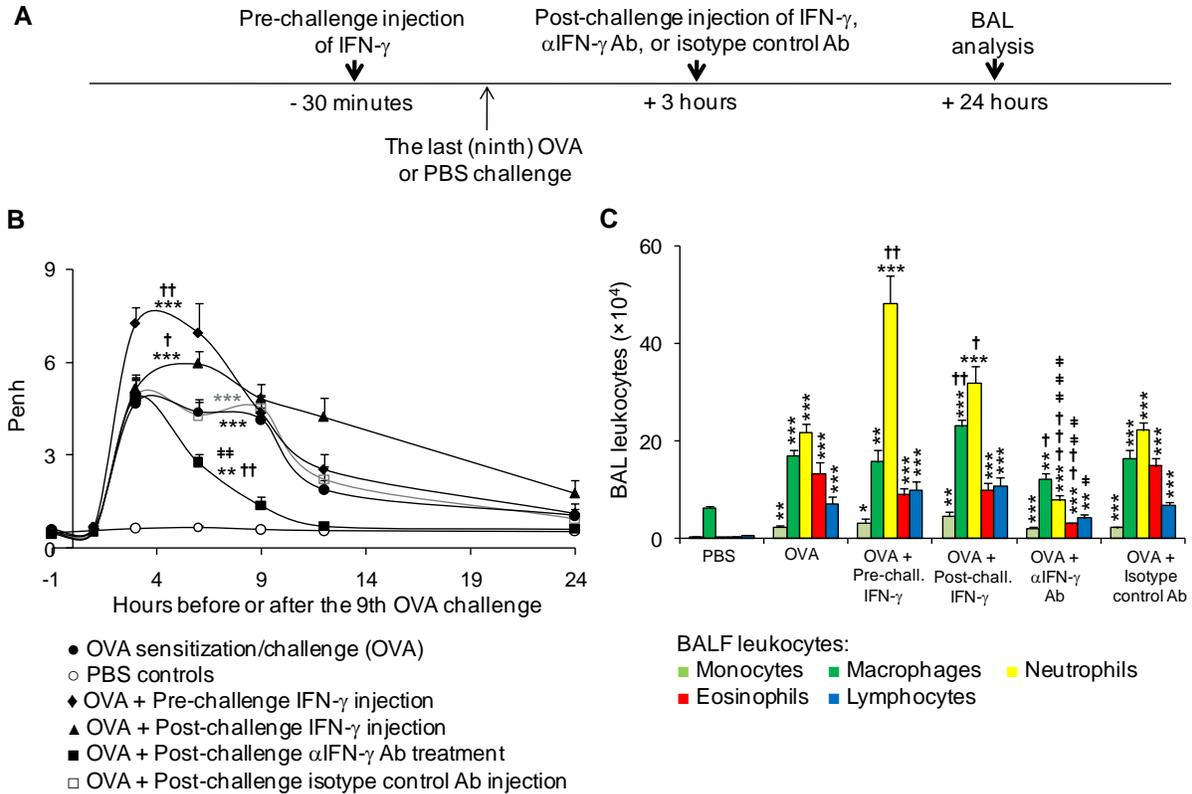**Supplemental Figures and Tables, and Supplemental Methods for Supplemental Figures 7-12 and Supplemental Tables 2 and 3.**
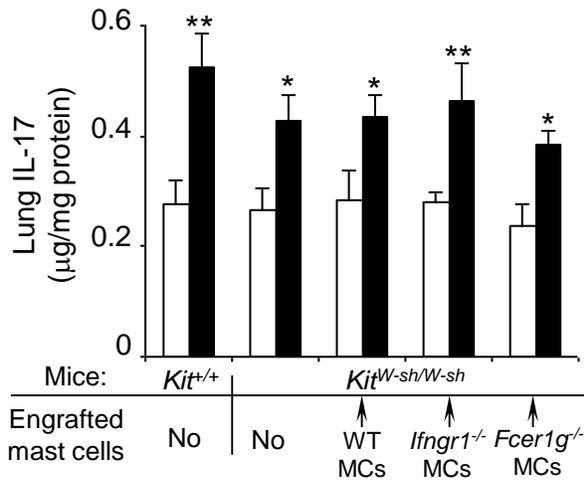

Supplemental Figure 1

Effects of treatment with IFN-γ or a neutralizing monoclonal antibody to (αIFN-γ Ab) on the development of antigen (OVA)-induced changes in Penh responses and numbers of leukocytes in the bronchoalveolar lavage (BAL) fluid of C57BL/6-$Kit^{+/+}$ wild-type (WT) mice in our standard model of chronic allergic inflammation of the airways. (**A**) Treatment protocols: Different groups of WT C57BL6/J mice received either an intra-peritoneal (*i.p.*) injection of IFN-γ (5 μg per mouse) at 30 min before or 3 h after the last (ninth) OVA or PBS challenge or received an *i.p.* injection of αIFN-γ Ab or an isotype-matched control Ab (100 μg per mouse) at 3 h after the last (ninth) OVA or PBS challenge; (**B**) Changes in Penh measured 1 h before and 1, 3, 6, 9, 12, and 24 h after the ninth OVA or PBS challenge in mice that were sensitized and challenged with OVA (OVA/OVA) or mock sensitized and challenged with PBS (PBS controls); (**C**) Numbers of leukocytes in BAL fluid recovered from the lungs 24 h after the ninth OVA or PBS challenge. *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$ versus PBS control group; †$P < 0.05$, ††$P < 0.01$,††† $P < 0.001$ versus OVA/OVA group; for αINF-γ Ab-treated group: ‡$P < 0.05$, ‡‡$P < 0.01$, ‡‡‡$P < 0.001$ versus group treated with isotype control Ab. Data are presented as mean + s.e.m. ($n = 5$ per group). (**B**) ANOVA; (**C**) unpaired Student's *t*-test (2-tailed).

1
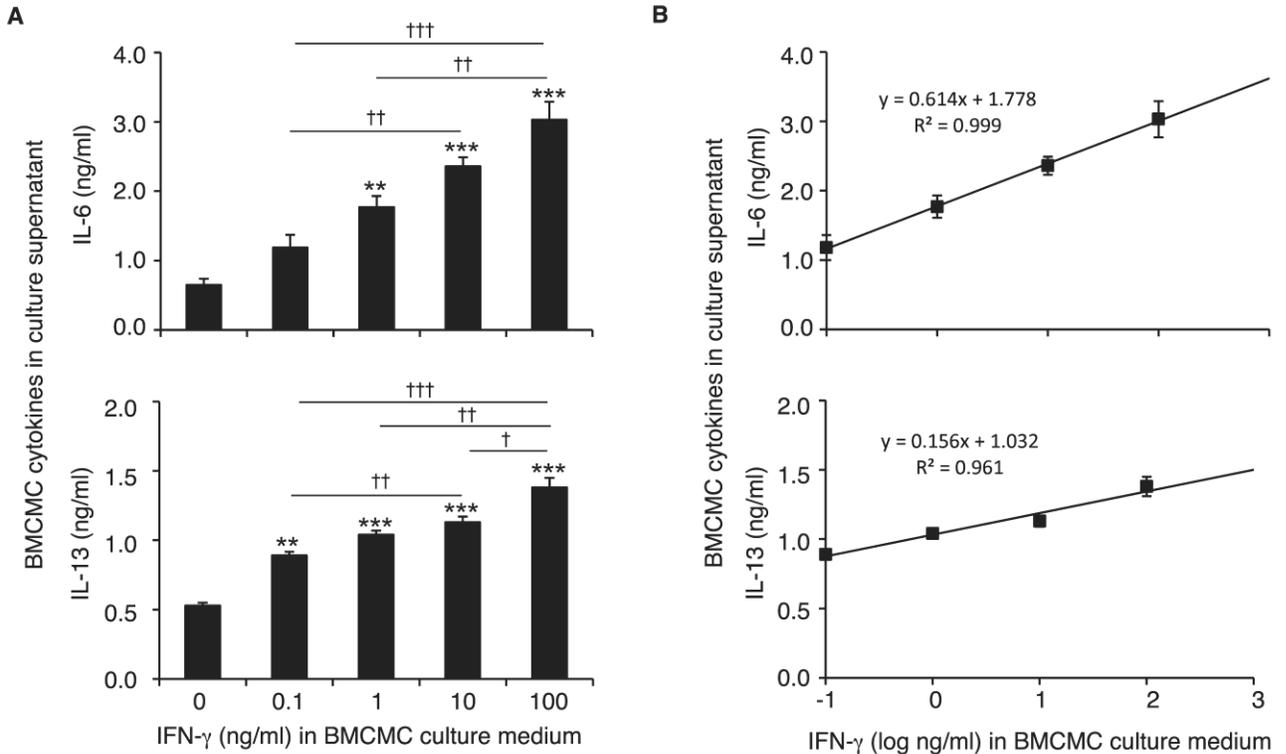
Supplemental Figure 2

Influence of IFN-γ on the production of cytokines by mast cells *in vitro*. (**A**) The culture supernatants of anti-DNP IgE-sensitized BMCMCs from wild type C57BL/6 mice were collected 24 h after addition of DNP (10 ng/ml) or DNP (10 ng/ml) plus various concentrations of IFN-γ. Data were calculated from results pooled from three independent experiments, each of which gave similar results. **$P < 0.01$, ***$P < 0.001$ vs. values from the corresponding BMCMCs stimulated with 10 ng/ml DNP alone (no added IFN-γ). †$P < 0.05$, ††$P < 0.01$, †††$P < 0.001$ vs. group indicated. $n = 3$ per group. (**B**) The dose response curves representing the correlation between the concentration of IL-6 (top) or IL-13 (bottom) in the BMCMC culture supernatants and the concentration of IFN-γ added to the culture medium.

Supplemental Figure 3

IL-17 level in the lung tissues. Tissues were sampled 24 h after the ninth OVA or PBS challenge. Open bars, PBS-treated groups; solid bars, OVA-sensitized and challenged groups. *$P < 0.05$, **$P < 0.01$ versus values for corresponding PBS-treated control group (unpaired Student's t-test, 2-tailed). Data are presented as mean + s.e.m. ($n = 6$-10 per group).
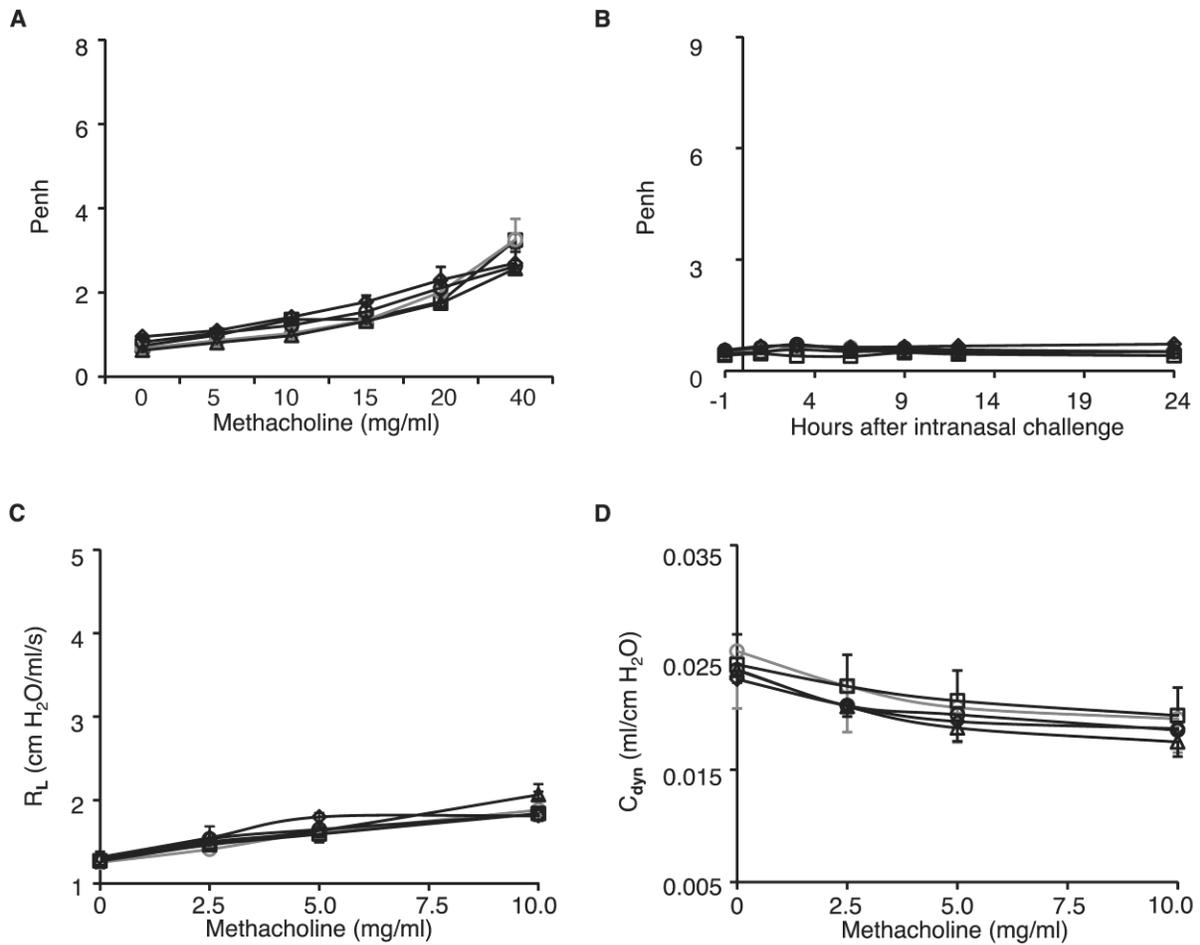
Supplemental Figure 4

Airway responses following intranasal challenge with PBS in mice mock sensitized with PBS. (**A**) Penh responses to aerosolized methacholine measured 24 h after the eighth PSB challenge. (**B**) PBS challenge-induced changes in Penh measured 1 h before and 1, 3, 6, 9, 12, and 24 hours after the ninth OVA or PBS challenge. (**C-D**) Changes in R_L and C_{dyn} to aerosolized methacholine administered 24 h after the ninth PBS challenge. Data are from PBS-treated WT C57BL/6 (empty grey circles), mast cell-deficient C57BL/6-$Kit^{W-sh/W-sh}$ (empty black squares), WT C57BL/6 BMCMCs→C57BL/6-$Kit^{W-sh/W-sh}$ (empty black circles), $Ifngr1^{-/-}$ BMCMCs→C57BL/6-$Kit^{W-sh/W-sh}$ (empty black diamonds), or $Fcer1g^{-/-}$ BMCMCs →C57BL/6-$Kit^{W-sh/W-sh}$ (empty black triangles) mice, $n = 6$ to 12 per group (**A** and **B**); $n = 4$ to 6 per group (**C** and **D**). The values for the PBS-treated WT C57BL/6 mice and mast cell-deficient C57BL/6-$Kit^{W-sh/W-sh}$ mice are also shown in Figure 4, for comparison to the values for OVA-sensitized and OVA-challenged groups.
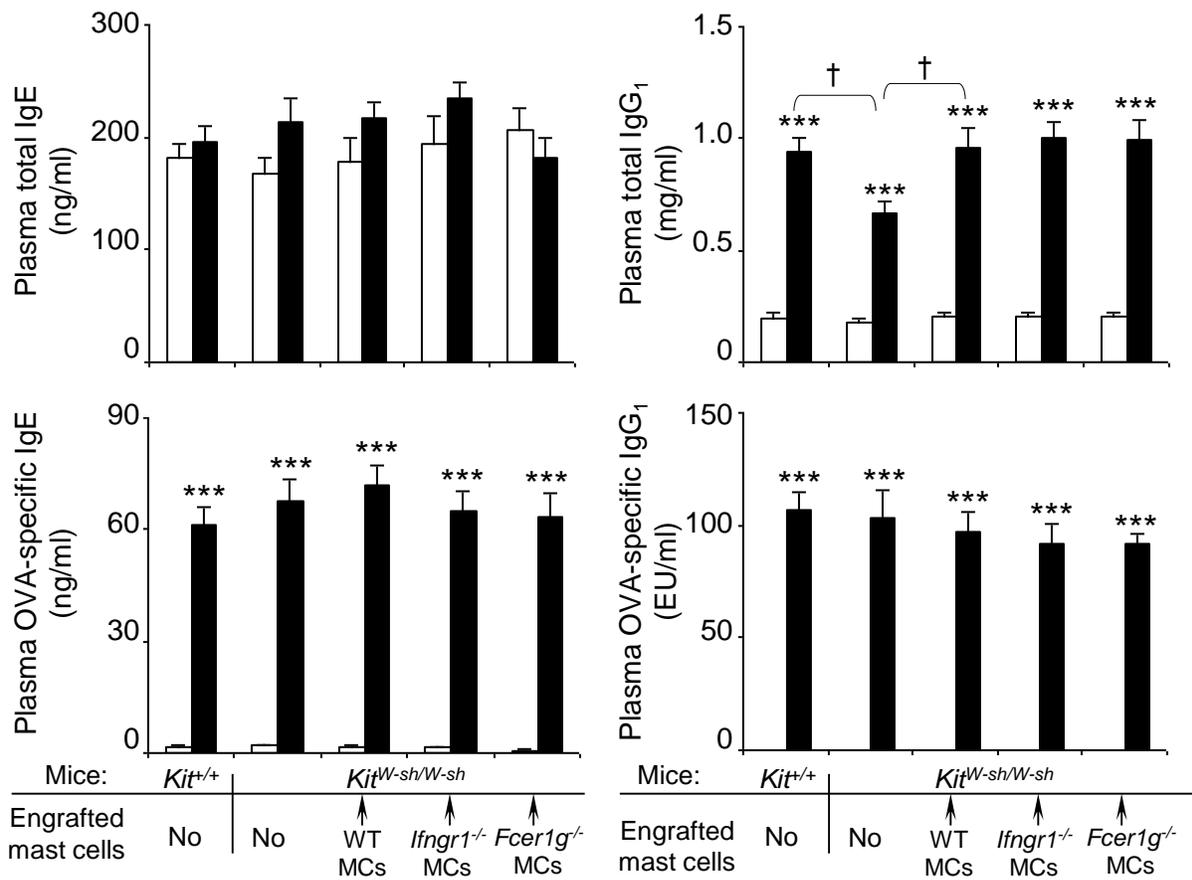
Supplemental Figure 5

Plasma levels of total IgE/IgG1 and antigen-specific IgE/IgG1. Plasma concentrations of total or OVA-specific IgE and IgG1 antibodies in C57BL/6-$Kit^{+/+}$ wild-type mice, mast cell-deficient C57BL/6-$Kit^{W-sh/W-sh}$ mice, or C57BL/6-$Kit^{W-sh/W-sh}$ mice engrafted with BMCMCs derived from C57BL/6 wild-type mice (WT MCs), C57BL/6-$Ifngr1^{-/-}$ mice ($Ifngr1^{-/-}$ MCs) or C57BL/6-$Fcer1g^{-/-}$ mice ($Fcer1g^{-/-}$ MCs) that were OVA-sensitized and challenged (solid bars) or treated with PBS (open bars). Blood was sampled 24 h after the 9th OVA or PBS challenge. ***$P < 0.001$ versus values for corresponding PBS-treated control group; †$P < 0.05$ versus the group indicated (unpaired Student's t-test). Data are presented as mean + s.e.m. ($n = 6$-10 per group).
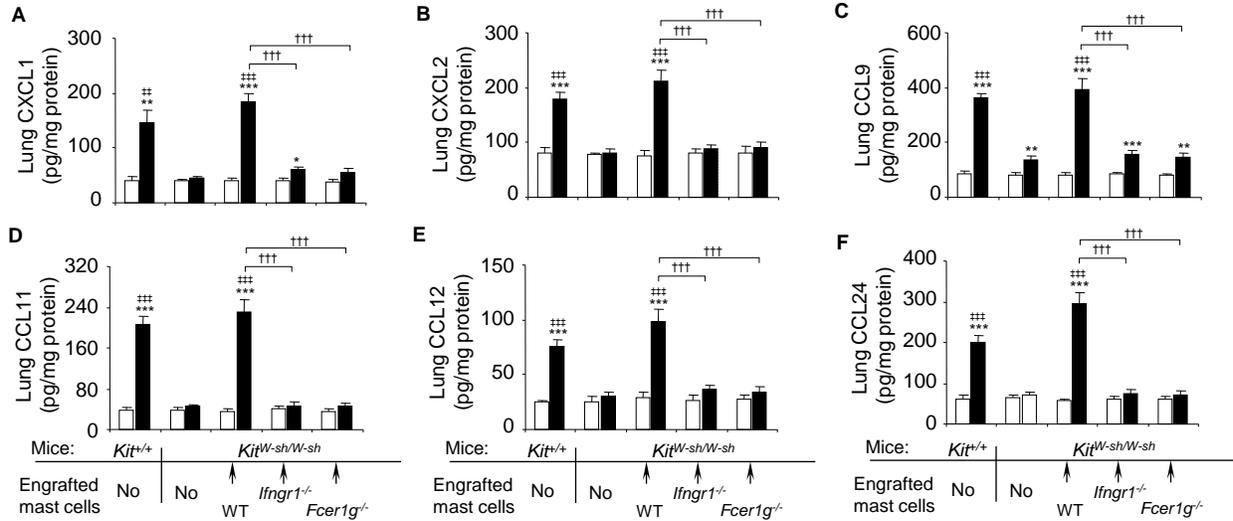
Supplemental Figure 6

Chemokine levels in the lung. The protein levels of a panel of chemokines CXCL1 (**A**), CXCL2 (**B**), CCL9 (**C**), CCL11 (**D**), CCL12 (**E**), and CCL24 (**F**) measured in the lungs 24 h after the ninth OVA or PBS challenge. Data are from WT C57BL/6 ($Kit^{+/+}$) mice, mast cell-deficient C57BL/6-$Kit^{W-sh/W-sh}$ ($Kit^{W-sh/W-sh}$) mice, WT BMCMCs→C57BL/6-$Kit^{W-sh/W-sh}$ mice, $Ifngr1^{-/-}$ BMCMCs→C57BL/6-$Kit^{W-sh/W-sh}$ mice, or $Fcer1g^{-/-}$ BMCMCs→C57BL/6-$Kit^{W-sh/W-sh}$ mice treated with OVA (black bars), and the corresponding PBS-treated control mice (white bars). *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$ versus the corresponding PBS controls; ‡‡$P < 0.01$, ‡‡‡$P < 0.001$ versus OVA-sensitized and challenged $Kit^{W-sh/W-sh}$ mice; †††$P < 0.001$ versus group indicated (unpaired Student's *t*-test, 2-tailed). Data are presented as mean + s.e.m. ($n = 6$-10 per group).

Supplemental Methods for Gene Set Enrichment Analysis (data shown in Supplemental Figures 7-12 Supplemental Methods for Gene Set Enrichment Analysis (data shown in Supplemental Figures 7-12 and Supplemental Tables 2 and 3)

Mouse gene expression arrays were processed using GCRMA implemented in Bioconductor for R (1, 2) to provide probe intensities. The data were entered into the public repository, the Gene Expression Omnibus, with an accession number of GSE27066. To identify a set of genes upregulated in human asthma, we obtained a previously published publicly-available gene expression dataset (3) measuring gene expression in bronchial biopsies from four patients with asthma and four subjects without asthma. The intensity levels were quantile normalized and differential expression of probes was detected using Significance Analysis of Microarrays (4). The probes were matched to genes using AILUN (5), and a set of 96 genes were found to have significant up-regulation of expression in the human asthma samples (*P* value < 0.01). We considered these 96 genes as a "gene set" or "signature" reflecting genes up-regulated in human asthma. Employing the commonly used non-parametric, rank based tool, Gene Set Enrichment Analysis (GSEA version 2) (6), we looked for enrichment in differential expression in the mouse samples of these genes up-regulated in human asthma. Of the 96 genes in our asthma "gene set", GSEA identified 67 homologues measured on our microarrays. GSEA calculates an enrichment score (very similar to a Kolmogorov-Smirnov statistic), giving weight to highly differentially expressed genes (highly ranked relative to other genes) in the gene set of interest. The significance of this enrichment is calculated using a permutation test over all samples to obtain a *P* value.

6

Supplemental References

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4. Tusher, V.G., Tibshirani, R., and Chu, G. 2001. Significance analysis of microarrays applied to the ionizing radiation response. *Proc Natl Acad Sci U S A* 98:5116-5121.

5. Chen, R., Li, L., and Butte, A.J. 2007. AILUN: reannotating gene expression data automatically. *Nat Methods* 4:879.

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Supplemental Figure 7

A. Wild type B6 mice — *$P = 0.021$ — Enrichment plot: LAPRISEUPASTHMA

B. $Kit^{W-sh/W-sh}$ mice — $P = 0.309$ — Enrichment plot: LAPRISEUPASTHMA

C. WT BMCMCs→$Kit^{W-sh/W-sh}$ mice — *$P = 0.020$ — Enrichment plot: LAPRISEUPASTHMA
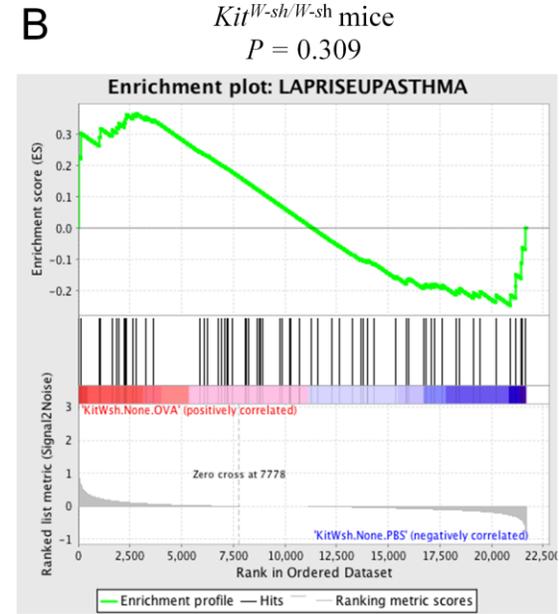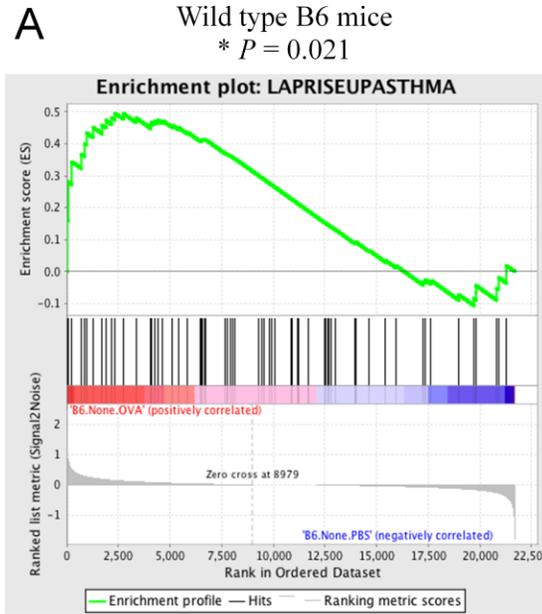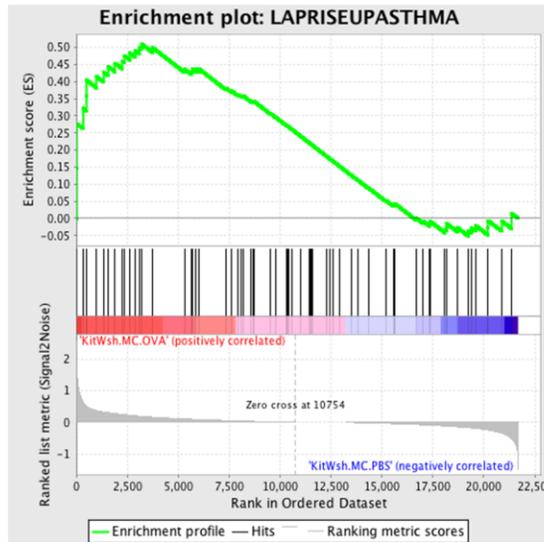
D. $Fcer1g^{-/-}$ BMCMCs→$Kit^{W-sh/W-sh}$ mice — $P > 0.73$ — Enrichment plot: LAPRISEUPASTHMA
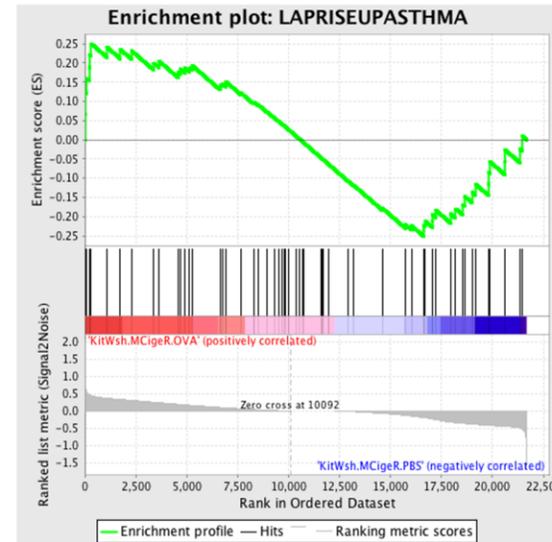
E. $Ifngr1^{-/-}$ BMCMCs→$Kit^{W-sh/W-sh}$ mice — $P = 0.089$ — Enrichment plot: LAPRISEUPASTHMA
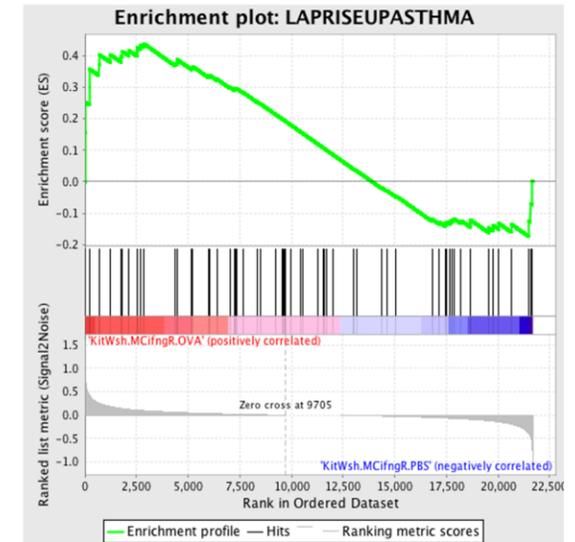
Supplemental Figure 7

Gene Set Enrichment Analysis comparing genes upregulated in bronchial biopsy specimens of human patients with asthma and genes upregulated in OVA-sensitized and OVA-challenged mice in our standard model of chronic allergic inflammation of the airways. Whole lung samples of OVA-sensitized and OVA-challenged mice were contrasted with samples from the corresponding control mice treated with PBS, based on results of gene expression analysis using Affymetrix Mouse Genome 430 2.0 arrays. These mouse expression profiles were examined against a set of genes found to be upregulated in human asthma (suppl. ref. 3 [Laprise, C., Sladek, R., Ponton, A., Bernier, M.C., Hudson, T.J., and Laviolette, M. Functional classes of bronchial mucosa genes that are differentially expressed in asthma. *BMC Genomics.* 2004;5(1):21]). Only the wild type B6-$Kit^{+/+}$ mice (**A**) and the WT BMCMCs$\rightarrow Kit^{W\text{-}sh/W\text{-}sh}$ mice (**C**) were found to be significantly ($P < 0.05$) enriched for increased expression of genes upregulated in human asthma. By contrast, mast cell-deficient $Kit^{W\text{-}sh/W\text{-}sh}$ mice (**B**) and $Kit^{W\text{-}sh/W\text{-}sh}$ mice that had been engrafted with BMCMCs lacking either FcεR1γ (**D**) or IFN-γR1 (**E**) were not significantly enriched for increased expression of genes upregulated in human asthma.

Supplemental Figure 8

Heatmap of expression levels for the 67 mouse homologues of the genes up-regulated in human asthma for the wild type mice as reported by GSEA. The gray columns represent samples taken from WT C57BL/6 mice challenged with OVA (B6.None.OVA.1-4) and the yellow columns represent control samples from WT C57BL/6 mice challenged with PBS (B6.None.PBS.5-8).

Gene	Gene	SampleName
MUC5AC	MUC5AC	mucin 5AC, oligomeric mucus/gel-forming
TFF2	TFF2	trefoil factor 2 (spasmolytic protein 1)
ALOX15	ALOX15	arachidonate 15-lipoxygenase
SLC36A1	SLC36A1	solute carrier family 36 (proton/amino acid symporter), member 1
RAPGEF3	RAPGEF3	Rap guanine nucleotide exchange factor (GEF) 3
LEFTY1	LEFTY1	left-right determination factor 1
LDB1	LDB1	LIM domain binding 1
TBL3	TBL3	transducin (beta)-like 3
IL1RL1	IL1RL1	interleukin 1 receptor-like 1
CCDC22	CCDC22	coiled-coil domain containing 22
CPA3	CPA3	carboxypeptidase A3 (mast cell)
CTDP1	CTDP1	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) phosphatase, subunit 1
DNAJC7	DNAJC7	DnaJ (Hsp40) homolog, subfamily C, member 7
VGF	VGF	VGF nerve growth factor inducible
AMELX	AMELX	amelogenin (amelogenesis imperfecta 1, X-linked)
TCF25	TCF25	transcription factor 25 (basic helix-loop-helix)
BRD4	BRD4	bromodomain containing 4
GATA2	GATA2	GATA binding protein 2
ARHGEF16	ARHGEF16	Rho guanine nucleotide exchange factor (GEF) 16
ANGEL2	ANGEL2	angel homolog 2 (Drosophila)
PCYT1B	PCYT1B	phosphate cytidylyltransferase 1, choline, beta
KLHL20	KLHL20	kelch-like 20 (Drosophila)
CNP	CNP	2',3'-cyclic nucleotide 3' phosphodiesterase
ACPP	ACPP	acid phosphatase, prostate
TRIM16	TRIM16	tripartite motif-containing 16
SERPINB2	SERPINB2	serpin peptidase inhibitor, clade B (ovalbumin), member 2
FOXD1	FOXD1	forkhead box D1
TBXA2R	TBXA2R	thromboxane A2 receptor
ANXA13	ANXA13	annexin A13
P2RX3	P2RX3	purinergic receptor P2X, ligand-gated ion channel, 3
TRAF3IP1	TRAF3IP1	TNF receptor-associated factor 3 interacting protein 1
SLC17A2	SLC17A2	solute carrier family 17 (sodium phosphate), member 2
IRS4	IRS4	insulin receptor substrate 4
DLGAP2	DLGAP2	discs, large (Drosophila) homolog-associated protein 2
HOXD9	HOXD9	homeobox D9
OXT	OXT	oxytocin, prepro- (neurophysin I)
CHRNB3	CHRNB3	cholinergic receptor, nicotinic, beta 3
GPR3	GPR3	G protein-coupled receptor 3
MUC2	MUC2	mucin 2, oligomeric mucus/gel-forming
KCNA1	KCNA1	potassium voltage-gated channel, shaker-related subfamily, member 1 (episodic ataxia with myokymia)
POU3F1	POU3F1	POU domain, class 3, transcription factor 1
GRM5	GRM5	glutamate receptor, metabotropic 5
GRM8	GRM8	glutamate receptor, metabotropic 8
CPA1	CPA1	carboxypeptidase A1 (pancreatic)
CACNA2D2	CACNA2D2	calcium channel, voltage-dependent, alpha 2/delta subunit 2
SLC6A3	SLC6A3	solute carrier family 6 (neurotransmitter transporter, dopamine), member 3
PTEN	PTEN	phosphatase and tensin homolog (mutated in multiple advanced cancers 1)
KCNC4	KCNC4	potassium voltage-gated channel, Shaw-related subfamily, member 4
ESR2	ESR2	estrogen receptor 2 (ER beta)
RASGRF1	RASGRF1	Ras protein-specific guanine nucleotide-releasing factor 1
ME3	ME3	malic enzyme 3, NADP(+)-dependent, mitochondrial
AFF2	AFF2	AF4/FMR2 family, member 2
TRAPPC6A	TRAPPC6A	trafficking protein particle complex 6A
MLLT4	MLLT4	myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila); translocated to, 4
TPSAB1	TPSAB1	tryptase alpha/beta 1
POSTN	POSTN	periostin, osteoblast specific factor
TSPAN8	TSPAN8	tetraspanin 8
CAV2	CAV2	caveolin 2
ZFR	ZFR	zinc finger RNA binding protein
DTX2	DTX2	deltex homolog 2 (Drosophila)
NAT8	NAT8	N-acetyltransferase 8 (camello like)
CDC45L	CDC45L	CDC45 cell division cycle 45-like (S. cerevisiae)
REPS2	REPS2	RALBP1 associated Eps domain containing 2
SERPIND1	SERPIND1	serpin peptidase inhibitor, clade D (heparin cofactor), member 1
POLR3F	POLR3F	polymerase (RNA) III (DNA directed) polypeptide F, 39 kDa
SNAPC3	SNAPC3	small nuclear RNA activating complex, polypeptide 3, 50kDa
MYL1	MYL1	myosin, light chain 1, alkali; skeletal, fast

Supplemental Figure 9

Heatmap of expression levels for the 67 mouse homologues of the genes up-regulated in human asthma for mast cell-deficient C57BL/6-$Kit^{W-sh/W-sh}$ mice as reported by GSEA. The gray columns represent samples taken from C57BL/6-$Kit^{W-sh/W-sh}$ mice challenged with OVA (KitWsh.None.OVA.30-33) and the yellow columns represent control C57BL/6-$Kit^{W-sh/W-sh}$ mice challenged with PBS (KitWsh.None.PBS.34-36).

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Supplemental Figure 10

Heatmap of expression levels for the 67 mouse homologues of the genes up-regulated in human asthma for mast cell-deficient C57BL/6-$Kit^{W-sh/W-sh}$ mice engrafted with bone marrow-derived cultured mast cells (BMCMCs) from C57BL/6 wild type mice. The gray columns represent samples taken from C57BL/6 BMCMC engrafted C57BL/6-$Kit^{W-sh/W-sh}$ mice challenged with OVA (KitWsh.MC.OVA.9-12), and the yellow columns represent control WT C57BL/6 BMCMC engrafted C57BL/6-$Kit^{W-sh/W-sh}$ mice challenged with PBS (KitWsh.MC.PBS.13-15).
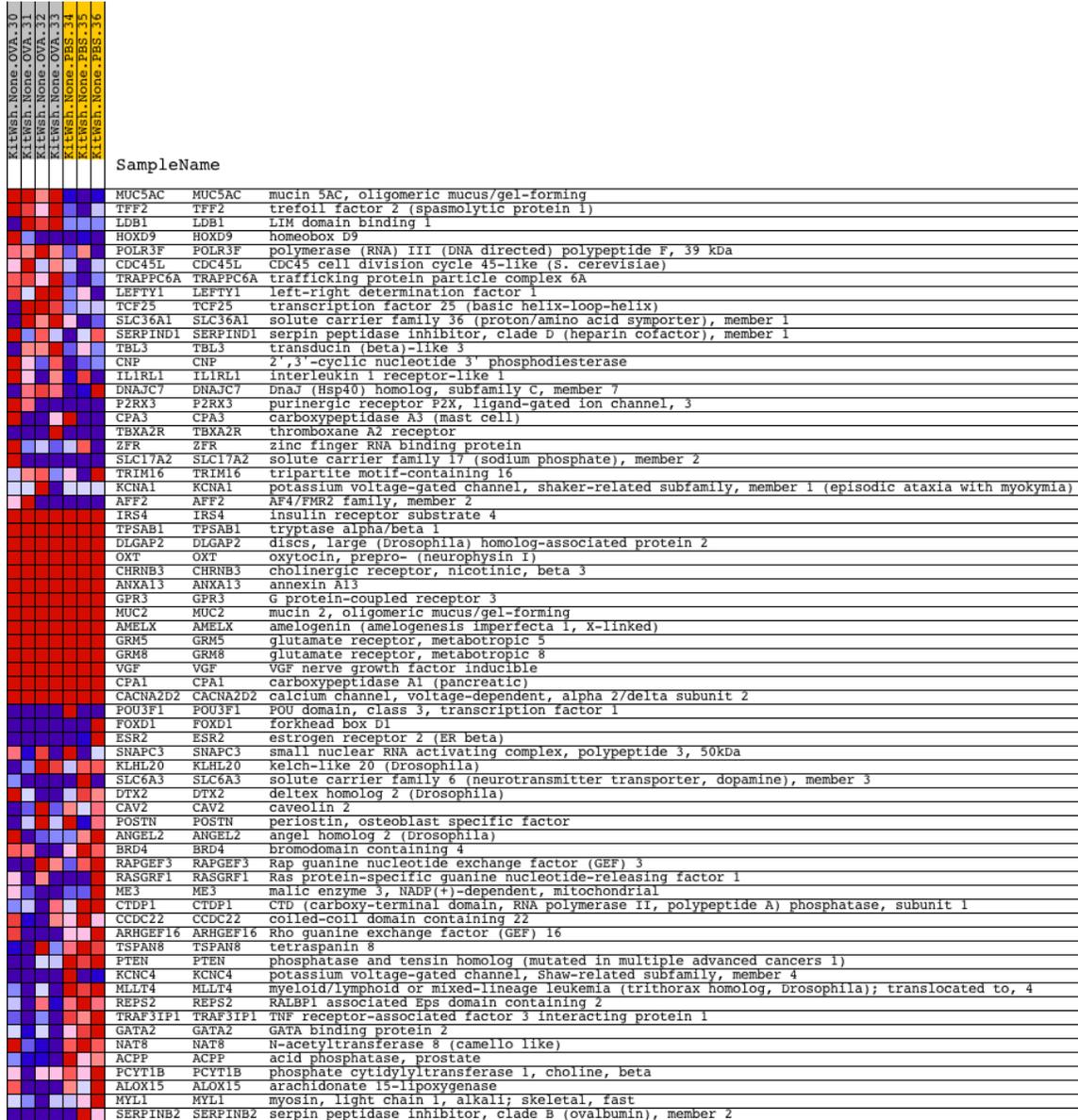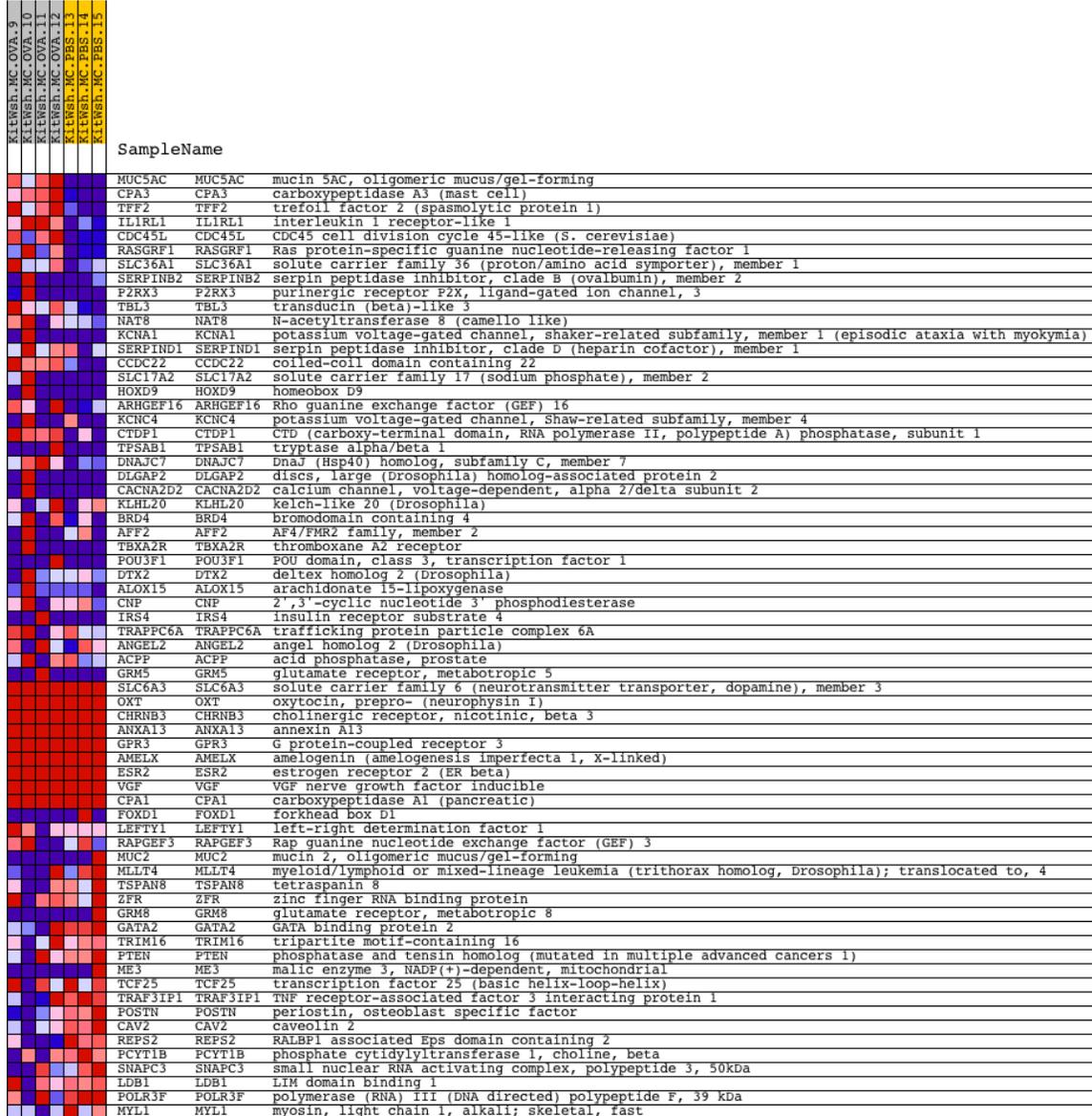
Supplemental Figure 11

Heatmap of expression levels for the 67 mouse homologues of the genes up-regulated in human asthma for mast cell-deficient C57BL/6-*Kit*$^{W-sh/W-sh}$ mice engrafted with bone marrow-derived cultured mast cells (BMCMCs) from C57BL/6 mice deficient in the interferon gamma receptor (*Ifngr1*$^{-/-}$). The gray columns represent samples taken from *Ifngr1*$^{-/-}$ BMCMC engrafted C57BL/6-*Kit*$^{W-sh/W-sh}$ mice challenged with OVA (KitWsh.MCifngR.OVA.16-19) and the yellow columns represent control *Ifngr1*$^{-/-}$ BMCMC engrafted C57BL/6-*Kit*$^{W-sh/W-sh}$ mice challenged with PBS (KitWsh.MCifngR.PBS.20-22).

Column labels (top to bottom):
KitWsh.MCifngR.OVA.16
KitWsh.MCifngR.OVA.17
KitWsh.MCifngR.OVA.18
KitWsh.MCifngR.OVA.19
KitWsh.MCifngR.PBS.20
KitWsh.MCifngR.PBS.21
KitWsh.MCifngR.PBS.22

SampleName

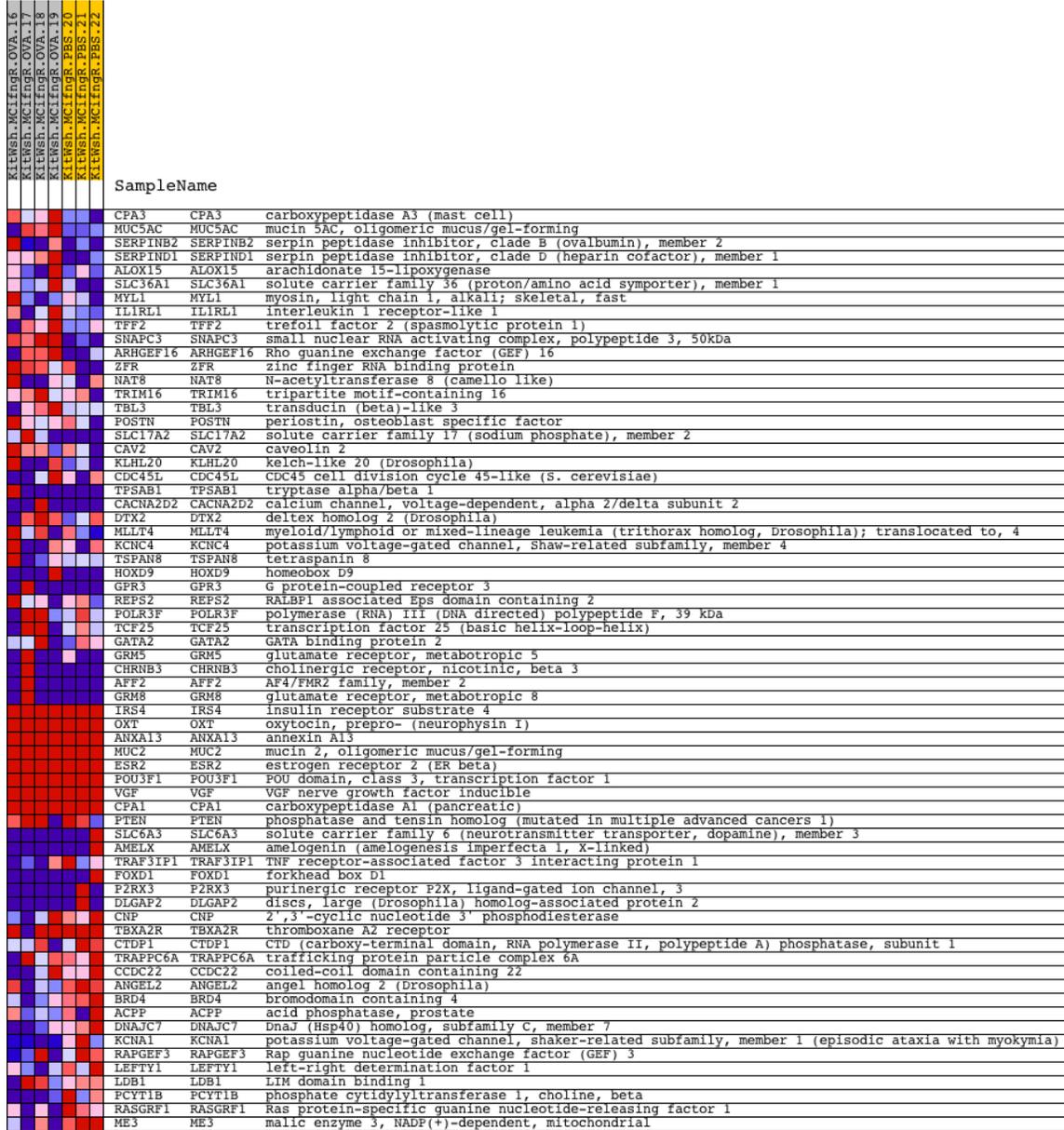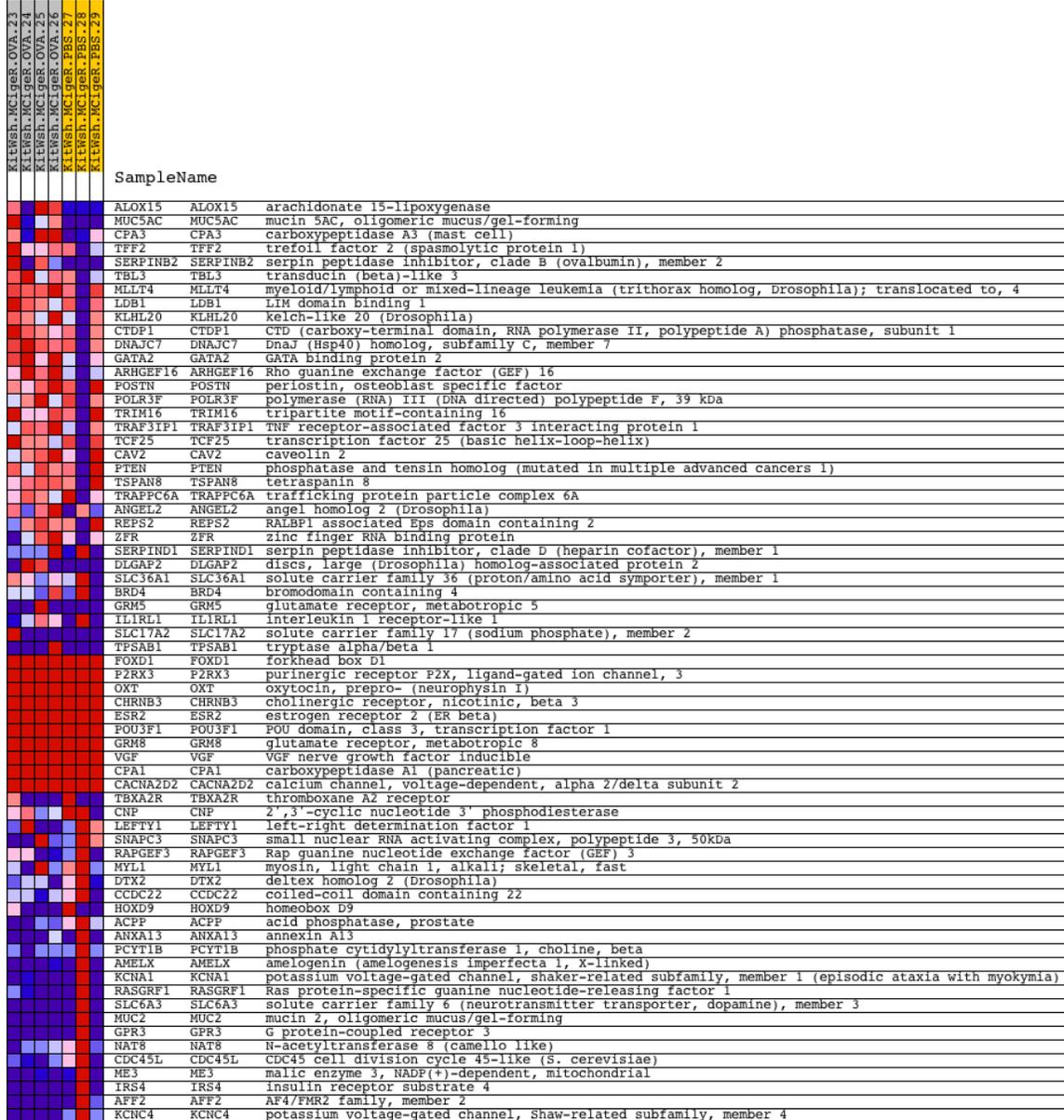| Gene	Gene	Description
CPA3	CPA3	carboxypeptidase A3 (mast cell)
MUC5AC	MUC5AC	mucin 5AC, oligomeric mucus/gel-forming
SERPINB2	SERPINB2	serpin peptidase inhibitor, clade B (ovalbumin), member 2
SERPIND1	SERPIND1	serpin peptidase inhibitor, clade D (heparin cofactor), member 1
ALOX15	ALOX15	arachidonate 15-lipoxygenase
SLC36A1	SLC36A1	solute carrier family 36 (proton/amino acid symporter), member 1
MYL1	MYL1	myosin, light chain 1, alkali; skeletal, fast
IL1RL1	IL1RL1	interleukin 1 receptor-like 1
TFF2	TFF2	trefoil factor 2 (spasmolytic protein 1)
SNAPC3	SNAPC3	small nuclear RNA activating complex, polypeptide 3, 50kDa
ARHGEF16	ARHGEF16	Rho guanine exchange factor (GEF) 16
ZFR	ZFR	zinc finger RNA binding protein
NAT8	NAT8	N-acetyltransferase 8 (camello like)
TRIM16	TRIM16	tripartite motif-containing 16
TBL3	TBL3	transducin (beta)-like 3
POSTN	POSTN	periostin, osteoblast specific factor
SLC17A2	SLC17A2	solute carrier family 17 (sodium phosphate), member 2
CAV2	CAV2	caveolin 2
KLHL20	KLHL20	kelch-like 20 (Drosophila)
CDC45L	CDC45L	CDC45 cell division cycle 45-like (S. cerevisiae)
TPSAB1	TPSAB1	tryptase alpha/beta 1
CACNA2D2	CACNA2D2	calcium channel, voltage-dependent, alpha 2/delta subunit 2
DTX2	DTX2	deltex homolog 2 (Drosophila)
MLLT4	MLLT4	myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila); translocated to, 4
KCNC4	KCNC4	potassium voltage-gated channel, Shaw-related subfamily, member 4
TSPAN8	TSPAN8	tetraspanin 8
HOXD9	HOXD9	homeobox D9
GPR3	GPR3	G protein-coupled receptor 3
REPS2	REPS2	RALBP1 associated Eps domain containing 2
POLR3F	POLR3F	polymerase (RNA) III (DNA directed) polypeptide F, 39 kDa
TCF25	TCF25	transcription factor 25 (basic helix-loop-helix)
GATA2	GATA2	GATA binding protein 2
GRM5	GRM5	glutamate receptor, metabotropic 5
CHRNB3	CHRNB3	cholinergic receptor, nicotinic, beta 3
AFF2	AFF2	AF4/FMR2 family, member 2
GRM8	GRM8	glutamate receptor, metabotropic 8
IRS4	IRS4	insulin receptor substrate 4
OXT	OXT	oxytocin, prepro- (neurophysin I)
ANXA13	ANXA13	annexin A13
MUC2	MUC2	mucin 2, oligomeric mucus/gel-forming
ESR2	ESR2	estrogen receptor 2 (ER beta)
POU3F1	POU3F1	POU domain, class 3, transcription factor 1
VGF	VGF	VGF nerve growth factor inducible
CPA1	CPA1	carboxypeptidase A1 (pancreatic)
PTEN	PTEN	phosphatase and tensin homolog (mutated in multiple advanced cancers 1)
SLC6A3	SLC6A3	solute carrier family 6 (neurotransmitter transporter, dopamine), member 3
AMELX	AMELX	amelogenin (amelogenesis imperfecta 1, X-linked)
TRAF3IP1	TRAF3IP1	TNF receptor-associated factor 3 interacting protein 1
FOXD1	FOXD1	forkhead box D1
P2RX3	P2RX3	purinergic receptor P2X, ligand-gated ion channel, 3
DLGAP2	DLGAP2	discs, large (Drosophila) homolog-associated protein 2
CNP	CNP	2',3'-cyclic nucleotide 3' phosphodiesterase
TBXA2R	TBXA2R	thromboxane A2 receptor
CTDP1	CTDP1	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) phosphatase, subunit 1
TRAPPC6A	TRAPPC6A	trafficking protein particle complex 6A
CCDC22	CCDC22	coiled-coil domain containing 22
ANGEL2	ANGEL2	angel homolog 2 (Drosophila)
BRD4	BRD4	bromodomain containing 4
ACPP	ACPP	acid phosphatase, prostate
DNAJC7	DNAJC7	DnaJ (Hsp40) homolog, subfamily C, member 7
KCNA1	KCNA1	potassium voltage-gated channel, shaker-related subfamily, member 1 (episodic ataxia with myokymia)
RAPGEF3	RAPGEF3	Rap guanine nucleotide exchange factor (GEF) 3
LEFTY1	LEFTY1	left-right determination factor 1
LDB1	LDB1	LIM domain binding 1
PCYT1B	PCYT1B	phosphate cytidylyltransferase 1, choline, beta
RASGRF1	RASGRF1	Ras protein-specific guanine nucleotide-releasing factor 1
ME3	ME3	malic enzyme 3, NADP(+)-dependent, mitochondrial

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Supplemental Figure 12

Heatmap of expression levels for the 67 mouse homologues of the genes up-regulated in human asthma for mast cell-deficient C57BL/6-$Kit^{W-sh/W-sh}$ mice engrafted with bone marrow-derived cultured mast cells (BMCMCs) from C57BL/6 mice deficient in the signaling γ chain shared by FcεRI and FcγRIII (*Fcer1g*$^{-/-}$). The gray columns represent samples taken from *Fcer1g*$^{-/-}$ BMCMC engrafted C57BL/6-$Kit^{W-sh/W-sh}$ mice challenged with OVA (KitWsh.MCigeR.OVA.23-26) and the yellow columns represent control *Fcer1g*$^{-/-}$ BMCMC engrafted C57BL/6-$Kit^{W-sh/W-sh}$ mice challenged with PBS (KitWsh.MCigeR.OVA.PBS.27-29).

Gene	Gene	Description
ALOX15	ALOX15	arachidonate 15-lipoxygenase
MUC5AC	MUC5AC	mucin 5AC, oligomeric mucus/gel-forming
CPA3	CPA3	carboxypeptidase A3 (mast cell)
TFF2	TFF2	trefoil factor 2 (spasmolytic protein 1)
SERPINB2	SERPINB2	serpin peptidase inhibitor, clade B (ovalbumin), member 2
TBL3	TBL3	transducin (beta)-like 3
MLLT4	MLLT4	myeloid/lymphoid or mixed-lineage leukemia (trithorax homolog, Drosophila); translocated to, 4
LDB1	LDB1	LIM domain binding 1
KLHL20	KLHL20	kelch-like 20 (Drosophila)
CTDP1	CTDP1	CTD (carboxy-terminal domain, RNA polymerase II, polypeptide A) phosphatase, subunit 1
DNAJC7	DNAJC7	DnaJ (Hsp40) homolog, subfamily C, member 7
GATA2	GATA2	GATA binding protein 2
ARHGEF16	ARHGEF16	Rho guanine exchange factor (GEF) 16
POSTN	POSTN	periostin, osteoblast specific factor
POLR3F	POLR3F	polymerase (RNA) III (DNA directed) polypeptide F, 39 kDa
TRIM16	TRIM16	tripartite motif-containing 16
TRAF3IP1	TRAF3IP1	TNF receptor-associated factor 3 interacting protein 1
TCF25	TCF25	transcription factor 25 (basic helix-loop-helix)
CAV2	CAV2	caveolin 2
PTEN	PTEN	phosphatase and tensin homolog (mutated in multiple advanced cancers 1)
TSPAN8	TSPAN8	tetraspanin 8
TRAPPC6A	TRAPPC6A	trafficking protein particle complex 6A
ANGEL2	ANGEL2	angel homolog 2 (Drosophila)
REPS2	REPS2	RALBP1 associated Eps domain containing 2
ZFR	ZFR	zinc finger RNA binding protein
SERPIND1	SERPIND1	serpin peptidase inhibitor, clade D (heparin cofactor), member 1
DLGAP2	DLGAP2	discs, large (Drosophila) homolog-associated protein 2
SLC36A1	SLC36A1	solute carrier family 36 (proton/amino acid symporter), member 1
BRD4	BRD4	bromodomain containing 4
GRM5	GRM5	glutamate receptor, metabotropic 5
IL1RL1	IL1RL1	interleukin 1 receptor-like 1
SLC17A2	SLC17A2	solute carrier family 17 (sodium phosphate), member 2
TPSAB1	TPSAB1	tryptase alpha/beta 1
FOXD1	FOXD1	forkhead box D1
P2RX3	P2RX3	purinergic receptor P2X, ligand-gated ion channel, 3
OXT	OXT	oxytocin, prepro- (neurophysin I)
CHRNB3	CHRNB3	cholinergic receptor, nicotinic, beta 3
ESR2	ESR2	estrogen receptor 2 (ER beta)
POU3F1	POU3F1	POU domain, class 3, transcription factor 1
GRM8	GRM8	glutamate receptor, metabotropic 8
VGF	VGF	VGF nerve growth factor inducible
CPA1	CPA1	carboxypeptidase A1 (pancreatic)
CACNA2D2	CACNA2D2	calcium channel, voltage-dependent, alpha 2/delta subunit 2
TBXA2R	TBXA2R	thromboxane A2 receptor
CNP	CNP	2',3'-cyclic nucleotide 3' phosphodiesterase
LEFTY1	LEFTY1	left-right determination factor 1
SNAPC3	SNAPC3	small nuclear RNA activating complex, polypeptide 3, 50kDa
RAPGEF3	RAPGEF3	Rap guanine nucleotide exchange factor (GEF) 3
MYL1	MYL1	myosin, light chain 1, alkali; skeletal, fast
DTX2	DTX2	deltex homolog 2 (Drosophila)
CCDC22	CCDC22	coiled-coil domain containing 22
HOXD9	HOXD9	homeobox D9
ACPP	ACPP	acid phosphatase, prostate
ANXA13	ANXA13	annexin A13
PCYT1B	PCYT1B	phosphate cytidylyltransferase 1, choline, beta
AMELX	AMELX	amelogenin (amelogenesis imperfecta 1, X-linked)
KCNA1	KCNA1	potassium voltage-gated channel, shaker-related subfamily, member 1 (episodic ataxia with myokymia)
RASGRF1	RASGRF1	Ras protein-specific guanine nucleotide-releasing factor 1
SLC6A3	SLC6A3	solute carrier family 6 (neurotransmitter transporter, dopamine), member 3
MUC2	MUC2	mucin 2, oligomeric mucus/gel-forming
GPR3	GPR3	G protein-coupled receptor 3
NAT8	NAT8	N-acetyltransferase 8 (camello like)
CDC45L	CDC45L	CDC45 cell division cycle 45-like (S. cerevisiae)
ME3	ME3	malic enzyme 3, NADP(+)-dependent, mitochondrial
IRS4	IRS4	insulin receptor substrate 4
AFF2	AFF2	AF4/FMR2 family, member 2
KCNC4	KCNC4	potassium voltage-gated channel, Shaw-related subfamily, member 4

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Supplemental Table 1. Dependence of features of this mouse model of chronic asthma on mast cells (MC) or on MC expression of IFN-γR1 (MC IFN-γR1) or FcεRIγ (MC FcεRIγ).

Increased in lungs of OVA-sensitized and challenged mice	Dependence [A]		
	MC	MC IFN-γR1	MC FcεRIγ
IFN-γ & IL-17	No	0	0
IL-6 & IL-13	+++	‡‡‡	‡‡‡
IL-33	+++*	‡‡	‡‡
CXCL1	+++	‡‡	‡‡‡
CXCL2	+++	‡‡‡	‡‡‡
CCL9	+++*	‡‡	‡‡
CCL11, CCL12 & CCL24	+++	‡‡‡	‡‡‡
Tissue mast cells	N/A	0	‡‡‡
Tissue neutrophils	+++	‡‡	‡‡
Tissue eosinophils	+++*	‡‡	‡‡
Leukocytes in BAL fluid [B]	+++	‡ or ‡‡	‡ or ‡‡
Airway response to antigen	+++	‡‡ or ‡‡‡	‡‡ or ‡‡‡
AHR to methacholine	+++	‡‡ or ‡‡‡	‡‡ or ‡‡‡
Collagen	+++	‡‡‡	‡‡‡
Airway goblet cells	+++	‡	‡
TIPM-1	+++	‡‡	‡‡
Integrin α7	+++	‡‡‡	‡
MARCO	+++	‡‡‡	0
Arginase-1	+++	‡‡‡	‡‡‡
Saa3 mRNA	+++	‡‡	‡‡

[A] All listed features of the model except lung levels of IFN-γ and IL-17 were observed in OVA-sensitized and challenged *Kit*$^{+/+}$ mice but were absent or only weakly expressed in OVA-sensitized and challenged genetically mast cell-deficient *Kit*$^{W-sh/W-sh}$ mice. "MC dependence" is defined as the extent to which the expression of a specific feature in OVA sensitized and challenged *Kit*$^{W-sh/W-sh}$ mice was restored to *Kit*$^{+/+}$ levels in *Kit*$^{W-sh/W-sh}$ mice which were engrafted with wild type *Kit*$^{+/+}$ BMCMCs. "Mast cell IFNγ-R1 dependence" is defined as the extent to which expression of that feature in OVA-sensitized and challenged mice was stronger in wild type (WT) BMCMC-engrafted *Kit*$^{W-sh/W-sh}$ (WT BMCMC→*Kit*$^{W-sh/W-sh}$) mice versus *Ifngr1*$^{-/-}$ BMCMC-engrafted (*Ifngr1*$^{-/-}$ BMCMC→*Kit*$^{W-sh/W-sh}$) mice; "Mast cell FcεRIγ

dependence" is defined as the extent to which expression of that feature in OVA-sensitized and challenged mice was stronger in WT BMCMC→$Kit^{W-sh/W-sh}$ mice versus $Fcer1g^{-/-}$ BMCMC-engrafted mice ($Fcer1g^{-/-}$ BMCMC→$Kit^{W-sh/W-sh}$).

[B] Results were different for different types of leukocytes.

No: Values in OVA-sensitized and challenged WT mice were significantly elevated ($P < 0.05$) versus corresponding values in PBS-treated mice, but not significant (N.S., $P > 0.05$) versus OVA-sensitized and challenged $Kit^{W-sh/W-sh}$ mice.

+++ In OVA-sensitized and challenged mice, responses in WT BMCMC→$Kit^{W-sh/W-sh}$ mice N.S. versus those in WT $Kit^{+/+}$ mice and significantly higher than those in MC-deficient $Kit^{W-sh/W-sh}$ mice.

‡‡‡ In OVA-sensitized and challenged mice, significant responses (versus corresponding values in PBS-treated mice) in WT BMCMC→$Kit^{W-sh/W-sh}$ mice and responses in $Ifngr1^{-/-}$ or $Fcer1g^{-/-}$ BMCMC→$Kit^{W-sh/W-sh}$ mice N.S. versus those in the corresponding PBS-treated controls.

‡‡ In OVA-sensitized and challenged mice, significant responses (versus corresponding values in PBS-treated mice) in WT BMCMC→$Kit^{W-sh/W-sh}$ mice and responses in $Ifngr1^{-/-}$ or $Fcer1g^{-/-}$ BMCMC→ $Kit^{W-sh/W-sh}$ mice significantly higher than those in the corresponding PBS-treated mice but < 50% those in WT BMCMC→$Kit^{W-sh/W-sh}$ mice.

‡ In OVA-sensitized and challenged mice, significant responses (versus corresponding values in PBS-treated mice) in WT BMCMC→$Kit^{W-sh/W-sh}$ mice and responses in $Ifngr1^{-/-}$ or $Fcer1g^{-/-}$ BMCMC→$Kit^{W-sh/W-sh}$ mice significantly higher than those in the corresponding PBS-treated mice and significantly lower than but > 50% those in WT BMCMC→$Kit^{W-sh/W-sh}$ mice.

0 In OVA-sensitized and challenged mice, significant responses (versus corresponding values in PBS-treated mice) in WT BMCMC→$Kit^{W-sh/W-sh}$ mice but N.S. versus those in $Ifngr1^{-/-}$ or $Fcer1g^{-/-}$ BMCMC→$Kit^{W-sh/W-sh}$ mice.

* Significant responses also seen in OVA sensitized and challenged mast cell-deficient $Kit^{W-sh/W-sh}$ mice versus values in the corresponding PBS-treated $Kit^{W-sh/W-sh}$ mice.

Supplemental Table 2

Genes up-regulated in human asthma. The 96 genes found to be up-regulated in human asthma in the data provided by Laprise, et al. (3), by Significance Analysis of Microarrays (SAM) at raw *P* value < 0.01.

ACPP	GRM8	PMS2L1
AFF2	HOXD9	POLR3F
ALOX15	IL1RL1	POSTN
AMELX	IRS4	POU3F1
ANGEL2	KCNA1	PRRC1
ANXA13	KCNB2	PSG4
ARHGEF16	KCNC4	PSG7
ATP10B	KIAA0408	PTEN
BRD4	KLHL20	RAPGEF3
C1ORF63	KLHL35	RASGRF1
CACNA2D2	KRT9	REPS2
CAV2	KRTAP26-1	SERPINB2
CCDC22	LDB1	SERPIND1
CD1C	LEFTY1	SLC17A2
CDC45L	LILRP2	SLC36A1
CHRNB3	LOC100134197	SLC6A3
CNP	LOC81691	SNAPC3
CPA1	LPAR4	TBL3
CPA3	ME3	TBXA2R
CST1	MLLT4	TCF25
CST2	MUC2	TFF2
CST4	MUC3A	TPSAB1
CTDP1	MUC5AC	TPSB2
CYP2D6	MYL1	TPSD1
DLGAP2	NAT8	TRAF3IP1
DNAJC7	NOP14	TRAPPC6A
DTX2	NOS2	TRIM16
ESR2	OXT	TRIM16L
FOXD1	P2RX3	TSPAN8
GATA2	PART1	VGF
GPR3	PCYT1B	ZFR
GRM5	PDX1	ZMIZ2

Supplemental Table 3 Legend

Gene Set Enrichment Analysis for genes up-regulated in human asthma (fold change). The fold change (reported by GSEA as the rank metric) for the 67 mouse homologues of genes found to be up-regulated in human asthma. A positive number indicates increased expression of that gene in mice exposed to OVA, relative to mice in the same group (i.e., having the same genotype and mast cell engraftment status) challenged only with PBS, a zero indicates no change, and a negative number indicates decreased expression. "B6.None" mice are the C57BL/6 wild type control mice, not engrafted with *in vitro*-generated mouse bone marrow-derived cultured mast cells (BMCMCs). "KitWsh.None" are genetically mast cell-deficient C57BL/6-*Kit*$^{W-sh/W-sh}$ mice without engrafted mast cells. "KitWsh.MC" are C57BL/6-*Kit*$^{W-sh/W-sh}$ mice engrafted with wild type (WT) C57BL/6 BMCMCs. "KitWsh.MCifngR" are C57BL/6-*Kit*$^{W-sh/W-sh}$ mice engrafted with BMCMCs derived from C57BL/6 mice deficient in the interferon gamma receptor (*Ifngr1*$^{-/-}$). "KitWsh.MCigeR" are mast cell-deficient C57BL/6-*Kit*$^{W-sh/W-sh}$ mice engrafted with BMCMCs from C57BL/6 mice deficient in the signaling γ chain shared by the FcεRI and FcγRIII (*Fcer1g*$^{-/-}$).

Supplemental Table 3

Gene	B6.None	KitWsh.None	KitWsh.MC	KitWsh.MCifngR	KitWsh.MCigeR
ACPP	0.025	-0.304	0.002	-0.088	-0.233
AFF2	-0.016	0.001	0.041	0.000	-0.494
ALOX15	0.502	-0.391	0.016	0.258	0.910
AMELX	0.077	0.000	0.000	-0.005	-0.342
ANGEL2	0.045	-0.036	0.003	-0.069	0.042
ANXA13	0.008	0.000	0.000	0.000	-0.255
ARHGEF16	0.051	-0.083	0.107	0.109	0.186
BRD4	0.067	-0.052	0.043	-0.076	0.005
CACNA2D2	0.000	0.000	0.052	0.032	0.000
CAV2	-0.072	-0.031	-0.167	0.049	0.095
CCDC22	0.153	-0.079	0.196	-0.067	-0.201
CDC45L	-0.154	0.148	0.508	0.037	-0.420
CHRNB3	0.000	0.000	0.000	0.000	0.000
CNP	0.025	0.078	0.011	-0.055	-0.020
CPA1	0.000	0.000	0.000	0.000	0.000
CPA3	0.145	0.014	1.451	1.177	0.549
CTDP1	0.123	-0.076	0.097	-0.062	0.250
DLGAP2	0.000	0.000	0.058	-0.050	0.012
DNAJC7	0.101	0.020	0.089	-0.089	0.236
DTX2	-0.081	-0.029	0.031	0.024	-0.194
ESR2	-0.002	-0.008	0.000	0.000	0.000
FOXD1	0.009	-0.002	-0.003	-0.020	0.000
GATA2	0.061	-0.190	-0.077	0.001	0.191
GPR3	0.000	0.000	0.000	0.016	-0.417
GRM5	0.000	0.000	0.001	0.000	0.003
GRM8	0.000	0.000	-0.067	0.000	0.000
HOXD9	0.000	0.227	0.163	0.020	-0.233
IL1RL1	0.171	0.065	0.516	0.143	0.002
IRS4	0.000	0.000	0.004	0.000	-0.449
KCNA1	0.000	0.003	0.223	-0.120	-0.360
KCNC4	-0.002	-0.111	0.098	0.021	-0.535
KLHL20	0.026	-0.021	0.046	0.047	0.305
LDB1	0.225	0.239	-0.240	-0.191	0.332
LEFTY1	0.270	0.123	-0.007	-0.145	-0.073
ME3	-0.005	-0.063	-0.114	-0.561	-0.448
MLLT4	-0.016	-0.116	-0.040	0.021	0.367
MUC2	0.000	0.000	-0.032	0.000	-0.390
MUC5AC	1.143	1.826	1.685	0.728	0.794

MYL1	-0.382	-0.406	-0.503	0.184	-0.194
NAT8	-0.120	-0.263	0.243	0.103	-0.417
OXT	0.000	0.000	0.000	0.000	0.000
P2RX3	0.006	0.016	0.278	-0.025	0.000
PCYT1B	0.037	-0.308	-0.189	-0.370	-0.327
POLR3F	-0.259	0.167	-0.336	0.008	0.163
POSTN	-0.038	-0.031	-0.140	0.061	0.175
POU3F1	0.000	0.000	0.032	0.000	0.000
PTEN	-0.001	-0.094	-0.088	-0.004	0.089
RAPGEF3	0.277	-0.061	-0.016	-0.128	-0.150
RASGRF1	-0.003	-0.061	0.369	-0.447	-0.364
REPS2	-0.158	-0.138	-0.176	0.010	0.041
SERPINB2	0.022	-0.565	0.305	0.430	0.462
SERPIND1	-0.159	0.103	0.208	0.430	0.021
SLC17A2	0.004	0.005	0.189	0.061	0.001
SLC36A1	0.311	0.119	0.328	0.255	0.007
SLC6A3	-0.001	-0.027	0.000	-0.004	-0.383
SNAPC3	-0.269	-0.012	-0.239	0.123	-0.131
TBL3	0.183	0.098	0.252	0.063	0.444
TBXA2R	0.008	0.008	0.033	-0.060	-0.012
TCF25	0.072	0.121	-0.118	0.002	0.099
TFF2	0.838	0.635	0.658	0.140	0.473
TPSAB1	-0.025	0.000	0.093	0.036	0.001
TRAF3IP1	0.005	-0.150	-0.118	-0.018	0.100
TRAPPC6A	-0.016	0.142	0.004	-0.065	0.064
TRIM16	0.023	0.003	-0.087	0.098	0.157
TSPAN8	-0.047	-0.087	-0.041	0.021	0.089
VGF	0.078	0.000	0.000	0.000	0.000
ZFR	-0.074	0.006	-0.042	0.108	0.034