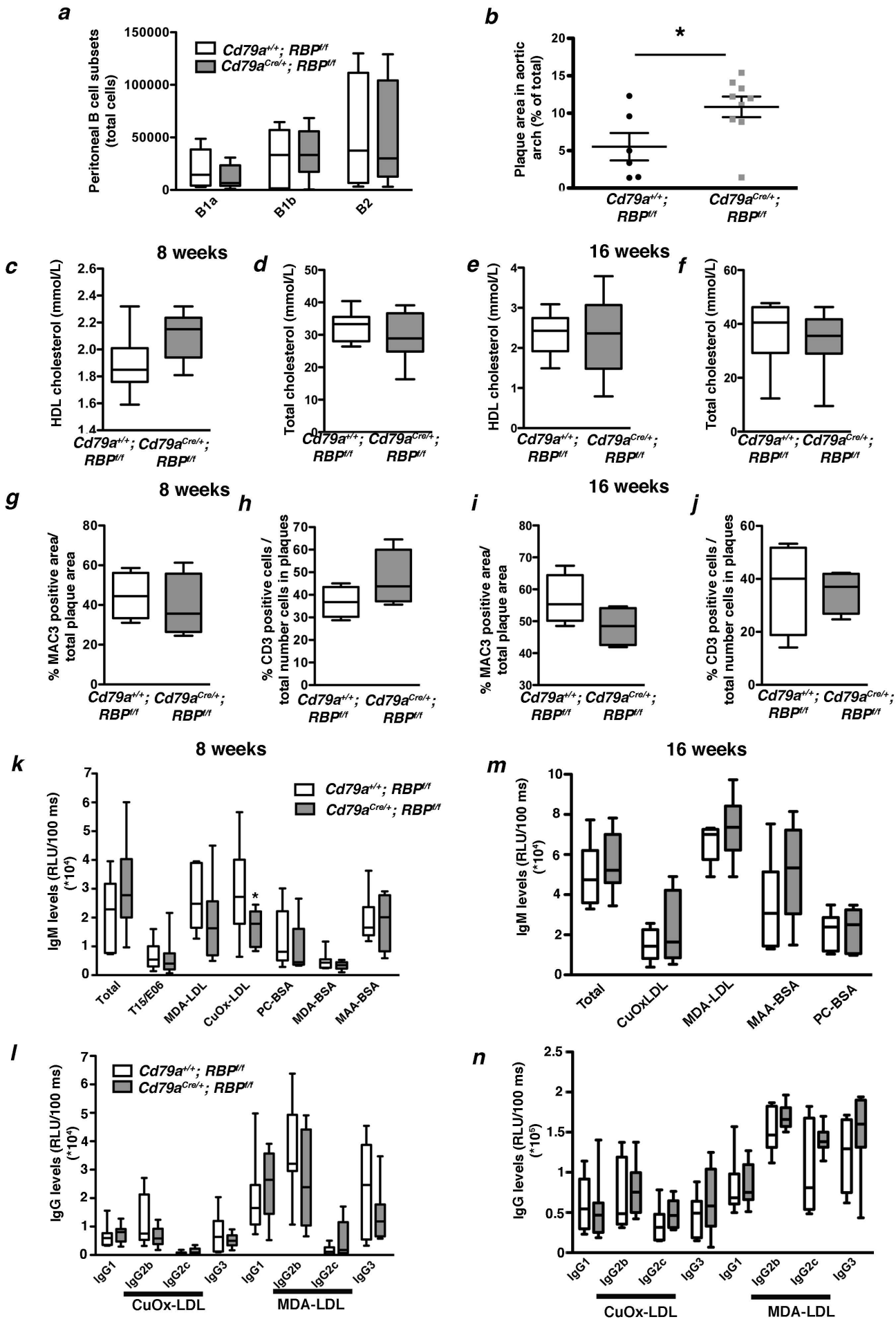
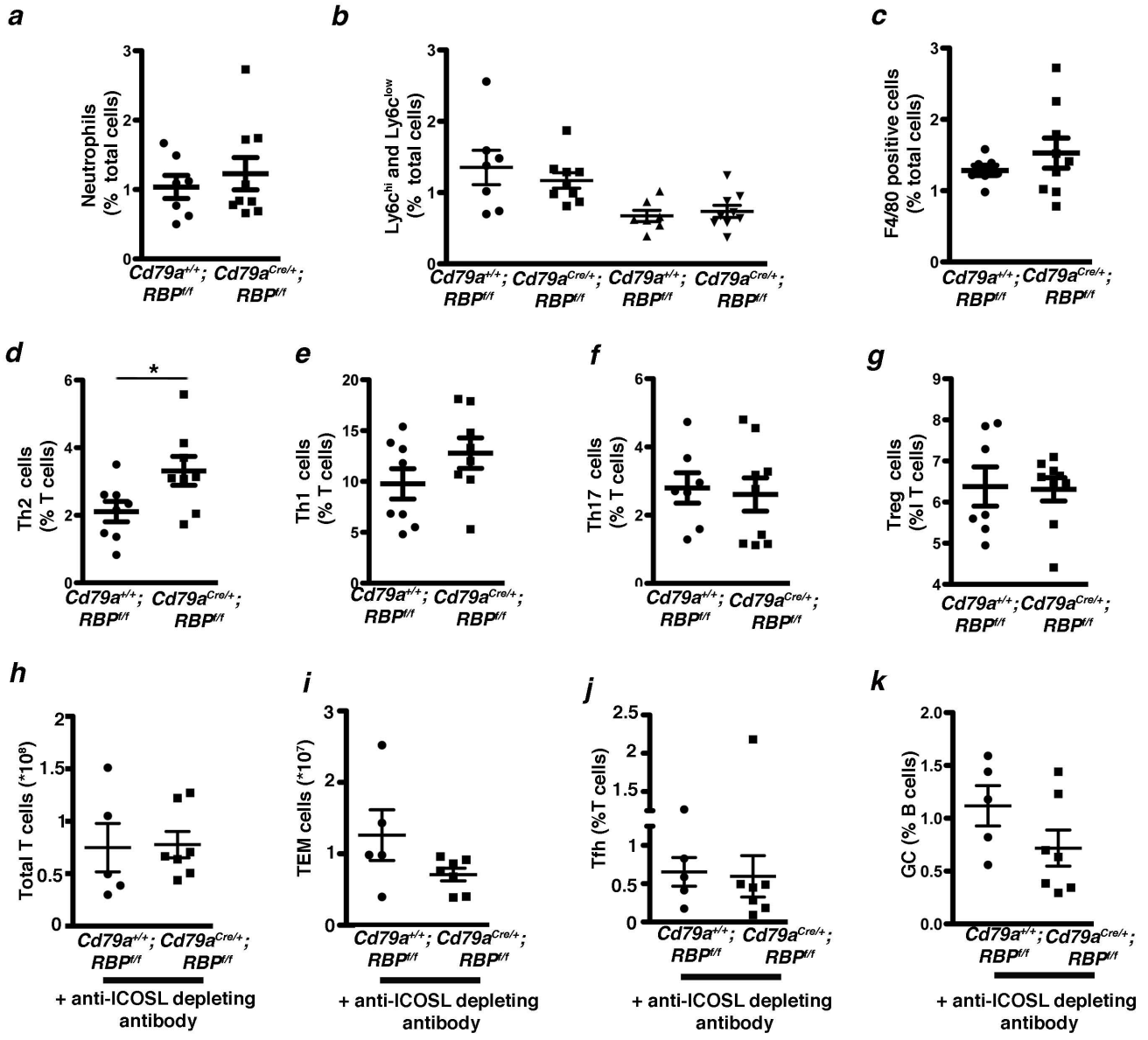
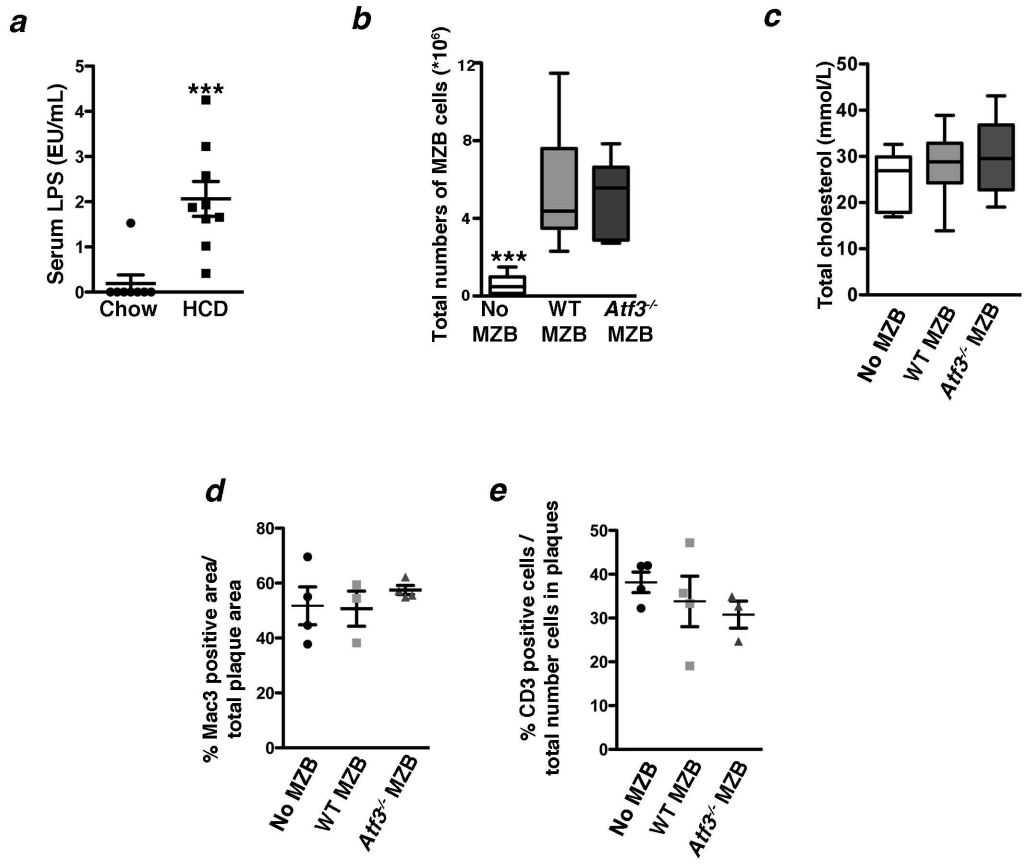

a
Peritoneal B cell subsets (total cells)
150000
100000
50000
0
Cd79a+/+; RBPf/f
Cd79aCre/+; RBPf/f
B1a
B1b
B2
b
Plaque area in aortic arch (% of total)
20
15
10
5
0
*
Cd79a+/+; RBPf/f
Cd79aCre/+; RBPf/f
8 weeks
16 weeks
c
HDL cholesterol (mmol/L)
2.6
2.4
2.2
2.0
1.8
1.6
1.4
d
Total cholesterol (mmol/L)
50
40
30
20
10
0
e
HDL cholesterol (mmol/L)
4
3
2
1
0
f
Total cholesterol (mmol/L)
60
40
20
0
Cd79a+/+; RBPf/f
Cd79aCre/+; RBPf/f
g
% MAC3 positive area/ total plaque area
80
60
40
20
0
h
% CD3 positive cells / total number cells in plaques
70
60
50
40
30
20
10
0
i
% MAC3 positive area/ total plaque area
80
70
60
50
40
30
j
% CD3 positive cells / total number cells in plaques
60
40
20
0
k
IgM levels (RLU/100 ms) (*10⁴)
7
6
5
4
3
2
1
0
*
Total
T15/E06
MDA-LDL
CuOx-LDL
PC-BSA
MDA-BSA
MAA-BSA
m
IgM levels (RLU/100 ms) (*10⁴)
10
8
6
4
2
0
Total
CuOxLDL
MDA-LDL
MAA-BSA
PC-BSA
l
IgG levels (RLU/100 ms) (*10⁴)
7
6
5
4
3
2
1
0
IgG1
IgG2b
IgG2c
IgG3
CuOx-LDL
MDA-LDL
n
IgG levels (RLU/100 ms) (*10⁵)
2.5
2
1.5
1
0.5
0
IgG1
IgG2b
IgG2c
IgG3
CuOx-LDL
MDA-LDL

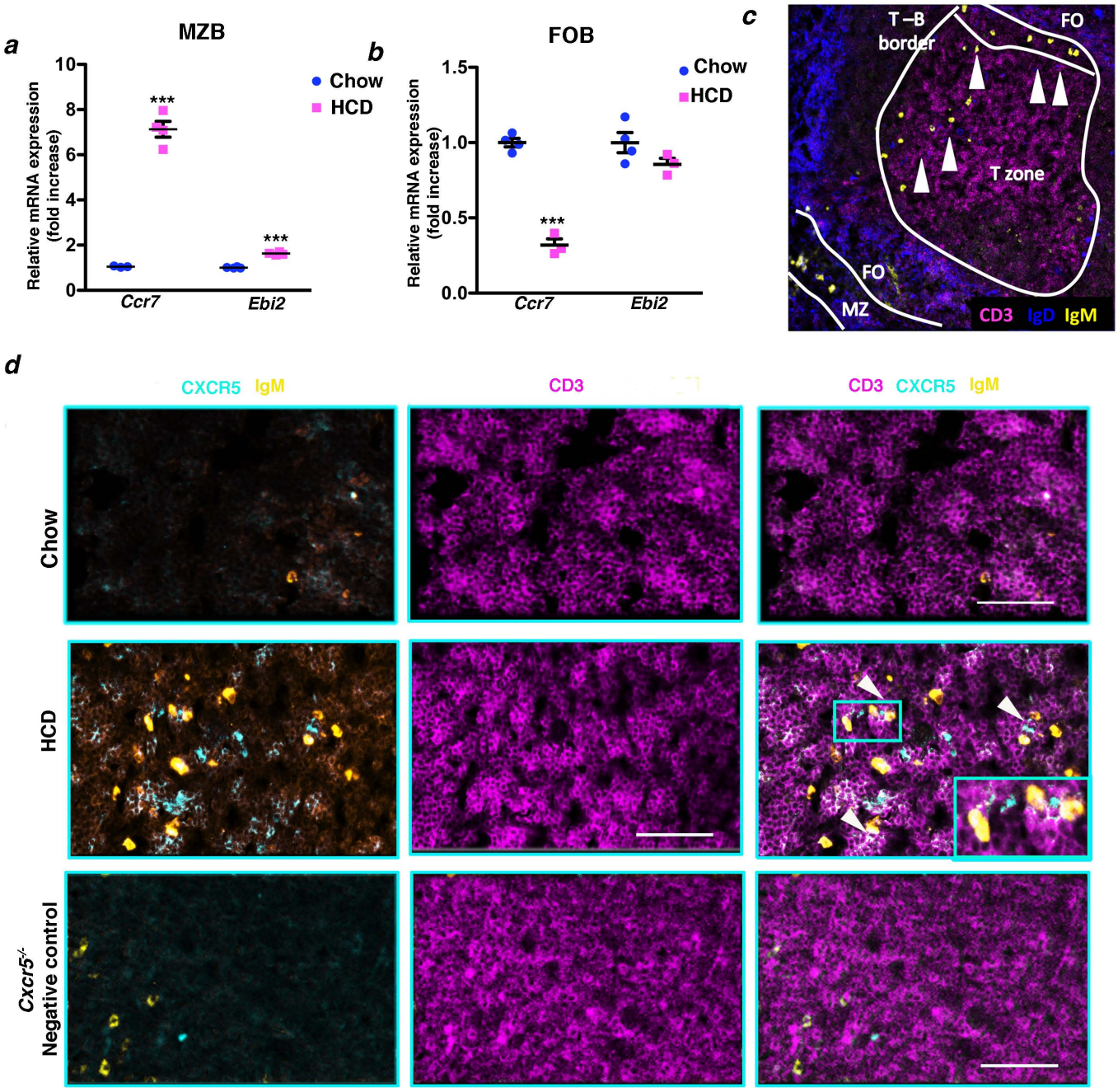
Supplementary Figure 1. Further characterization of *Ldlr*$^{-/-}$ mice transplanted with wild type or MZB deficient bone marrow. *Ldlr*$^{-/-}$ mice were transplanted with donor bone marrow cells from *Cd79a*$^{Cre/+}$/*Rbpjk*$^{flox/flox}$ or *Cd79a*$^{+/+}$/*Rbpjk*$^{flox/flox}$ after the consumption of a high cholesterol diet for 8 weeks (a-d, g, h, k, l) or 16 weeks (e, f, i, j, m, n). (a) Total number of peritoneal B cell subsets by flow cytometry (n=7 to 9 mice per group). (b) Quantification of Oil red *en face* staining of aortic arches (with each symbol representing one animal and horizontal bars mean ± s.e.m.). Aortic arch was not available for quantification in one mouse in the WT group. HDL-C (c, e) and total cholesterol (d, f) levels in serum. Quantification of Mac3 (g, i) and CD3 (h, j) positive staining in atherosclerotic plaques (n=4 mice/group and 3 representative sections from each mouse were analyzed). Graphs showing total plasma and subtypes of IgM (k, m) and IgG (m, n) levels. In (k-m) n=7 and n=9 for each group at 8 weeks and n=8 for each group at 16 weeks. Whisker bars represents maximum and minimum levels. For (a-n) * $p<0.05$; ** $p<0.01$ and *** $p<0.001$. Student t-test.



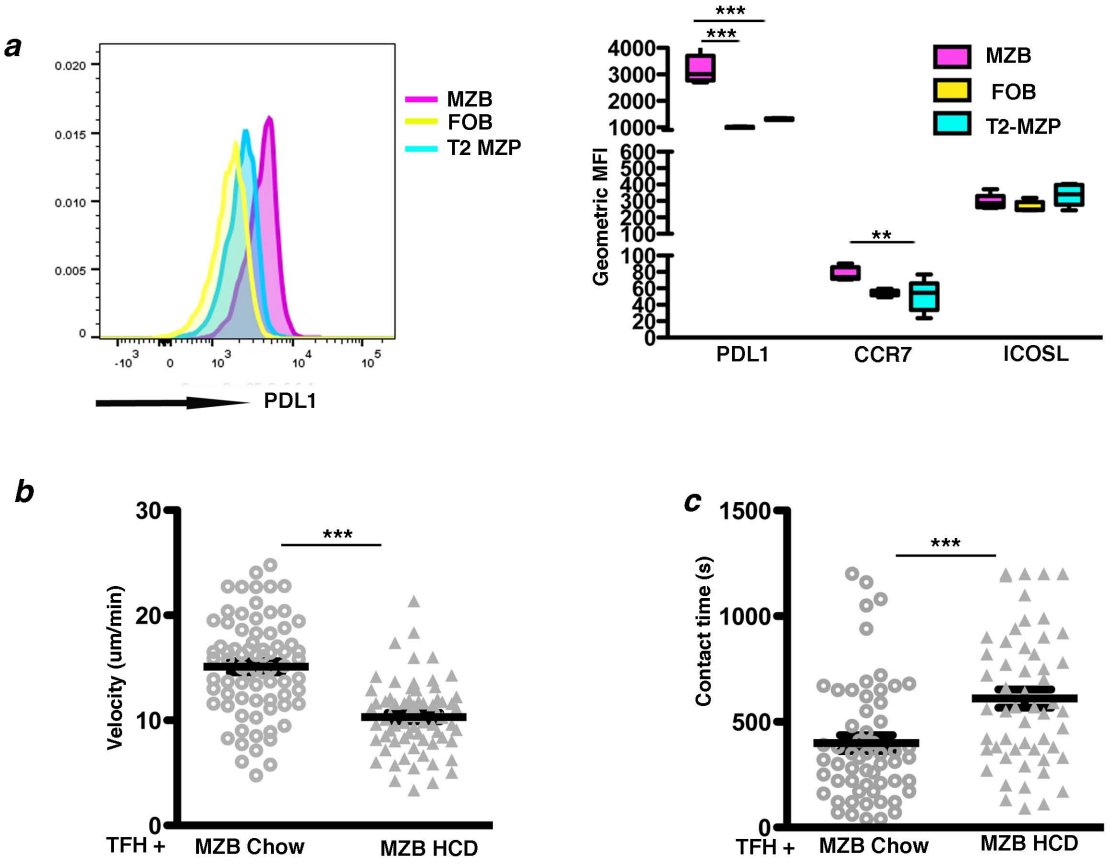
Supplementary Figure 2. Immune cell analyses on *Ldlr*$^{-/-}$ mice transplanted with wild type or MZB deficient bone marrow. *Ldlr*$^{-/-}$ mice were transplanted with donor bone marrow cells from *Cd79a*$^{Cre/+}$/*Rbpjk*$^{flox/flox}$ *vs.* *Cd79a*$^{+/+}$/*Rbpjk*$^{flox/flox}$ (a-k) or *Cd79a*$^{Cre/+}$ *vs.* *Cd79a*$^{+/+}$ after the consumption of a high cholesterol diet for 8 weeks without treatment (a-g) or following 8 weeks of treatment with anti-ICOSL depleting antibody (h-k). Percentage of Ly6G positive (neutrophils) (a), Ly6C high and low (monocytes) (b) and F4/80 positive (macrophages) cells (c) with respect to total spleen cells. Percentage of T-bet (Th1) (d), GATA3 (Th2) (e), RORγt (Th17) (f) and FOXP3 (Treg) (g) positive cells in spleens, with respect to total T cells. (h) Total numbers of T cells, (i) T effector memory (TEM) cells and percentage of (j) Tfh cells and (k) GC B cells in spleen after the consumption of HCD for 8 weeks. Each symbol represents an individual mouse; horizontal bars denote mean ± s.e.m. For (a-k) two-tailed unpaired Student t-test or 2 way Anova * $p<0.05$; ** $p<0.01$ and *** $p<0.001$.



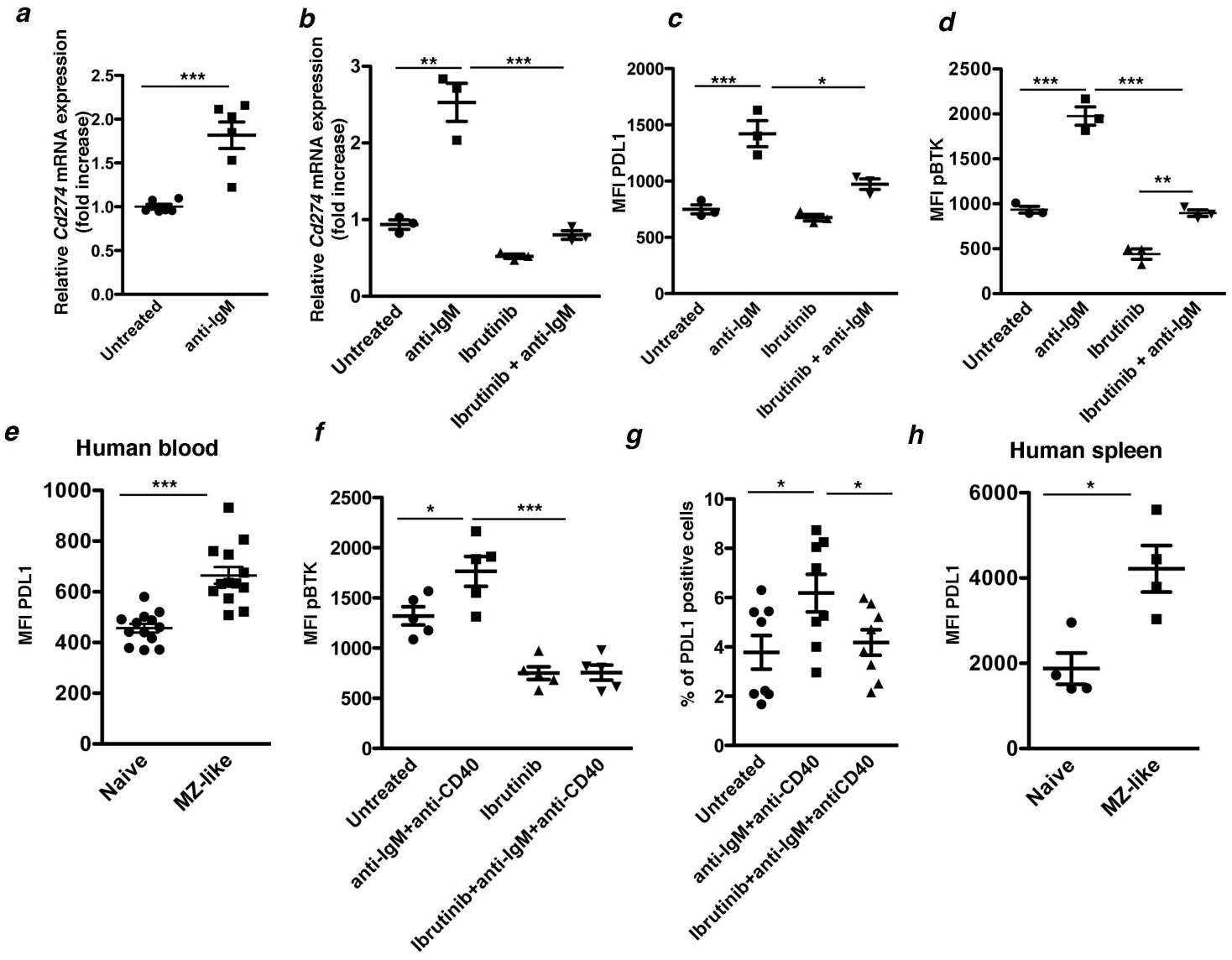
Supplementary Figure 3. Further characterization of *Ldlr*$^{-/-}$ mice with no MZB cells, wild type MZB cells or Atf3 deficient MZB cells. (a) LPS serum levels in mice after the consumption of a control chow *vs* high cholesterol diet for 8 weeks in *LDLr*$^{-/-}$ mice. Each symbol represents an individual mouse; horizontal bars denote mean ± s.e.m. (b-e) *Ldlr*$^{-/-}$ mice were transplanted with a mixed BM chimera containing 80% *Cd79a*$^{Cre/+}$/*Rbpjk*$^{flox/flox}$ + 20% WT (for rescue experiments) or *Atf3*$^{-/-}$ bone marrow (*Atf3*$^{-/-}$ MZB) (b-e). (b) Numbers of MZB cells in the spleens of the 3 groups of mice after BM transplantation and HCD for 8 weeks. (c) Total plasma cholesterol levels (n=7 to 10 in each group). Whisker bars represents maximum and minimum levels. Quantification of Mac3 (d) and CD3 (e) positive staining in atherosclerotic plaques of aortic roots. (Each dot represent a mouse and 3 representative sections from each mouse were analyzed). Horizontal bars represent mean ± s.e.m. For (a-e) * $p<0.05$; ** $p<0.01$ and *** $p<0.001$.



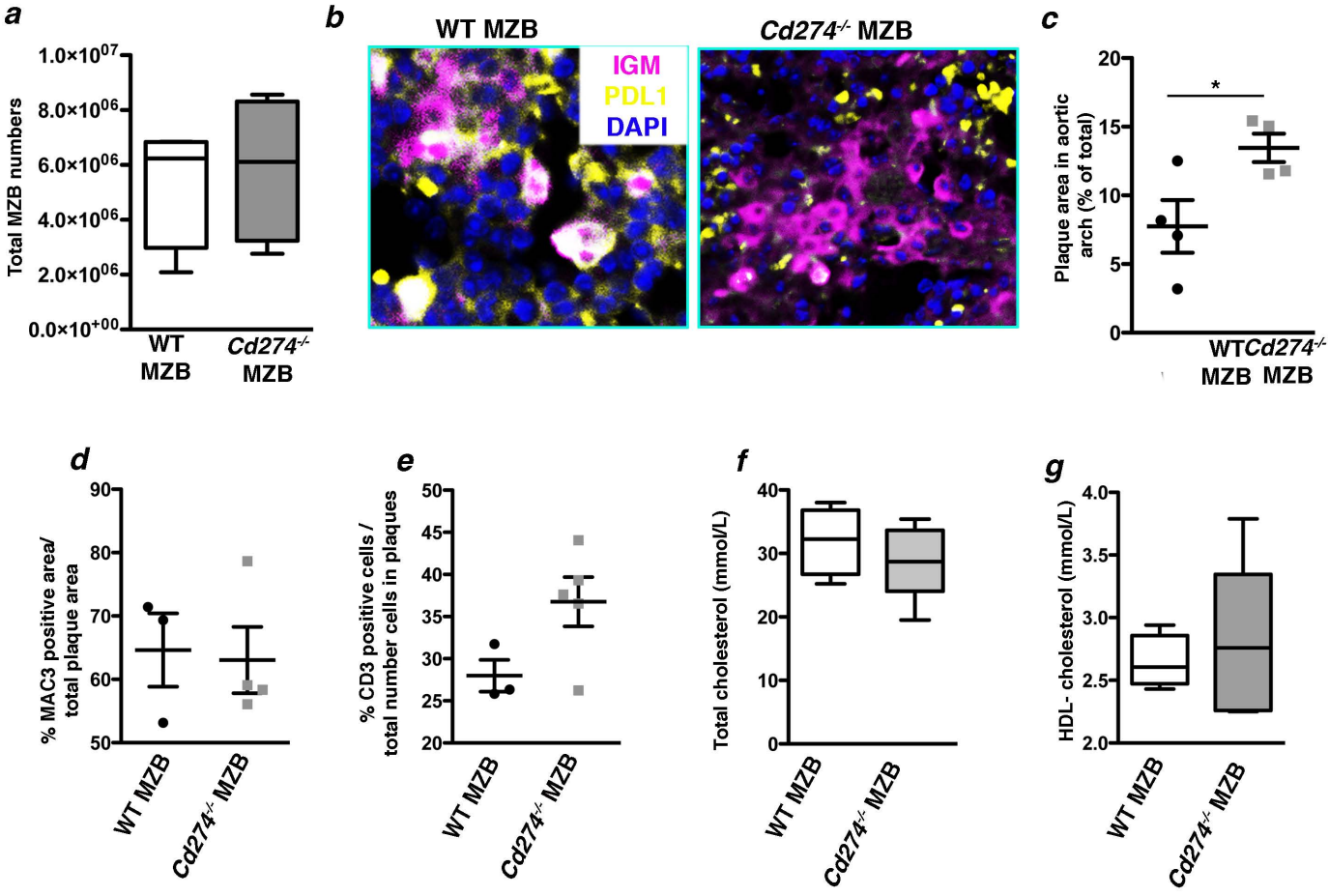
Supplementary Figure 4. Chemokine receptor expression and distribution of MZB cells in the spleen after high cholesterol diet. Relative mRNA expression for *Ccr7* and *Ebi2* on sorted MZB (a) and FOB (b) from *Ldlr*$^{-/-}$ mice after the consumption of chow diet or HCD (with each symbol representing one animal and horizontal bars mean ± s.e.m.). Two-tailed unpaired Student t-test * $p<0.05$; ** $p<0.01$ and *** $p<0.001$. (c) Representative spleen sections from *Ldlr*$^{-/-}$ mice after 8 weeks on chow diet or HCD showing T cell zone boundary. TFH cells (white) stained with CD3 (magenta) and CXCR5 (cyan) and MZB cells stained with IgM (yellow) in the T cell zone. A negative control for CXCR5 staining is shown (*Cxcr5*$^{-/-}$ mouse). Original magnification, 10x. Scale bars, 50 μm.



Supplementary Figure 5. Expression of PDL1 on splenic B cell subsets and effects of high cholesterol diet on the interaction between MZB cells and follicular helper T cells. (a) Diagram and quantification of surface PDL1, CCR7 and ICOSL expression by flow cytometry in FOB, MZB cells and MZ progenitors (MZP). (b, c) Labeled sorted MZB cells from mice fed a chow or a HCD for 8 weeks, co-cultured with sorted Tfh cells from previously immunized mice fed a chow diet. Tfh movement was visualized by time-lapse microscopy. (b) Quantification of the T-cell centroid velocity (μm/min) and (c) contact time (s) between B-Tfh cells (with each symbol representing one Tfh-B cell interaction and horizontal bars mean ± s.e.m.).



Supplementary Figure 6. Effects of BCR signaling on PDL1 expression in murine MZB cells and human MZ-like B cells. Shown are data from sorted MZB cells of WT mice, treated in vitro with anti-IgM, ibrutinib (Btk inhibitor) or both for 3 hours to assess *Cd274* mRNA (a-b), or for 6 hours to assess PDL1 protein expression by flow cytometry (c). Also shown is the phosphorylation of Btk (pBtk) analyzed by flow cytometry in the presence or absence of anti-IgM and/or ibrutinib (d). All experiments were carried in n=5 biological replicates/conditions. We also analyzed human blood (e-g) and spleen (h) B cells. (e, h) PDL1 expression using flow cytometry in naïve and MZ-like cells in blood (n=13) and spleen (n=4). pBTK (f) and percentage of PDL1 positive cells with respect to total blood B cells (g) in purified B cells treated for 18 hours with anti-IgM+anti-CD40 antibodies, ibrutinib or their combination (n=6 biological replicates/ condition). Bars represent mean ± s.e.m. * $p<0.05$; **$p<0.01$ and ***$p<0.001$.



Supplementary Figure 7. Further characterization of *Ldlr*$^{-/-}$ mice with either wild type MZB cells or CD274 deficient MZB cells. Shown are data from *Ldlr*$^{-/-}$ mice transplanted with a mixed BM chimera containing 80% *Cd79a*$^{Cre/+}$/*Rbpjk*$^{flox/flox}$ + 20% WT or *Cd274*$^{-/-}$ bone marrow (a-f). (a) Numbers of MZB cells in the spleens of the 2 groups of mice after BM transplantation and HCD for 8 weeks. (b) Spleen sections from WT MZB and *Cd274*$^{-/-}$ MZB groups were immunostained for PDL1 (yellow) and for IgM (magenta). White color indicates a detection of PDL1 expression on IgM^{+} MZB cells. (c) Quantification of Oil red O *en face* staining of aortic arches (with each symbol representing one animal and horizontal bars mean ± s.e.m). Quantification of Mac3 (d) and CD3 (e) positive staining in atherosclerotic plaques of aortic roots (n=4 mice/group and 3 representative sections from each mouse were analyzed). Total cholesterol (e) and HDL-C (f) levels in serum (n=5 mice/group). Bars represent mean ± s.e.m. Two-tailed unpaired Student t-test * $p<0.05$; ** $p<0.01$ and *** $p<0.001$.

Supplementary Table 1. Flow Cytometry antibodies

Target	Clone	Company
B220	RA3-6B2	eBioscience
IgM	II-41	eBio
MHC-II	M5/114.15.2	Biolegend
CD23	B3/B4	eBioscience
CD21	eBio4E3	eBioscience
CD69	H1.2F3	Biolegend
CD44	1M7	Biolegend
CD4	RM4-5	Biolegend
CD3	145-2C11	Biolegend
CD62L	MEL-14	Biolegend
CD95	Jo2	BD
GL7	GL7	eBioscience
B220	RA3-6B2	eBioscience
CD19	1D3	BD
CD138	281-2	Biolegend
CD4	RM4-5	Biolegend
CXCR5	L138D7	Biolegend
ICOS	C398.4A	eBioscience
PD1	RMP1-30	Biolegend
CD274	MIH5	eBioscience
pBtk	M4G3LN	eBioscience
pSyk	Moch1 ct	eBioscience

Supplementary Table 2: Primers used for qRT-PCR

	Sense	Antisense
A20	TGGTTCCAATTTTGCTCCTT	CGTTGATCAGGTGAGTCGTG
Abcg1	GGAAGATGTAGGACGGTTGG	GAGCACAGGATGGCATTCTAT
Fosb	ATGTCTCCACTCTCAATG	GTCACACTTACTTACAGAAG
Atf3	GCGAAGACTGGAGCAAAAT	TGGATGGCGAATCTCAGCTC
IL10	ATGGCCCAGAAATCAAGGA	CACAGGGGAGAAATCGATGA
Junb	GAACAGCCTTTCTATCAC	TTTCAGGAGTTTGTAGTC
Klf4	TTATTGTGTCGGAGGAAGAG	TCACCAAGCACCATCATT
Nur77	CCCACTATTTGTCTTATCC	CATCTCAACCTCTTCCTT
Ccr7	CTGAATGAACCTGCTTCT	CTTGCTAAGTGTGGAGATAA
Ebi2	TGCTGCGATTCTCTGTAAT	CTTAGGAACTTAGGAAGACCAT
Cd274	CTTCCTTCCTTCCTTCCT	GCATAGTGAGCAACCATT
Icosl	AGGAATGAGGAGTGAGAAC	ATTGAATACATCGGTGTGAAG
IL6	CCAGAGATACAAAGAAATGAT	ACTCCAGAAGACCAGAGGAAA
36B4	TCTCCAGTGGCTCCATTGA	CTCGCTGGCTCCCACCTT
Il21	AAGCAATGATGGACAGAGA	GTCAAGAAGTCAACAGTTACA
Icos	ATATGAGTTAGTTGGAAGGATT	TAGGCATACAGACAGGAA
S1pr1	TACACAGGCAAGTTGAAC	AGCAGATGAGAATGAACAC
Ascl2	TGACATCTTCCATCTTCC	GAGTCCTACAACAGTTCA
cMaf	TTCTGAGTTCTTCTGATTG	TTGATGTAGGCTTGATTG