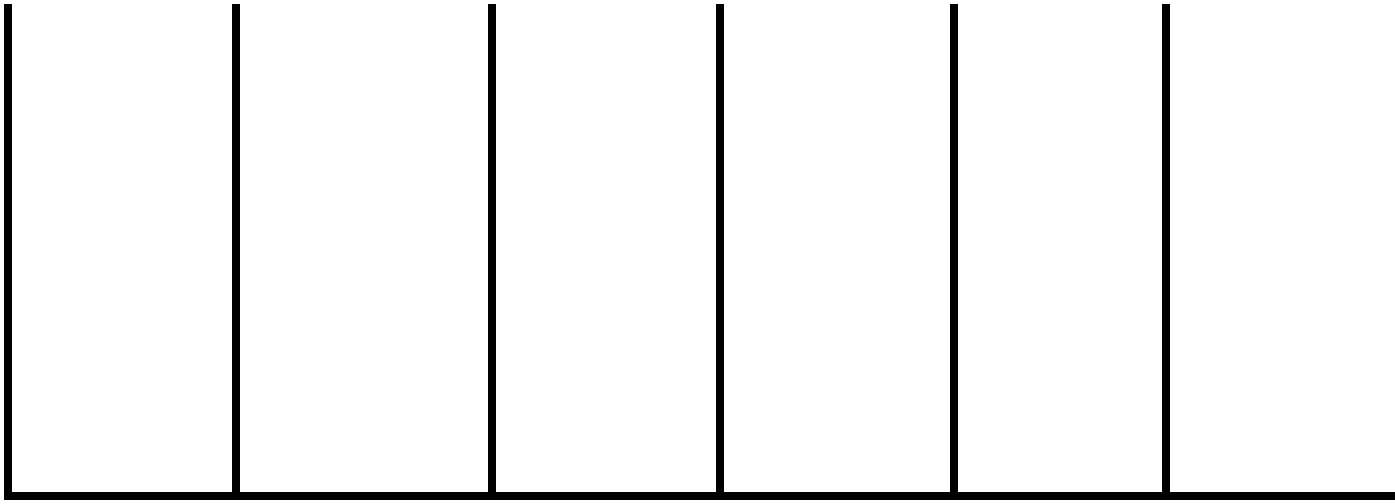


Fig. S1. Genome-wide scans for peripheral blood immunophenotypes of 41 BXD strains: MHCII density as measured by the LN of the median fluorescence of MHCII on MHCII⁺ lymphocytes (A), T:B ratio as measured by the LN of the ratio of %CD3 to %CD79 lymphocytes (B), CD4:CD8 as measured by the LN of the ratio of %CD4 to %CD8 lymphocytes (C). Solid horizontal lines represent genome-wide significance at $P < 0.05$, and the dashed lines represent $P < 0.63$, based on 1,000 permutations. LOD indicates logarithm of odds scores.

Fig. S2. Spleen transcriptome map based on 38 BXD strains. The horizontal axis represents the genomic locations of the SNP markers/ QTL locations in Mb (chromosomes are in alternating colors), and the vertical axis represents the genomic location of each transcript in Mb. Each data point represents the maximum eQTL for each of the 1,881 transcripts that had a permuted p -value < 0.05 .

Table S1. Data shown as mean \pm SEM of 5 to 9 mice per strain.

Table S2. N = the number of transcripts in the maximal biclique for each of the immunophenotypes. The transcript names correspond to the "Symbol" descriptions in the Illumina Bead Studio annotation file.