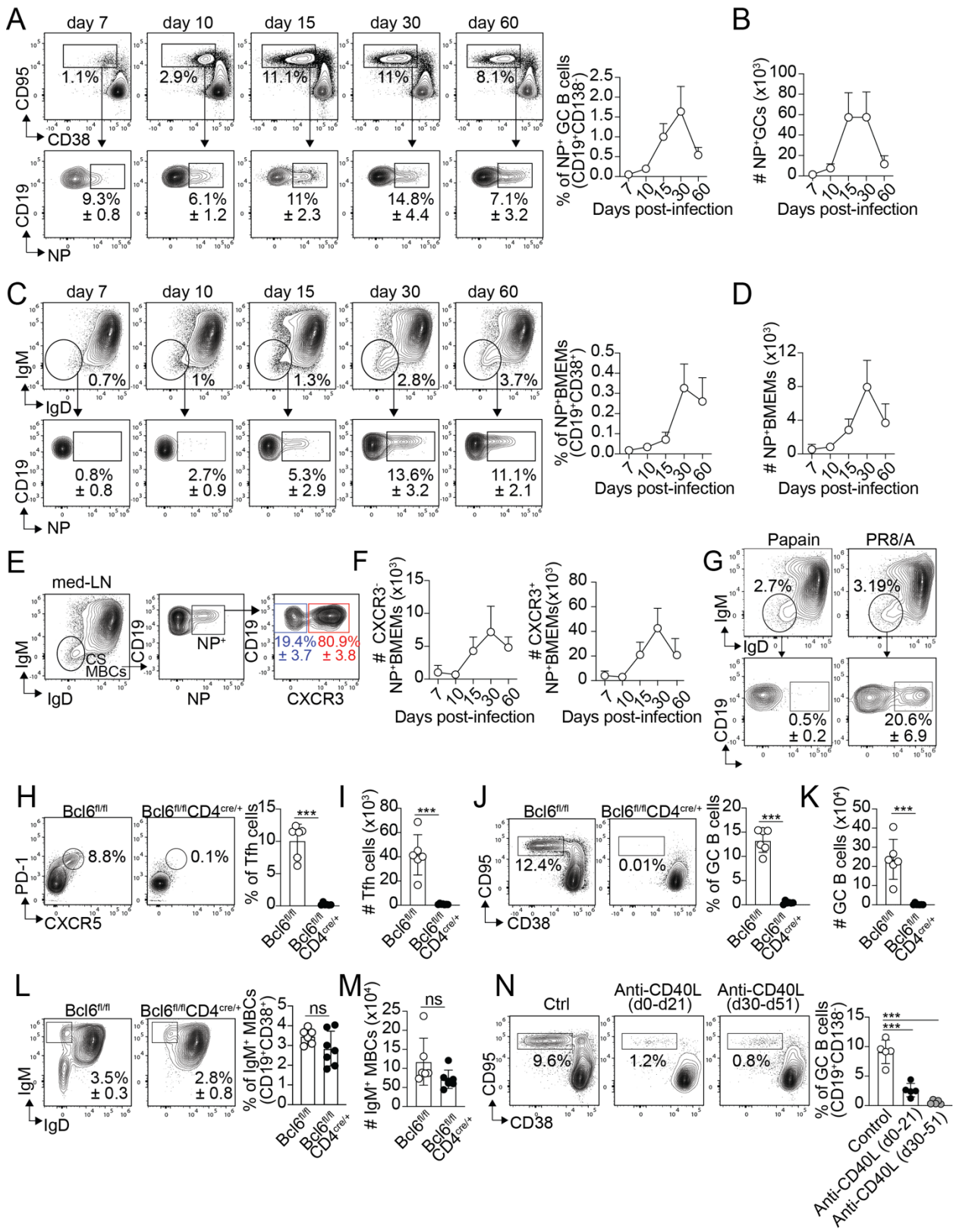
A
day 7
day 10
day 15
day 30
day 60
CD95
CD38
1.1%
2.9%
11.1%
11%
8.1%
CD19
NP
9.3% ± 0.8
6.1% ± 1.2
11% ± 2.3
14.8% ± 4.4
7.1% ± 3.2
% of NP+ GC B cells (CD19+CD138-)
Days post-infection
B
NP+GCs (x10³)
Days post-infection
C
IgM
IgD
0.7%
1%
1.3%
2.8%
3.7%
0.8% ± 0.8
2.7% ± 0.9
5.3% ± 2.9
13.6% ± 3.2
11.1% ± 2.1
% of NP+BMEMs (CD19+CD38+)
Days post-infection
D
NP+BMEMs (x10³)
Days post-infection
E
med-LN
IgM
IgD
CS MBCs
CD19
NP+
NP
CD19
CXCR3
19.4% ± 3.7
80.9% ± 3.8
F
CXCR3- NP+BMEMs (x10³)
Days post-infection
CXCR3+ NP+BMEMs(x10³)
Days post-infection
G
Papain
PR8/A
IgM
IgD
2.7%
3.19%
CD19
0.5% ± 0.2
20.6% ± 6.9
H
Bcl6fl/fl
Bcl6fl/flCD4cre/+
PD-1
CXCR5
8.8%
0.1%
% of Tfh cells
***
I
Tfh cells (x10³)
***
J
Bcl6fl/fl
Bcl6fl/flCD4cre/+
CD95
CD38
12.4%
0.01%
% of GC B cells
***
K
GC B cells (x10⁴)
***
L
Bcl6fl/fl
Bcl6fl/flCD4cre/+
IgM
IgD
3.5% ± 0.3
2.8% ± 0.8
% of IgM+ MBCs (CD19+CD38+)
ns
M
IgM+ MBCs (x10⁴)
ns
N
Ctrl
Anti-CD40L (d0-d21)
Anti-CD40L (d30-d51)
CD95
CD38
9.6%
1.2%
0.8%
% of GC B cells (CD19+CD138-)
***
***
Control
Anti-CD40L (d0-21)
Anti-CD40L (d30-51)

Figure Supplementary 1. GC and memory B cell responses in the med-LN, related to Figure 1. (A-F) B6 mice were infected with PR8, and cells from the med-LN were analyzed by flow cytometry at the indicated time points. Frequency **(A)** and number **(B)** of NP-specific GCs in the med-LN at the indicated time points. Representative plots gated on $CD19^{+}CD138^{-}$ B cells are shown. Frequency **(C)** and number **(D)** of class-switched NP-specific memory B cells in the med-LN at the indicated time points. Representative plots gated on $CD19^{+}CD38^{+}CD138^{-}$ B cells are shown are shown. (**E**) Expression of CXCR3 in class-switched NP-specific memory B cells in the med-LN. **(F)** Number $CXCR3^{-}$ and $CXCR3^{+}$ class-switched NP-specific memory B cells in the med-LN at the indicated time points. All data are shown as the mean ± SD (n=5 mice/time point). Data are representative of four independent experiments. **(G)** B6 mice were infected with PR8 or intranasally sensitized with 100µg of papain. Cells from the lungs were analyzed by flow cytometry on day 30. The frequencies of NP-specific B cells within the class-switched memory B cell compartment are shown. Data are shown as the mean ± SD (n=5 mice/time point). Data are representative of two independent experiments. **(H-M)** Control ($B6.Bcl6^{fl/fl}$) and Tfh-deficient ($B6.Bcl6^{fl/fl}/CD4^{cre/+}$) mice were infected with PR8 and cells from the were analyzed by flow cytometry on day 30. Frequency (**H**) and number (**I**) of $PD\text{-}1^{hi}CXCR5^{hi}$ (Tfh cells) within the $CD4^{+}$ T cells in the med-LN. Frequency (**J**) and number (**K**) of GC B cells within the $CD19^{+}CD138^{-}$ B cells in the med-LN. Frequency (**L**) and number (**M**) IgM^{+} memory B cells in the lungs of control and Tfh-deficient on day 30 after infection. Representative plots are shown. Data are shown as the mean ± SD (n=5 mice/time point). P value was determined using a two-tailed Student´s t-test. Data are representative of three independent experiments. **(N)** B6 mice were infected with PR8 and treated with 250 µg of anti-CD40L (MR1) antibody between day 0 and day 21 or between day 30 and day 51. In each treated group, mice receive 3 injections administered

one week apart. The frequency of GC B cells in the med-LN on day 55 after infection is shown. Representative plots are shown. Data are shown as the mean ± SD (n=5 mice/time point). P values were determined by one-way ANOVA with a post-hoc Kruskal–Wallis comparison test. Data are representative of three independent experiments.

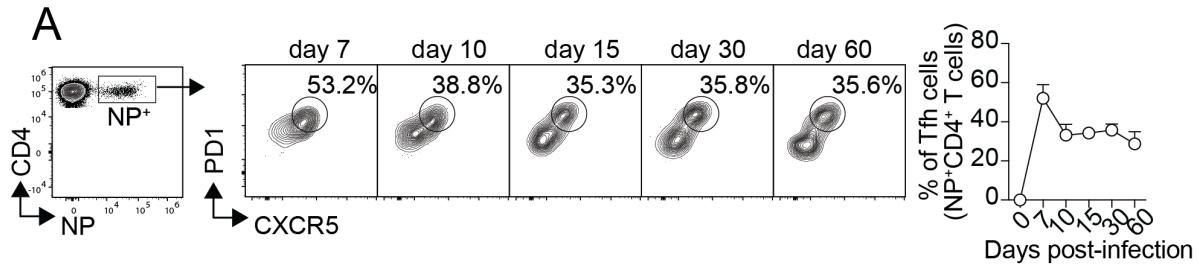

Figure Supplementary 2. NP-specific Tfh cell response, related to Figure 2. B6 mice were infected with PR8 and cells from the med-LN were analyzed by flow cytometry at the indicated time points. The frequency of $PD1^{hi}CXCR5^{hi}$ cells within the NP-specific $CD4^{+}$ T cell population is shown at the indicated time points. Representative plots are shown. Data are shown as the mean ± SD (n=5 mice/time point). Data are representative of three independent experiments.

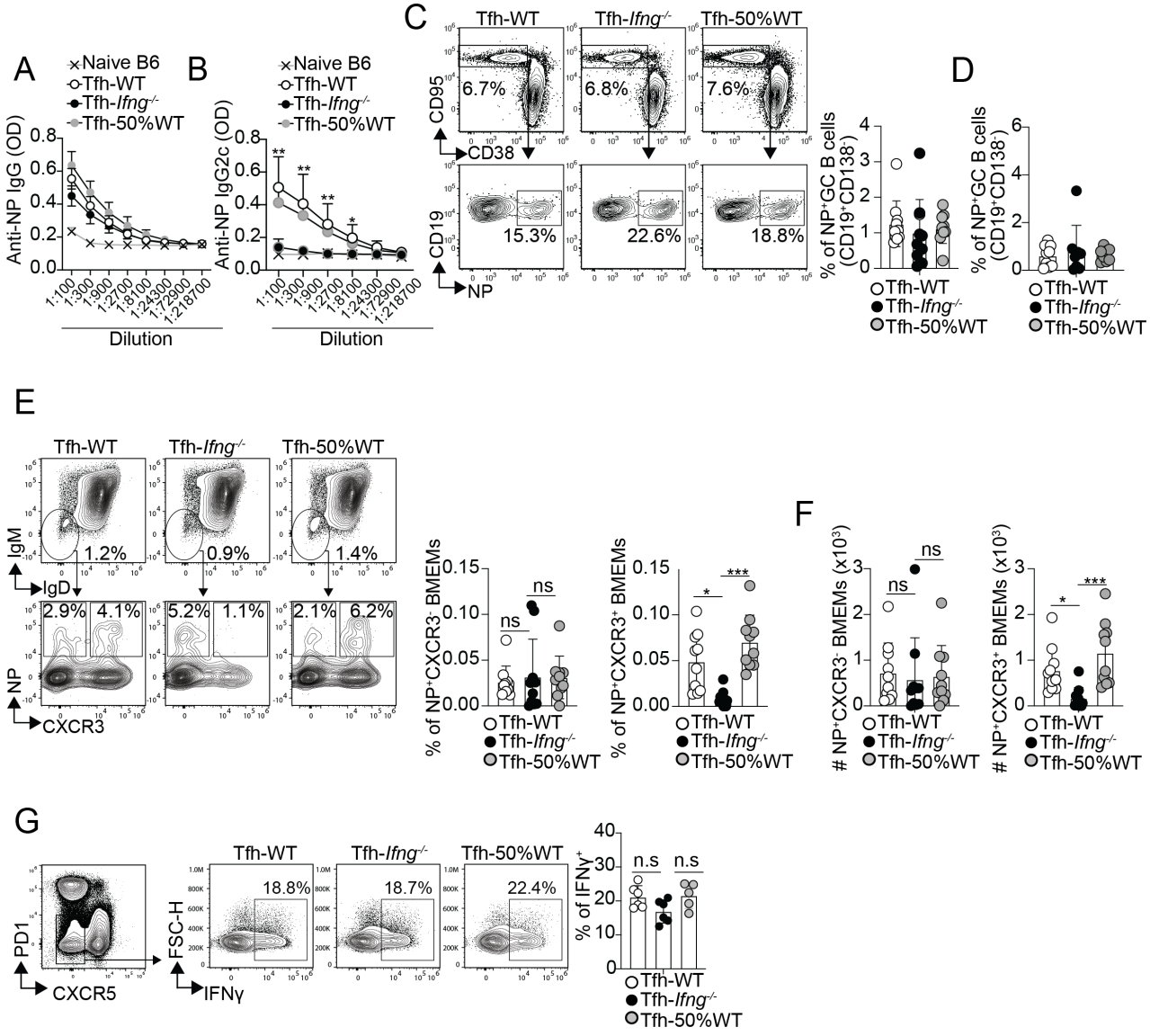

Figure Supplementary 3. Normal GC B cell responses in the Tfh- *Ifng*$^{-/-}$ chimeras, related to Figure 3. (A-H) Irradiated *Tcrb*$^{-/-}$*Tcrd*$^{-/-}$ mice were reconstituted with the indicated BM mixtures to generate Tfh-WT, Tfh- *Ifng*$^{-/-}$, and Tfh-50%WT chimeras. Eight weeks after reconstitution, the chimeric mice were infected with PR8. **(A-B)** Serum was obtained at day 30 and NP-specific IgG **(A)** and IgG2c **(B)** Abs were measured by ELISA. Data are representative of three independent experiments. (n=5 mice/group). All data are shown as the mean ± SD. P values were determined

by one-way ANOVA with a post-hoc Kruskal–Wallis comparison test. (**C**) Frequency of NP-specific GC B cells within the $CD19^+$ B cells in the med-LN (**C)** on day 30 after infection. Representative plots gated on $CD19^+CD138^-$ B cells are shown. (**D**) Frequency of class-switched NP-specific GC B cells within the $CD19^+$ B cells in the lung on day 60 after infection. Data were pooled from two independent experiments (n=10 mice/group). Data are representative of four independent experiments. **(E-F)** Frequency (**E**) and number (**F**) of $CXCR3^+$ and $CXCR3^-$ class-switched NP-specific memory B cells in the med-LN on day 60 after infection. Representative plots gated on $CD19^+CD38^+CD138^-$ B cells are shown are shown. Data were pooled from two independent experiments (n=10 mice/group). Data are representative of four independent experiments. All data are shown as the mean ± SD. P values were determined by one-way ANOVA with a post-hoc Kruskal–Wallis comparison test. (**G)** The chimeric mice were infected with PR8 and challenged with X31 on day 30. The frequencies of $IFN\gamma^+$ cells within $CD4^-$ T cells in the med-LN on day 6 after rechallenge are shown. Representative plots are shown. Data are representative of two independent experiments. Data are shown as the mean ± SD (n=5-6 mice). P values were determined by one-way ANOVA with a post-hoc Kruskal–Wallis comparison test.

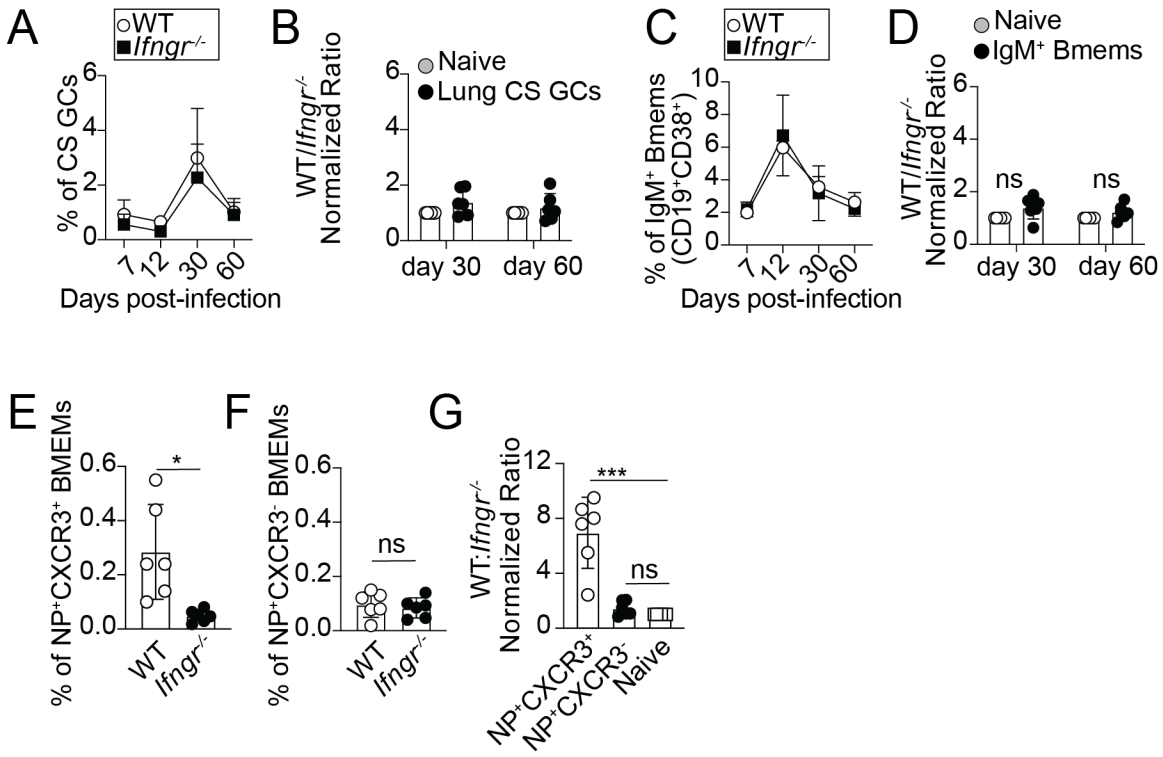

Figure Supplementary 4. Intrinsic IFNγ signaling is dispensable for CXCR3$^-$ class-switched NP-specific memory B cells in the med-LN, related to Figure 4. (**A-E)** CD45.1$^+$ B6 mice were irradiated and reconstituted with a 50:50 mix of BM from CD45.1$^+$ B6 and CD45.2$^+$ *IfngR1*$^{-/-}$ donors. Eight weeks later, reconstituted mice were infected with PR8 and B cells were analyzed at the indicated time points. (**A)** Frequency of class-switched GC B cells within the CD45.1$^+$ B6 and CD45.2$^+$ *IfngR1*$^{-/-}$ compartments in the lungs. Data in the graph are shown as the mean ± SD (n=5-6 mice). P values were determined using a two-tailed Student´s t-test. **(B)** Ratio of B6 to *IfngR1*$^{-/-}$ naïve B cells (naïve) and class-switched GC B cells from the lungs. Data in the graph are shown as the mean ± SD (n=5-6 mice). (**C)** Frequency of lung IgM$^+$ memory B cells within the CD45.1$^+$ B6 and CD45.2$^+$ *IfngR1*$^{-/-}$ compartments in the lungs. Data in the graph are shown as the mean ± SD (n=5-6 mice). P values were determined using a two-tailed Student´s t-test. **(D)**

Ratio of B6 to *IfngR1*$^{-/-}$ naïve B cells (naïve) and IgM^{+} memory B cells from the lungs. Data in the graph are shown as the mean ± SD (n=5-6 mice). P values were determined by one-way ANOVA with a post-hoc Kruskal–Wallis comparison test. **(E-G)** Frequency of class-switched CXCR3^{+} **(E)** and CXCR3^{-} **(F)** class-switched NP-specific memory B cells within the CD45.1^{+} B6 and CD45.2^{+} *IfngR1*$^{-/-}$ compartments in the med-LN. Data in the graph are shown as the mean ± SD (n=5-6 mice). P values were determined using a two-tailed Student´s t-test. **(G)** Ratio of B6 to *IfngR1*$^{-/-}$ naïve B cells (naïve) and CXCR3^{+} and CXCR3^{-} class-switched NP-specific memory B cells. Data in the graph are shown as the mean ± SD (n=5-6 mice). values were determined by one-way ANOVA with a post-hoc Kruskal–Wallis comparison test. Data are representative of three independent experiments.

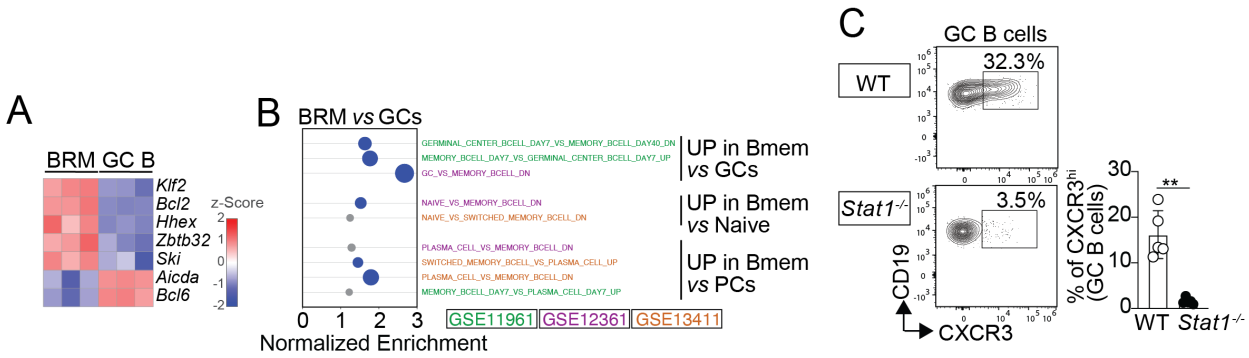

Figure Supplementary 5. Lung-BRMs are bona fide memory B cells, related to Figure 5. (A-B) B6 mice were infected with PR8. Class-switched GC B cells from the med-LN and paired lung-BRMs were sorted on day 30 after infection and RNA-seq was performed. **(A)** Heatmap showing the z-score of expression of key GC and memory B cell genes in BRM and GC B cells. **(B)** Gene set enrichment analysis (GSEA) for the indicated gene expression signatures of memory B cells in BRM vs. GC B cells. Circles size represents the Normalized enrichment score (NES). Blue color indicates FDR <0.05. Three replicates for each cell type were obtained from three independent experiments. Genes for GSEA were ranked by -log10(p-value) times the sign of the fold change for the paired BRM vs. GC B cells comparison. **(C)** WT/*Stat1*$^{-/-}$ BM chimeras were infected with PR8. The frequency of CXCR3^{hi} cells within the WT and *Stat1*$^{-/-}$ GC B cells were calculated at the indicated time points. Representative plots gated from day 12 shown are shown. Data are shown as the mean ± SD (n=5-6 mice/time point). Data are representative of two independent experiments. P values were determined using a two-tailed Student´s t-test.

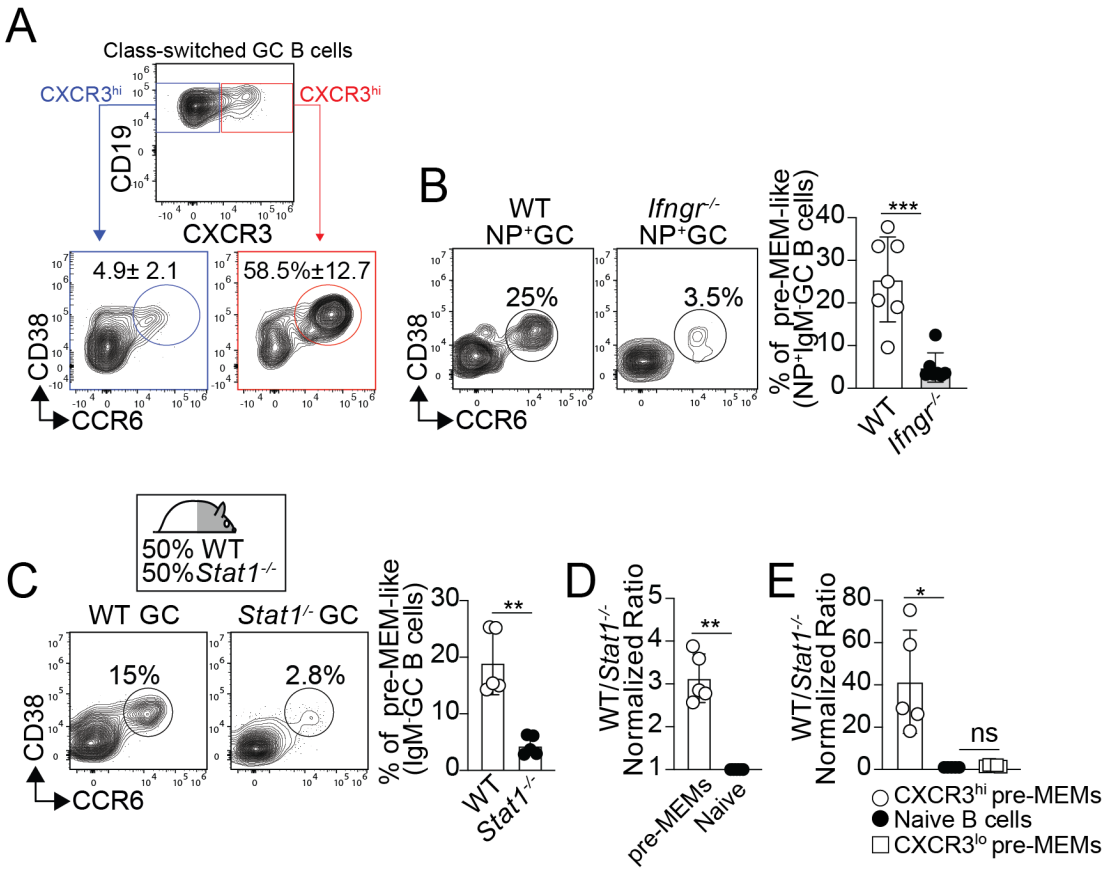

Figure Supplementary 6. Intrinsic STAT1 signaling is required for the differentiation of CXCR3^{+}pre-MEMs, related to Figure 6. (A) B6 were infected with PR8 and GC B cells from the med-LN were analyzed by flow cytometry on day 10 after infection. The frequencies of pre-MEMs within the CXCR3^{lo} and CXCR3^{hi} GC B cells are shown. Representative plots gated on CD19^{+} CD138^{-}IgD^{-}IgM^{-}FAS^{+} B cells. All data are shown as the mean ± SD (n=5 mice/time point). Data are representative of four independent experiments. **(B)** WT/*IfngR1*$^{-/-}$ BM chimeras were infected with PR8 and cells from the med-LN were analyzed on day 10. The frequencies of pre-MEMs within the B6 and *IfngR1*$^{-/-}$ NP-specific GC B cells in the med-LN are shown. Data in the graph are shown as the mean ± SD (n=7 mice). P values were determined using a two-tailed Student´s t-test. Data are representative of two independent experiments. **(C-E)** WT/*Stat1*$^{-/-}$ BM chimeras were infected with PR8 and cells from the med-LN were analyzed on day 10. **(C)**

Frequency of pre-MEMs within the B6 and *Stat1*$^{-/-}$ GC B cells in the med-LN. **(D)** Ratio of B6 to *Stat1*$^{-/-}$ pre-MEMs. **(E)** Ratio of B6 to *Stat1*$^{-/-}$ CXCR3^{+} and CXCR3^{-} pre-MEMs. Data in the graph are shown as the mean ± SD (n=5 mice). P values were determined using a two-tailed Student´s t-test. Data are representative of two independent experiments.

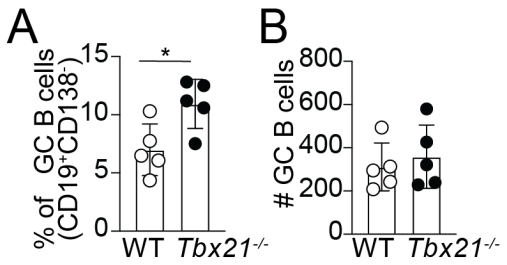

Figure Supplementary 7. GC B cells normally differentiate in the absence of T-bet, related to Figure 7. B6 and *Tbx21*$^{-/-}$ (T-bet deficient) mice were infected with PR8 and the frequency **(A)** and number **(B)** of GC B cells were calculated in the med-LN on day 10 after infection. Data in the graph sare shown as the mean ± SD (n=5mice). P values were determined using a two-tailed Student´s t-test. Data are representative of two independent experiments.