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Genome-wide association study identifies *TNFSF15* associated with childhood asthma

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Short title: GWAS of childhood asthma identifies *TNFSF15*

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ABSTRACT

Background: Genome-wide association studies (GWASs) of asthma have identified several risk alleles and loci, but most have been conducted in individuals with European ancestry. Studies in Asians, especially children, are still lacking. We aimed to identify susceptibility loci by performing the first GWAS of asthma in Korean children with persistent asthma.

Methods: We used a discovery set of 741 children with persistent asthma as cases and 589 healthy children and 551 healthy adults as controls to perform a GWAS. We validated our GWAS findings using UK Biobank data. We then used the Genotype-Tissue Expression database to identify expression quantitative trait loci of candidate variants. Finally, we quantified proteins of genes associated with asthma.

Results: Variants at the 17q12-21 locus and SNPs in *CYBRD1* and *TNFSF15* genes were associated with persistent childhood asthma at genome-wide thresholds of significance. Four SNPs in the *TNFSF15* gene were also associated with childhood-onset asthma in British white participants in the UK Biobank data. The asthma-associated rs7856856-C allele, the lead SNP, was associated with decreased *TNFSF15* expression in whole blood and in arteries. Korean children with asthma had lower serum *TNFSF15* levels than controls, and those with the asthma risk rs7856856-CC genotype exhibited the lowest serum *TNFSF15* levels overall, especially asthmatic children.

Conclusions: Our GWAS of persistent childhood asthma with allergic sensitization identified a new susceptibility gene, *TNFSF15*, and replicated associations at the 17q12-21 childhood-onset asthma locus. This novel association may be mediated by reduced expression of serum *TNFSF15* and loss of suppression of angiogenesis.

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allergic sensitization; asthma; children; genome-wide association study; *TNFSF15*

INTRODUCTION

Asthma is the most prevalent chronic respiratory disease in children worldwide.¹ It is heterogeneous in nature and is caused by complex gene–gene and gene–environment interactions.² Over the past decade, genome-wide association studies (GWASs) of asthma have identified many risk loci, including 17q12-21 (*ORMDL3*, *GSDMB*), 6p21 (HLA region), 2q12 (*IL1RL1/IL18R1*), 5q22 (*TSLP*), and 9p24 (*IL33*), which have provided an understanding of its genetic architecture and the molecular pathways involved in disease pathogenesis.³ Moreover, recent large-scale meta-analyses from the Trans-National Asthma Genetic Consortium (TAGC)⁴ and UK Biobank⁵ have identified novel asthma loci with trans-ethnic effects and further provided essential insights into the immunological relevance of asthma-associated risk variants.

Most GWASs and large meta-analyses of asthma have involved subjects of European ancestry. Thus, inferences regarding the genetic architecture of asthma are based on observations in this population, whereas much less is known about the populations of Asian and African ancestry. As populations vary with respect to allele frequencies, patterns of linkage disequilibrium (LD), and effect sizes of variants that underlie disease risk,^{6, 7} inferences based on Europeans may have limited utility in other groups. For example, a next-generation sequencing study of 10 asthma candidate genes revealed differences in allele frequencies and haplotype structures at the 17q12-21 asthma locus between Chinese and other ethnic groups.⁸ As a result, GWASs in European populations will most likely miss risk variants important in non-European populations.

Only two GWASs of asthma cases and controls in Asian populations have been reported in the GWAS catalog.⁹ Both were conducted in Japanese populations, one for childhood asthma (N=938)¹⁰ and one for adult asthma (N=7,171).¹¹ These studies identified *HLA-DP* as a childhood asthma locus, and 5q22 (*TSLP*), 4q31 (*USP38*), 10p14, and 6p21 (HLA region) as adult asthma loci. GWASs were also conducted in Koreans for toluene diisocyanate-induced asthma, an occupation-associated form of asthma, and for aspirin-exacerbated respiratory disease.¹²⁻¹⁶ There was a recent report on the first GWAS of asthma in Korean adults, but no genome-wide significant variants were identified.¹⁷ A GWAS of childhood asthma in the Korean population has not previously been reported.

In this study, we present the results of the first GWAS of asthma in Korean children. Our goal was to identify novel genetic susceptibilities predicting disease risk for persistent asthma in these

children and to translate genetic findings into disease mechanisms via functional, bioinformatic, and enrichment analyses.

METHODS

Clinical evaluations

We recruited 741 children with both persistent asthma and allergic sensitization as cases. Asthma was confirmed based on persistent respiratory symptoms verified by physicians. Presence of either a bronchodilator (BD) response with $\geq 12\%$ increase in forced expiratory volume in 1 s (FEV₁) or bronchial hyperresponsiveness (BHR), defined as a decrease in FEV₁ of $\geq 20\%$ with inhalation of < 16 mg/mL methacholine, was considered symptomatic of asthma. Persistent asthma was assessed based on the level of treatment required, with at least regular controller treatment, in compliance with the Global Initiative for Asthma.¹⁸ Allergic sensitization was defined by specific IgE levels > 0.7 kU/L to at least one of the following foods or airborne allergens: egg white, milk, peanut, soybean, wheat, *Dermatophagoides pteronyssinus* (*Der. p*), *Dermatophagoides farina* (*Der. f*), *Alternaria* species, or *Blattellagermanica*. Additionally, we recruited 589 children as controls during routine hospital visits. These children had a negative history of allergic diseases based on interviews with their parents, had negative serum specific IgE to six common allergens (egg white, milk, *Der. p*, *Der. f*, *Alternaria* species, or *Blattellagermanica*), and had total serum IgE levels of less than 100 kU/L. We also confirmed that all control children had neither a BD response nor BHR. Lastly, we selected 551 adult control subjects with a negative history for both allergic diseases and allergic sensitization from among 1,214 adults who had the results of BHR and allergic sensitization. Negative histories of allergic diseases, including asthma and atopic dermatitis, were based on self-administered questionnaires; lack of sensitization was based on a negative skin prick test response to 12 common allergens (*Der. p*, *Der. f*, two tree pollen mixtures, grass pollen mixture, ragweed, mugwort, cockroach, *Alternaria* species, *Aspergillus* species, cat dander, and dog dander). Blood eosinophils were determined using an NE-8000 hematology analyzer (Sysmex Corporation, Kobe, Japan), and total serum IgE, serum specific IgE, and eosinophil cationic protein were measured using the Pharmacia CAP assay (Uppsala, Sweden).

Genotyping, imputation, and quality control in the GWAS

FigureS1 summarizes our study design. As the three genotype arrays contained different genetic variants, we performed imputation for each platform using a standardized method. For details on genotyping, imputation, and quality control methods, see the Supporting Methods.

Replication studies

To further examine the association of 103 SNPs with P -values $< 1.0 \times 10^{-7}$ in our GWAS, we validated P -values of those SNPs using GWAS data of Caucasian British individuals from the UK Biobank data released on July 10, 2017.¹⁹ We used summary statistics from a GWAS (onset younger than 12 years), which included 9,433 cases with childhood-onset asthma and 318,237 control subjects without an asthma diagnosis (i.e., no self-reports and no ICD-10 codes).²⁰

Bioinformatics and functional enrichment analysis

Gene ontology (GO) of asthma-associated genes was analyzed using the Database for Annotation, Visualization and Integrated Discovery (DAVID; david.abcc.ncifcrf.gov/knowledgebase).²¹ To select genes associated with both asthma and angiogenesis, we first searched for genes at asthma loci in the GWAS catalog.⁹ This yielded 340 genes, which were classified into 880 GO terms. Among them, we focused on the single term “cardiovascular system development,” which yielded 24 asthma-associated genes (Table S2). These 24 genes were further analyzed with *TNFSF15*; visualizing gene networks using GeneMANIA.²² For cis-expression quantitative trait loci (cis-eQTL) analysis of rs7856856 in human tissues, see the Supporting Methods.

Statistical analysis

We evaluated genome-wide associations between childhood asthma and imputed variants, adjusting for age and sex, using PLINK (v.1.07).²³ Associations between asthma and variants were examined with logistic regression assuming an additive genetic model. Logistic regression was performed using Python and PLINK. A genomic inflation factor (λ) was calculated based on median chi-square statistics. Thereafter, a Manhattan plot and a quantile–quantile plot were obtained using R software. Regional association plots were generated with LocusZoom.²⁴ We analyzed the serum

TNFSF15 levels using the Mann–Whitney U test and Jonckheere–Terpstra test; the Mann-Whitney U tests whether the two samples are likely drawn from the same population and the Jonckheere-Terpstra tests for determining statistically significant differences between two or more groups of an independent variable on a continuous variable. All statistical analyses were conducted using IBM SPSS Statistics software version 20.0 (IBM Inc, Armonk, NY).

RESULTS

Characteristics of study participants

Clinical details of childhood asthma cases and controls, and adult controls included in the main GWAS are summarized in Table 1. The children's mean ages were 8.6 and 9.2 years in the asthma and control groups, respectively. There were more males among children with asthma (68.1%) than among control children (44.7%, $P < 0.001$). Total serum IgE levels and blood eosinophils were higher in children with asthma than in control children ($P < 0.001$ for both). As expected, all lung function phenotypes, including FEV₁, FEF_{25–75} (forced expiratory flow at 25%–75% of forced vital capacity), FEV₁/FVC, and maximal BD response, were significantly different between the asthma cases and control groups in children ($P < 0.001$). In adult controls from the Ansong population-based cohort, the mean age was 65.0 years, and the number of males was 211 (38.3%).

Genome-wide associations with asthma

A total of 4.6 million SNPs passed imputation and quality control and were included in the asthma GWAS in the discovery group. The genomic inflation factor (λ) was 1.03, indicating that our findings were not affected by systemic bias in the underlying population substructure. This was also confirmed by the P -value deviation on the quantile–quantile plot (Figure S2A).

In the discovery GWAS ($N = 1,881$), at least one significant SNP at the three loci exhibited genome-wide significance ($P < 5.0 \times 10^{-8}$), with the most significant SNP with P -value = 4.45×10^{-9} at the chromosome 17q12-21 childhood-onset asthma locus (Figure 1A).²⁵ Ninety-six SNPs at this locus had $P < 1.0 \times 10^{-7}$ (Table S1). The two other SNPs that exhibited genome-wide significance were in *CYBRD1* on chromosome 2q31.1 and in *TNFSF15* on chromosome 9q32; both of which are loci that have not been reported in previous asthma GWASs (Table 2). Two additional SNPs at the 2q31.1 locus and three additional SNPs at the 9q32 locus were significant at $P < 1.0 \times 10^{-7}$ (Table S1). To determine whether *TNFSF15* variants were primarily associated with childhood asthma rather than allergic sensitization, total serum IgE levels were analyzed in both case and control groups by *TNFSF15* genotype (Figure S5). There were no trends for the difference in total serum IgE levels between the genotypes, suggesting that *TNFSF15* is primarily associated with childhood asthma but not with IgE levels (i.e., allergic sensitization). We next sought to replicate the four most significant

variants at the 17q12-21 locus in the discovery GWAS, and the seven variants at the two novel loci using summary statistics from a UK Biobank GWAS of childhood-onset asthma.²⁰ The four variants at the 17q12-21 locus that were most associated with childhood asthma in Korean children were also highly associated with childhood-onset asthma in British white individuals ($P < 10^{-96}$ for these variants). The four variants in *TNFSF15* were also associated with childhood-onset asthma in the UK Biobank replication sample ($P < 10^{-3}$) with the same direction of effect. However, the three variants in *CYBRD1* were not associated with childhood-onset asthma in British white individuals ($P > 0.299$) (Table 2). Additionally, we investigated asthma loci that have been previously reported in multiple studies by looking at the results in our study for SNPs at previously reported asthma GWAS loci. Our study identified SNPs at the 17q12-21 locus, the most widely replicated asthma region, with genome-wide significance, including rs7224129 ($P = 4.45 \times 10^{-9}$), rs34233420 ($P = 1.01 \times 10^{-8}$), and rs1008723 ($P = 1.33 \times 10^{-8}$). The widely replicated asthma loci including 2q12 (*IL1RL1/IL18R1*), 5q22 (*TSLP*), 5q31 (*RAD50*), 6p21 (HLA region), 12q13 (*STAT6*), and 15q22 (*SMAD3*) also showed nominal significance ($P < 0.05$) in our study, suggesting that these loci also contribute to asthma in Korean children but that our sample was not powered to detect these smaller effect loci compared to 17q12-21 (Table S4).

A regional association plot of the *TNFSF15* locus is presented in Figure 1B. To further validate that the four imputed SNPs were associated with childhood asthma, we genotyped the lead SNP, rs7856856, which had high LD ($r^2 = 1.0$, Figure S2B) with the other three SNPs in our discovery cohort. The proportion of CC genotypes in the asthma group (109/741, 14.7%) was significantly greater than in the control group (111/1140, 9.73%, $P = 0.001$) (Figure 2).

Effect of rs7856856 on TNFSF15 expression

TNFSF15, which encodes the tumor necrosis factor super family-15 protein, is a modulator of vascular homeostasis and inflammation. It is also a cytokine that promotes the secretion of inflammatory factors that play important roles in immune regulation and inflammatory diseases.²⁶⁻²⁸ To further explore its function, we first examined the expression level of *TNFSF15* in Genotype-Tissue Expression (GTEx).²⁹ The asthma-associated rs7856856-C allele, the lead SNP, was associated with decreased *TNFSF15* expression in a dose-dependent (additive) manner in whole blood and in arteries

(aorta and tibial), but not in the lung tissue (FigureS3). This suggested that TNFSF15 protein may be reduced in the blood of asthmatic children in our cohort compared to controls, and in children with the rs7856856-CC genotype. Indeed, in our sample, children with asthma had lower serum TNFSF15 levels (median [interquartile range], 56.30 [49.15–65.49]pg/mL) compared to controls (72.77 [60.50–81.88]pg/mL, $P < 0.0001$) (Figure 3A). Asthmatic children with the rs7856856-C risk allele had low TNFSF15 levels in serum (62.98 [57.00–68.66]pg/mL for TT, 53.17 [47.89–59.65]pg/mL for TC, 54.48 [45.72–62.34]pg/mL for CC, P for trend = 0.0371) (Figure 3B). There was no such trend in the controls (FigureS4), suggesting that both asthma status and the risk allele interact to affect TNFSF15 levels in the serum, possibly due to both transcriptional and post-transcriptional mechanisms. Taken together, our results indicate that the asthma-associated rs7856856 allele is correlated with decreased *TNFSF15* transcript expression and that serum levels of TNFSF15 are decreased in asthmatics compared to controls, especially among asthmatic children with the rs7856856-C risk allele.

Effect of TNFSF15 on angiogenesis and its potential contribution to asthma

As serum levels of TNFSF15 were lower in asthmatic children compared to healthy controls, we investigated other known functions of TNFSF15. TNFSF15 also functions as an inhibitor of vascular endothelial cell growth factor, a well-known stimulator of angiogenesis. Angiogenesis has been regarded as an important event in the development of airway inflammation and tissue remodeling in asthma.³⁰ Therefore, decreased TNFSF15 levels might contribute to increased angiogenesis in asthmatic patients.

To further investigate this hypothesis, we examined asthma-associated genes for their involvement in angiogenesis. Among 340 genes reported in the GWAS Catalog for asthma, we focused on the 24 genes that were related to the GO term “cardiovascular system development” (Table S2). Further analysis of these 24 genes indicated that they are involved in six processes: animal organ development, vasculature development, anatomical structure morphogenesis, regulation of multicellular organismal development, nitric oxide metabolic process, and angiogenesis (Figure 4A and Table S3). Fourteen of the 24 genes were associated with the GO term “vasculature development,” and included all 7 genes associated with the GO term “angiogenesis” (Table S3). Finally, we examined the relationship between *TNFSF15* and these 24 genes using GeneMANIA software. Genetic interactions were

predicted between *TNFSF15* with *RORA*, *GATA3* and *SLC8A1*(Figure 4B).

DISCUSSION

GWASs of asthma with large sample sizes are necessary to identify asthma-associated loci.³ Given that large-scale studies increase clinical heterogeneity,^{4, 31} we hypothesized that focusing on more stringent inclusion criteria for subjects would identify additional genes. Hence, we focused on children with persistent asthma and allergic sensitization and included children without current or prior history of allergic disease and a lack of allergic sensitization based on laboratory tests as control subjects, and not only by questionnaires. Our stringent criteria for cases and controls in a homogeneous Asian population resulted in a sample with <2,000 subjects, yet we identified new risk alleles at genome-wide levels of significance, and replicated associations with variants in the *TNFSF15* gene on chromosome 9, as well as the 17q12-21 locus, the most frequently replicated and most statistically significant locus in childhood-onset asthma GWAS across different populations.³

The most significant association in our GWAS was with SNPs ($N = 96$, smallest $P = 4.45 \times 10^{-9}$) on 17q12-21, including *ZPBP2*, *GSDMB*, *IKZF*, and *ORMDL3*. Chromosome 17q12-21 has been robustly associated with childhood asthma in previous studies.²⁵ Our GWAS confirmed that variants at the 17q12-21 locus were also associated with childhood asthma at genome-wide significance levels in an Asian population. Notably, our results confirm that variants at the 17q12-21 locus affect asthma risk across ethnicities,⁴ including Asians, despite differences in allele frequencies and haplotype structures at this locus.^{8, 32} Taken together, these results suggest that variants at the 17q12-21 locus may improve the accuracy of trans-ethnic polygenic risk scores.³³ There are two previous asthma GWAS (for childhood and adult asthma, respectively) in Asian populations, and both were conducted with Japanese subjects. The childhood asthma GWAS showed only nominally significant associations ($P < 0.05$),¹⁰ but the adult asthma GWAS did not report any association at this locus.¹¹ Our data further support recent evidence suggesting that childhood asthma has greater genetic risk with more significant overall effects compared to adult-onset asthma.²⁰

Our GWAS of childhood asthma in Korean children identified two novel loci. Among them, *TNFSF15* at 9q32, has been reported in a GWAS of European individuals. Moreover, the asthma-associated variants (rs7856856 T>C, rs6478106 C>T, rs1857335 C>T, and rs10117785 T>A) in the *TNFSF15* gene at the replicated locus were associated with lower transcript levels in blood and aorta (GTEx), and decreased serum *TNFSF15* levels in children with asthma. This suggests that reduced

TNFSF15 expression is associated with increased risk of childhood asthma. In particular, the rs7856856-C allele was associated with persistent asthma and decreased serum *TNFSF15* levels in children with asthma, but not in controls. This suggests that *TNFSF15* expression may be influenced by the effect of the rs7856856-C allele differently in children with or without asthma risk.

The more modest *P*-values for the *TNFSF15* SNPs in the replication studies could be explained by several factors. First, although the replication cohort of British white subjects was much larger, it was also more heterogeneous with respect to clinical features than our cohort, which consisted of Korean children with clinically diagnosed persistent asthma and allergic sensitization. In contrast, childhood-onset asthma in the replication cohort was defined retrospectively by self-reported questionnaires and medical records in adults. Thus, only a subset of subjects in the childhood-onset GWAS used for replication would have met our criteria for persistent asthma and allergic sensitization, and associations specific to this phenotype may have been diluted in the larger study. In this context, our study provides another example of how careful phenotyping in smaller samples can reveal novel loci for asthma.³⁴⁻³⁶ Second, more general differences between the discovery and replication cohorts could underlie differences in estimated effect sizes of alleles at this locus. In addition to geographic, environmental, and cultural differences, the subjects in the UK Biobank childhood-onset asthma GWAS were born 40 to 70 years prior to recruitment (approximately 1950s through 1980s), whereas the Korean children in the discovery GWAS were born within the last 15 years. Thus, numerous temporal factors that have influenced the increased asthma prevalence over the past decades³⁷ may have also been enriched for specific subtypes of asthma. A GWAS of childhood-onset asthma in a more contemporaneous cohort would be needed to evaluate this hypothesis.

A role for *TNFSF15* in allergic asthma is indirectly supported by existing data. One of the functions of *TNFSF15* is mediating the inflammatory pathway through activation of NF-kappa-B.³⁸ Consistent with this role, variants at the *TNFSF15* locus have been associated with increased susceptibility for inflammatory autoimmune diseases, such as Crohn's disease,³⁹ ulcerative colitis,⁴⁰ ankylosing spondylitis,⁴¹ and psoriasis.⁴¹ *TNFSF15* is also expressed in the lungs (Figure S3). Specifically, *TNFSF15* is predominantly expressed in type II pneumocytes of both proximal and distal airway stromal cells (Figure S6). However, previous studies suggested that increased expression of *TNFSF15* was

associated with disease risk, whereas our study indicated the asthma-associated SNPs at this locus were associated with decreased expression levels of *TNFSF15* in whole blood and arteries (GTEx), and lower serum levels of *TNFSF15* in Korean children with asthma. The opposite direction of the allele effect on *TNFSF15* expression is consistent with the hypothesis that many variants associated with both asthma and autoimmune diseases have opposite directions of effects^{42, 43} even though they are both considered chronic inflammatory diseases.

In this regard, our findings are consistent with the view that suppression of angiogenesis may promote the development of childhood-onset asthma. Through GO and network analysis, we identified potential genetic interactions between *TNFSF15* and genes at three asthma-associated GWAS loci: *RORA*, *GATA3*, and *SLC8A1*. Interestingly, these three genes have been implicated in angiogenesis,⁴⁴⁻⁴⁶ as well as in asthma.^{3, 47} For example, a SNP in the *RORA* gene increased the incidence of neovascularization in age-related macular degeneration.⁴⁴ SNPs in the *SLC8A1* gene were associated with higher rates of coronary artery abnormalities via increased intracellular calcium mobilization,⁴⁶ and *GATA3* has been shown to mediate angiopoietin-induced AKT signaling and Tie2 expression in endothelial cells.⁴⁵ All three of these genes are at reproducible loci in asthma GWASs. Further research is needed to elucidate the nature of the interactions between these genes and *TNFSF15* in asthma, especially through angiogenic mechanisms. Taken together, our study not only identifies a novel locus for childhood asthma but also highlights the role of angiogenesis in the pathogenesis of asthma. In fact, targeting angiogenesis has been considered a potential therapeutic option for treatment of asthma.^{48, 49}

Despite the strengths of our study with respect to the careful clinical evaluations leading to novel GWAS discoveries, there were limitations. First, our data shows that reduced *TNFSF15* gene expression and reduced *TNFSF15* levels are associated with the asthma risk rs7856856 variant (T>C), suggesting that loss of angiogenesis inhibition is a possible mechanism. However, functional studies directly evaluating this hypothesis have not yet been conducted. The fact that the effect of rs7856856 on *TNFSF15* expression differs between tissues indicates that *TNFSF15* expression in other tissues that have not been included in GTEx may be more applicable to asthma, such as airway epithelial or smooth muscle cells, or specific immune cell types. Thus, it remains possible that increased *TNFSF15* expression in other tissues induces asthma via the *TNFSF15* inflammatory pathway. Second,

while the replication of our findings in a GWAS of European-ancestry subjects suggests that the associations at the *TNFSF15* locus with childhood asthma is common across populations, this question still needs to be more broadly explored in cohorts of other ancestries and ethnicities.

In conclusion, we report an association between variations in the *TNFSF15* gene and the development of persistent asthma in children of Korean descent. We suggest that this association is mediated by loss of suppression of angiogenesis via lower expression of TNFSF15. Further studies are needed to elucidate the mechanism linking altered TNFSF15 expression and angiogenesis to childhood asthma. Furthermore, these studies can also prospectively explore whether reduced serum levels of TNFSF15 can serve as an early marker for development of persistent asthma and allergy in childhood.

Author contributions:

All authors made substantial contributions to the conception or design and data acquisition of the work. Kim KW, Kim DY, Yoon D, Lee JK, Gee HY, and Sohn MH designed the study, enrolled the patients, analyzed data, and wrote the paper. Kim K, Jang H, Kim S, Kim EG, Kim MN, and Hong JY made substantial contributions to the literature review, data collection, and writing of the paper. Kim KW, Kim DY, and Gee HY performed the analysis and interpretation of data. Kim KW, Kim DY, Schoettler N, Ober C, and Gee HY drafted the work, and reviewed and edited the manuscript. All authors revised the manuscript for relevant content and gave final approval of the version submitted for publication.

Conflicts of interests:

The authors declare that they have no competing interests.

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Table 1. Subject characteristics in the discovery group

Study population	Children Cases (n = 741)			Children Controls (n = 589)			Adult controls (n = 551)
	Cohort 1	Cohort 2	Total ^a	Cohort 1	Cohort 2	Total ^a	
Sample size	498	243	741	481	108	589	551
Age, y	8.6 ± 2.9	8.7 ± 3.0	8.6 ± 2.9*	9.1 ± 3.1	9.5 ± 3.1	9.2 ± 3.1	64.9 ± 8.4
Male, sex	337 (67.7)	168 (69.1)	505 (68.1)**	214 (45.5)	49 (45.3)	263 (44.7)	211 (38.3)
Total serum IgE, kU/L	827.6 ± 877.2	817.4 ± 771.6	824.1 ± 844.7**	41.1 ± 32.2	40.2 ± 32.1	40.8 ± 32.1	-
Blood eosinophils, /mm	578.0 ± 363.1	571.6 ± 364.9	575.6 ± 363.8**	173.4 ± 135.0	175.0 ± 172.0	174.0 ± 149.1	-
Asthma related phenotypes							
FEV ₁ , % predicted	92.2 ± 16.1	91.4 ± 15.9	91.9 ± 16.5**	104.4 ± 13.8	101.1 ± 15.6	103.3 ± 14.5	114.5 ± 18.4
FEF ₂₅₋₇₅ , % predicted	76.5 ± 25.7	80.1 ± 28.1	77.7 ± 26.6**	101.2 ± 22.6	103.8 ± 25.4	102.1 ± 23.6	100.7 ± 31.3
FEV ₁ /FVC, %	85.3 ± 9.3	87.9 ± 9.7	86.2 ± 9.5**	90.8 ± 5.4	93.1 ± 6.1	91.7 ± 5.8	78.8 ± 8.3
Maximal BD response,	9.1	9.4	9.25**	2.9	4.0	3.4	-
% change in FEV ₁	(3.9, 14.4)	(4.2, 15.3)	(4.0, 14,75)	(0.9, 5.4)	(1.4, 6.1)	(1.1, 5.9)	-
PC ₂₀ methacholine, mg/dl	4.52 (1.9, 8.1)	3.7 (1.6, 7.3)	4.2 (1.8, 7.9)	-	-	-	-

Notes: Data expressed as number, number (%), mean ± standard deviation or median (interquartile range)

^aInformation on cohort 1 and cohort 2 is available in Figure S1.

^aThe values of total case data were compared to total control data in children. ** $P < 0.001$, * $P < 0.05$

Abbreviations: FEV₁, forced expiratory volume in the first second; FEF₂₅₋₇₅, forced expiratory flow at 25%–75% of forced vital capacity; FVC, forced vital capacity; BD, bronchodilator; PC₂₀methacholine, provocation concentration of methacholine required to produce a 20% fall in FEV₁

Table 2. Summary of significant SNPs for childhood asthma with $P < 1.0 \times 10^{-7}$ in a Korean population

Chromosome	Position	rs number	Closest gene ^a	Allele	MAF	OR^b (Discovery)	P^c (Discovery)	OR^b (Replication)	P^c (Replication)
2q31.1	172416992	rs2542932	<i>CYBRD1</i>	C > G	0.2095	0.517 (0.41–0.65)	2.05×10^{-8}	0.985 (0.956–1.014)	3.12×10^{-1}
	172414462	rs528	<i>CYBRD1</i>	G > A	0.1953	0.52 (0.411–0.658)	5.68×10^{-8}	0.984 (0.956–1.013)	3.02×10^{-1}
	172412510	rs2542940	<i>CYBRD1</i>	T > C	0.1969	0.527 (0.416–0.666)	8.75×10^{-8}	0.984 (0.956–1.013)	2.99×10^{-1}
9q32	117540910	rs7856856	<i>TNFSF15</i>	T > C	0.349	1.819 (1.473–2.245)	2.61×10^{-8}	1.064 (1.03–1.1)	1.83×10^{-4}
	117545666	rs6478106	<i>TNFSF15</i>	C > T	0.347	1.798 (1.453–2.224)	6.39×10^{-8}	1.057 (1.02–1.092)	6.29×10^{-4}
	117551718	rs1857335	<i>TNFSF15</i>	C > T	0.347	1.787 (1.444–2.21)	8.65×10^{-8}	1.066 (1.03–1.101)	1.30×10^{-4}
	117551603	rs10117785	<i>TNFSF15</i>	T > A	0.346	1.787 (1.444–2.21)	8.86×10^{-8}	1.056 (1.02–1.091)	7.45×10^{-4}
17q12-21 ^d	38075426	rs7224129	<i>GSDMB</i>	G > A	0.24	1.904 (1.535–2.36)	4.45×10^{-9}	1.376 (1.337–1.417)	7.25×10^{-102}

38076137	rs8074437	<i>ORMDL3</i>	T > G	0.235	1.875 (1.513–2.323)	9.01×10^{-9}	1.378 (1.338–1.419)	1.70×10^{-102}
38031857	rs59716545	<i>ZPBP2</i>	T > G	0.232	1.869 (1.502–2.324)	1.91×10^{-8}	1.388 (1.346–1.428)	8.84×10^{-104}
38020419	rs1453559	<i>IKZF3</i>	T > C	0.234	1.851 (1.49–2.298)	2.58×10^{-8}	1.367 (1.327–1.407)	1.75×10^{-97}

Notes:

^a The closest gene was annotated using the UCSC Genome Browser (GRCh37/hg19).

^b *P*-values were determined by logistic regression analysis using an additive model.

^c Odds ratio and 95% confidence interval (CI) of minor allele.

^d The most significant SNPs at each gene are shown. All SNPs are listed in Table S1.

Abbreviations: MAF, minor allele frequency; OR, odds ratio; NA, not applicable.

FIGURE LEGENDS

Figure 1 Genome-wide association study (GWAS) reveals that *TNFSF15* is associated with childhood asthma. (A) Manhattan plot of GWAS of persistent asthma with allergic sensitization in Korean children. Variants are plotted on the x-axis of the Manhattan plot according to their chromosomal position and their $-\log_{10}(P\text{-value})$ is shown on the y-axis. The red line shows the genome-wide significance threshold ($P < 5 \times 10^{-8}$). (B) Regional association plot at the *TNFSF15* locus for persistent childhood asthma. Genome build and linkage disequilibrium used in this plot is from hg19/1000 Genomes Asian (Nov 2014); the blue line indicates the recombination rate according to HapMap data. The four most significant SNPs in *TNFSF15* are labeled. Colors correspond to LD (r^2) with the lead SNP, rs7856856, as shown in the color scale in the upper left.

Figure 2 rs7856856-C risk allele in *TNFSF15* increases the susceptibility to asthma. Proportion of asthma by rs7856856 (T > C) by genotype. *TNFSF15* rs7856856 genotypes on the x-axis indicate reference allele homozygotes (T/T), heterozygotes (T/C), and risk allele homozygotes (C/C). The proportion of CC genotypes in the asthma group (14.7%) was significantly higher than that in the control group (9.73%, $P = 0.001$).

Figure 3 rs7856856-C risk allele decreases serum levels of TNFSF15 in asthma group. (A) Serum TNFSF15 levels stratified by disease status. TNFSF15 levels in serum were lower in children with persistent asthma (median [interquartile range], 56.30 [49.15–65.49]) pg/mL than in controls (72.77 [60.50–81.88] pg/mL, $P < 0.0001$; Mann–Whitney U test). (B) Serum TNFSF15 levels stratified by *TNFSF15* rs7856856-C risk allele in children with asthma. Asthmatic children with the rs7856856-C risk allele had low TNFSF15 levels in the serum (62.98 [57.00–68.66] pg/mL for TT, 53.17 [47.89–59.65] pg/mL for TC, 54.48 [45.72–62.34] pg/mL for CC, P for trend = 0.0371; Jonckheere–Terpstra test).

Figure 4 Interaction of *TNFSF15* with genes related to angiogenesis. (A) Gene ontology (GO) analysis of the 24 asthma genes that belong to cardiovascular system development. GO enrichment

was retrieved using DAVID. Top six representative GO terms ($P < 0.005$) in the biological process category are shown. (B) Functional prediction of *TNFSF15* with the 24 asthma genes which belong to cardiovascular system development. Interactions and/or co-expression were predicted using GeneMANIA software. The black, yellow, orange, and purple nodes represent input genes, and grey nodes indicate neighborhood genes of the input genes. *TNFSF15* is shown in yellow. Genes in the purple lined circle belong to the GO term “vasculature development.” Genes in the orange lined circle belong to the GO term “angiogenesis.” The names of genes that have a genetic association with *TNFSF15* are shown in bold blue. Node size is inversely proportional to the rank of the gene in a list sorted by gene score.

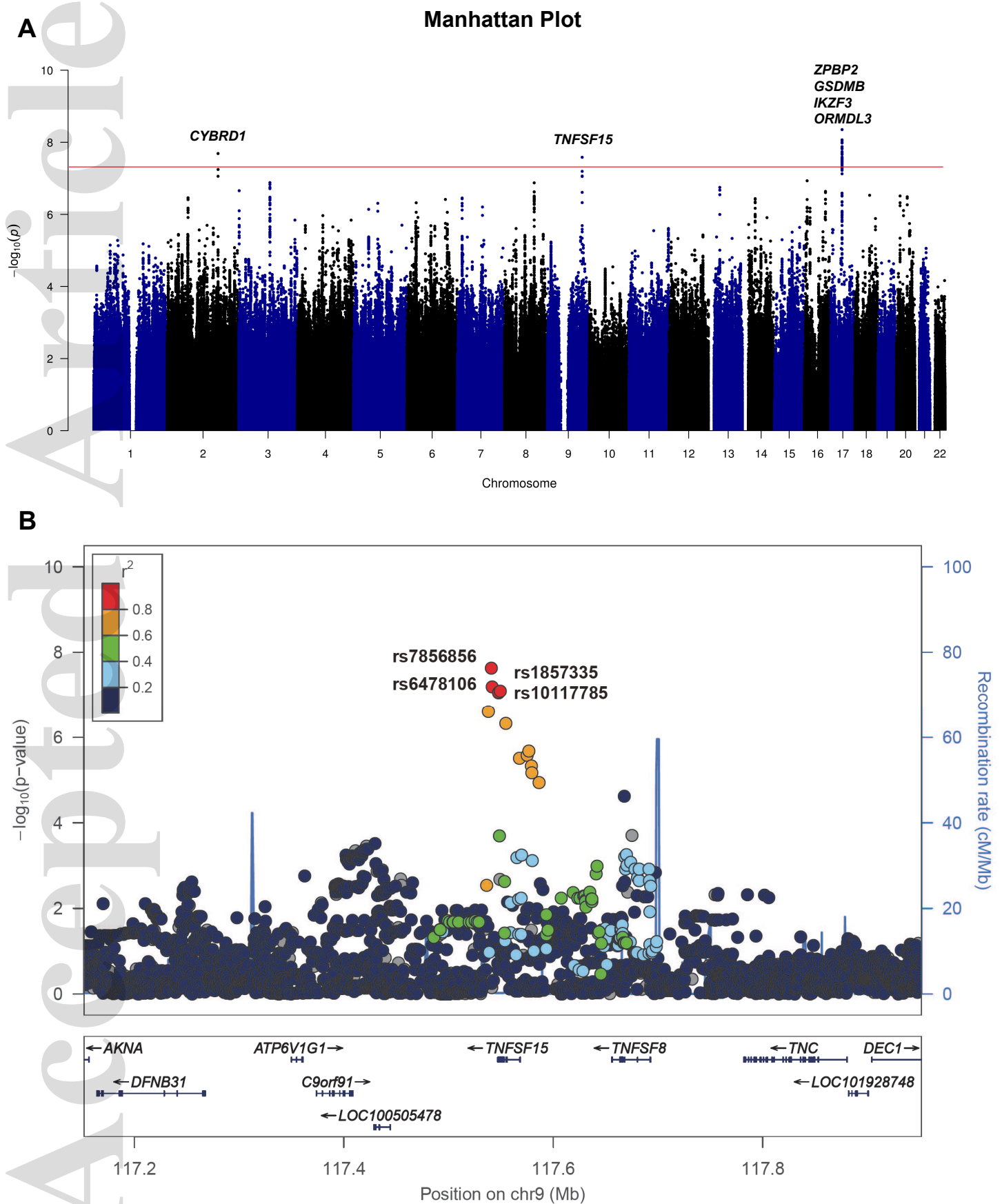
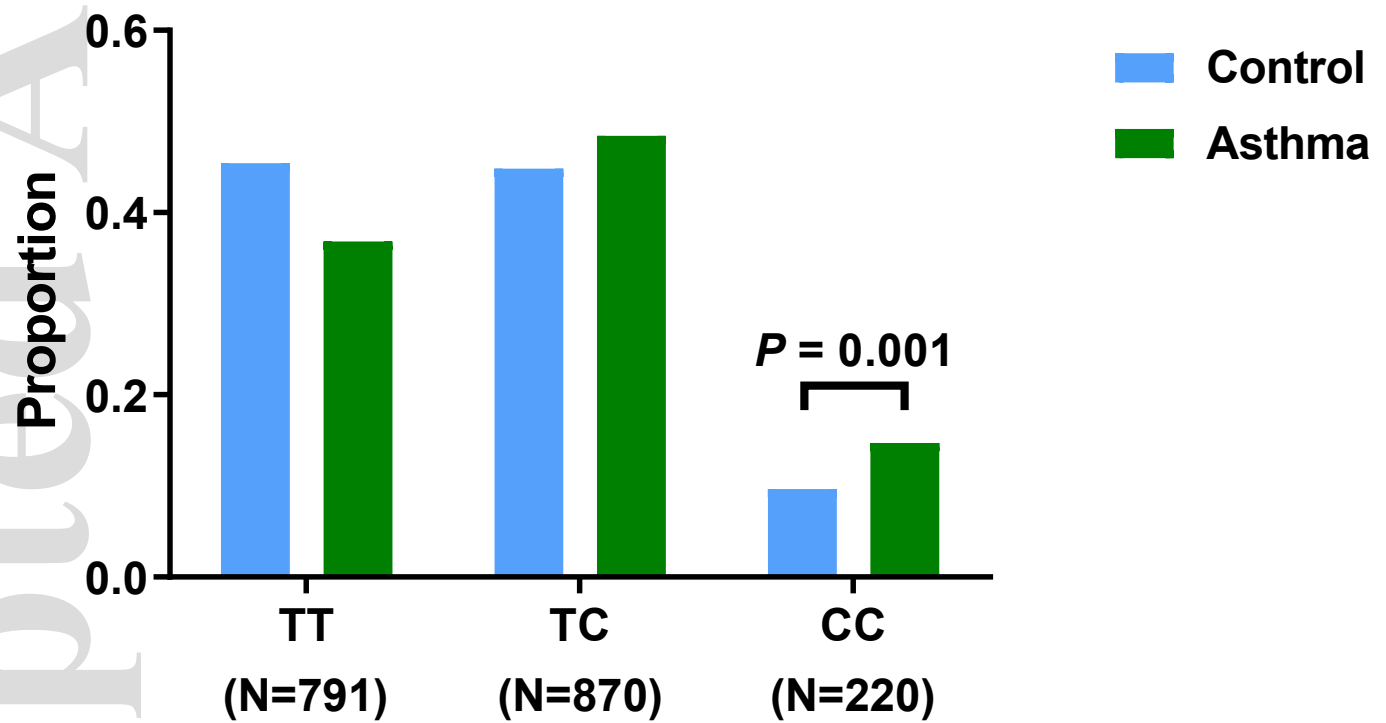


Figure 1

**Figure 2**

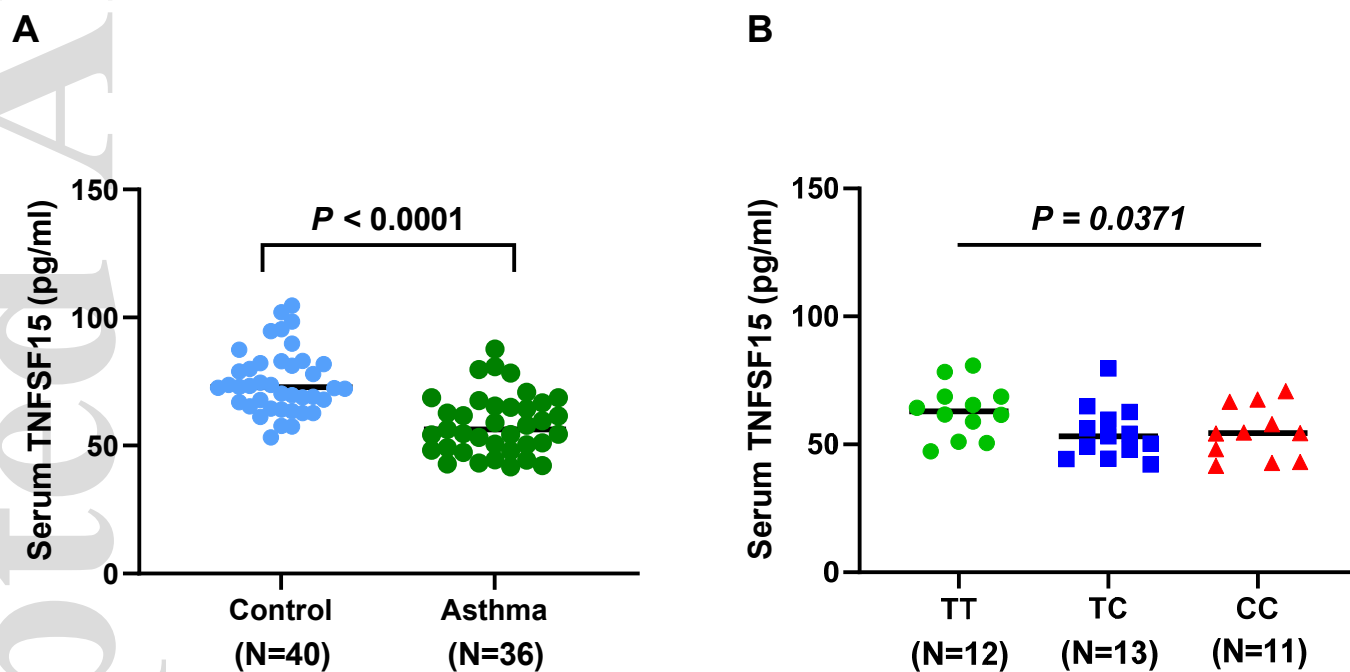
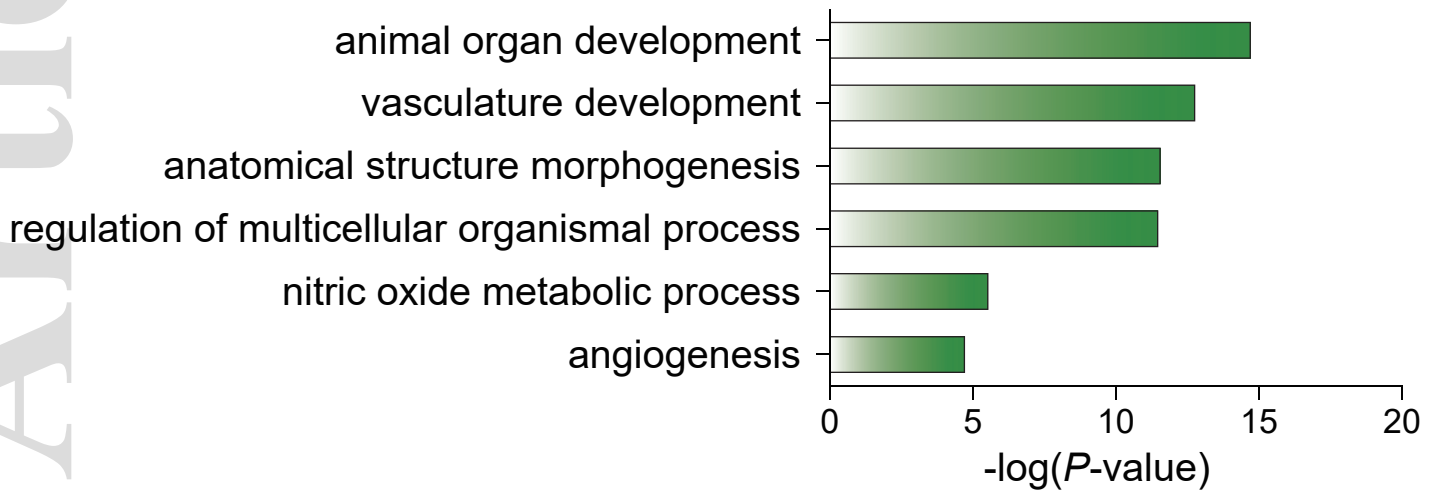


Figure 3

A

Biological Process



B

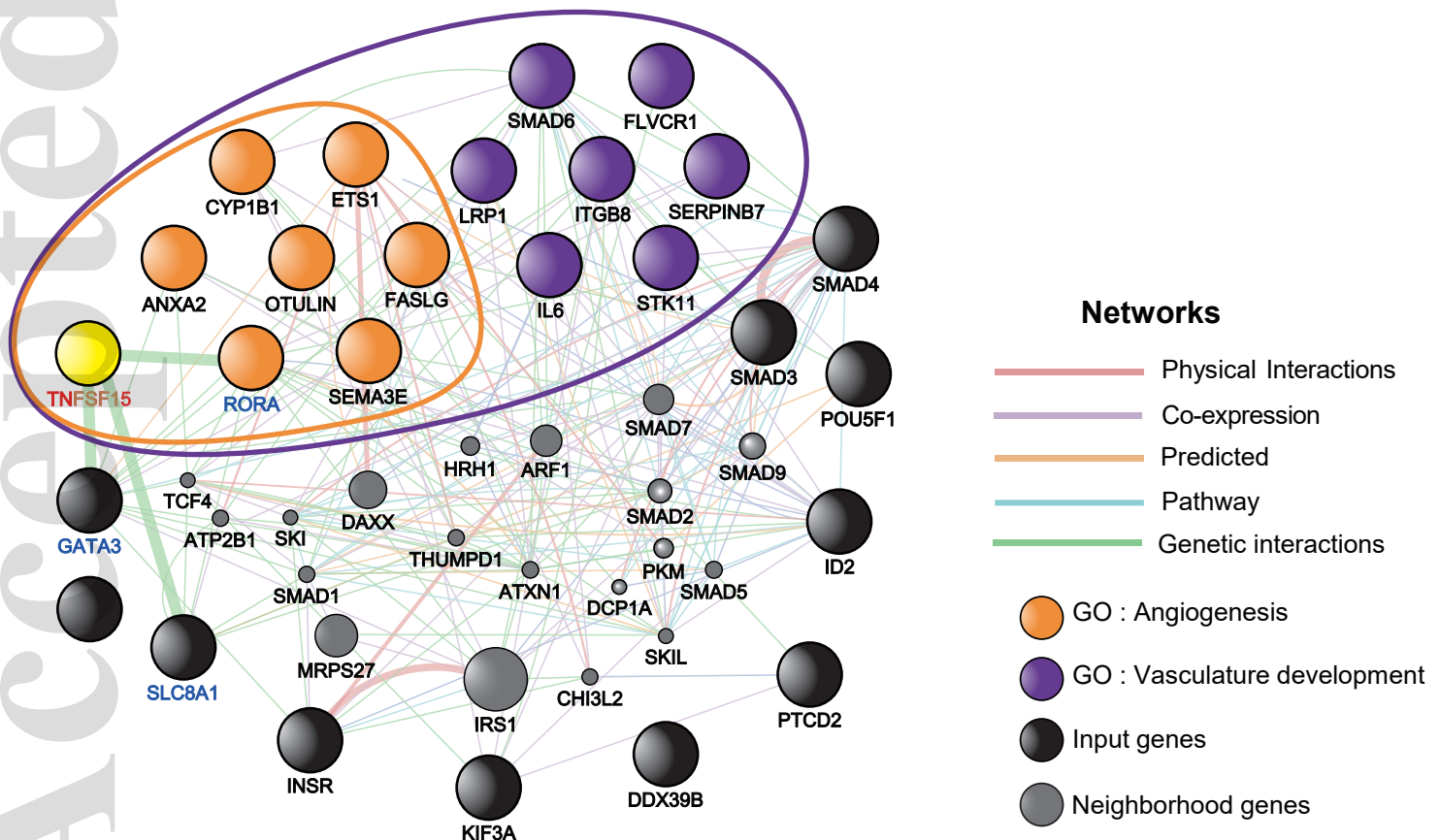


Figure 4

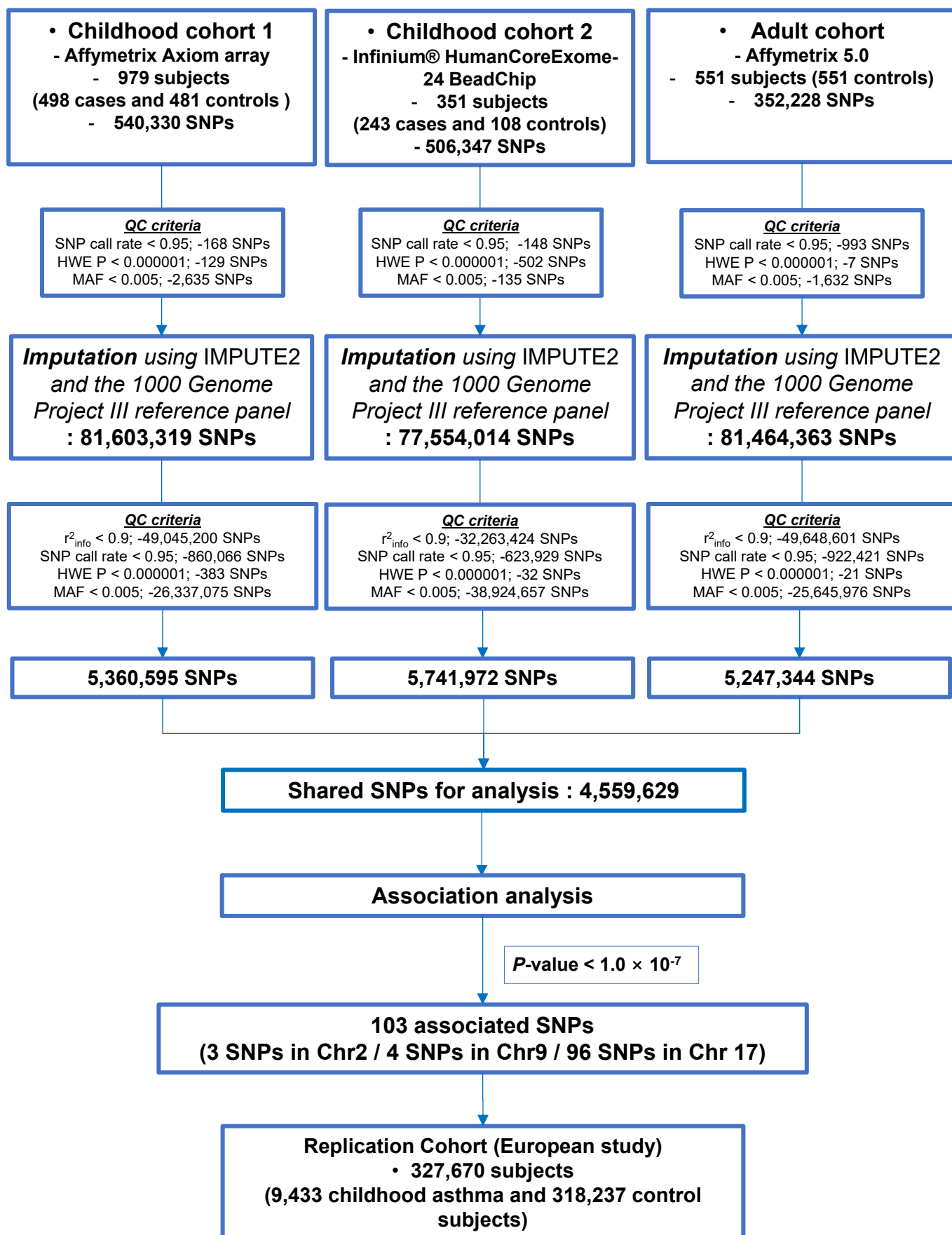


Figure S1. Flow chart of Study Design. Blood samples were collected from each participant, and derived genomic DNA was genotyped with the Affymetrix Axiom array or Infinium® HumanCoreExome-24 BeadChip or Affymetrix 5.0. Each set of single nucleotide polymorphisms (SNPs) was used for imputation using IMPUTE2 with the 1000 Genomes project phase III reference panel. The total number of shared SNPs was 4,559,629. With logistic regression analysis, 103 SNPs were associated with childhood asthma in the discovery cohort and these SNPs were analyzed in the replication cohort.

* Quality control process: SNP call rate > 0.95, Hardy-Weinberg equilibrium $p > 0.000001$, Minor Allele Frequency (MAF) > 0.005, Information score > 0.9.

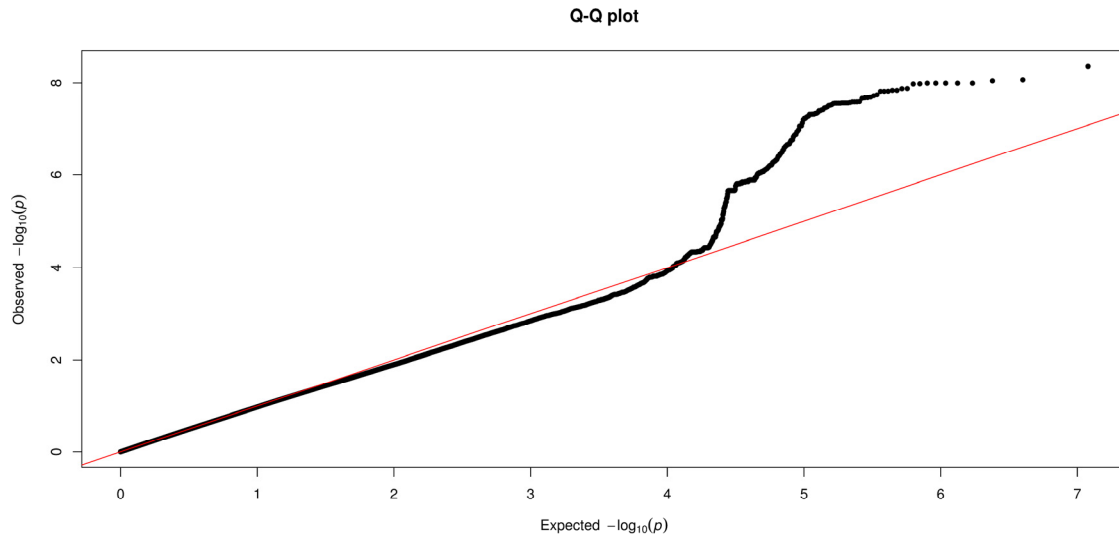
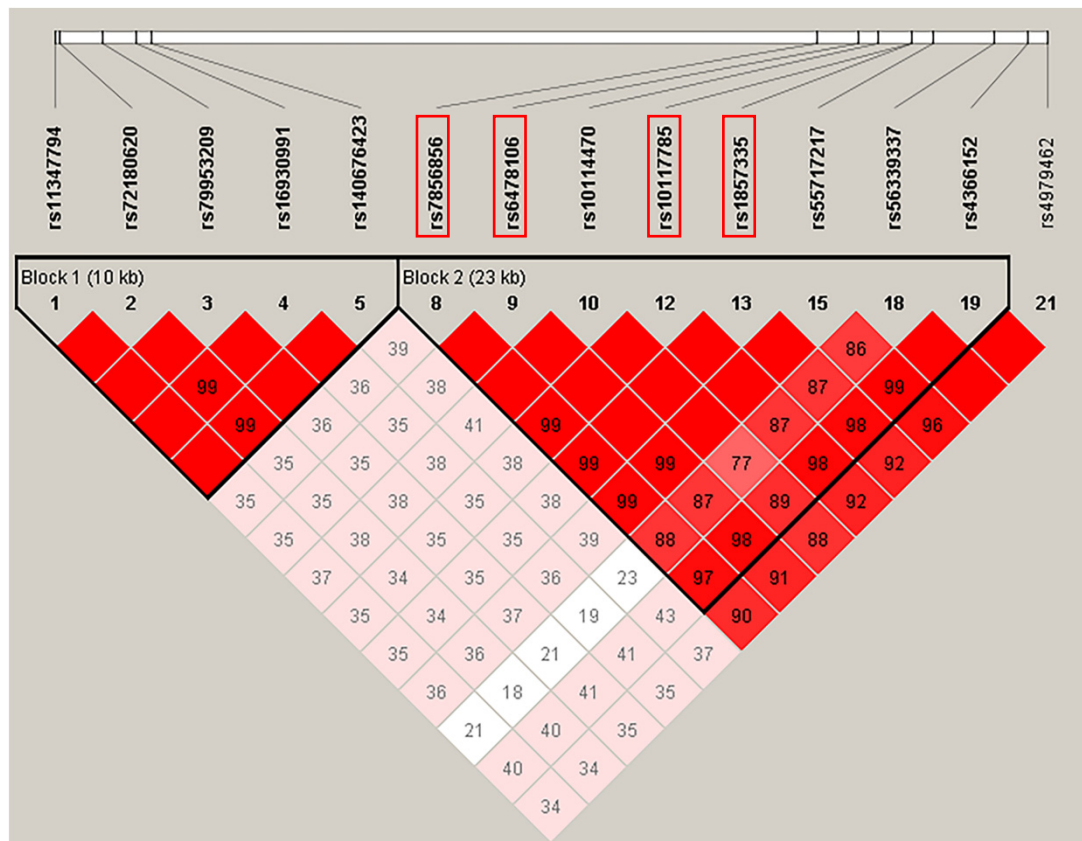
A**B**

Figure S2. The Quantile-quantile (QQ) Plot and haplotypes of *TNFSF15* SNPs. (A) Quantile–quantile plot in the discovery group. The negative logarithm of the observed (y-axis) and the expected (x-axis) P value is plotted for each SNP (dot), and the red line indicates the null hypothesis of no true association. This plot suggests that deviated signals indicate true association. (B) The relative positions of *TNFSF15* SNPs (build 37.3) are displayed, along with the basic gene structure, above the Haploview diagram. The relative linkage disequilibrium (LD) between pairs of *TNFSF15* SNPs is color-indicated. This was based on D' , i.e., normalized linkage disequilibrium measure or D divided by the theoretical maximum for the observed allele frequencies, multiplied by 100. Values close to zero indicate no LD, while values approaching 100 indicate full LD. The red colored square represents varying degrees of $LD < 1$ and LOD (logarithm of odds) > 2 scores; darker shades indicate stronger LD.

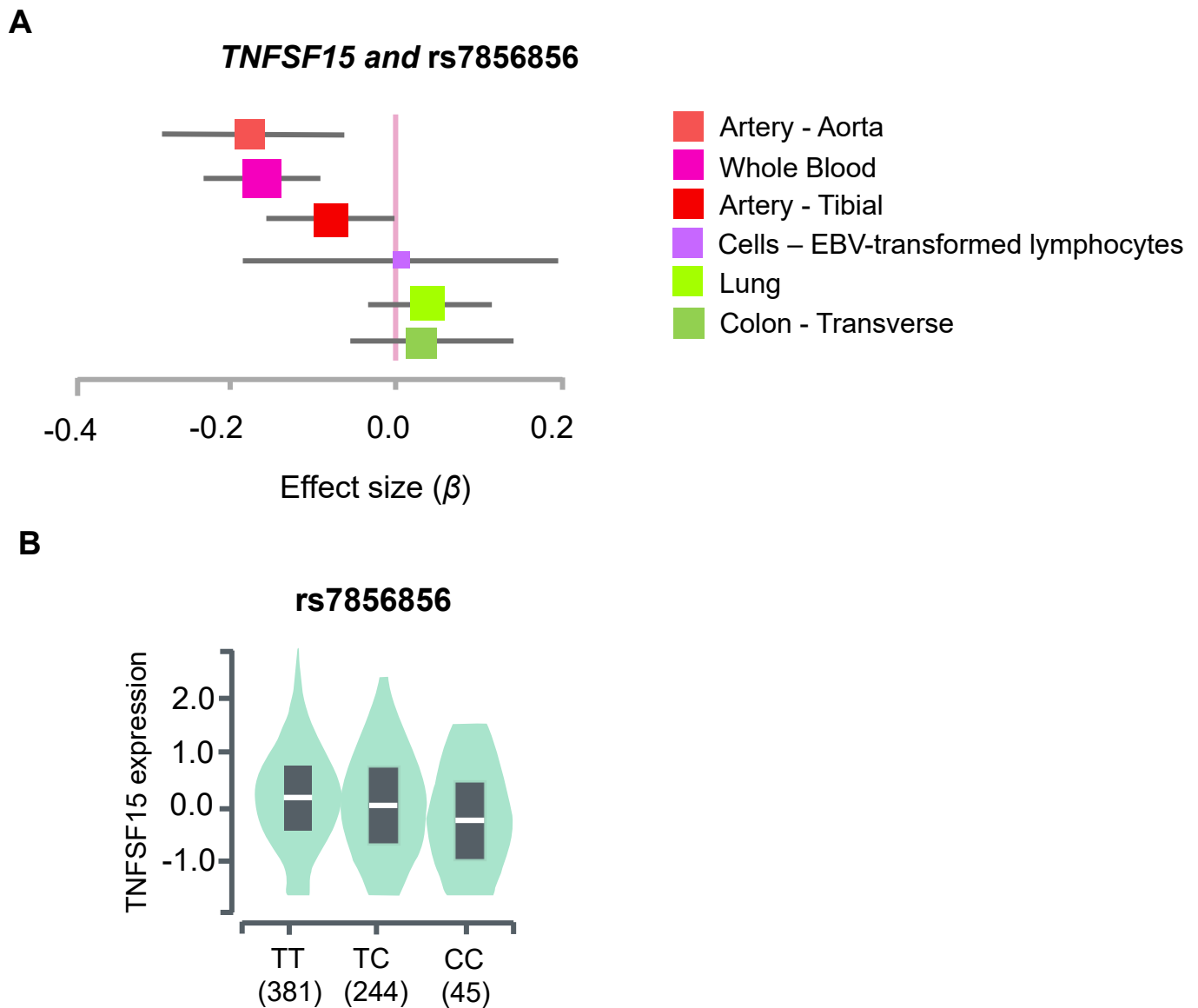


Figure S3. *TNFSF15* expression in tissues and the effect of rs7856856 on *TNFSF15* expression. (A) The effect size (β) of expression quantitative trait loci (eQTLs) association between rs7856856 and *TNFSF15* in artery-aorta (N = 387), whole blood (N = 670), artery-tibial (N = 584), cells-EBV-transformed lymphocytes (N = 147), lung (N = 515), and colon-transverse (N=368) in human tissue from GTEx (v8). The square size reflects sample size. The x-axis shows β with the 95% confidence interval (CI). EBV, Epstein-Barr virus. (B) Violin plot show the correlation between the rs7856856 genotype and *TNFSF15* expression in whole blood from the GTEx database.

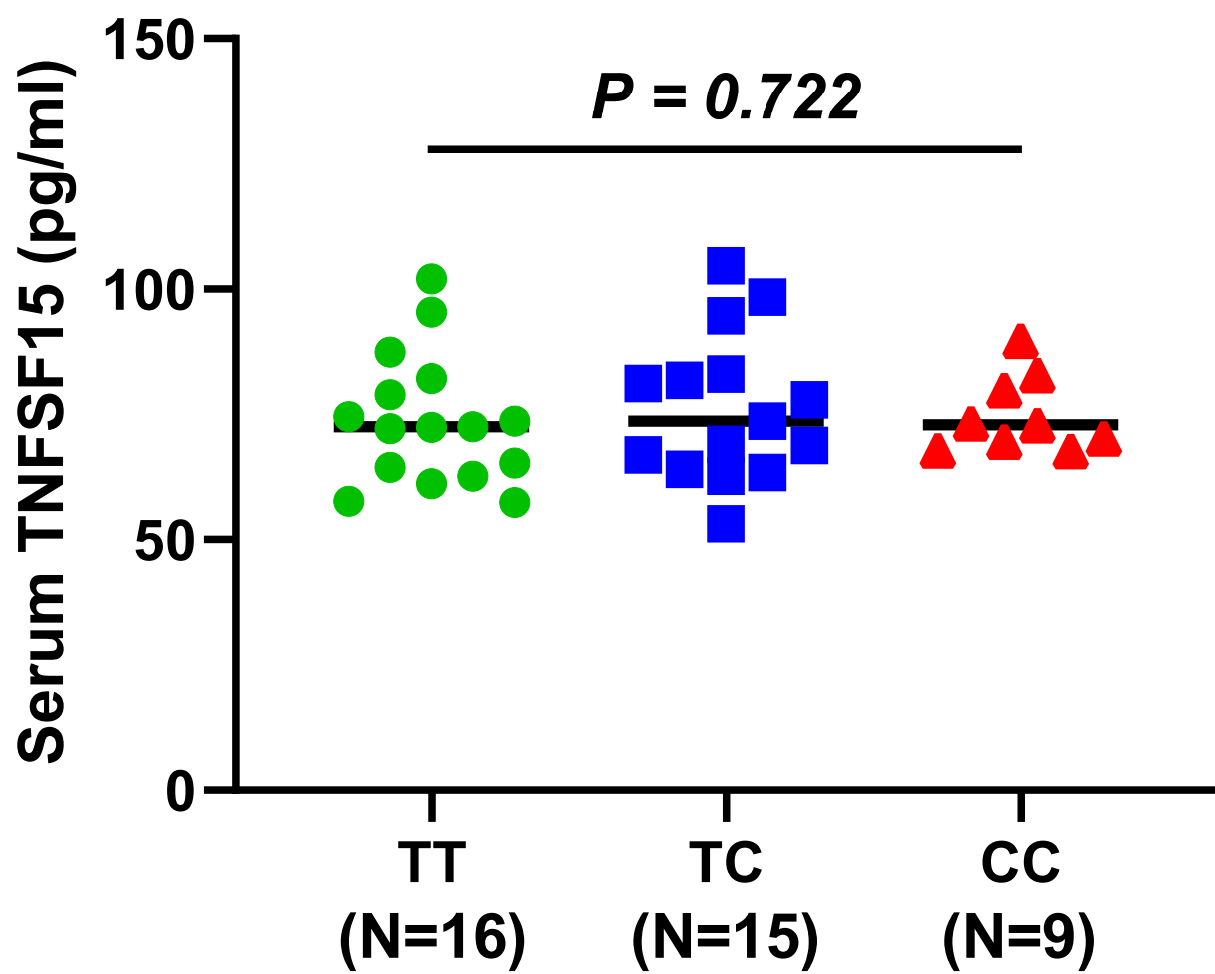


Figure S4. Serum TNFSF15 levels stratified by rs7856856 in control individuals. No significant differences or trends were observed between genotypes. (Jonckheere-Terpstrat test)

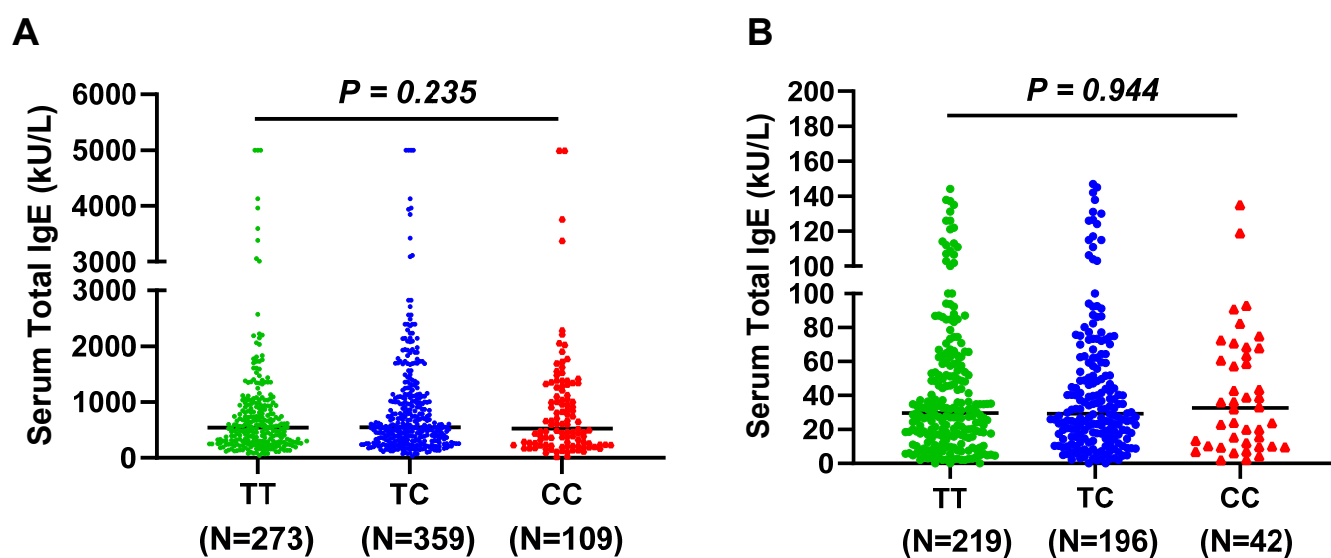
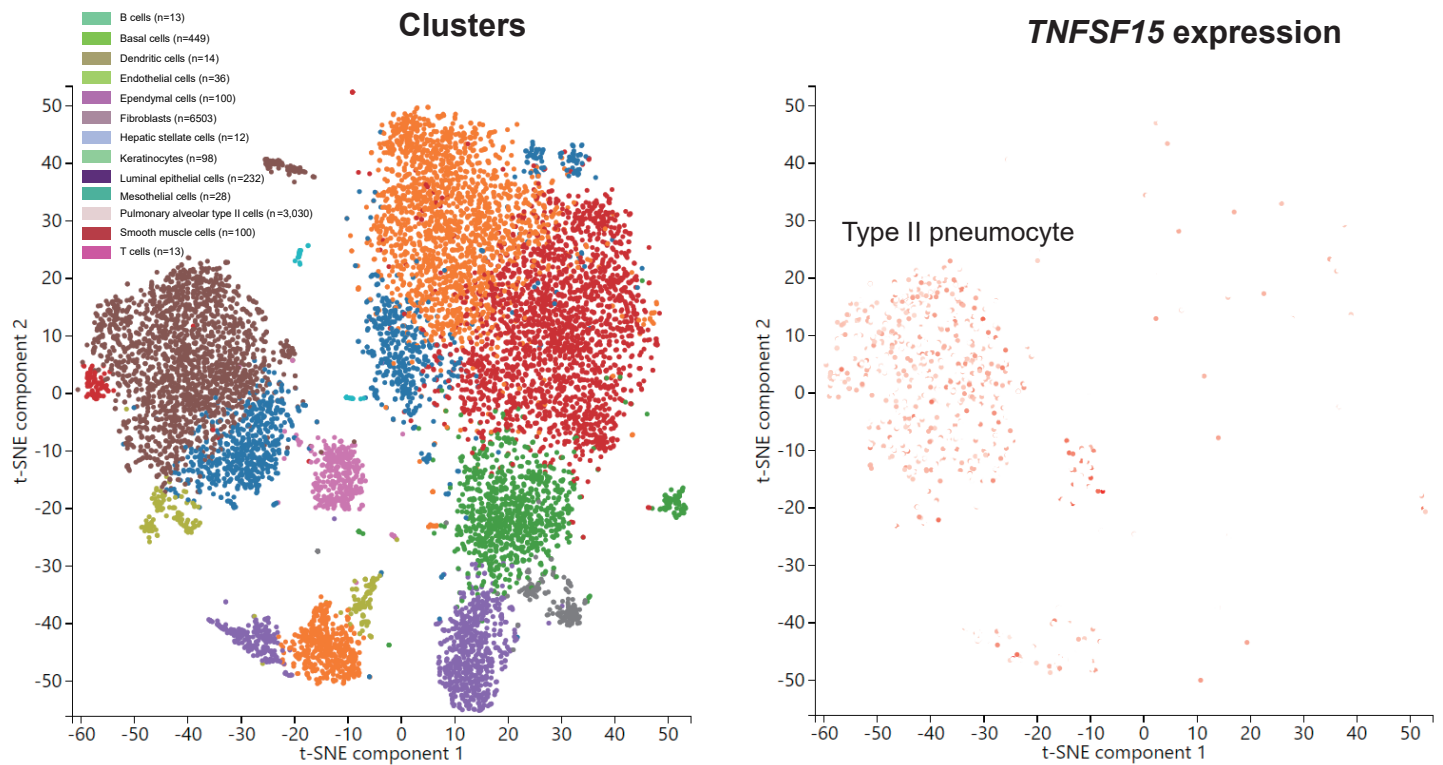
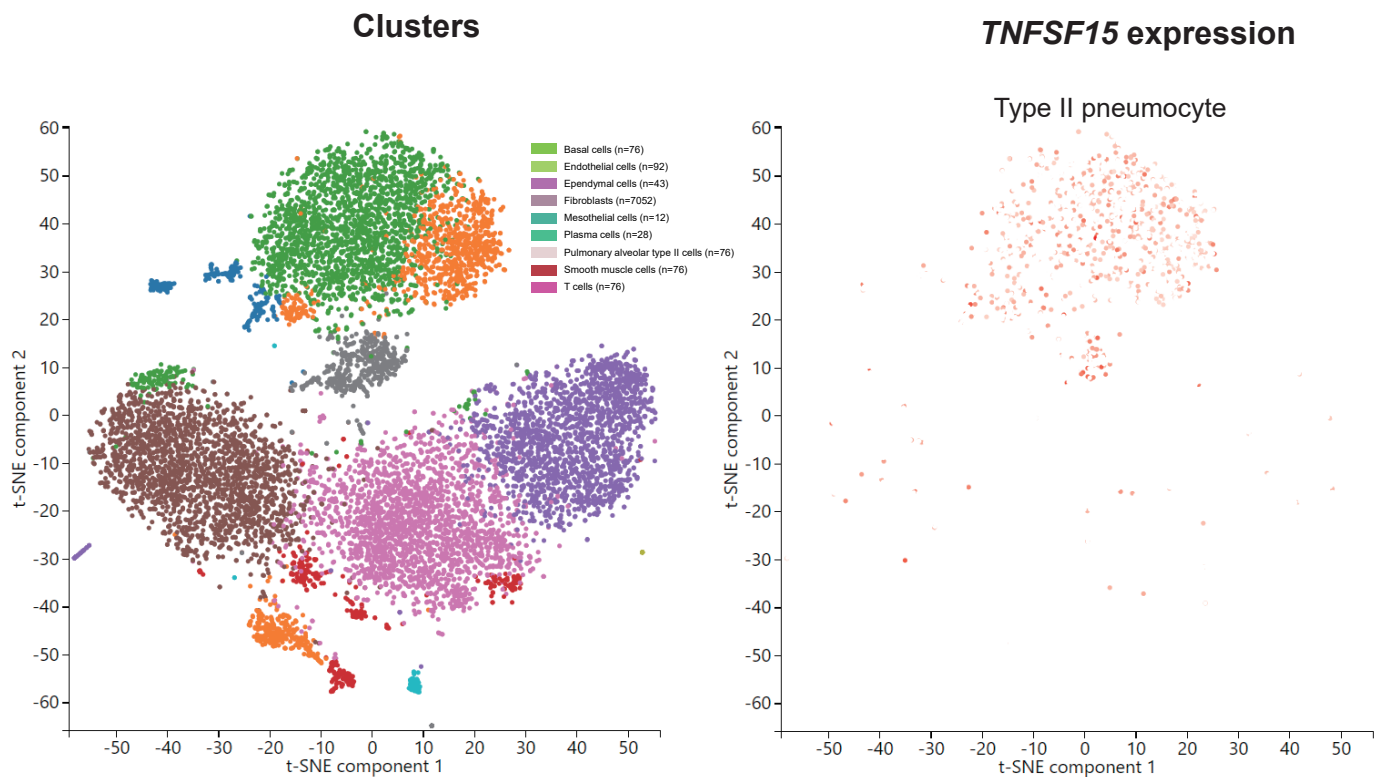


Figure S5. Serum IgE levels stratified by rs7856856 in case (A) and control (B) individuals in child cohort. No significant trends were observed between genotypes in both groups. (Jonckheere-Terpstrat test)

A**Lung proximal airway stromal cells****B****Lung distal airway stromal cells**

* Using public data from PanglaoDB

Figure S6. *TNFSF15* is predominantly expressed in type II pneumocytes. Single cell RNA seq data of lung airway stromal cells is visualized by using public data (PanglaoDB: a web server for exploration of mouse and human single-cell RNA sequencing data, Database, Volume 2019, 2019, baz046, <https://doi.org/10.1093/database/baz046>). t-SNE representation of single cells from lung airway proximal stromal cells (A) and distal stromal cells (B). Cells are colored by clustering (left panel) and t-SNE maps showing the colour-coded logged expression levels of *TNFSF15* for each population (right panel).

**Genome-wide association study identifies *TNFSF15* associated with childhood
asthma**

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Haerin Jang, BS,¹ Nathan Schoettler, MD,⁶ Eun Gyul Kim, MSc,¹ Mi Na Kim, PhD,¹ Jung Yeon Hong,
PhD,¹ Jeom-Kyu Lee, PhD,⁴ Sangwoo Kim, PhD,⁵ Carole Ober, PhD,⁷ Heon Yung Gee, MD, PhD,^{2*}
and Myung Hyun Sohn, MD, PhD^{1*}

1 **Supporting Information:**

2 Additional Supporting Information may be found in the online version of this article:

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16 of *TNFSF15* SNPs (build 37.3) are displayed, along with the basic gene structure, above the Haploview
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18 **Table S1.** Single nucleotide polymorphisms with genome-wide significant association in the discovery
19 set

20 **Table S2.** Functions of 24 asthma genes associated with cardiovascular system development

21 **Table S3.** Gene list of the top six representative gene ontology (GO) terms for 24 asthma genes

22 **Table S4.** Comparison of previously reported asthma-related SNPs with our associations

23

1 **Table S1.** Single nucleotide polymorphisms with genome-wide significant association in the discovery
2 set

	Chr.	Position	rs ID	<i>OR</i> (Discovery cohort)	<i>P</i> [†] (Discovery cohort)	<i>OR</i> (Replication cohort)	<i>P</i> ^{††} (Replication cohort)
#1	17	38075426	rs7224129	1.905	4.45E-09	1.377	7.25E-102
#2	17	38007321	rs35222145	1.905	8.58E-09	0.736	6.81E-91
#3	17	38076137	rs8074437	1.876	9.01E-09	1.378	1.70E-102
#4	17	38004929	rs34233420	1.882	1.01E-08	NA	NA
#5	17	38006767	rs202126107	1.882	1.01E-08	NA	NA
#6	17	38020058	rs35564481	1.882	1.01E-08	NA	NA
#7	17	38006333	rs8071789	1.885	1.04E-08	NA	NA
#8	17	38005595	rs9916765	1.882	1.05E-08	NA	NA
#9	17	38066372	rs56380902	1.87	1.32E-08	0.724	8.96E-104
#10	17	38066267	rs1008723	1.87	1.33E-08	0.723	1.24E-104
#11	17	37983492	rs12944882	1.87	1.45E-08	0.739	9.88E-92
#12	17	37985801	rs3816470	1.87	1.45E-08	0.740	1.63E-91
#13	17	38068043	rs869402	1.866	1.51E-08	1.378	2.15E-102
#14	17	38067020	rs4795400	1.866	1.52E-08	0.713	7.77E-110
#15	17	38067533	rs4795401	1.866	1.52E-08	0.723	5.36E-104
#16	17	38023745	rs4795397	1.869	1.82E-08	0.724	3.47E-102
#17	17	38031857	rs59716545	1.869	1.91E-08	1.388	8.84E-104
#18	2	172416992	rs2542932	0.517	2.05E-08	0.985	0.312027
#19	17	38032132	rs200216139	1.869	2.11E-08	NA	NA
#20	17	38074518	rs7219923	1.85	2.13E-08	1.377	9.61E-102
#21	17	38024626	rs11557466	1.859	2.18E-08	0.721	1.14E-103
#22	17	38020419	rs1453559	1.85	2.58E-08	1.367	1.75E-97
#23	9	117540910	rs7856856	1.819	2.61E-08	1.065	0.000183
#24	17	38073968	rs9303279	1.843	2.62E-08	1.394	7.51E-107
#25	17	38074046	rs9303281	1.843	2.62E-08	1.376	1.47E-101
#26	17	38062942	rs35196450	1.852	2.70E-08	NA	NA
#27	17	38032680	rs35736272	1.851	2.76E-08	0.721	9.15E-104
#28	17	38040119	rs12232497	1.851	2.76E-08	0.721	1.09E-103

#29	17	38026035	rs34120102	1.851	2.76E-08	0.721	1.12E-103
#30	17	38070789	rs7221605	1.848	2.80E-08	1.379	3.33E-99
#31	17	38072173	rs1031458	1.848	2.80E-08	1.360	9.04E-94
#32	17	38072247	rs1031460	1.848	2.80E-08	1.360	1.28E-93
#33	17	38072402	rs8065777	1.848	2.80E-08	1.360	1.40E-93
#34	17	38071855	rs143385463	1.848	2.80E-08	1.360	1.44E-93
#35	17	38072727	rs2872516	1.848	2.80E-08	1.359	3.93E-93
#36	17	38074031	rs9303280	1.848	2.80E-08	NA	NA
#37	17	38044893	rs33938760	1.877	2.84E-08	NA	NA
#38	17	38073842	rs58989791	1.839	3.01E-08	NA	NA
#39	17	38032460	rs34189114	1.846	3.10E-08	0.721	7.96E-104
#40	17	38035624	rs35569035	1.846	3.10E-08	0.721	9.07E-104
#41	17	38035766	rs71355426	1.846	3.10E-08	0.721	1.00E-103
#42	17	38038179	rs4795398	1.846	3.10E-08	0.721	1.07E-103
#43	17	38042777	rs9908132	1.846	3.10E-08	0.721	1.09E-103
#44	17	38043343	rs9901146	1.846	3.10E-08	0.721	1.17E-103
#45	17	38043649	rs12936409	1.846	3.10E-08	0.730	7.84E-99
#46	17	38031674	rs10852935	1.846	3.10E-08	0.730	8.14E-99
#47	17	38031865	rs36095411	1.846	3.10E-08	0.730	8.22E-99
#48	17	38048244	rs9906951	1.846	3.10E-08	0.730	1.03E-98
#49	17	38045725	rs12103884	1.846	3.10E-08	NA	NA
#50	17	38025208	rs11078925	1.846	3.10E-08	NA	NA
#51	17	38035116	rs9907088	1.842	3.14E-08	0.721	8.74E-104
#52	17	38070071	rs7216558	1.83	3.38E-08	1.379	1.14E-102
#53	17	38068514	rs1011082	1.83	3.38E-08	1.378	2.71E-102
#54	17	38069076	rs921650	1.83	3.38E-08	1.377	3.23E-102
#55	17	38069274	rs921649	1.83	3.38E-08	1.377	3.42E-102
#56	17	38069364	rs141758348	1.83	3.38E-08	1.377	4.58E-102
#57	17	38069809	rs6503524	1.83	3.38E-08	NA	NA
#58	17	38049102	rs12950209	1.841	3.56E-08	0.729	2.31E-99
#59	17	38049233	rs12950743	1.841	3.56E-08	0.730	3.73E-99
#60	17	38031714	rs10852936	1.835	3.88E-08	0.721	1.56E-103

#61	17	38071086	rs150597688	1.835	3.93E-08	NA	NA
#62	17	38050092	rs68122720	1.836	4.08E-08	NA	NA
#63	17	38038391	rs62067029	1.849	4.49E-08	NA	NA
#64	17	38053207	rs12453507	1.834	4.67E-08	0.724	2.75E-103
#65	17	38049589	rs7359623	1.832	4.70E-08	0.731	1.63E-97
#66	17	38062944	rs56750287	1.829	4.86E-08	0.711	2.40E-111
#67	17	38062976	rs11078926	1.829	4.86E-08	0.712	8.35E-111
#68	17	38063381	rs883770	1.829	4.86E-08	0.721	1.15E-105
#69	17	38063738	rs62067034	1.829	4.86E-08	0.722	1.61E-105
#70	17	38063929	rs36000226	1.829	4.86E-08	0.722	1.65E-105
#71	17	38063980	rs36084703	1.829	4.86E-08	NA	NA
#72	17	38064405	rs11078927	1.829	4.86E-08	NA	NA
#73	17	38026169	rs11655198	1.825	4.89E-08	0.721	7.86E-104
#74	17	38026286	rs11650661	1.825	4.89E-08	0.721	7.87E-104
#75	17	38026361	rs11655292	1.825	4.89E-08	0.721	8.59E-104
#76	17	38030205	rs11870965	1.825	4.89E-08	0.721	8.61E-104
#77	17	38031030	rs9903250	1.825	4.89E-08	0.721	8.70E-104
#78	17	38031138	rs9905959	1.825	4.89E-08	0.721	1.32E-103
#79	17	38031164	rs11658278	1.825	4.89E-08	0.721	1.42E-103
#80	17	38032188	rs12939457	1.825	4.89E-08	0.721	1.43E-103
#81	17	38032200	rs367998020	1.825	4.89E-08	0.730	8.98E-99
#82	17	38033277	rs1054609	1.825	4.89E-08	0.730	9.19E-99
#83	17	38035370	rs36038753	1.825	4.89E-08	0.730	9.20E-99
#84	17	38035648	rs9910826	1.825	4.89E-08	0.730	9.20E-99
#85	17	38036586	rs9904624	1.825	4.89E-08	0.730	9.57E-99
#86	17	38038389	rs12939565	1.825	4.89E-08	0.730	1.04E-98
#87	17	38038390	rs12939566	1.825	4.89E-08	NA	NA
#88	17	38040363	rs12232498	1.825	4.89E-08	NA	NA
#89	17	38040534	rs12941333	1.825	4.89E-08	NA	NA
#90	17	38029120	rs12936231	1.825	4.89E-08	NA	NA
#91	17	38039561	rs71152620	1.825	4.89E-08	NA	NA
#92	17	38027400	rs12709365	1.825	4.90E-08	0.721	1.43E-103

#93	17	38027583	rs13380815	1.825	4.90E-08	0.721	1.43E-103
#94	17	38057189	rs12949100	1.826	5.35E-08	0.711	1.45E-111
#95	17	38061439	rs4795399	1.826	5.35E-08	0.712	1.04E-110
#96	17	38031802	rs9891174	1.821	5.50E-08	0.722	3.09E-103
#97	2	172414462	rs528	0.521	5.68E-08	0.985	0.30215
#98	17	38057197	rs8069176	1.821	5.99E-08	0.712	4.14E-111
#99	9	117545666	rs6478106	1.798	6.39E-08	1.058	0.000629
#100	17	38056116	rs11651596	1.819	7.49E-08	0.712	5.84E-111
#101	9	117551718	rs1857335	1.787	8.65E-08	1.066	0.00013
#102	2	172412510	rs2542940	0.527	8.75E-08	0.985	0.299099
#103	9	117551603	rs10117785	1.787	8.86E-08	1.057	0.000763

1 **Notes:**

2 † *P* -alues were determined by logistic regression analysis using the additive model.

3 †† Replicated *P*-value calculated by threshold for Bonferroni-corrected significance ($P < 4.85 \times 10^{-4}$, 0.05/103).

4 Abbreviations: OR, odds ratio; NA, not applicable.

Table S2. Functions of 24 asthma genes associated with cardiovascular system development

Gene name	Functions	Reference
<i>ANXA2</i>	Calcium-regulated membrane-binding protein whose affinity for calcium is greatly enhanced by anionic phospholipids	Gaétan Mayer et al. ¹
<i>CYP1B1</i>	Promotes retinal angiogenesis and capillary morphogenesis, most likely by metabolizing oxygenated products generated during oxidative stress	T Shimada et al. ²
<i>DDX39B</i>	Involved in nuclear export of spliced and unspliced mRNA	Ichiro Taniguchi et al. ³
<i>ETS1</i>	Regulates angiogenesis via regulation of gene expression, controlling endothelial cell migration and invasion	John S Yordy et al. ⁴
<i>FASLG</i>	Cytokine that binds to TNFRSF6/FAS, a receptor that transduces the apoptotic signal into cells	M Tanaka et al. ⁵
<i>FLVCR1</i>	Heme transporter that exports cytoplasmic heme	John G Quigley et al. ⁶
<i>GATA3</i>	Transcriptional activator which binds to the enhancer of the T-cell receptor alpha and delta genes	Tetsuya Sasaki et al. ⁷
<i>ID2</i>	Inhibits skeletal muscle and cardiac myocyte differentiation and regulates the circadian clock by repressing the transcriptional activator activity of the CLOCK-ARNTL/BMAL1 heterodimer	Sarah M Ward et al. ⁸
<i>IL6</i>	Plays an essential role in the final differentiation of B-cells into Ig-secreting cells and involved in lymphocyte and monocyte differentiation	Sujin Kang et al. ⁹
<i>INSR</i>	Receptor tyrosine kinase which mediates the pleiotropic actions of insulin	J Kasuya et al. ¹⁰
<i>ITGB8</i>	A receptor for fibronectin and recognizes the sequence R-G-D in its ligand, thereby playing a key role in TGF-beta-1 activation on the surface of activated regulatory T-cells	Rui Wang et al. ¹¹
<i>KIF3A</i>	Microtubule-based anterograde translocator for membranous organelles	Andrew Kodani et al. ¹²

<i>LRP1</i>	Involved in the plasma clearance of chylomicron remnants and activated LRPAP1 (alpha 2-macroglobulin), as well as the local metabolism of complexes between plasminogen activators and their endogenous inhibitors	Petra May et al. ¹³
<i>OTULIN</i>	1. Acts as a regulator of angiogenesis and innate immune response 2. Acts as a negative regulator of NF-kappa-B by regulating the activity of the LUBAC complex	Veronique Schaeffer et al. ¹⁴ , Elena Rivkin et al. ¹⁵
<i>POU5F1</i>	Forms a trimeric complex with SOX2 or SOX15 on DNA and controls the expression of a number of genes involved in embryonic development such as YES1, FGF4, UTF1, and ZFP206	Kazutoshi Takahashi et al. ¹⁶
<i>PTCD2</i>	Involved in mitochondrial RNA maturation and mitochondrial respiratory chain function	Fenghao Xu et al. ¹⁷
<i>RORA</i>	Key regulator of embryonic development, cellular differentiation, immunity, circadian rhythm, as well as lipids, steroid, xenobiotics, and glucose metabolism	P Delerive et al. ¹⁸
<i>SEMA3E</i>	1. Promotes focal adhesion disassembly and inhibits adhesion of endothelial cells to the extracellular matrix 2. Regulates angiogenesis and can down-regulate sprouting angiogenesis	Xiaoli Zhang et al. ¹⁹
<i>SERPINB7</i>	Might function as an inhibitor of Lys-specific proteases. Might influence the maturation of megakaryocytes via its action as a serpin	Takenori Yoshikawa et al. ²⁰
<i>SLC8A1</i>	Mediates the exchange of one Ca ²⁺ ion against three to four Na ⁺ ions across the cell membrane, and thereby contributes to the regulation of cytoplasmic Ca ²⁺ levels and Ca ²⁺ -dependent cellular processes	I Komuro et al. ²¹
<i>SMAD3</i>	Form a SMAD3/SMAD4/JUN/FOS complex at the AP-1/SMAD site to regulate TGF-beta-mediated transcription	Y Zhang et al. ²²
<i>SMAD4</i>	Plays a central role in the balance between atrophy and hypertrophy	F Liu et al. ²³
<i>SMAD6</i>	Acts as a mediator of TGF-beta and BMP anti-inflammatory activity	A Hata et al. ²⁴

STK11

Controls the activity of AMP-activated protein kinase (AMPK) family members, thereby playing a role in various processes such as cell metabolism, cell polarity, apoptosis, and DNA damage response Jose M Lizcano et al.²⁵

Table S3. Gene list of the top six representative gene ontology (GO) terms for 24 asthma genes

GO term	Genes list
Animal organ development	<i>ANXA2, CYP1B1, DDX39B, ETS1, FASLG, FLVCR1, GATA3, ID2, IL6, INSR, ITGB8, KIF3A, LRP1, POU5F1, PTCD2, RORA, SEMA3E, SERPINB7, SLC8A1, SMAD3, SMAD4, SMAD6, STK11</i>
Vasculature development	<i>ANXA2, CYP1B1, ETS1, FASLG, FLVCR1, IL6, ITGB8, LRP1, OTULIN, RORA, SEMA3E, SERPINB7, SMAD6, STK11</i>
Anatomical structure morphogenesis	<i>ANXA2, CYP1B1, ETS1, FASLG, FLVCR1, GATA3, ID2, IL6, INSR, KIF3A, LRP1, OTULIN, POU5F1, PTCD2, RORA, SEMA3E, SMAD3, SMAD4, SMAD6, STK11</i>
Regulation of multicellular organismal development	<i>ANXA2, CYP1B1, DDX39B, ETS1, FASLG, FLVCR1, GATA3, ID2, IL6, INSR, LRP1, POU5F1, RORA, SEMA3E, SERPINB7, SLC8A1, SMAD3, SMAD4, SMAD6, STK11</i>
Nitric oxide metabolic process	<i>CYP1B1, IL6, INSR, RORA, SMAD3</i>
Angiogenesis	<i>ANXA2, CYP1B1, ETS1, FASLG, OTULIN, RORA, SEMA3E</i>

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Table S4. Association results of previously reported asthma-related SNPs in this study cohort.

SNP	Chromosome	Location (Bp)	Previously reported asthma related SNPs				Our study	
			Genes	P value	OR	Reference	P value	OR
rs11121240	1	8894357	<i>REER, ENO1</i>	2.40E-09	1.042		NA	NA
rs67551275	1	9356676	<i>SPSB1</i>	5.80E-11	1.046		NA	NA
rs541559418	1	151760522	<i>TDRKH</i>	2.40E-10	1.215		NA	NA
rs35570272	3	33047662	<i>GLB1</i>	3.10E-20	1.066		NA	NA
rs1806656	3	121716171	<i>ILDR1</i>	7.40E-09	1.043		NA	NA
rs7625643	3	141150026	<i>ZBTB38</i>	2.90E-08	1.039		0.3936	1.114
rs7626218	3	176852038	<i>TBL1XR1</i>	4.80E-15	1.056		0.9982	1
rs11715524	3	195762492	<i>SDHAP1, TFRC</i>	3.50E-10	1.044		0.5011	0.8678
rs1684466	3	196359310	<i>FBXO45, CEP19</i>	8.90E-13	1.053		NA	NA
rs45613035	4	123141070	<i>KIAA1109</i>	5.80E-19	1.107		NA	NA
rs11742240	5	35881376	<i>IL7R, CAPSL</i>	2.30E-13	1.057		0.5251	0.9297
rs113010607	5	132105698	<i>SEP9</i>	3.40E-13	1.095		NA	NA
rs449454	5	141533062	<i>NDFIP1</i>	1.10E-16	1.059		0.7833	0.966
rs3190923	6	31324499	<i>HLA-B</i>	9.30E-22	1.129		NA	NA
rs115468973	6	32544121	<i>HLA-DRB6</i>	2.50E-23	1.267		NA	NA
rs1064713	6	32546666	<i>HLA-DRB6</i>	1.20E-25	1.205		NA	NA
rs28522747	6	35134729	<i>TCP11, SCUBE3</i>	7.90E-09	1.062		0.6173	1.057
rs55743914	6	128293562	<i>PTPRK</i>	7.30E-15	1.064		0.02878	3.291
rs6927172	6	138002175	<i>OLIG3, LOC100130476</i>	1.90E-10	1.053		NA	NA
rs149317277	7	20423923	<i>ITGB8</i>	1.30E-12	1.051		NA	NA
rs4722758	7	28156606	<i>JAZF1</i>	5.60E-18	1.076		0.02802	0.7941
rs13277355	8	128777719	<i>POU5F1B, MYC</i>	2.00E-11	1.052		0.3843	1.097
rs12722502	10	6093139	<i>IL2RA</i>	1.70E-18	1.253	1	NA	NA
rs943451	10	6621773	<i>PRKCQ</i>	5.10E-10	1.047		NA	NA
rs28415845	11	1145844	<i>MUC2, MUC5B</i>	4.40E-12	1.053		NA	NA
rs10836538	11	36365253	<i>PRR5L</i>	6.00E-12	1.05		0.8583	0.9824
rs174535	11	61551356	<i>MYRF</i>	6.60E-12	1.05		0.9457	1.007
rs1784775	11	111472460	<i>LAYN, SIK2</i>	1.80E-09	1.046		0.03264	0.4937
rs12365699	11	118743286	<i>DDX6, CXCR5</i>	7.20E-12	1.064		NA	NA
rs62623446	12	55368291	<i>TESPA1</i>	2.30E-09	1.082		NA	NA
rs188074962	12	121365431	<i>SPPL3, HNF1A-AS1</i>	6.30E-11	1.048		0.3196	1.151
rs17103286	14	35885041	<i>NFKB1A, INSM2</i>	1.40E-09	1.042		NA	NA
rs1655558	15	41787585	<i>ITPKA</i>	7.50E-12	1.048		NA	NA
rs117683492	15	67413624	<i>SMAD3</i>	1.20E-08	1.156		NA	NA
rs34445740	15	67475764	<i>SMAD3</i>	4.50E-19	1.069		NA	NA
rs3024655	16	27369502	<i>IL4R</i>	4.20E-20	1.139		0.06263	0.7381
rs2066844	16	50745926	<i>NOD2</i>	6.30E-09	1.098		NA	NA
rs56308324	17	45819206	<i>TBX21</i>	1.30E-09	1.063		0.9726	1.0062387
rs12965763	18	19067435	<i>POLI</i>	1.10E-08	1.048		NA	NA
rs10413947	19	9128342	<i>MUC16, OR1M1</i>	1.40E-08	1.045		NA	NA
rs2766667	20	52172404	<i>TSHZ2, ZNF217</i>	5.40E-10	1.049		0.502	1.091
rs11088309	21	36464631	<i>RUNX1</i>	1.50E-15	1.08		NA	NA
rs5758364	22	41855912	<i>PHF5A</i>	1.20E-10	1.055		NA	NA
rs850637	23	13023741	<i>TMSB4X, FAM9C</i>	5.70E-12	1.04		NA	NA
rs5953283	23	49139787	<i>PPP1R3F</i>	6.90E-11	1.038		NA	NA
rs1438673	5	110467499	<i>WDR36</i>	3.00E-13	1.105	2	0.5778	1.056
rs10905284	10	8115362	<i>GATA3</i>	2.00E-10	1.11		NA	NA
rs6600246	1	25299426	<i>RUNX3, LOC105376879</i>	5.00E-09	1.124		0.04489	4.589
rs12123821	1	152179152	<i>RPTN, HRNR</i>	1.00E-09	1.177		NA	NA
rs115913567	3	23653570	<i>UBE2E2, LOC105376993</i>	1.90E-08	1.23		NA	NA
rs4380538	4	123448562	<i>IL2, IL21</i>	1.60E-10	1.09		0.01831	0.7932
rs6461503	7	20560996	<i>ITGB8, ABCB5</i>	2.10E-09	1.08		0.1138	0.84
rs10876864	12	56401085	<i>IKZF4</i>	1.40E-12	1.1	3	0.5659	1.069
rs1319132	13	99999601	<i>UBAC2</i>	1.70E-08	1.087		0.9663	0.9959
rs146644295	17	37574592	<i>MED1</i>	9.40E-09	1.32		NA	NA
rs11658582	17	38763200	<i>CCR7-, -SMARCE1</i>	1.90E-08	1.075		0.9561	0.9940358
rs10414065	19	33721455	<i>SLC7A10, CEBPA</i>	6.80E-09	1.176		0.4336	0.6862
rs1623866	20	62333022	<i>ARFRP1</i>	4.00E-09	1.099		0.7261	1.047
rs3771180	2	102953617	<i>IL1RL1</i>	1.50E-20	1.21		0.0001672	0.5907
rs6893213	5	110198114	<i>SLC25A46, BCLAF1P1</i>	8.00E-11	1.141		0.0707	3.956
rs6894249	5	131797547	<i>C5orf56</i>	2.00E-11	1.08		0.8395	1.02
rs1233578	6	28712247	<i>TRR-CCG1-2, TRK-TTT7-1</i>	5.00E-09	1.073		0.08423	1.424
rs2855812	6	31472720	<i>MICB</i>	9.00E-12	1.08		0.006375	1.394
rs17806299	16	11199980	<i>CLEC16A</i>	2.00E-10	1.11		0.8782	1.025
rs17637472	17	47461433	<i>LOC102724596, -RPL21P124</i>	3.00E-09	1.07		0.8869	1.0335917

rs1465325	2	102118091	ILIRI	5.63.E-12	NA	0.1926	0.8336
rs1465324	2	102119152	ILIRI	2.64.E-10	NA	0.1896	0.8326
rs12328681	2	102120407	ILIRI	1.99.E-10	NA	0.1896	0.8326
rs10172039	2	102122325	ILIRI	8.07.E-11	NA	0.2806	0.8589
rs12619383	2	102125258	ILIRI	3.00.E-11	NA	0.2539	0.8508
rs12620132	2	102125655	ILIRI	1.97.E-11	NA	0.2539	0.8508
rs13392285	2	102127878	ILIRI	5.87.E-12	NA	0.2262	0.8363
rs13387400	2	102133560	ILIRI	1.16.E-11	NA	0.1816	0.8213
rs1558641	2	102149405	ILIRI	2.39.E-09	NA	0.8803	0.9835
rs1558640	2	102149418	ILIRI	3.05.E-11	NA	0.8803	0.9835
rs949963	2	102153326	ILIRI	2.34.E-10	NA	0.8097	0.9738
rs871657	2	102154881	ILIRI	5.35.E-11	NA	0.839	0.9778
rs2287048	2	102157539	ILIRI	5.55.E-10	NA	0.71	0.9598
rs2160227	2	102166895	ILIRI	4.94.E-08	NA	0.4331	0.9286
rs951192	2	102169394	ILIRI	2.37.E-09	NA	0.4339	0.9283
rs3917304	2	102171665	ILIRI	1.06.E-08	NA	0.4268	0.9274
rs3917318	2	102176300	ILIRI	2.45.E-08	NA	0.3655	0.9175
rs7582198	2	102183374	ILIRI	3.26.E-08	NA	0.4056	0.924
rs1030021	2	102185018	ILIRL2	5.34.E-09	NA	0.3887	0.9208
rs10181869	2	102185392	ILIRL2	2.88.E-08	NA	0.3012	0.9055
rs10184597	2	102185795	ILIRL2	1.31.E-08	NA	0.2591	0.8978
rs10178214	2	102242461	ILIRL2	1.15.E-08	NA	0.3151	0.8813
rs10189629	2	102263004	-	7.13.E-13	NA	0.0094	0.6807
rs11692065	2	102267515	-	4.32.E-13	NA	0.008623	0.6688
rs11674302	2	102270668	-	3.20.E-12	NA	0.009402	0.6807
rs11690644	2	102297754	-	2.95.E-13	NA	NA	NA
rs950880	2	102316102	ILIRL1	2.62.E-17	NA	0.3007	0.9035
rs13001325	2	102322576	ILIRL1	3.58.E-17	NA	0.3008	0.9036
rs12479210	2	102332701	ILIRL1	1.31.E-17	NA	0.2192	0.8854
rs13019081	2	102334362	ILIRL1	1.32.E-17	NA	0.3007	0.9036
rs17026974	2	102335900	ILIRL1	3.50.E-13	NA	0.5799	0.9468
rs3771180	2	102337157	ILIRL1	1.68.E-18	NA	0.0001672	0.5907
rs13431828	2	102338193	ILIRL1	1.19.E-18	NA	0.0001672	0.5907
rs13408661	2	102338622	ILIRL1	2.13.E-18	NA	0.0001672	0.5907
rs1041973	2	102339008	ILIRL1	3.63.E-08	NA	0.1369	0.7319
rs873022	2	102339223	ILIRL1	2.58.E-13	NA	0.6374	0.9543
rs3771177	2	102339400	ILIRL1	2.50.E-13	NA	0.6232	0.9524
rs10173081	2	102340888	ILIRL1	1.94.E-18	NA	0.0001672	0.5907
rs3732129	2	102341072	ILIRL1	3.23.E-13	NA	0.6419	0.9549
rs1420101	2	102341256	ILIRL1	3.92.E-21	NA	0.4243	0.9246
rs12905	2	102343547	ILIRL1	3.99.E-13	NA	0.6312	0.9533
rs12712142	2	102344124	ILIRL1	1.50.E-18	NA	0.3486	0.9118
rs2160203	2	102344364	ILIRL1	1.42.E-16	NA	0.0002358	0.5975
rs13017455	2	102348282	ILIRL1	1.03.E-19	NA	0.3898	0.9187
rs12469506	2	102349411	ILIRL1	1.99.E-14	NA	0.5877	0.9473
rs1921622	2	102349607	ILIRL1	2.42.E-12	NA	0.5624	1.058
rs10208293	2	102349850	ILIRL1	3.63.E-12	NA	0.1205	0.816
rs10197862	2	102350089	ILIRL1	4.03.E-17	NA	0.0001739	0.5915
rs1861245	2	102350446	ILIRL1	1.14.E-14	NA	0.2382	0.8498
rs13424006	2	102350776	ILIRL1	1.23.E-16	NA	0.1288	0.8197
rs6751967	2	102350953	ILIRL1	1.17.E-16	NA	0.1288	0.8197
rs6749114	2	102351127	ILIRL1	1.12.E-16	NA	0.1288	0.8197
rs11123923	2	102351384	ILIRL1	6.82.E-15	NA	0.3254	0.9078
rs4988955	2	102351468	ILIRL1	7.66.E-17	NA	0.1287	0.8197
rs4988956	2	102351547	ILIRL1	4.41.E-17	NA	0.1288	0.8197
rs4988957	2	102351615	ILIRL1	7.59.E-17	NA	0.1288	0.8197
rs10204137	2	102351752	ILIRL1	9.58.E-13	NA	0.1289	0.8197
rs4988958	2	102351825	ILIRL1	7.46.E-17	NA	0.1289	0.8197
rs10192157	2	102351896	ILIRL1	6.64.E-17	NA	0.9661	0.9907
rs10206753	2	102351902	ILIRL1	1.80.E-12	NA	0.9661	0.9907
rs7603730	2	102357911	IL18R1	3.86.E-17	NA	0.1289	0.8198
rs12998521	2	102357957	IL18R1	7.18.E-13	NA	0.2473	0.8922
rs10170583	2	102358304	IL18R1	1.79.E-16	NA	0.1289	0.8198
rs10176664	2	102359712	IL18R1	2.76.E-17	NA	0.1305	0.8203
rs3755276	2	102361999	IL18R1	3.04.E-17	NA	0.1264	0.8185
rs2287037	2	102362568	IL18R1	7.90.E-20	NA	0.2686	0.8964
rs3771172	2	102369352	IL18R1	6.06.E-14	NA	0.3887	0.9177
rs3771171	2	102369490	IL18R1	4.69.E-13	NA	0.3887	0.9177
rs2160202	2	102369694	IL18R1	4.80.E-13	NA	0.3887	0.9177

rs3771166	2	102369762	<i>IL18R1</i>	1.09.E-21	NA	0.1324	0.821
rs1974675	2	102369915	<i>IL18R1</i>	1.28.E-21	NA	0.1325	0.821
rs10439410	2	102374328	<i>IL18R1</i>	2.25.E-12	NA	0.000403	0.6403
rs6758936	2	102374909	<i>IL18R1</i>	2.05.E-12	NA	0.000403	0.6403
rs2041739	2	102377873	<i>IL18R1</i>	1.67.E-12	NA	0.000403	0.6403
rs17027037	2	102378424	<i>IL18R1</i>	1.91.E-14	NA	0.6948	1.039
rs2080289	2	102378560	<i>IL18R1</i>	2.12.E-14	NA	0.6948	1.039
rs10208196	2	102379885	<i>IL18R1</i>	1.56.E-12	NA	0.000403	0.6403
rs11683700	2	102380345	<i>IL18R1</i>	1.62.E-12	NA	0.6948	1.039
rs3213733	2	102381424	<i>IL18R1</i>	4.71.E-12	NA	0.0002273	0.598
rs3213732	2	102381819	<i>IL18R1</i>	1.49.E-12	NA	0.000403	0.6403
rs6760621	2	102383492	<i>IL18R1</i>	3.58.E-11	NA	0.000403	0.6403
rs1035130	2	102384942	<i>IL18R1</i>	1.63.E-14	NA	0.6887	1.04
rs3771161	2	102387501	<i>IL18R1</i>	4.09.E-09	NA	0.0003034	0.6046
rs6706002	2	102389644	<i>IL18R1</i>	1.57.E-12	NA	0.0005551	0.6476
rs4851570	2	102389927	<i>IL18R1</i>	1.43.E-14	NA	0.6429	1.047
rs6749014	2	102389988	<i>IL18R1</i>	1.45.E-10	NA	0.0005551	0.6476
rs4851004	2	102393077	<i>IL18R1</i>	5.89.E-13	NA	0.0004607	0.6439
rs3771158	2	102393434	<i>IL18R1</i>	8.18.E-12	NA	0.000374	0.6087
rs2287034	2	102394128	<i>IL18R1</i>	5.97.E-14	NA	0.5571	1.059
rs2287033	2	102394777	<i>IL18R1</i>	5.59.E-13	NA	0.0004607	0.6439
rs1135354	2	102397842	<i>IL18R1</i>	1.22.E-11	NA	0.5559	1.059
rs1420094	2	102399227	<i>IL18R1</i>	4.31.E-13	NA	0.0004607	0.6439
rs17027087	2	102399458	-	2.81.E-14	NA	0.5294	1.064
rs6710528	2	102399682	-	1.61.E-12	NA	0.0004607	0.6439
rs3732124	2	102401592	-	1.15.E-12	NA	0.0004595	0.6438
rs4851571	2	102402540	-	1.14.E-12	NA	0.0004607	0.6439
rs4851572	2	102402571	-	1.13.E-12	NA	0.0004607	0.6439
rs10202813	2	102403280	-	1.34.E-11	NA	0.0003782	0.6089
rs6710034	2	102407218	-	3.68.E-13	NA	0.0004607	0.6439
rs10181785	2	102408814	-	6.97.E-12	NA	0.0003754	0.6088
rs12712148	2	102409087	-	1.32.E-11	NA	0.0003754	0.6088
rs11687768	2	102409278	-	5.76.E-12	NA	0.0003754	0.6088
rs10203558	2	102411180	-	7.65.E-13	NA	0.0004607	0.6439
rs10200952	2	102411191	-	1.77.E-10	NA	0.0004607	0.6439
rs7586983	2	102411606	-	8.90.E-12	NA	0.0003754	0.6088
rs1420105	2	102418659	<i>IL18RAP</i>	2.62.E-13	NA	0.0004583	0.6438
rs2293223	2	102419008	<i>IL18RAP</i>	1.23.E-11	NA	0.0004712	0.614
rs2293224	2	102419319	<i>IL18RAP</i>	6.02.E-13	NA	0.0004607	0.6439
rs6743516	2	102419875	<i>IL18RAP</i>	5.63.E-13	NA	0.0004607	0.6439
rs3771156	2	102420217	<i>IL18RAP</i>	4.74.E-13	NA	0.5294	1.064
rs1420100	2	102420542	<i>IL18RAP</i>	5.29.E-13	NA	0.0004607	0.6439
rs3771155	2	102421366	<i>IL18RAP</i>	4.74.E-13	NA	0.0004607	0.6439
rs10206291	2	102422403	<i>IL18RAP</i>	5.43.E-13	NA	0.0004607	0.6439
rs885088	2	102422584	<i>IL18RAP</i>	5.06.E-13	NA	0.0004604	0.6439
rs3771154	2	102422900	<i>IL18RAP</i>	5.74.E-13	NA	0.0004607	0.6439
rs6759479	2	102423587	<i>IL18RAP</i>	7.32.E-13	NA	0.0004607	0.6439
rs887972	2	102424485	<i>IL18RAP</i>	2.66.E-11	NA	0.6141	1.051
rs887971	2	102424707	<i>IL18RAP</i>	2.78.E-14	NA	0.6333	1.048
rs3755266	2	102426252	<i>IL18RAP</i>	4.62.E-13	NA	0.0004611	0.6439
rs7559845	2	102429754	<i>IL18RAP</i>	4.12.E-13	NA	0.0004611	0.6439
rs2310300	2	102432614	<i>MIR4772</i>	2.82.E-13	NA	0.0004611	0.6439
rs10166330	2	102433930	<i>IL18RAP</i>	9.53.E-12	NA	0.0003754	0.6088
rs11681718	2	102434684	<i>IL18RAP</i>	3.57.E-11	NA	0.5008	1.068
rs4851582	2	102435098	<i>IL18RAP</i>	3.79.E-13	NA	0.4771	1.072
rs3755265	2	102436356	<i>IL18RAP</i>	7.10.E-14	NA	0.0007217	0.6524
rs10176820	2	102437960	<i>IL18RAP</i>	1.41.E-11	NA	0.0003252	0.6065
rs2058659	2	102438096	<i>IL18RAP</i>	7.49.E-14	NA	0.0007217	0.6524
rs17027166	2	102438960	<i>IL18RAP</i>	7.63.E-13	NA	0.5165	1.066
rs13021177	2	102440033	<i>IL18RAP</i>	1.12.E-13	NA	0.0007217	0.6524
rs10490204	2	102440074	<i>IL18RAP</i>	9.67.E-12	NA	0.5009	1.068
rs17027179	2	102440699	<i>IL18RAP</i>	5.53.E-13	NA	0.5165	1.066
rs2075186	2	102440791	<i>IL18RAP</i>	1.62.E-11	NA	0.0003252	0.6065
rs10490203	2	102442777	<i>IL18RAP</i>	5.16.E-13	NA	0.5453	1.061
rs3771150	2	102444391	<i>IL18RAP</i>	2.11.E-11	NA	0.5293	1.064
rs11123928	2	102444826	<i>IL18RAP</i>	7.04.E-09	NA	0.554	1.06
rs7597017	2	102445656	<i>IL18RAP</i>	1.05.E-08	NA	0.5453	1.061
rs17027230	2	102462870	-	3.06.E-11	NA	0.5932	1.054
rs10210176	2	102463056	-	8.57.E-12	NA	0.0002314	0.5995

rs10172116	2	102471113	-	2.21.E-11	NA	0.0002244	0.5988
rs4851011	2	102473219	<i>SLC9A4</i>	5.57.E-10	NA	0.5099	1.067
rs17027255	2	102473668	<i>SLC9A4</i>	8.91.E-11	NA	0.5142	1.066
rs17027258	2	102475081	<i>SLC9A4</i>	3.29.E-11	NA	0.8139	1.038
rs13030642	2	102475126	<i>SLC9A4</i>	5.73.E-11	NA	0.0002244	0.5988
rs13018263	2	102475811	<i>SLC9A4</i>	4.95.E-10	NA	0.5377	0.8952
rs12187994	5	110615280	<i>TMEM232</i>	8.80.E-09	NA	0.6977	0.9339
rs12186893	5	110617282	<i>TMEM232</i>	7.94.E-09	NA	0.8771	0.9758
rs3985087	5	110736955	<i>TMEM232</i>	8.51.E-09	NA	0.5468	1.173
rs17132319	5	110738976	<i>TMEM232</i>	4.54.E-09	NA	NA	NA
rs665063	5	110739713	<i>TMEM232</i>	4.37.E-09	NA	0.8786	0.9753
rs12187004	5	110740651	<i>TMEM232</i>	4.51.E-09	NA	0.6649	1.12
rs244411	5	110742779	<i>SLC25A46</i>	1.26.E-09	NA	NA	NA
rs17446534	5	110743749	<i>SLC25A46</i>	1.82.E-09	NA	0.8078	1.07
rs244923	5	110744662	<i>SLC25A46</i>	7.46.E-10	NA	0.8566	0.9708
rs381661	5	110749397	<i>SLC25A46</i>	8.07.E-12	NA	0.2174	0.7482
rs11548494	5	110764618	<i>SLC25A46</i>	9.68.E-09	NA	0.8235	1.065
rs3853750	5	110818610	-	4.96.E-08	NA	0.2975	1.22
rs12659961	5	110851305	-	3.91.E-08	NA	0.3197	1.134
rs10056340	5	110854353	-	3.23.E-08	NA	0.4469	1.126
rs17132442	5	110856423	-	4.58.E-08	NA	0.3718	1.118
rs6893213	5	110862415	-	3.87.E-11	NA	0.0707	3.956
rs1837253	5	111066174	-	1.63.E-18	NA	0.02711	1.246
rs10455025	5	111069301	<i>TSLP</i>	9.38.E-26	NA	0.3589	0.8223
rs3806932	5	111069977	<i>TSLP</i>	4.46.E-08	NA	0.9018	0.9871
rs3806933	5	111071044	<i>TSLP</i>	1.06.E-08	NA	0.9933	1.001
rs1898671	5	111072304	<i>TSLP</i>	4.03.E-25	NA	0.1509	0.7477
rs1993465	5	111097400	<i>WDR36</i>	2.93.E-08	NA	0.948	0.9935
rs10038177	5	111100751	<i>WDR36</i>	1.96.E-08	NA	0.948	0.9935
rs10491424	5	111118108	<i>WDR36</i>	3.50.E-08	NA	0.7861	0.9723
rs17624673	5	111121460	<i>WDR36</i>	3.58.E-19	NA	0.2677	0.7928
rs4530809	5	111126532	<i>WDR36</i>	3.54.E-08	NA	0.8806	0.9846
rs1043828	5	111128310	<i>WDR36</i>	1.96.E-19	NA	0.3932	0.8359
rs1438673	5	111131801	-	4.19.E-13	NA	0.5778	1.056
rs6594499	5	111134439	-	3.50.E-12	NA	0.8335	1.021
rs2162893	5	111222366	<i>CAMK4</i>	2.82.E-13	NA	0.991	0.9988
rs10057913	5	111230477	<i>CAMK4</i>	2.10.E-08	NA	0.7466	1.055
rs1457115	5	111231900	<i>CAMK4</i>	2.52.E-10	NA	0.2827	1.14
rs11950562	5	132316836	<i>LOC553103</i>	8.98.E-11	NA	NA	NA
rs1050152	5	132340627	<i>LOC553103</i>	4.22.E-08	NA	NA	NA
rs10058074	5	132350453	<i>LOC553103</i>	2.22.E-09	NA	NA	NA
rs4705938	5	132358384	<i>LOC553103</i>	1.44.E-09	NA	NA	NA
rs17622208	5	132381358	<i>SLC22A5</i>	2.64.E-10	NA	NA	NA
rs2158101	5	132433581	<i>C5orf56</i>	1.69.E-08	NA	0.2928	1.231
rs11741543	5	132435623	<i>C5orf56</i>	1.22.E-08	NA	0.2928	1.231
rs11744116	5	132444068	<i>C5orf56</i>	1.14.E-08	NA	0.2631	1.243
rs4540166	5	132444165	<i>C5orf56</i>	9.32.E-09	NA	0.2631	1.243
rs4371745	5	132444263	<i>C5orf56</i>	9.64.E-09	NA	0.2631	1.243
rs4235801	5	132446752	<i>C5orf56</i>	1.55.E-08	NA	0.2631	1.243
rs4235802	5	132447145	<i>C5orf56</i>	1.13.E-08	NA	0.2188	1.273
rs10036896	5	132449486	<i>C5orf56</i>	3.45.E-08	NA	0.3064	1.211
rs12515180	5	132449992	<i>C5orf56</i>	3.95.E-08	NA	NA	NA
rs11951091	5	132450903	<i>C5orf56</i>	3.82.E-08	NA	NA	NA
rs6866614	5	132451445	<i>C5orf56</i>	4.64.E-08	NA	NA	NA
rs4705950	5	132457594	<i>C5orf56</i>	1.74.E-08	NA	0.03707	3.045
rs1023518	5	132458080	<i>C5orf56</i>	7.14.E-09	NA	0.2988	1.111
rs3857440	5	132458377	<i>C5orf56</i>	2.08.E-09	NA	0.2988	1.111
rs11745587	5	132461230	<i>C5orf56</i>	1.24.E-09	NA	0.3389	0.9043
rs6894249	5	132461855	<i>C5orf56</i>	3.51.E-11	NA	0.8395	1.02
rs2248116	5	132468655	<i>LOC105379175</i>	4.53.E-08	NA	0.03698	3.075
rs10039559	5	132468815	<i>LOC105379175</i>	4.16.E-08	NA	0.6822	0.928
rs2548993	5	132473177	<i>LOC105379175</i>	2.52.E-08	NA	0.9887	1.001
rs2070729	5	132484229	<i>IRF1</i>	4.46.E-08	NA	0.4298	1.106
rs17622656	5	132485305	<i>IRF1</i>	2.29.E-10	NA	NA	NA
rs736801	5	132497907	-	1.98.E-11	NA	0.02456	4.018
rs2706338	5	132560157	<i>RAD50</i>	4.98.E-08	NA	0.2041	1.167
rs2244012	5	132565533	<i>RAD50</i>	4.19.E-08	NA	0.2164	1.161
rs2706347	5	132569425	<i>RAD50</i>	4.44.E-08	NA	0.2165	1.161
rs2706348	5	132570118	<i>RAD50</i>	2.62.E-08	NA	0.2164	1.161

rs17166050	5	132579521	<i>RAD50</i>	1.80.E-08	NA	0.233	1.155
rs2522403	5	132579625	<i>RAD50</i>	3.78.E-08	NA	0.2407	1.152
rs2246176	5	132581658	<i>RAD50</i>	2.23.E-08	NA	0.2165	1.161
rs2252775	5	132582752	<i>RAD50</i>	1.25.E-08	NA	0.233	1.155
rs10463893	5	132592347	<i>RAD50</i>	2.93.E-08	NA	0.2388	1.153
rs2897443	5	132593902	<i>RAD50</i>	1.14.E-08	NA	0.233	1.155
rs17622991	5	132597061	<i>RAD50</i>	3.43.E-09	NA	0.1961	1.17
rs2706370	5	132597324	<i>RAD50</i>	1.32.E-08	NA	0.2424	1.153
rs2706372	5	132599785	<i>RAD50</i>	1.99.E-08	NA	0.2165	1.161
rs12187537	5	132604212	<i>RAD50</i>	8.73.E-09	NA	0.2644	1.145
rs2522394	5	132608437	<i>RAD50</i>	1.42.E-08	NA	0.2165	1.161
rs10520114	5	132613199	<i>RAD50</i>	1.53.E-08	NA	0.2566	1.147
rs2301713	5	132616304	<i>RAD50</i>	3.71.E-08	NA	0.1913	1.173
rs6596086	5	132616530	<i>RAD50</i>	1.31.E-08	NA	0.2166	1.161
rs7449456	5	132617735	<i>RAD50</i>	4.14.E-08	NA	0.1913	1.173
rs3798135	5	132629417	<i>RAD50</i>	1.08.E-09	NA	0.1675	1.184
rs3798134	5	132629487	<i>RAD50</i>	1.67.E-09	NA	0.1406	1.199
rs6596087	5	132632917	<i>RAD50</i>	1.52.E-09	NA	0.1676	1.184
rs6871536	5	132634182	<i>RAD50</i>	1.00.E-08	NA	0.181	1.178
rs12653750	5	132636210	<i>RAD50</i>	8.68.E-10	NA	0.2002	1.169
rs2040704	5	132637485	<i>RAD50</i>	5.55.E-09	NA	0.6465	1.096
rs2074369	5	132637971	<i>RAD50</i>	5.95.E-09	NA	0.245	1.151
rs2240032	5	132641435	<i>RAD50</i>	2.86.E-10	NA	0.2206	1.161
rs2158177	5	132648366	<i>TH2LCRR</i>	7.83.E-13	NA	0.26	1.148
rs3091307	5	132653444	<i>TH2LCRR</i>	2.01.E-10	NA	0.2264	1.164
rs1295686	5	132660151	<i>IL13</i>	2.80.E-15	NA	NA	NA
rs20541	5	132660272	<i>IL13</i>	5.01.E-16	NA	0.2548	1.158
rs1295685	5	132660753	<i>IL13</i>	9.36.E-16	NA	0.3082	1.143
rs848	5	132660808	<i>IL13</i>	9.00.E-15	NA	0.3156	1.139
rs847	5	132660977	<i>IL13</i>	5.51.E-13	NA	0.2787	1.152
rs30513	5	132779532	-	4.69.E-08	NA	NA	NA
rs12655443	5	142088291	<i>LOC105378204</i>	2.12.E-08	NA	NA	NA
rs4912622	5	142111022	<i>NDFIP1</i>	8.50.E-09	NA	0.8715	0.9841
rs7705042	5	142112854	<i>NDFIP1</i>	7.90.E-09	NA	0.8711	0.9841
rs10875596	5	142116150	<i>NDFIP1</i>	1.20.E-08	NA	0.871	0.9841
rs11749731	5	142120871	<i>NDFIP1</i>	1.01.E-08	NA	0.9972	0.9997
rs1835966	5	142121943	<i>NDFIP1</i>	1.40.E-08	NA	0.9206	0.9902
rs2338822	5	142123494	<i>NDFIP1</i>	1.47.E-08	NA	0.9206	0.9902
rs11739961	5	142128923	<i>NDFIP1</i>	1.81.E-08	NA	0.8834	0.9856
rs6860138	5	142130420	<i>NDFIP1</i>	1.74.E-08	NA	0.9569	0.9947
rs7709361	5	142134289	<i>NDFIP1</i>	1.11.E-08	NA	0.9168	0.9897
rs7723666	5	142134401	<i>NDFIP1</i>	1.25.E-08	NA	0.7177	1.061
rs6922111	6	28357531	<i>ZSCAN31</i>	4.66.E-08	NA	0.4728	1.112
rs16901847	6	28408074	-	2.44.E-08	NA	0.4761	1.166
rs7765989	6	28432518	<i>ZSCAN23</i>	2.69.E-08	NA	0.4761	1.166
rs7766356	6	28432761	<i>ZSCAN23</i>	1.87.E-08	NA	0.4715	1.17
rs16894116	6	28447190	-	2.66.E-08	NA	0.4761	1.166
rs2523721	6	30198489	<i>TRIM26</i>	4.93.E-08	NA	0.06117	1.298
rs2844777	6	30238237	<i>HCG17</i>	4.38.E-08	NA	NA	NA
rs3132619	6	30406434	-	2.52.E-08	NA	NA	NA
rs3132616	6	30448679	-	6.29.E-09	NA	NA	NA
rs3094024	6	30528083	-	7.10.E-09	NA	NA	NA
rs3130117	6	30541179	<i>GNL1</i>	3.38.E-09	NA	NA	NA
rs3130247	6	30547266	<i>GNL1</i>	6.20.E-09	NA	NA	NA
rs3132610	6	30576624	<i>ABCF1</i>	1.19.E-09	NA	NA	NA
rs9262130	6	30635742	<i>ATAT1</i>	2.29.E-09	NA	NA	NA
rs9262135	6	30651129	<i>C6orf136</i>	5.22.E-09	NA	NA	NA
rs9262143	6	30685004	<i>PPP1R18</i>	2.99.E-09	NA	NA	NA
rs3095330	6	30725856	<i>TUBB</i>	4.14.E-09	NA	0.9039	0.9861
rs1059612	6	30741178	<i>FLOT1</i>	3.41.E-10	NA	NA	NA
rs2284174	6	30745803	<i>HCG20</i>	1.39.E-09	NA	0.001709	1.684
rs3129973	6	30753366	<i>HCG20</i>	3.54.E-09	NA	NA	NA
rs3095326	6	30758064	<i>HCG20</i>	5.70.E-09	NA	NA	NA
rs3130665	6	30768202	<i>HCG20</i>	2.05.E-09	NA	NA	NA
rs3095336	6	30770669	<i>HCG20</i>	1.18.E-09	NA	NA	NA
rs3132605	6	30772195	<i>HCG20</i>	1.21.E-09	NA	NA	NA
rs3129978	6	30778554	<i>HCG20</i>	1.29.E-09	NA	NA	NA
rs3132600	6	30778590	<i>HCG20</i>	4.32.E-09	NA	NA	NA
rs3130673	6	30778742	<i>HCG20</i>	1.06.E-09	NA	NA	NA

rs3131044	6	30790887	HCG20	9.46.E-10	NA	NA	NA
rs3131050	6	30792248	HCG20	1.65.E-09	NA	NA	NA
rs9262200	6	30792948	-	1.19.E-09	NA	NA	NA
rs9262204	6	30793312	-	1.01.E-08	NA	NA	NA
rs3131055	6	30793710	-	1.43.E-09	NA	NA	NA
rs3129984	6	30793795	-	4.64.E-09	NA	NA	NA
rs3129985	6	30794765	-	1.59.E-09	NA	NA	NA
rs3131060	6	30795514	-	1.86.E-09	NA	NA	NA
rs3131064	6	30796116	-	2.58.E-08	NA	0.2744	1.376
rs3130641	6	30796304	-	4.08.E-09	NA	NA	NA
rs1264376	6	30797802	-	1.42.E-09	NA	0.1114	1.338
rs886424	6	30814225	LOC107987453	2.58.E-08	NA	NA	NA
rs1264353	6	30819985	LOC107987453	1.99.E-08	NA	NA	NA
rs1264349	6	30828882	LINC00243	3.78.E-08	NA	NA	NA
rs1264341	6	30834688	-	1.63.E-08	NA	NA	NA
rs2535332	6	30845472	LOC105375014	1.19.E-08	NA	NA	NA
rs886422	6	30896502	DDR1	3.43.E-08	NA	NA	NA
rs3130955	6	31086734	-	6.62.E-09	NA	0.8915	1.023
rs3130544	6	31090563	-	1.84.E-08	NA	NA	NA
rs3094216	6	31116271	CDSN	3.36.E-08	NA	0.7822	1.053
rs3132550	6	31118271	CDSN	2.18.E-08	NA	0.3412	1.233
rs3094211	6	31118625	CDSN	1.83.E-08	NA	0.954	1.011
rs3130557	6	31126926	PSORSIC1	2.84.E-08	NA	NA	NA
rs3130564	6	31133897	PSORSIC1	1.61.E-10	NA	NA	NA
rs2442719	6	31352761	-	2.02.E-08	NA	NA	NA
rs2596464	6	31445184	LINC01149	3.11.E-10	NA	0.05972	1.19
rs2596472	6	31461190	HCP5	3.43.E-10	NA	0.8031	0.9509
rs2596450	6	31470466	HCG26	4.36.E-08	NA	0.4153	1.108
rs3099844	6	31481199	LOC102725068	1.43.E-09	NA	0.03638	1.981
rs2855812	6	31504943	MICB	8.89.E-12	NA	0.006375	1.394
rs2734583	6	31537703	ATP6V1G2	3.84.E-08	NA	0.04014	1.679
rs3134950	6	32159700	PPT2-EGFL8	5.04.E-09	NA	0.6451	0.9574
rs1061808	6	32168770	PPT2-EGFL8	4.88.E-09	NA	0.3614	0.8967
rs2269423	6	32177930	MIR6833	1.01.E-08	NA	NA	NA
rs9268082	6	32267176	LOC101929163	4.21.E-08	NA	0.6349	1.078
rs9268132	6	32286877	LOC101929163	4.22.E-08	NA	0.7047	1.061
rs4713518	6	32289560	LOC101929163	4.53.E-08	NA	0.615	1.082
rs502626	6	32310489	LOC101929163	4.08.E-08	NA	0.95	1.006
rs572730	6	32321987	LOC101929163	3.93.E-08	NA	0.7094	0.9649
rs533885	6	32325375	LOC101929163	2.85.E-08	NA	0.7306	0.9675
rs476885	6	32326935	LOC101929163	4.99.E-08	NA	0.8442	0.9813
rs505274	6	32327215	LOC101929163	4.28.E-08	NA	0.7185	1.058
rs742582	6	32331938	LOC101929163	4.91.E-08	NA	0.6479	1.074
rs1474728	6	32334290	LOC101929163	4.87.E-08	NA	0.9253	0.991
rs926591	6	32337913	LOC101929163	4.73.E-08	NA	0.9253	0.991
rs9368716	6	32338313	LOC101929163	1.72.E-10	NA	0.4605	1.072
rs2022534	6	32339360	LOC101929163	4.55.E-08	NA	0.9253	0.991
rs2143465	6	32341575	LOC101929163	4.39.E-08	NA	0.6479	1.074
rs4576282	6	32345019	LOC101929163	4.49.E-08	NA	0.9253	0.991
rs4959092	6	32345234	LOC101929163	4.38.E-08	NA	0.9253	0.991
rs4959093	6	32345320	LOC101929163	4.17.E-08	NA	0.9253	0.991
rs9268283	6	32347396	LOC101929163	1.73.E-08	NA	0.9253	0.991
rs2076542	6	32349350	LOC101929163	1.95.E-08	NA	0.9253	0.991
rs2076538	6	32349694	LOC101929163	4.70.E-08	NA	0.9253	0.991
rs9268301	6	32351860	LOC101929163	2.92.E-11	NA	0.3439	0.9113
rs1265762	6	32353338	LOC101929163	1.79.E-09	NA	0.1578	1.147
rs1265760	6	32354095	LOC101929163	1.98.E-09	NA	0.1578	1.147
rs1265759	6	32354616	LOC101929163	1.70.E-08	NA	0.1639	1.145
rs1265758	6	32355752	LOC101929163	6.09.E-10	NA	0.1578	1.147
rs3129909	6	32357933	LOC101929163	9.32.E-10	NA	0.1662	1.144
rs2395150	6	32358268	LOC101929163	4.46.E-10	NA	0.6458	0.9304
rs6904608	6	32359950	LOC101929163	3.89.E-10	NA	0.1578	1.147
rs6904636	6	32360004	LOC101929163	4.22.E-09	NA	0.1578	1.147
rs9268368	6	32366178	LOC101929163	4.76.E-08	NA	0.6479	1.074
rs9268384	6	32368809	LOC101929163	2.97.E-08	NA	0.6479	1.074
rs2073044	6	32371209	LOC101929163	1.26.E-12	NA	0.6519	0.925
rs9268403	6	32373696	LOC101929163	1.88.E-14	NA	0.2556	1.243
rs9268429	6	32377275	LOC101929163	4.68.E-13	NA	0.2564	1.243
rs1980495	6	32379017	LOC101929163	1.89.E-12	NA	0.2555	1.244

rs8180664	6	32379713	LOC101929163	2.17.E-14	NA	0.2555	1.244
rs2395157	6	32380368	LOC101929163	1.64.E-14	NA	0.2943	1.227
rs17423649	6	32389356	LOC101929163	3.39.E-09	NA	0.211	0.8367
rs9268474	6	32389388	LOC101929163	5.97.E-14	NA	0.2555	1.244
rs12529049	6	32389938	LOC101929163	3.10.E-09	NA	0.5809	0.876
rs12525722	6	32390386	LOC101929163	3.42.E-09	NA	0.0009127	0.6809
rs17423691	6	32390568	LOC101929163	8.63.E-09	NA	0.2112	0.8367
rs17423698	6	32390591	LOC101929163	9.33.E-09	NA	0.2112	0.8367
rs17495592	6	32390756	LOC101929163	3.08.E-08	NA	0.0009127	0.6809
rs9268477	6	32391344	LOC101929163	2.73.E-12	NA	0.03413	1.285
rs17495612	6	32391654	LOC101929163	2.67.E-08	NA	0.0009127	0.6809
rs16870123	6	32391683	LOC101929163	1.58.E-08	NA	0.2302	0.8428
rs9268480	6	32396067	LOC101929163	6.23.E-14	NA	0.03413	1.285
rs4248166	6	32398644	LOC101929163	4.70.E-10	NA	0.3305	0.8331
rs2294881	6	32399827	LOC101929163	1.69.E-09	NA	0.00114	0.712
rs2294880	6	32399945	LOC101929163	1.06.E-11	NA	0.07564	1.223
rs3817966	6	32400070	LOC101929163	1.31.E-11	NA	0.9071	0.9883
rs3817963	6	32400310	LOC101929163	6.38.E-13	NA	0.9071	0.9883
rs3817962	6	32400537	LOC101929163	3.03.E-11	NA	0.03413	1.285
rs2076525	6	32402839	LOC101929163	1.03.E-12	NA	0.03413	1.285
rs2076524	6	32402907	LOC101929163	1.42.E-14	NA	0.03413	1.285
rs3793126	6	32403842	LOC101929163	1.36.E-13	NA	0.06814	1.319
rs3793127	6	32404138	LOC101929163	1.24.E-13	NA	0.5631	1.125
rs9268493	6	32407553	LOC101929163	2.12.E-11	NA	0.1301	1.164
rs9268494	6	32407575	LOC101929163	1.30.E-12	NA	0.6659	0.9594
rs9268497	6	32407647	LOC101929163	1.91.E-11	NA	0.6658	0.9593
rs3763309	6	32408196	LOC101929163	1.72.E-14	NA	0.2069	1.171
rs3763311	6	32408399	BTNL2	6.64.E-12	NA	0.02609	1.255
rs3763312	6	32408571	BTNL2	3.25.E-09	NA	0.2069	1.171
rs3763313	6	32408694	BTNL2	4.18.E-08	NA	0.5903	0.9353
rs3763316	6	32408969	BTNL2	5.07.E-14	NA	0.2556	1.243
rs9268516	6	32411712	-	3.46.E-15	NA	0.3057	1.216
rs9268528	6	32415331	-	1.57.E-08	NA	0.0105	1.28
rs9268542	6	32416944	-	8.87.E-09	NA	0.0105	1.28
rs9268544	6	32417676	-	2.30.E-08	NA	0.0105	1.28
rs9268556	6	32419187	-	3.59.E-08	NA	0.0105	1.28
rs2395163	6	32420032	-	1.53.E-10	NA	0.1468	1.198
rs2187818	6	32427791	-	4.79.E-08	NA	0.09336	1.311
rs4321864	6	32431410	-	1.96.E-09	NA	0.01803	1.267
rs9268614	6	32435001	-	2.13.E-10	NA	0.3421	1.127
rs14004	6	32439932	HLA-DRA	4.57.E-08	NA	0.09357	1.311
rs6926374	6	32441528	HLA-DRA	1.36.E-09	NA	0.1312	0.8652
rs2239804	6	32443746	HLA-DRA	1.06.E-09	NA	0.3745	0.8717
rs2239803	6	32444056	HLA-DRA	1.40.E-09	NA	0.3636	0.915
rs9268831	6	32459971	-	8.53.E-09	NA	0.07684	0.8464
rs9268853	6	32461866	-	6.14.E-17	NA	0.6663	1.075
rs9268858	6	32461981	-	5.54.E-17	NA	0.3666	1.095
rs9268877	6	32463370	-	4.00.E-13	NA	0.4858	0.8918
rs9268923	6	32465058	-	1.27.E-24	NA	0.6663	1.075
rs2395185	6	32465390	-	3.57.E-17	NA	0.6663	1.075
rs9268969	6	32466572	-	1.59.E-25	NA	0.3675	1.094
rs9268979	6	32467267	-	2.36.E-11	NA	0.6576	0.9564
rs9405040	6	32471616	-	3.84.E-17	NA	0.6624	1.076
rs9286790	6	32472051	-	4.82.E-18	NA	0.3333	1.102
rs5026743	6	32472187	-	2.70.E-08	NA	NA	NA
rs9269065	6	32472395	-	8.42.E-11	NA	NA	NA
rs9269069	6	32472585	-	2.85.E-13	NA	0.4597	0.8844
rs9269070	6	32472674	-	3.50.E-10	NA	0.4175	1.088
rs9269071	6	32472690	-	1.56.E-12	NA	0.8036	0.9677
rs9269080	6	32473192	-	3.91.E-11	NA	0.691	0.9608
rs7755212	6	32473631	-	8.69.E-12	NA	NA	NA
rs7739203	6	32473778	-	1.80.E-12	NA	0.5824	0.9123
rs7739357	6	32473864	-	1.84.E-12	NA	0.5072	0.8967
rs9405112	6	32477823	-	1.76.E-16	NA	0.3667	1.095
rs6916742	6	32485414	-	2.27.E-11	NA	NA	NA
rs2516049	6	32602623	-	2.00.E-10	NA	0.1987	0.7915
rs17533090	6	32622945	-	4.79.E-08	NA	0.01613	0.717
rs9271605	6	32623671	-	2.16.E-08	NA	0.7655	1.03
rs9271608	6	32623811	-	2.02.E-08	NA	0.1132	0.7406

rs9272346	6	32636595	<i>HLA-DQA1</i>	5.72.E-24	NA	0.293	0.8534
rs9272723	6	32641650	<i>LOC107986589</i>	2.91.E-20	NA	NA	NA
rs6928482	6	32658472	<i>HLA-DQB1-AS1</i>	1.75.E-12	NA	0.628	0.9294
rs9273363	6	32658495	<i>HLA-DQB1-AS1</i>	2.74.E-12	NA	0.9946	1.001
rs6906021	6	32658534	<i>HLA-DQB1-AS1</i>	8.37.E-10	NA	0.2712	1.116
rs9275141	6	32683340	-	1.82.E-10	NA	0.4763	1.074
rs6457614	6	32684123	-	2.89.E-08	NA	0.02395	0.6783
rs3134975	6	32684804	-	3.63.E-08	NA	0.1336	1.211
rs2858330	6	32690938	-	1.05.E-10	NA	0.509	1.068
rs5000634	6	32695787	-	2.36.E-08	NA	0.4324	0.9289
rs7745040	6	32696555	-	2.39.E-08	NA	0.4422	0.9305
rs16898264	6	32709375	-	1.32.E-09	NA	0.3069	1.108
rs10947332	6	32709663	-	4.48.E-09	NA	0.04545	0.7531
rs17581326	6	32710976	-	3.27.E-08	NA	0.3571	1.166
rs3104405	6	32714531	-	1.32.E-12	NA	NA	NA
rs241425	6	32837132	<i>TAP2</i>	3.23.E-08	NA	0.1544	0.8617
rs2239701	6	32837272	<i>TAP2</i>	2.34.E-10	NA	0.481	0.8953
rs6454802	6	90104480	<i>BACH2</i>	7.40.E-09	NA	0.2268	0.3266
rs11753332	6	90109434	<i>BACH2</i>	7.21.E-10	NA	0.2295	0.3286
rs12194007	6	90113440	<i>BACH2</i>	2.80.E-09	NA	0.2295	0.3286
rs12199079	6	90142539	<i>BACH2</i>	1.29.E-10	NA	NA	NA
rs1010473	6	90147159	<i>BACH2</i>	1.06.E-09	NA	NA	NA
rs1010474	6	90147309	<i>BACH2</i>	1.14.E-10	NA	NA	NA
rs17711850	6	90155151	<i>BACH2</i>	1.07.E-10	NA	NA	NA
rs10455168	6	90173806	<i>BACH2</i>	1.56.E-11	NA	NA	NA
rs10806423	6	90177105	<i>BACH2</i>	1.51.E-11	NA	NA	NA
rs11757155	6	90231521	<i>BACH2</i>	4.02.E-12	NA	0.7657	0.931
rs2021716	6	90231570	<i>BACH2</i>	8.56.E-12	NA	0.829	0.8868
rs17585295	6	90235112	<i>BACH2</i>	1.13.E-10	NA	0.5795	1.091
rs4707609	6	90236760	<i>BACH2</i>	1.05.E-10	NA	0.7456	1.051
rs2875584	6	90240909	<i>BACH2</i>	8.74.E-12	NA	0.7363	0.9201
rs17513531	6	90241520	<i>BACH2</i>	7.88.E-12	NA	0.9502	0.9849
rs905670	6	90248783	<i>BACH2</i>	3.23.E-12	NA	0.85	0.9538
rs1847472	6	90263440	<i>BACH2</i>	1.44.E-11	NA	0.9033	1.054
rs943689	6	90274316	<i>BACH2</i>	2.20.E-12	NA	0.7668	1.082
rs2325291	6	90276967	<i>BACH2</i>	2.19.E-12	NA	0.8378	1.056
rs2325292	6	90277030	<i>BACH2</i>	1.49.E-12	NA	0.8379	1.056
rs2174281	6	90278153	<i>BACH2</i>	9.10.E-11	NA	0.8496	1.052
rs4142967	6	90286630	<i>BACH2</i>	7.03.E-11	NA	0.9602	1.013
rs12212193	6	90287050	<i>BACH2</i>	6.70.E-11	NA	0.9964	1.001
rs1504215	6	90296508	<i>LOC105377891</i>	1.46.E-12	NA	NA	NA
rs6925032	6	90298308	<i>LOC105377891</i>	1.63.E-12	NA	NA	NA
rs1321859	6	90301954	<i>LOC105377891</i>	2.18.E-12	NA	NA	NA
rs7822328	8	80334424	-	1.40.E-08	NA	0.1069	1.304
rs7006626	8	80335441	-	1.39.E-08	NA	0.6681	1.044
rs13275219	8	80347591	-	1.22.E-09	NA	0.8156	1.024
rs4739735	8	80347642	-	1.23.E-09	NA	0.7285	1.035
rs3913969	8	80348829	-	1.62.E-09	NA	0.6012	0.9484
rs7462675	8	80351727	-	1.04.E-09	NA	0.8939	0.9868
rs1911713	8	80353809	-	2.33.E-10	NA	0.8939	0.9868
rs6992476	8	80355471	-	9.90.E-10	NA	0.8101	0.9764
rs7012968	8	80355573	-	8.95.E-10	NA	0.8101	0.9764
rs6473222	8	80355702	-	7.72.E-10	NA	0.7658	0.9709
rs6473223	8	80355920	-	1.32.E-10	NA	0.7364	0.9672
rs6987042	8	80361648	-	5.55.E-10	NA	0.7846	0.9734
rs11786704	8	80363625	-	9.14.E-10	NA	0.7563	0.9698
rs13275449	8	80363878	-	6.80.E-10	NA	0.7519	0.9692
rs12543811	8	80366650	-	1.11.E-10	NA	0.7967	0.9747
rs13270496	8	80368431	-	1.34.E-09	NA	0.8915	0.9864
rs6473225	8	80368772	-	2.82.E-10	NA	0.8915	0.9864
rs7837153	8	80371141	-	5.12.E-10	NA	0.3539	0.8875
rs6473226	8	80373524	-	2.30.E-08	NA	0.2539	0.8668
rs6473227	8	80373657	-	1.41.E-08	NA	0.2539	0.8668
rs952559	8	80376399	-	4.82.E-08	NA	0.3043	0.8811
rs952557	8	80376690	-	3.13.E-08	NA	0.3043	0.8811
rs4739737	8	80377390	-	3.88.E-08	NA	0.3735	0.8958
rs10957979	8	80377552	-	2.44.E-08	NA	0.3735	0.8958
rs2370615	8	80378152	-	2.56.E-08	NA	0.3735	0.8958
rs7009110	8	80379644	-	4.68.E-08	NA	0.674	1.042

rs2202750	8	80382269	-	3.21.E-08	NA	0.5499	1.06
rs2221641	8	80382467	-	3.17.E-08	NA	0.5204	1.065
rs10975413	9	6049843	-	2.91.E-08	NA	0.3068	1.348
rs10975416	9	6051924	-	1.40.E-08	NA	0.3024	1.352
rs1330124	9	6053098	-	1.17.E-08	NA	0.3329	1.378
rs380568	9	6055531	-	4.30.E-09	NA	0.3632	1.353
rs343490	9	6064575	-	2.45.E-09	NA	0.2216	1.496
rs343476	9	6072597	-	1.76.E-09	NA	0.1621	1.607
rs189348	9	6073194	-	3.34.E-09	NA	0.1621	1.607
rs378952	9	6078146	-	8.73.E-10	NA	0.345	1.515
rs371454	9	6078614	-	9.81.E-10	NA	0.164	1.604
rs340923	9	6088628	-	2.14.E-08	NA	0.1206	1.724
rs340921	9	6090160	-	3.00.E-09	NA	0.1088	1.792
rs340918	9	6091048	-	1.27.E-08	NA	0.1242	1.754
rs695013	9	6091565	-	1.80.E-08	NA	0.1111	1.833
rs531759	9	6091996	-	1.97.E-09	NA	0.1111	1.833
rs639247	9	6092089	-	2.02.E-09	NA	0.1111	1.833
rs420445	9	6092154	-	2.32.E-08	NA	0.1111	1.833
rs9408638	9	6096931	-	2.02.E-09	NA	0.1111	1.833
rs437389	9	6099531	-	8.53.E-10	NA	0.1115	1.831
rs340906	9	6106086	-	1.67.E-09	NA	0.2201	1.52
rs340905	9	6106169	-	1.39.E-09	NA	0.2201	1.52
rs340904	9	6106779	-	1.66.E-09	NA	0.2175	1.523
rs974936	9	6111703	-	1.10.E-09	NA	0.2175	1.523
rs441616	9	6113940	-	1.44.E-09	NA	0.299	1.412
rs1556470	9	6115538	-	1.39.E-09	NA	0.2992	1.412
rs374672	9	6119038	-	1.22.E-09	NA	0.2179	1.525
rs443175	9	6123556	-	8.00.E-10	NA	0.4021	1.312
rs1332291	9	6124101	-	1.76.E-08	NA	0.4047	1.309
rs1755531	9	6124250	-	1.22.E-09	NA	0.4021	1.312
rs1970089	9	6124359	-	7.75.E-10	NA	0.4021	1.312
rs1537285	9	6124584	-	1.16.E-09	NA	0.4021	1.312
rs1332292	9	6124862	-	1.23.E-09	NA	0.4066	1.308
rs7039066	9	6125539	-	1.22.E-09	NA	0.4066	1.308
rs340915	9	6126588	-	1.18.E-09	NA	0.4066	1.308
rs340914	9	6126799	-	1.08.E-09	NA	0.4055	1.309
rs340913	9	6127330	-	1.58.E-09	NA	0.361	1.343
rs340912	9	6127851	-	8.82.E-10	NA	0.4055	1.309
rs340908	9	6128897	-	8.84.E-10	NA	0.4055	1.309
rs340907	9	6129637	-	7.52.E-10	NA	0.4055	1.309
rs1888906	9	6131460	-	6.77.E-10	NA	0.3582	1.359
rs376690	9	6134926	-	1.82.E-09	NA	0.357	1.36
rs413382	9	6142948	-	3.85.E-10	NA	0.8472	0.9356
rs386880	9	6144333	-	3.47.E-09	NA	0.4775	1.132
rs369756	9	6146441	-	1.09.E-09	NA	0.8474	1.042
rs450108	9	6153485	-	8.42.E-09	NA	0.8568	0.9698
rs1116795	9	6155226	-	8.06.E-09	NA	0.9006	1.021
rs2225537	9	6160578	-	1.26.E-08	NA	0.9668	1.004
rs10124250	9	6161686	-	6.09.E-09	NA	0.9263	1.01
rs10119713	9	6163823	-	3.84.E-09	NA	0.9949	0.9989
rs7032572	9	6172380	-	1.42.E-16	NA	NA	NA
rs1412426	9	6188652	-	4.16.E-10	NA	0.8874	1.025
rs1412425	9	6188740	-	1.99.E-10	NA	0.8912	1.024
rs1342326	9	6190076	-	8.61.E-14	NA	NA	NA
rs2095044	9	6192796	-	1.29.E-17	NA	0.7092	1.071
rs2381416	9	6193455	-	1.30.E-17	NA	0.6532	1.102
rs10815370	9	6194831	-	4.56.E-10	NA	0.7321	1.064
rs1888909	9	6197392	-	2.43.E-18	NA	0.6851	0.9138
rs992969	9	6209697	-	7.23.E-20	NA	0.7652	0.9353
rs3939286	9	6210099	-	1.94.E-17	NA	0.6192	0.895
rs928413	9	6213387	IL33	3.46.E-16	NA	0.6755	1.074
rs7848215	9	6213468	IL33	2.05.E-16	NA	0.9218	1.018
rs2066362	9	6219176	IL33	5.95.E-13	NA	NA	NA
rs12551256	9	6231239	LOC107987046	2.74.E-08	NA	0.3652	0.9161
rs17582919	9	6233376	LOC107987046	1.67.E-11	NA	NA	NA
rs17498196	9	6237547	LOC107987046	5.01.E-12	NA	NA	NA
rs10815393	9	6240324	LOC107987046	4.42.E-09	NA	NA	NA
rs17756142	9	6301578	LOC107987046	4.43.E-08	NA	NA	NA
rs10491836	9	6331421	TPD52L3	2.89.E-09	NA	NA	NA

rs16924356	9	6331610	<i>TPD52L3</i>	2.78.E-09	NA	NA	NA
rs16924428	9	6351111	-	2.53.E-08	NA	NA	NA
rs7851246	9	6362365	-	1.14.E-08	NA	NA	NA
rs10975558	9	6364449	-	3.18.E-08	NA	NA	NA
rs4116669	10	8998737	-	3.18.E-08	NA	0.09301	1.305
rs2589561	10	9004682	-	3.49.E-09	NA	NA	NA
rs1775551	10	9011080	-	2.69.E-08	NA	0.08489	1.294
rs2797288	10	9011210	-	3.05.E-08	NA	NA	NA
rs2589563	10	9020320	-	4.25.E-08	NA	0.07611	1.302
rs1612986	10	9022753	-	3.85.E-08	NA	0.09027	1.282
rs7130588	11	76559639	-	3.37.E-11	NA	0.1857	1.25
rs3862807	11	76572037	-	4.26.E-08	NA	0.5456	1.076
rs2155219	11	76588150	-	5.14.E-13	NA	0.4954	1.067
rs7927894	11	76590272	-	2.22.E-14	NA	0.5633	1.073
rs7927997	11	76590331	-	3.20.E-13	NA	0.2389	1.266
rs167769	12	57109992	<i>STAT6</i>	3.88.E-09	NA	NA	NA
rs7172011	15	60747188	<i>RORA</i>	3.12.E-08	NA	NA	NA
rs1351544	15	60750668	<i>RORA</i>	9.79.E-09	NA	0.6228	0.9442
rs8025324	15	60751179	<i>RORA</i>	2.59.E-09	NA	0.685	0.9422
rs12900122	15	60763212	<i>LOC105370844</i>	2.09.E-09	NA	0.4245	0.8974
rs16943087	15	60763836	<i>LOC105370844</i>	4.46.E-09	NA	0.4195	0.8968
rs2279292	15	60765571	<i>LOC105370844</i>	2.05.E-09	NA	0.4857	0.91
rs11633029	15	60773354	<i>RORA</i>	5.73.E-09	NA	0.2153	0.8428
rs11637671	15	60773408	<i>RORA</i>	6.35.E-09	NA	0.2482	0.8529
rs11639084	15	60774317	<i>RORA</i>	1.13.E-08	NA	0.2111	0.8409
rs10519067	15	60776148	<i>RORA</i>	7.84.E-10	NA	0.8759	1.037
rs10519068	15	60776505	<i>RORA</i>	1.63.E-08	NA	0.639	1.11
rs11071557	15	60776755	<i>RORA</i>	1.21.E-08	NA	0.3773	0.8274
rs11071558	15	60777222	<i>RORA</i>	1.25.E-09	NA	0.6621	0.9091
rs11071559	15	60777789	<i>RORA</i>	2.20.E-09	NA	0.4407	0.8376
rs1866316	15	67149659	<i>SMAD3</i>	1.75.E-14	NA	0.499	1.072
rs17293632	15	67150258	<i>SMAD3</i>	1.46.E-11	NA	0.3585	0.6332
rs10152544	15	67152409	<i>SMAD3</i>	1.85.E-13	NA	0.02248	0.8059
rs744910	15	67154447	<i>SMAD3</i>	9.85.E-14	NA	0.01703	0.7979
rs11634793	15	67155114	<i>SMAD3</i>	1.65.E-13	NA	0.02051	0.8029
rs8032739	15	67156561	<i>SMAD3</i>	1.07.E-14	NA	0.3831	1.093
rs2033784	15	67157322	<i>SMAD3</i>	7.39.E-15	NA	0.379	1.093
rs17228058	15	67157967	<i>SMAD3</i>	9.41.E-11	NA	0.6446	0.8651
rs7173698	15	67158555	<i>SMAD3</i>	1.05.E-14	NA	0.409	1.088
rs4562997	15	67165814	<i>SMAD3</i>	5.15.E-14	NA	0.4434	1.081
rs16950687	15	67171675	<i>SMAD3</i>	1.34.E-12	NA	0.3866	1.094
rs12708492	15	67175203	<i>SMAD3</i>	6.54.E-13	NA	NA	NA
rs17294280	15	67175947	<i>SMAD3</i>	2.27.E-10	NA	0.7649	0.8104
rs17802927	16	10943881	<i>CLEC16A</i>	3.61.E-10	NA	0.5253	1.101
rs3743976	16	10944967	<i>CLEC16A</i>	3.10.E-10	NA	0.9918	1.002
rs1035088	16	10954517	<i>CLEC16A</i>	2.47.E-08	NA	0.8538	1.041
rs17229044	16	10969079	<i>CLEC16A</i>	3.94.E-09	NA	0.9102	0.9759
rs12921922	16	10970464	<i>CLEC16A</i>	5.90.E-09	NA	0.9102	0.9759
rs7201845	16	10984481	<i>CLEC16A</i>	3.18.E-08	NA	0.7849	1.044
rs8055968	16	10990846	<i>CLEC16A</i>	2.03.E-08	NA	0.952	0.9869
rs8062923	16	11067109	<i>CLEC16A</i>	1.95.E-09	NA	0.6325	1.081
rs4781035	16	11067321	<i>CLEC16A</i>	2.55.E-09	NA	0.4826	1.121
rs12444495	16	11076598	<i>CLEC16A</i>	4.77.E-10	NA	0.8669	1.027
rs17806299	16	11106123	<i>CLEC16A</i>	2.66.E-10	NA	0.8782	1.025
rs12935657	16	11125184	<i>CLEC16A</i>	3.02.E-09	NA	0.9609	1.008
rs17673553	16	11148049	<i>CLEC16A</i>	1.70.E-08	NA	0.671	1.071
rs12950186	17	39237142	<i>LOC101929578</i>	3.67.E-11	NA	0.2086	1.152
rs2879258	17	39243126	<i>LOC101929578</i>	8.33.E-10	NA	0.259	1.136
rs11078895	17	39244798	<i>LOC101929578</i>	7.11.E-11	NA	0.2734	1.131
rs3964723	17	39247726	-	1.94.E-08	NA	0.2959	1.118
rs11655972	17	39250819	-	2.65.E-11	NA	0.322	1.117
rs755500	17	39253612	<i>FBXL20</i>	1.55.E-08	NA	0.3575	1.103
rs752314	17	39254447	<i>FBXL20</i>	1.42.E-08	NA	0.3575	1.103
rs3744349	17	39258589	<i>FBXL20</i>	2.29.E-11	NA	0.3857	1.103
rs11078897	17	39259617	<i>FBXL20</i>	1.59.E-08	NA	0.3575	1.103
rs2338755	17	39263064	<i>FBXL20</i>	1.68.E-08	NA	0.3575	1.103
rs8073907	17	39267896	<i>FBXL20</i>	6.73.E-10	NA	0.3141	1.119
rs4795355	17	39271129	<i>FBXL20</i>	4.51.E-08	NA	0.292	1.119
rs588193	17	39284186	<i>FBXL20</i>	2.07.E-08	NA	0.3575	1.103

rs801426	17	39284856	<i>FBXL20</i>	2.67.E-08	NA	0.3131	1.114
rs667239	17	39285988	<i>FBXL20</i>	3.57.E-11	NA	0.2765	1.13
rs590051	17	39290318	<i>FBXL20</i>	4.06.E-11	NA	0.3222	1.117
rs620686	17	39297364	<i>FBXL20</i>	2.08.E-08	NA	0.3576	1.103
rs2302073	17	39301089	<i>FBXL20</i>	3.74.E-11	NA	0.3222	1.117
rs584377	17	39303875	<i>FBXL20</i>	3.87.E-11	NA	0.4698	1.085
rs649180	17	39308706	<i>FBXL20</i>	8.28.E-11	NA	0.3222	1.117
rs9904334	17	39312083	<i>FBXL20</i>	2.07.E-08	NA	0.3576	1.103
rs8066704	17	39320965	<i>FBXL20</i>	1.83.E-08	NA	0.3521	1.104
rs9944411	17	39327346	<i>FBXL20</i>	2.78.E-08	NA	0.3521	1.104
rs7220650	17	39330915	<i>FBXL20</i>	1.41.E-08	NA	0.3521	1.104
rs9916302	17	39343696	<i>FBXL20</i>	2.83.E-08	NA	NA	NA
rs8069451	17	39348680	<i>FBXL20</i>	1.97.E-08	NA	NA	NA
rs9894586	17	39349168	<i>FBXL20</i>	3.79.E-08	NA	0.352	1.104
rs9892055	17	39354149	<i>FBXL20</i>	2.63.E-08	NA	0.3344	1.109
rs2338799	17	39357688	<i>FBXL20</i>	4.03.E-11	NA	0.4401	1.091
rs6503503	17	39358120	<i>FBXL20</i>	2.13.E-08	NA	0.3344	1.109
rs6503504	17	39358159	<i>FBXL20</i>	6.48.E-11	NA	0.4401	1.091
rs8076494	17	39360469	<i>FBXL20</i>	1.99.E-08	NA	0.352	1.104
rs9908131	17	39364196	<i>FBXL20</i>	4.41.E-11	NA	0.4401	1.091
rs6503507	17	39369021	<i>FBXL20</i>	2.55.E-08	NA	0.3344	1.109
rs11078898	17	39380227	<i>FBXL20</i>	8.58.E-09	NA	0.3344	1.109
rs7208487	17	39387196	<i>FBXL20</i>	6.42.E-11	NA	0.6157	1.097
rs9906612	17	39391378	<i>FBXL20</i>	6.92.E-10	NA	0.4291	1.093
rs6503513	17	39405360	<i>MED1</i>	5.85.E-09	NA	0.3246	1.112
rs4795358	17	39416812	<i>MED1</i>	2.28.E-10	NA	0.3771	1.105
rs7501488	17	39420164	<i>MED1</i>	2.87.E-08	NA	0.2838	1.122
rs10445306	17	39435169	<i>MED1</i>	1.06.E-08	NA	0.2498	1.132
rs9646419	17	39440932	<i>MED1</i>	1.99.E-10	NA	0.3532	1.111
rs12938099	17	39456657	-	1.18.E-10	NA	0.3696	1.107
rs12449852	17	39475835	<i>CDK12</i>	5.19.E-09	NA	0.3925	1.102
rs11078907	17	39506701	<i>CDK12</i>	3.22.E-08	NA	0.2856	1.121
rs7225096	17	39508190	<i>CDK12</i>	3.76.E-08	NA	0.2856	1.121
rs12936996	17	39509301	<i>CDK12</i>	8.90.E-09	NA	0.2778	1.123
rs12937013	17	39509318	<i>CDK12</i>	6.86.E-12	NA	0.3699	1.107
rs7503705	17	39513451	<i>CDK12</i>	2.15.E-09	NA	0.2856	1.121
rs11078913	17	39515461	<i>CDK12</i>	8.88.E-09	NA	0.2856	1.121
rs11658678	17	39523843	<i>CDK12</i>	1.05.E-08	NA	0.3731	1.101
rs8065963	17	39525079	<i>CDK12</i>	3.08.E-09	NA	0.3731	1.101
rs8069074	17	39529148	<i>CDK12</i>	4.53.E-11	NA	0.471	1.085
rs12450559	17	39538456	<i>CDK12</i>	2.58.E-09	NA	0.3625	1.103
rs4239222	17	39539982	<i>CDK12</i>	3.29.E-09	NA	0.3625	1.103
rs11657058	17	39543125	<i>CDK12</i>	8.60.E-12	NA	0.4592	1.088
rs11657153	17	39543476	<i>CDK12</i>	2.28.E-10	NA	0.4592	1.088
rs11654018	17	39547487	<i>CDK12</i>	2.67.E-09	NA	0.3623	1.103
rs2303316	17	39547964	<i>CDK12</i>	9.04.E-09	NA	0.3625	1.103
rs12947506	17	39551339	<i>CDK12</i>	1.03.E-11	NA	0.5518	1.07
rs7503377	17	39552588	<i>CDK12</i>	2.27.E-11	NA	0.47	1.085
rs7216086	17	39553169	<i>CDK12</i>	6.74.E-09	NA	0.3625	1.103
rs11078915	17	39559173	<i>CDK12</i>	8.69.E-10	NA	0.3625	1.103
rs6503521	17	39559298	<i>CDK12</i>	1.37.E-11	NA	0.4436	1.092
rs903507	17	39570170	-	1.13.E-12	NA	0.4773	1.084
rs8182252	17	39571697	<i>LOC105371770</i>	1.43.E-09	NA	0.5065	1.078
rs1874226	17	39572778	<i>LOC105371770</i>	1.51.E-12	NA	0.4775	1.084
rs4795385	17	39576895	-	2.95.E-14	NA	0.465	1.086
rs1619021	17	39583021	-	7.61.E-11	NA	0.449	1.086
rs1877030	17	39583908	-	2.55.E-13	NA	0.5072	1.079
rs12453198	17	39585626	-	1.93.E-14	NA	0.01688	1.265
rs11654954	17	39589726	-	8.91.E-15	NA	0.02059	1.254
rs12453682	17	39613752	-	6.89.E-14	NA	NA	NA
rs1874228	17	39619021	-	4.22.E-14	NA	0.04495	0.7813
rs879606	17	39625596	<i>PPP1R1B</i>	1.36.E-12	NA	0.06964	0.8029
rs2271309	17	39628737	<i>PPP1R1B</i>	1.95.E-16	NA	0.06665	0.8014
rs907094	17	39634118	<i>PPP1R1B</i>	6.37.E-15	NA	0.08547	0.8131
rs3764352	17	39634686	<i>PPP1R1B</i>	5.45.E-11	NA	0.08547	0.8131
rs9972882	17	39651445	<i>STARD3</i>	2.19.E-21	NA	0.09206	0.8163
rs1877031	17	39657827	<i>STARD3</i>	1.05.E-21	NA	NA	NA
rs2271308	17	39661229	<i>STARD3</i>	3.42.E-18	NA	0.05872	0.7951
rs931992	17	39665182	<i>TCAP</i>	2.26.E-21	NA	0.05545	0.7922

rs1053651	17	39666058	PNMT	1.62.E-15	NA	0.09434	0.817
rs876493	17	39668292	PNMT	5.89.E-13	NA	NA	NA
rs14050	17	39671819	PGAP3	6.28.E-23	NA	0.05547	0.8312
rs2952151	17	39672243	PGAP3	3.78.E-28	NA	0.06357	0.8361
rs2941503	17	39672492	PGAP3	6.79.E-23	NA	0.07214	0.8409
rs907087	17	39672534	PGAP3	6.00.E-23	NA	0.07182	0.8407
rs903502	17	39673351	PGAP3	1.00.E-26	NA	0.0623	0.8359
rs2941504	17	39674647	PGAP3	1.28.E-27	NA	0.07216	0.8417
rs1565922	17	39674782	PGAP3	6.99.E-28	NA	0.07064	0.841
rs2934952	17	39676113	PGAP3	1.19.E-23	NA	0.07061	0.8409
rs2941505	17	39676451	PGAP3	1.98.E-25	NA	0.07066	0.841
rs2941506	17	39676782	PGAP3	1.42.E-24	NA	0.07066	0.841
rs907089	17	39677347	PGAP3	8.78.E-24	NA	0.07058	0.8409
rs2313171	17	39677589	PGAP3	1.57.E-24	NA	0.07784	0.8444
rs12150298	17	39678288	PGAP3	2.33.E-24	NA	0.07481	0.8429
rs8078228	17	39678745	PGAP3	1.38.E-24	NA	0.07066	0.841
rs11078919	17	39679502	PGAP3	1.43.E-22	NA	0.06926	0.8402
rs1476278	17	39679990	PGAP3	2.82.E-26	NA	0.06926	0.8402
rs9303274	17	39680100	PGAP3	1.87.E-25	NA	0.0674	0.8393
rs2517957	17	39682463	PGAP3	2.31.E-27	NA	0.05947	0.8344
rs2517958	17	39682498	PGAP3	2.18.E-27	NA	0.06042	0.8347
rs903501	17	39683240	PGAP3	1.96.E-17	NA	0.05941	0.8344
rs2517954	17	39687297	ERBB2	2.09.E-28	NA	0.01825	0.795
rs2517955	17	39687428	ERBB2	1.26.E-26	NA	0.01827	0.7951
rs2517956	17	39687606	ERBB2	3.31.E-27	NA	0.01789	0.7946
rs1565923	17	39702425	ERBB2	2.09.E-25	NA	0.009788	0.777
rs2952155	17	39705465	ERBB2	2.92.E-26	NA	0.009254	0.7758
rs1810132	17	39709752	ERBB2	2.94.E-30	NA	0.01133	0.7797
rs2952156	17	39720582	ERBB2	2.24.E-30	NA	0.006354	0.7646
rs907091	17	39765489	IKZF3	2.82.E-20	NA	1.59E-06	1.6714023
rs907092	17	39766006	IKZF3	2.52.E-23	NA	0.007628	0.6292
rs10445308	17	39781794	IKZF3	1.76.E-24	NA	3.11E-07	1.7190992
rs9909593	17	39813896	IKZF3	5.13.E-24	NA	2.58E-07	1.7274141
rs9303277	17	39820216	IKZF3	9.57.E-26	NA	2.95E-07	1.7223562
rs3816470	17	39829548	IKZF3	1.23.E-26	NA	1.45E-08	1.8691589
rs9635726	17	39863888	IKZF3	1.50.E-23	NA	0.001728	0.6738
rs4795397	17	39867492	ZBPB2	2.55.E-16	NA	1.82E-08	1.8684604
rs11557466	17	39868373	ZBPB2	8.06.E-22	NA	2.18E-08	1.8587361
rs11078925	17	39868955	ZBPB2	2.15.E-24	NA	3.10E-08	1.8416206
rs12150079	17	39869164	ZBPB2	2.45.E-15	NA	1.28E-05	2.0004001
rs11557467	17	39872381	ZBPB2	3.27.E-21	NA	0.005456	0.6075
rs10852936	17	39875461	ZBPB2	3.10.E-17	NA	3.88E-08	1.8345258
rs1054609	17	39877024	ZBPB2	1.14.E-24	NA	4.89E-08	1.8248175
rs9907088	17	39878863	-	1.58.E-24	NA	3.14E-08	1.8416206
rs12232497	17	39883866	-	1.57.E-24	NA	2.76E-08	1.8501388
rs2872507	17	39884510	-	2.02.E-24	NA	0.005445	0.6075
rs9901146	17	39887090	-	9.03.E-30	NA	3.10E-08	1.8456995
rs12950743	17	39892980	-	6.78.E-30	NA	3.56E-08	1.840265
rs7359623	17	39893336	-	1.93.E-27	NA	4.70E-08	1.8311665
rs8067378	17	39895095	-	1.46.E-28	NA	0.003695	0.5937
rs8069176	17	39900944	-	1.97.E-23	NA	5.99E-08	1.8208303
rs2305480	17	39905943	GSDMB	3.47.E-23	NA	0.007652	0.6202
rs2305479	17	39905964	GSDMB	2.00.E-28	NA	0.007652	0.6202
rs11078926	17	39906723	GSDMB	2.57.E-16	NA	4.86E-08	1.8284878
rs11078927	17	39908152	GSDMB	1.45.E-23	NA	4.86E-08	1.8284878
rs2290400	17	39909987	GSDMB	1.51.E-25	NA	0.004144	0.6004
rs1008723	17	39910014	GSDMB	6.13.E-29	NA	1.33E-08	1.8695083
rs4795400	17	39910767	GSDMB	7.48.E-23	NA	1.52E-08	1.8653236
rs869402	17	39911790	GSDMB	1.27.E-25	NA	1.51E-08	1.8653236
rs7216389	17	39913696	GSDMB	6.73.E-26	NA	0.00576	0.6141
rs9303280	17	39917778	GSDMB	9.30.E-25	NA	2.80E-08	1.8456995
rs9303281	17	39917793	GSDMB	2.41.E-24	NA	2.62E-08	1.8426387
rs7219923	17	39918265	GSDMB	2.20.E-24	NA	2.13E-08	1.8491124
rs7224129	17	39919173	GSDMB	8.94.E-25	NA	4.45E-09	1.9043992
rs8076131	17	39924659	ORMDL3	9.81.E-21	NA	4.41E-06	1.9069413
rs12603332	17	39926554	LRRC3C	8.90.E-23	NA	1.01E-06	1.977457
rs4795402	17	39929132	LRRC3C	2.50.E-10	NA	1.62E-05	1.8268177
rs4795405	17	39932164	LRRC3C	4.05.E-21	NA	NA	NA
rs4794820	17	39933091	LRRC3C	3.12.E-18	NA	NA	NA

rs7207600	17	39935407	<i>LRRC3C</i>	5.63.E-18	NA	0.006759	0.7536
rs8079416	17	39936460	<i>LRRC3C</i>	1.28.E-19	NA	NA	NA
rs8065126	17	39942782	<i>LRRC3C</i>	1.19.E-18	NA	0.01173	0.7673
rs4795408	17	39951374	-	1.59.E-20	NA	NA	NA
rs9895948	17	39952110	-	3.76.E-13	NA	0.1246	0.819
rs17609240	17	39954436	-	5.76.E-12	NA	0.04969	0.702
rs1007654	17	39955101	-	1.29.E-15	NA	0.1468	0.8282
rs1007655	17	39955166	-	3.89.E-13	NA	0.1468	0.8282
rs2313640	17	39955592	-	1.20.E-15	NA	0.1468	0.8282
rs7218742	17	39958108	-	1.18.E-16	NA	0.1593	0.832
rs7218321	17	39958216	-	4.44.E-12	NA	0.1652	0.8341
rs7219080	17	39958263	-	3.59.E-13	NA	0.1652	0.8341
rs6503526	17	39958345	-	2.17.E-20	NA	0.08152	0.8069
rs6503527	17	39958466	-	1.59.E-12	NA	0.1593	0.832
rs3902025	17	39963001	<i>GSDMA</i>	8.44.E-15	NA	0.03405	0.7731
rs3894194	17	39965740	<i>GSDMA</i>	2.43.E-20	NA	0.02804	0.7651
rs7212938	17	39966427	<i>GSDMA</i>	2.56.E-19	NA	NA	NA
rs3859192	17	39972395	<i>GSDMA</i>	3.50.E-14	NA	0.4749	0.9344
rs8075668	17	39981370	<i>PSMD3</i>	5.83.E-15	NA	0.5049	0.9366
rs2305481	17	39982371	<i>PSMD3</i>	1.84.E-15	NA	0.5833	0.9475
rs2305482	17	39984674	<i>PSMD3</i>	4.09.E-10	NA	0.8167	0.9774
rs11078930	17	39985702	<i>PSMD3</i>	6.64.E-21	NA	0.6893	0.9616
rs4065321	17	39987295	<i>PSMD3</i>	1.51.E-10	NA	0.6296	0.9539
rs8066582	17	39990676	<i>PSMD3</i>	1.02.E-09	NA	0.6369	0.9549
rs11658328	17	39992983	<i>PSMD3</i>	3.60.E-10	NA	0.637	0.9549
rs2241245	17	39994761	<i>PSMD3</i>	5.38.E-10	NA	0.632	0.9542
rs12453334	17	39997220	<i>PSMD3</i>	2.43.E-19	NA	0.6886	0.9616
rs4794822	17	40000459	-	1.89.E-11	NA	0.1194	1.274
rs8070454	17	40004501	-	1.24.E-11	NA	0.5144	1.064
rs8078723	17	40010626	-	1.56.E-11	NA	0.5133	1.064
rs2227319	17	40014592	<i>CSF3</i>	9.69.E-20	NA	0.6376	0.9551
rs25645	17	40016890	<i>CSF3</i>	2.05.E-20	NA	0.5697	0.946
rs1042658	17	40017649	<i>CSF3</i>	3.83.E-11	NA	0.6113	1.049
rs1045929	17	40019173	<i>MED24</i>	3.25.E-09	NA	0.6144	1.049
rs12309	17	40019209	<i>MED24</i>	2.02.E-18	NA	0.6238	0.9533
rs709592	17	40019300	<i>MED24</i>	4.40.E-11	NA	0.6144	1.049
rs2302776	17	40021896	<i>MED24</i>	4.47.E-13	NA	NA	NA
rs3213762	17	40022374	<i>MED24</i>	2.20.E-11	NA	0.6266	1.048
rs12451897	17	40023022	<i>MED24</i>	7.88.E-18	NA	0.5715	0.9456
rs2302777	17	40023239	<i>MED24</i>	1.13.E-20	NA	0.5711	0.9456
rs9916158	17	40025976	<i>MIR6884</i>	1.07.E-14	NA	0.5694	0.9453
rs2302774	17	40026837	<i>MIR6884</i>	2.79.E-20	NA	0.5812	0.9469
rs7502514	17	40032591	<i>MED24</i>	1.50.E-10	NA	0.4596	1.074
rs11078936	17	40041661	<i>MED24</i>	3.52.E-18	NA	0.6118	0.951
rs8065443	17	40052687	<i>MED24</i>	1.73.E-10	NA	0.8866	1.014
rs868150	17	40057106	-	9.43.E-11	NA	0.9353	1.008
rs12940887	17	49325445	<i>ZNF652</i>	2.02.E-08	NA	0.01903	1.385
rs16948048	17	49363104	<i>LOC102724596</i>	1.89.E-08	NA	0.02127	1.377
rs17637472	17	49384071	-	6.58.E-09	NA	0.8869	0.9675
rs4378650	17	38080865 ^h	<i>GSDMB</i>	5.99.E-18	NA	NA	NA
rs1776883	6	34156444	<i>GRM4, KRT18P9</i>	5.00E-09	1	NA	NA
rs72721168	9	27308288	<i>EQTN,MOB3B</i>	7.00E-10	1.01	NA	NA
rs12551834	9	131613191	<i>C9orf114, LRRC8A</i>	4.00E-08	1.058	0.7877	1.127
rs11788591	9	132502801	<i>PTGES</i>	4.00E-08	0.98	0.9495	1.044
rs2893907	10	64382359	<i>ZNF365</i>	4.00E-08	1.031	NA	NA
rs75446656	10	65100016	<i>JMJD1C</i>	4.00E-08	1.01	NA	NA
rs1776881	6p21.31	34188546	<i>GRM4</i>	7.96.E-09	NA	NA	NA
rs1776883	6p21.31	34188667	<i>GRM4</i>	5.29.E-09	NA	NA	NA
rs1776884	6p21.31	34189193	<i>GRM4</i>	3.78.E-08	NA	NA	NA
rs1776885	6p21.31	34189201	<i>GRM4</i>	2.56.E-08	NA	NA	NA
rs1776886	6p21.31	34189336	<i>GRM4</i>	1.90.E-08	NA	NA	NA
rs34754950	6p21.31	34190429	<i>GRM4</i>	1.09.E-08	NA	0.08919	1.282
rs1776888	6p21.31	34190554	<i>GRM4</i>	7.63.E-09	NA	0.1009	1.267
rs1776889	6p21.31	34191389	<i>GRM4</i>	2.64.E-08	NA	NA	NA
rs72721158	9p21.2	27275908	<i>EQTN</i>	4.04.E-08	NA	NA	NA
rs72721164	9p21.2	27300441	<i>EQTN</i>	4.06.E-09	NA	NA	NA
rs72721166	9p21.2	27304550	<i>EQTN</i>	3.83.E-09	NA	NA	NA
rs72721168	9p21.2	27308290	<i>EQTN</i>	7.02.E-10	NA	NA	NA
rs662064	1	10557251	<i>PEX14</i>	3.20E-08	1.06	0.1031	0.8169

rs4233366	1	161159147	PPOX, ADAMTS4	4.80E-15	1.09		0.2007	0.8833
rs1723018	1	167433420	CD247	1.40E-08	1.05		0.8638	0.973
rs1102705	1	172700868	FASLG, TNFSF18	3.00E-08	1.066		NA	NA
rs6691738	1	173152036	TNFSF18, TNFSF4	2.90E-08	1.06		0.5918	1.103
rs6683383	1	203100504	ADORA1	1.10E-08	1.06		NA	NA
rs13412757	2	8458080	LINC00299	1.30E-08	1.06		0.1975	0.8802
rs34290285	2	242698640	D2HGDH	1.80E-15	1.124		NA	NA
rs519973	3	187633268	BCL6, LPP-AS2	7.00E-09	1.034		0.03004	1.305
rs2030030	3	187793833	BCL6-, LPP-AS2	7.00E-09	1.041		0.0767	0.4315
rs60946162	3	188133336	LPP	7.00E-09	1.08		0.5428	1.105
rs73196739	3	188402471	LPP	6.50E-09	1.09		0.9901	0.9965
rs740474	5	140925362	DIAPH1	3.00E-08	1.034		0.1388	1.158
rs200634877	5	141529762	NDFIP1	2.50E-08	1.06		NA	NA
rs58521088	6	90985198	BACH2	7.10E-11	1.082		0.8379	1.056
rs2025758	10	8841669	GATA3, CELF2	8.00E-12	1.068		0.1362	0.8254
rs12413578	10	9049253	GATA3, CELF2	8.00E-12	1.158		NA	NA
rs3001426	12	57509055	STAT6	1.40E-10	1.06		0.009012	1.585
rs3784099	14	68749927	RAD51B	1.60E-08	1.06		0.04518	1.322
rs56375023	15	67448363	SMAD3	2.00E-21	1.07		0.6446	0.8651
rs662064	1	10497194	PEX14	3.20E-08	0.94		0.1031	0.8169
rs4233366	1	161189357	ADAMTS4	4.80E-15	1.09		0.2007	0.8833
rs1723018	1	167464183	CD247	1.40E-08	0.95		0.8638	0.973
rs6691738	1	173182897	TNFSF4	2.90E-08	0.94	6	0.5918	1.103
rs6683383	1	203131376	ADORA1	1.10E-08	1.06		NA	NA
rs13412757	2	8317950	-	1.30E-08	1.06		0.1975	0.8802
rs202011557	2	102297183	IL1RL1	5.10E-31	0.84		0.2255	0.6536
rs34290285	2	241759225	D2HGDH	1.80E-15	1.11		NA	NA
rs73196739	3	188684683	LPP	6.50E-09	0.92		0.9901	0.9965
rs5743618	4	38797027	TLR1	3.90E-11	1.08		0.5262	0.7676
rs1837253	5	111066174	TSLP	3.30E-31	0.88		0.02711	1.246
rs2244012	5	132565533	RAD50	2.10E-16	1.10		0.2164	1.161
rs200634877	5	142150197	NDFIP1	2.50E-08	0.94		NA	NA
rs2428494	6	31354420	HLA-C/MICA	1.40E-16	0.92		0.3005	1.104
rs3104367	6	32635710	HLA-DQA1	1.00E-40	0.87		0.207	0.8877
rs58521088	6	90275479	BACH2	7.10E-11	0.93		0.8379	1.056
rs6959584	7	106036059	CDHR3	2.00E-08	1.09		0.2063	1.427
rs10957978	8	80372904	-	1.10E-11	0.93		0.1975	0.8502
rs144829310	9	6208030	IL33	1.30E-31	1.17		NA	NA
rs12413578	10	9007290	-	8.10E-12	0.89		NA	NA
rs7936323	11	76582714	LRRC32	1.40E-16	0.92		0.6192	1.049
rs3001426	12	57115272	STAT6	1.40E-10	0.94		0.009012	1.585
rs3784099	14	68283210	RAD51B	1.60E-08	0.94		0.04518	1.322
rs10519068	15	60776505	-	3.80E-11	1.10		0.639	1.11
rs56375023	15	67156025	SMAD3	2.40E-21	0.90		0.6446	0.8651
rs7203459	16	11136846	CLEC16A	3.50E-15	1.09		0.7803	1.045
rs11655198	17	39869916	ZBPB2	1.00E-63	0.85		4.89E-08	1.8248175
rs11204896	1	151796742	RORC	9.00E-11	1.063		NA	NA
rs61816761	1	152285861	FLG	9.00E-11	1.323		NA	NA
rs9357733	6	52292136	EFHC1	2.00E-08	1.27	7	0.6116	1.055
rs479844	11	65551957	KIRREL3-AS3, ETSI	4.00E-10	1.053		0.3612	0.8746
rs11236814	11	76343428	AP5B1, OVOL1	2.00E-15	1.068		0.4628	1.155
rs112401631	17	38764524	CCR7, SMARCE1	5.00E-08	1.254		NA	NA
rs16903574	5	14610309	FAM105A	2.00E-08	1.098	8	NA	NA
rs4833095	4	38799710	TLR1	5.00E-12	1.2		0.4073	1.146
rs7009110	8	81291879	MIR5708, ZBTB10	4.00E-09	1.14	9	0.674	1.042
rs12596613	16	11491007	RMI2, LITAF	1.00E-08	1.032		NA	NA
rs6967330	7	105658451	CDHR3	1.40E-08	1.45	10	0.6716	1.128
rs56129466	11	128158189	WNT11, LRRC32	7.00E-09	1.047	11	0.08032	0.8219
rs4129267	1	154426264	IL6R	2.40E-08	1.09		0.4218	0.8786
rs6871536	5	131969874	RAD50	2.40E-09	1.14	12	0.181	1.178
rs7130588	11	76270683	WNT11, LRRC32	1.80E-08	1.09		0.1857	1.25
rs11071559	15	61069988	RORA	3.80E-09	1.107		0.4407	0.8376
rs987870	6	33042880	HLA-DPA1	2.00E-10	1.04		0.4554	0.8306
rs3097670	6	33046752	HLA-DPA1	2.00E-10	1.072	13	0.327	0.6704
rs10947428	6	33647058	ITPR3	2.00E-10	1.046		0.2098	0.7169
rs3019885	8	118025645	SLC30A8	5.00E-13	1.01		0.8812	0.9832
rs1101999	1	158932555	PYHIN1	4.00E-09	NA		NA	NA
rs1837253	5	110401872	SLC25A46, TSLP	1.00E-14	1.11		0.02711	1.246
rs343478	9	6051399	RANBP6, IL33	2.00E-12	1.059		0.8827	1.025

rs3771180	2	102337157	<i>IL1RL1</i>	1.93E-08	NA	0.0001672	0.5907
rs10173081	2	102340888	<i>IL1RL1</i>	1.42E-08	1.20	0.0001672	0.5907
rs6770600	3	187697946	<i>RTP2</i>	6.97E-09 ^d	NA	0.3393	1.184
rs11928175	3	187699926	<i>RTP2</i>	7.32E-09 ^d	NA	0.3204	1.192
rs2017908	3	187700180	<i>RTP2</i>	4.42E-09 ^d	1.09	0.3473	1.182
rs9848804	3	187701528	<i>RTP2</i>	8.81E-09 ^d	NA	0.3204	1.192
rs9812190	3	187701940	<i>RTP2</i>	6.86E-09 ^d	NA	0.3204	1.192
rs7616923	3	187703431	<i>RTP2</i>	5.96E-09 ^d	NA	0.3369	1.184
rs1837253	5	111066174	<i>TSLP</i>	7.28E-10	1.10	0.02711	1.246
rs2381416	9	6193455	<i>IL33</i>	1.70E-12 ^c	1.18	0.6532	1.102
rs907092	17	39766006	<i>GSDMB</i>	3.24E-12	NA	0.007628	1.5893198
rs2313430	17	39773563	<i>GSDMB</i>	1.94E-11	NA	2.58E-07	1.7277125
rs10445308	17	39781794	<i>GSDMB</i>	8.39E-13	NA	3.11E-07	1.7190992
rs9909593	17	39813896	<i>GSDMB</i>	5.23E-13	NA	2.58E-07	1.7274141
rs9303277	17	39820216	<i>GSDMB</i>	1.01E-11	NA	2.95E-07	1.7223562
rs3816470	17	39829548	<i>GSDMB</i>	8.22E-12	NA	1.45E-08	1.8691589
rs11557466	17	39868373	<i>GSDMB</i>	6.02E-13	NA	2.18E-08	1.8587361
rs11078925	17	39868955	<i>GSDMB</i>	1.86E-12	NA	3.10E-08	1.8456995
rs12936231	17	39872867	<i>GSDMB</i>	1.95E-10	NA	4.89E-08	1.8248175
rs11870965	17	39873952	<i>GSDMB</i>	4.04E-10	NA	4.89E-08	1.8248175
rs1054609	17	39877024	<i>GSDMB</i>	2.23E-10	NA	4.89E-08	1.8248175
rs9907088	17	39878863	<i>GSDMB</i>	3.16E-12	NA	3.14E-08	1.8416206
rs12232497	17	39883866	<i>GSDMB</i>	1.21E-13	NA	2.76E-08	1.8501388
rs2872507	17	39884510	<i>GSDMB</i>	6.84E-12	NA	0.005445	1.6460905
rs9901146	17	39887090	<i>GSDMB</i>	5.57E-12	NA	3.10E-08	1.8456995
rs12950743	17	39892980	<i>GSDMB</i>	5.30E-12	NA	3.56E-08	1.840265
rs7359623	17	39893336	<i>GSDMB</i>	4.64E-12	NA	4.70E-08	1.8311665
rs8067378	17	39895095	<i>GSDMB</i>	6.43E-11	NA	0.003695	1.6843524
rs8069176	17	39900944	<i>GSDMB</i>	5.66E-12	NA	5.99E-08	1.8208303
rs2305480	17	39905943	<i>GSDMB</i>	1.31E-13	NA	0.007652	1.6123831
rs2305479	17	39905964	<i>GSDMB</i>	1.21E-12	NA	0.007652	1.6123831
rs11078927	17	39908152	<i>GSDMB</i>	1.22E-14	1.27	4.86E-08	1.8284878
rs2290400	17	39909987	<i>GSDMB</i>	3.75E-11	NA	0.004144	1.6655563
rs1008723	17	39910014	<i>GSDMB</i>	7.96E-13	NA	1.33E-08	1.8695083
rs4795400	17	39910767	<i>GSDMB</i>	1.38E-13	NA	1.52E-08	1.8653236
rs869402	17	39911790	<i>GSDMB</i>	3.46E-14	NA	1.51E-08	1.8653236
rs7216389	17	39913696	<i>GSDMB</i>	4.99E-12	NA	0.00576	1.6283993
rs9303280	17	39917778	<i>GSDMB</i>	4.09E-13	NA	2.80E-08	1.8474044
rs9303281	17	39917793	<i>GSDMB</i>	3.67E-12	NA	2.62E-08	1.8426387
rs7219923	17	39918265	<i>GSDMB</i>	3.25E-11	NA	2.13E-08	1.8491124
rs7224129	17	39919173	<i>GSDMB</i>	1.16E-11	NA	4.45E-09	1.9043992
rs8076131	17	39924659	<i>GSDMB</i>	8.62E-14	NA	4.41E-06	1.9069413
rs12603332	17	39926554	<i>GSDMB</i>	4.93E-11	NA	1.01E-06	1.977457
rs4795405	17	39932164	<i>GSDMB</i>	1.49E-10	NA	NA	NA
rs4794820	17	39933091	<i>GSDMB</i>	2.38E-09	NA	NA	NA
rs12452894	17	49384071	<i>GSDMB</i>	1.63E-12	NA	NA	NA
rs7686660	4	144003159	<i>LOC100287014, LOC105377623</i>	2.00E-12	1.16	0.08295	1.222
rs2507978	6	31351664	<i>HLA-B, MICA</i>	3.00E-15	1.035	0.7327	0.968
rs28895016	6	31574525	<i>NCR3, AIF1</i>	3.00E-15	1.134	0.9523	1.009
rs404860	6	32184345	<i>NOTCH4</i>	4.00E-23	1.01	0.264	0.8314
rs3117098	6	32358513	<i>HCG23</i>	5.00E-12	1.16	0.3572	1.113
rs11255753	10	8605553	<i>GATA3, CELF2</i>	2.00E-15	1.05	NA	NA
rs10508372	10	8972018	<i>GATA3, CELF2</i>	2.00E-15	0.95	0.1959	1.176
rs72782676	10	9032555	<i>GATA3, CELF2</i>	2.00E-15	1.303	NA	NA
rs17843604	6	32620283	<i>HLA-DQA1, HLA-DQB1</i>	1.70E-10	1.16	0.5417	0.9104
rs1342326	9	6190076	<i>RANBP6-, IL33</i>	9.20E-10	1.2	NA	NA
rs2284033	22	37534034	<i>IL2RB</i>	1.20E-08	1.12	0.6466	1.059
rs11674302	2	102270668	<i>IL1RL2</i>	8.72E-09	0.84	0.009402	0.6807
rs13431828	2	102338193	<i>IL1RL1</i>	1.00E-10	0.83	0.0001672	0.5907
rs10204137	2	102351752	<i>IL1RL1</i>	4.84E-12	0.87	0.1289	0.8197
rs10192157	2	102351896	<i>IL1RL1</i>	8.12E-12	0.87	0.9661	0.9907
rs10206753	2	102351902	<i>IL1RL1</i>	5.55E-12	0.87	0.9661	0.9907
rs3771166	2	102369762	<i>IL18R1</i>	3.52E-12	0.87	0.1324	0.821
rs4851004	2	102393077	<i>IL18R1</i>	9.78E-09	0.89	0.0004607	0.6439
rs2287033	2	102394777	<i>IL18R1</i>	7.69E-09	0.89	0.0004607	0.6439
rs1420094	2	102399227	<i>IL18R1</i>	7.53E-09	0.89	0.0004607	0.6439
rs3755266	2	102426252	<i>IL18RAP</i>	5.19E-09	0.89	0.0004611	0.6439
rs2310300	2	102432614	<i>IL18RAP</i>	5.75E-09	0.89	0.0004611	0.6439

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rs1837253	5	111066174	<i>TSLP</i>	3.03E-10	1.15		0.02711	1.246
rs2897443	5	132593902	<i>RAD50</i>	4.86E-08 ^a	1.15		0.233	1.155
rs6871536	5	132634182	<i>RAD50</i>	1.89E-08	1.14		0.181	1.178
rs2240032	5	132641435	<i>RAD50</i>	3.75E-08	1.14		0.2206	1.161
rs1295686	5	132660151	<i>IL13</i>	1.36E-08	0.87		NA	NA
rs20541	5	132660272	<i>IL13</i>	1.95E-08	0.87		0.2548	1.158
rs130065	6	31154723	<i>CCHCR1</i>	3.13E-08 ^b	1.18		0.8063	0.922
rs17843604	6	32652506	<i>HLA-DQ</i>	1.68E-10	1.16		0.5417	0.9104
rs9273349	6	32658092	<i>HLA-DQ</i>	6.95E-14	1.18		NA	NA
rs371454	9	6078614	<i>RANBP6</i>	5.35E-08	1.16		0.164	1.604
rs340908	9	6128897	<i>IL33</i>	3.50E-08	1.16		0.4055	1.309
rs1412426	9	6188652	<i>IL33</i>	1.34E-08	0.89		0.8874	1.025
rs1342326	9	6190076	<i>IL33</i>	8.71E-12	1.20		NA	NA
rs992969	9	6209697	<i>IL33</i>	4.03E-14	0.85		0.7652	0.9353
rs3939286	9	6210099	<i>IL33</i>	4.53E-14	0.84		0.6192	0.895
rs928413	9	6213387	<i>IL33</i>	8.99E-14	0.85		0.6755	1.074
rs2066362	9	6219176	<i>IL33</i>	2.81E-12	1.21		NA	NA
rs17498196	9	6237547	<i>IL33</i>	3.99E-08	1.15		NA	NA
rs744910	15	67154447	<i>SMAD3</i>	3.93E-09	0.89		0.01703	0.7979
rs12708492	15	67175203	<i>SMAD3</i>	1.74E-08	0.89	16	NA	NA
rs1877031	17	39657827	<i>STARD3</i>	1.45E-09	0.88		NA	NA
rs2271308	17	39661229	<i>STARD3</i>	2.36E-09	0.88		0.05872	1.2577034
rs931992	17	39665182	<i>TCAP</i>	1.34E-09	0.88		0.05545	1.2623075
rs3764351	17	39668086	-	6.69E-09	0.88		NA	NA
rs2941503	17	39672492	<i>PGAP3</i>	4.32E-11	0.87		0.07214	1.189202
rs2941504	17	39674647	<i>PGAP3</i>	3.81E-11	0.87		0.07216	1.1880718
rs1565922	17	39674782	<i>PGAP3</i>	6.12E-11	0.87		0.07064	1.1890606
rs12150298	17	39678288	<i>PGAP3</i>	6.33E-09	0.88		0.07481	1.1863804
rs1810132	17	39709752	<i>ERBB2</i>	1.31E-10	0.88		0.01133	1.2825446
rs4252627	17	39712462	-	4.77E-08	0.89		0.009358	1.2916559
rs907092	17	39766006	<i>ZNFN1A3</i>	3.65E-17	0.85		0.007628	1.5893198
rs9303277	17	39820216	<i>ZNFN1A3</i>	2.29E-17	0.85		2.95E-07	1.7223562
rs12150079	17	39869164	<i>ZBPB2</i>	2.04E-09	0.88		1.28E-05	2.0004001
rs11557467	17	39872381	<i>ZBPB2</i>	2.49E-17	0.85		0.005456	1.6460905
rs2884510	17	39884510	<i>ZBPB2</i>	5.70E-16	0.86		0.005445	1.6460905
rs8067378	17	39895095	<i>GSDMB</i>	1.04E-17	0.85		0.003695	1.6843524
rs2305480	17	39905943	<i>GSDMB</i>	7.93E-17	0.85		0.007652	1.6123831
rs2290400	17	39909987	<i>GSDMB</i>	2.77E-18	0.85		0.004144	1.6655563
rs7216389	17	39913696	<i>GSDMB</i>	8.60E-18	1.18		0.00576	1.6283993
rs3744246	17	39928097	<i>ORMDL3</i>	2.87E-08 ^c	1.21		2.36E-05	1.8099548
rs4795405	17	39932164	<i>ORMDL3</i>	8.75E-16	1.16		NA	NA
rs8079416	17	39936460	<i>ORMDL3</i>	7.07E-16	1.17		NA	NA
rs1007654	17	39955101	<i>GSDMI</i>	6.02E-09	1.12		0.1468	1.2074378
rs7219080	17	39958263	<i>GSDMI</i>	4.83E-09	1.13		0.1652	1.198897
rs3902025	17	39963001	<i>GSDMI</i>	3.52E-12	1.14		0.03405	1.2934937
rs3894194	17	39965740	<i>GSDMI</i>	9.25E-16	1.17		0.02804	1.3070187
rs3859192	17	39972395	<i>GSDMI</i>	1.11E-12	1.15		0.4749	1.0702055
rs8075668	17	39981370	<i>PSMD3</i>	2.34E-09	0.89		0.5049	1.0676917
rs12453334	17	39997220	<i>PSMD3</i>	9.60E-10 ^c	0.83		0.6886	1.0399334
rs8070454	17	40004501	<i>PSMD3</i>	6.60E-08 ^c	1.16		0.5144	0.9398496
rs9916158	17	40025976	<i>THRAP4</i>	3.13E-08	0.89		0.5694	1.0578652
rs11078936	17	40041661	<i>THRAP4</i>	4.39E-08	0.89		0.6118	1.0515247
rs2284033	22	37137994	<i>IL2RB</i>	1.15E-08	0.89		0.6466	1.059
rs2786098	1	197325908	<i>CRB1</i>	8.60E-09	1.59	17	0.3055	1.218
rs1588265	5	59369794	<i>PDE4D</i>	2.50E-08	1.7	18	0.5878	1.059
rs7216389	17	38069949	<i>GSDMB</i>	9.00E-11	1.45	19	0.00576	1.6283993
rs13408661	2	102338622	<i>IL1RL1/IL18R1</i>	1.10E-09 ^c	1.23	20	0.0001672	0.5907
rs9268516	6	32411712	<i>BTNL2/HLA-DRA</i>	1.10E-08 ^c	1.15		0.3057	1.216
rs2941522	17	39754115	<i>GRB7,IKZF3</i>	2.86.E-08	NA	21	1.09E-06	1.6803899
rs12946510	17	39756124	<i>GRB7,IKZF3</i>	5.90.E-12	NA		1.23E-06	1.6739203
rs907092	17	39766006	<i>IKZF3</i>	1.16.E-12	1.41		0.007628	1.5893198
rs10445308	17	39781794	<i>IKZF3</i>	1.01.E-11	NA		3.11E-07	1.7190992
rs12942330	17	39783586	<i>IKZF3</i>	1.23.E-11	NA		2.59E-07	1.7274141
rs11658993	17	39784555	<i>IKZF3</i>	5.09.E-12	NA		2.59E-07	1.7274141
rs4795395	17	39806734	<i>IKZF3</i>	1.66.E-11	NA		2.59E-07	1.7274141
rs9909593	17	39813896	<i>IKZF3</i>	1.51.E-11	NA		2.58E-07	1.7274141
rs34233420	17	39848677	<i>IKZF3</i>	2.41.E-11	NA		1.01E-08	1.8814675
rs4795397	17	39867492	<i>ZBPB2</i>	3.73.E-12	NA		1.82E-08	1.8684604

rs11557466	17	39868373	ZPBP2	5.21.E-12	NA	2.18E-08	1.8587361
rs11078925	17	39868955	ZPBP2	4.82.E-12	NA	3.10E-08	1.8456995
rs200306858	17	39869391	ZPBP2	9.16.E-09	NA	NA	NA
rs34120102	17	39869782	ZPBP2	4.52.E-12	NA	2.76E-08	1.8501388
rs11655198	17	39869916	ZPBP2	2.83.E-08	NA	4.89E-08	1.8248175
rs11650661	17	39870033	ZPBP2	1.77.E-08	NA	4.89E-08	1.8248175
rs11655292	17	39870108	ZPBP2	2.05.E-08	NA	4.89E-08	1.8248175
rs12709365	17	39871147	ZPBP2	3.80.E-09	NA	4.90E-08	1.8248175
rs13380815	17	39871330	ZPBP2	3.80.E-09	NA	4.90E-08	1.8248175
rs11557467	17	39872381	ZPBP2	2.29.E-08	NA	0.005456	1.6460905
rs11870965	17	39873952	ZPBP2	5.26.E-09	NA	4.89E-08	1.8248175
rs9903250	17	39874777	ZPBP2	5.26.E-09	NA	4.89E-08	1.8248175
rs9905959	17	39874885	ZPBP2	3.87.E-09	NA	4.89E-08	1.8248175
rs11658278	17	39874911	ZPBP2	7.62.E-09	NA	4.89E-08	1.8248175
rs10852935	17	39875421	ZPBP2	7.43.E-12	NA	3.10E-08	1.8456995
rs10852936	17	39875461	ZPBP2	5.66.E-09	NA	3.88E-08	1.8345258
rs9891174	17	39875549	ZPBP2	7.87.E-09	NA	5.50E-08	1.8208303
rs59716545	17	39875604	ZPBP2	9.11.E-12	NA	1.91E-08	1.8681113
rs36095411	17	39875612	ZPBP2	3.87.E-12	NA	3.10E-08	1.8456995
rs12939457	17	39875935	ZPBP2	1.19.E-08	NA	4.89E-08	1.8248175
rs34189114	17	39876207	ZPBP2	5.65.E-12	NA	3.10E-08	1.8456995
rs35736272	17	39876427	ZPBP2	5.04.E-12	NA	2.76E-08	1.8501388
rs1054609	17	39877024	ZPBP2	3.39.E-09	NA	4.89E-08	1.8248175
rs9907088	17	39878863	ZPBP2	2.16.E-09	NA	3.14E-08	1.8416206
rs36038753	17	39879117	ZPBP2,GSDMB	2.14.E-09	NA	4.89E-08	1.8248175
rs35569035	17	39879371	ZPBP2,GSDMB	4.33.E-12	NA	3.10E-08	1.8456995
rs9910826	17	39879395	ZPBP2,GSDMB	1.17.E-09	NA	4.89E-08	1.8248175
rs34074973	17	39879514	ZPBP2,GSDMB	5.64.E-12	NA	NA	NA
rs9904624	17	39880333	ZPBP2,GSDMB	1.15.E-09	NA	4.89E-08	1.8248175
rs4795398	17	39881926	ZPBP2,GSDMB	5.20.E-12	NA	3.10E-08	1.8456995
rs62067029	17	39882138	ZPBP2,GSDMB	3.54.E-09	NA	4.49E-08	1.8480872
rs148094956	17	39883309	ZPBP2,GSDMB	1.51.E-08	NA	NA	NA
rs12232497	17	39883866	ZPBP2,GSDMB	4.37.E-12	NA	2.76E-08	1.8501388
rs12232498	17	39884110	ZPBP2,GSDMB	2.17.E-09	NA	4.89E-08	1.8248175
rs12941333	17	39884281	ZPBP2,GSDMB	2.17.E-09	NA	4.89E-08	1.8248175
rs2872507	17	39884510	ZPBP2,GSDMB	1.85.E-09	NA	0.005445	1.6460905
rs9908132	17	39886524	ZPBP2,GSDMB	1.19.E-08	NA	3.10E-08	1.8456995
rs9901146	17	39887090	ZPBP2,GSDMB	1.19.E-08	NA	3.10E-08	1.8456995
rs12936409	17	39887396	ZPBP2,GSDMB	6.74.E-12	NA	3.10E-08	1.8456995
rs12103884	17	39889472	ZPBP2,GSDMB	1.26.E-08	NA	3.10E-08	1.8456995
rs9906951	17	39891991	ZPBP2,GSDMB	1.21.E-08	NA	3.10E-08	1.8456995
rs12950209	17	39892849	ZPBP2,GSDMB	7.68.E-09	NA	3.56E-08	1.840265
rs12950743	17	39892980	ZPBP2,GSDMB	1.15.E-08	NA	3.56E-08	1.840265
rs7359623	17	39893336	ZPBP2,GSDMB	4.50.E-09	NA	4.70E-08	1.8311665
rs11651596	17	39899863	ZPBP2,GSDMB	6.96.E-12	NA	7.49E-08	1.8181818
rs12949100	17	39900936	ZPBP2,GSDMB	8.70.E-12	NA	5.35E-08	1.8251506
rs8069176	17	39900944	ZPBP2,GSDMB	1.15.E-09	NA	5.99E-08	1.8208303
rs4795399	17	39905186	GSDMB	2.26.E-11	NA	5.35E-08	1.8251506
rs2305480	17	39905943	GSDMB	7.38.E-12	NA	0.007652	1.6123831
rs2305479	17	39905964	GSDMB	1.28.E-10	NA	0.007652	1.6123831
rs56750287	17	39906691	GSDMB	1.66.E-11	NA	4.86E-08	1.8284878
rs11078926	17	39906723	GSDMB	8.18.E-12	NA	4.86E-08	1.8284878
rs883770	17	39907128	GSDMB	1.35.E-10	NA	4.86E-08	1.8284878
rs62067034	17	39907485	GSDMB	1.54.E-10	NA	4.86E-08	1.8284878
rs36000226	17	39907676	GSDMB	1.35.E-10	NA	4.86E-08	1.8284878
rs36084703	17	39907728	GSDMB	1.41.E-09	NA	4.86E-08	1.8284878
rs11078927	17	39908152	GSDMB	8.13.E-12	NA	4.86E-08	1.8284878
rs11078928	17	39908216	GSDMB	7.02.E-12	NA	0.007647	1.6123831
rs12939832	17	39908623	GSDMB	6.39.E-12	NA	5.57E-07	1.7531557
rs1008723	17	39910014	GSDMB	2.30.E-08	NA	1.33E-08	1.8695083
rs4795400	17	39910767	GSDMB	7.74.E-12	NA	1.52E-08	1.8653236
rs4795401	17	39911280	GSDMB	9.09.E-09	NA	1.52E-08	1.8653236
rs869402	17	39911790	GSDMB	9.80.E-11	NA	1.51E-08	1.8653236
rs1011082	17	39912261	GSDMB	1.13.E-09	NA	3.38E-08	1.8298262
rs921650	17	39912823	GSDMB	2.67.E-10	NA	3.38E-08	1.8298262
rs921649	17	39913021	GSDMB	2.37.E-10	NA	3.38E-08	1.8298262
rs5820308	17	39913112	GSDMB	5.64.E-11	NA	NA	NA
rs6503524	17	39913556	GSDMB	2.51.E-10	NA	3.38E-08	1.8298262
rs7216389	17	39913696	GSDMB	4.16.E-10	NA	0.00576	1.6283993

rs7221605	17	39914536	<i>GSDMB</i>	1.09.E-09	NA	2.80E-08	1.8474044
rs1031458	17	39915920	<i>GSDMB</i>	2.66.E-09	NA	2.80E-08	1.8474044
rs1031460	17	39915994	<i>GSDMB</i>	4.68.E-09	NA	2.80E-08	1.8474044
rs8065777	17	39916149	<i>GSDMB</i>	3.72.E-09	NA	2.80E-08	1.8474044
rs2872516	17	39916474	<i>GSDMB</i>	8.66.E-09	NA	2.80E-08	1.8474044
rs146378727	17	39917585	<i>GSDMB</i>	1.72.E-08	NA	NA	NA
rs9303279	17	39917715	<i>GSDMB</i>	7.83.E-12	NA	2.62E-08	1.8426387
rs8076131	17	39924659	<i>ORMDL3</i>	1.74.E-11	NA	4.41E-06	1.9069413
rs7221814	17	39933464	<i>ORMDL3,LRRC3C</i>	6.59.E-09	NA	NA	NA
rs67786416	17	35316470 ^a	<i>GSDMB</i>	3.53.E-11	NA	NA	NA

Legend to table:

All base pair positions (bp) correspond to GRCh38/hg38 genome assembly.

GWAS, genome-wide association study; NA, not applicable; NS, not specific.

Exceptions are noted below. ^a*P* value from the combined GWAS of childhood onset asthma, later onset asthma, unknown onset asthma and severe asthma only; ^b*P* value from the GWAS of childhood onset asthma and later onset asthma only; ^c*P* value from the childhood onset asthma GWAS only; ^d*P* value from the Latino GWAS only; ^e*P* value from the combined analysis of meta-analysis and replication dataset; ^fGenome-wide significant SNPs with the smallest *P* value within a 250 kb interval only; ^aBase pair corresponds to NCBI36/hg18 genome assembly; ^bBase pair corresponds to GRCh37/hg19 (HapMap SNPs from the CEU Population).

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Table S4. Association results of asthma-related SNPs from the GWAS catalogue in this study cohort.

SNP	Chromosome	Location	GWAS Catalog			Reference	Our study	
			Mapped gene	P-value	OR		P-value	OR
rs12144049	1	152468434	FLG-AS1, LCE5A	2 x 10 ⁻²⁷	-		0.001563	0.6905
rs2070901	1	161215268	FCER1G	3 x 10 ⁻⁹	-		0.1406	0.793
rs10864360	1	8664463	RERE	4 x 10 ⁻⁹	-		0.5363	1.081
rs1552994	1	152198985	FLG-AS1	1 x 10 ⁻¹³	-		0.6674	0.8804
rs11811856	1	173202534	TNFSF4	1 x 10 ⁻¹¹	-		0.7187	1.068
rs11588970	1	152202679	FLG-AS1	2 x 10 ⁻¹⁰	-		0.9237	0.9785
rs6755248	2	223799333	AC093884.1, AP1S3	9 x 10 ⁻⁹	-		0.003111	1.354
rs2302621	2	102225664	IL1RL2	1 x 10 ⁻¹⁹	-		0.09627	1.177
rs874953	2	102113414	IL1R1	7 x 10 ⁻¹⁰	-		0.1303	1.21
rs12470864	2	102309902	FAM183DP, IL1RL1	3 x 10 ⁻²⁸	-		0.2734	0.898
rs10209131	2	102593137	SLC9A2, SLC9A4	3 x 10 ⁻¹²	-		0.5065	1.139
rs72823641	2	102319699	IL1RL1, IL18R1	7 x 10 ⁻⁶⁰	-		0.51	0.7204
rs17775170	2	102635468	SLC9A2	1 x 10 ⁻¹³	-		0.5773	1.1
rs1007027	2	102115136	IL1R1	6 x 10 ⁻¹⁴	-		0.6164	0.9047
rs141343442	2	241751355	D2HGDH	4 x 10 ⁻⁹	-		0.9535	0.9514
rs79337446	3	33047293	GLB1	3 x 10 ⁻¹⁰	-		0.03163	0.6418
rs9828592	3	33002847	GLB1	9 x 10 ⁻¹⁵	-		0.341	1.2
rs13097957	3	156638368	SSR3, TIPARP-AS1	2 x 10 ⁻⁸	-		0.7064	1.105
rs55661102	3	188683350	LPP	2 x 10 ⁻¹⁰	-		0.9901	0.9965
rs7626218	3	177134250	TBL1XR1	2 x 10 ⁻¹⁰	-		0.9982	1
rs2069772	4	122451978	IL2	8 x 10 ⁻¹¹	-		0.2518	1.192
rs62324212	4	122639784	IL21-AS1	3 x 10 ⁻¹³	-		0.8229	1.034
rs9784725	5	110877812	SLC25A46, AC008782.1	1 x 10 ⁻¹²	-		0.1792	1.179
rs6894017	5	132616706	RAD50, AC116366.3	3 x 10 ⁻²⁷	-		0.1913	1.173
rs7713065	5	132452642	AC116366.3, IRF1-AS1	2 x 10 ⁻¹⁵	-		0.2776	1.117
rs13164856	5	132477512	IRF1-AS1, AC116366.3	1 x 10 ⁻⁹	-		0.2858	0.8656
rs114081163	5	111133934	WDR36, AC010468.2	1 x 10 ⁻⁸	-		0.501	0.8633
rs306106	5	111285132	AC010275.1, CAMK4	4 x 10 ⁻⁹	-		0.5589	0.9318
rs17772583	5	132617818	RAD50, AC116366.3	3 x 10 ⁻⁸	-		0.5805	1.094
rs7730817	5	110669048	TMEM232	1 x 10 ⁻⁹	-		0.7596	1.082
rs2289278	5	111073450	TSLP	2 x 10 ⁻⁸	-		0.7808	0.9643
rs249677	5	142159774	NDFIP1, AC091825.3	1 x 10 ⁻⁹	-		0.7828	0.9659
rs2162893	5	111222366	RPS3AP21, CAMK4	4 x 10 ⁻¹⁷	-		0.991	0.9988
rs2855812	6	31504943	MICB	2 x 10 ⁻¹⁰	-		0.006375	1.394
rs13203830	6	29941027	HLA-A, HLA-U	8 x 10 ⁻¹⁰	-		0.008786	0.7524
rs2395141	6	32314291	TSBP1, TSBP1-AS1	3 x 10 ⁻¹⁰	-		0.01457	1.361
rs9275241	6	32692964	HLA-DQB1, MTCO3P1	2 x 10 ⁻¹³	-		0.02228	1.251
rs55743914	6	127972417	PTPRK	3 x 10 ⁻¹⁰	-		0.02878	3.291
rs9372120	6	106219660	ATG5	2 x 10 ⁻⁹	-		0.05415	0.6314
rs9273012	6	32643864	HLA-DQA1	3 x 10 ⁻¹⁶	-		0.07352	1.268
rs1799964	6	31574531	TNF, LTA	1 x 10 ⁻¹¹	-		0.1285	1.204
rs34492353	6	31552881	NFKBIL1	6 x 10 ⁻¹²	-		0.2396	0.7895
rs78546106	6	32337461	TSBP1, TSBP1-AS1	6 x 10 ⁻¹¹	-		0.2704	1.209
rs3130169	6	33080325	HLA-DPB1, HLA-DPA1	2 x 10 ⁻⁸	-		0.327	0.6704
rs35449774	6	33063835	HLA-DPA1, HLA-DOA	2 x 10 ⁻¹⁶	-		0.3445	1.156
rs2855811	6	31504024	MICB	1 x 10 ⁻⁹	-		0.3775	1.105
rs9270911	6	32604425	HLA-DRB1, HLA-DQA1	1 x 10 ⁻²⁷	-		0.4413	0.9301
rs6918558	6	127822379	THEMIS	2 x 10 ⁻⁹	-		0.4589	1.081
rs35342892	6	106165888	ATG5	2 x 10 ⁻⁹	-		0.5033	0.8081
rs34104805	6	32621440	HLA-DRB1, HLA-DQA1	4 x 10 ⁻¹⁷	-	GCST009841	0.5229	0.9312
rs9275602	6	32715035	AL662789.1, MTCO3P1	8 x 10 ⁻¹⁰	-		0.6244	1.112
rs73730372	6	32616804	HLA-DRB1, HLA-DQA1	9 x 10 ⁻²⁶	-		0.6277	1.065

rs11751024	6	32618459	HLA-DRB1, HLA-DQA1	9 x 10-35	-	0.756	0.9533
rs207270	6	90119163	BACH2	5 x 10-9	-	0.7756	0.9307
rs41316204	6	32666988	HLA-DQB1	2 x 10-12	-	0.7804	0.9433
rs62407927	6	33472004	GGNBPI, ZBTB9	5 x 10-9	-	0.7844	0.8699
rs41288889	6	32744232	HLA-DQA2	2 x 10-9	-	0.8175	0.9028
rs34853064	6	30977848	NAPGP2, MUC21	6 x 10-9	-	0.8767	0.9759
rs10244416	7	20536128	EEF1A1P27, ITGB8	1 x 10-13	-	0.02949	0.7882
rs10262599	7	20345190	ITGB8	8 x 10-9	-	0.105	0.3236
rs3757727	7	20372274	ITGB8	1 x 10-10	-	0.135	0.8616
rs2390314	7	20416355	ITGB8, EEF1A1P27	2 x 10-8	-	0.3925	0.5551
rs6954667	7	22740703	MTCYBP42, IL6	7 x 10-9	-	0.6422	0.8705
rs13279820	8	127765520	MYC, PVT1	5 x 10-14	-	0.3843	1.097
rs274943	9	23585841	AL445623.2	1 x 10-10	-	0.02166	0.7443
rs371454	9	6078614	AL162384.1, GTF3API	3 x 10-37	-	0.164	1.604
rs10815376	9	6222149	IL33	6 x 10-26	-	0.3483	2.894
rs544253	9	6142157	GTF3API, AL162384.1	1 x 10-10	-	0.6854	0.9363
rs928412	9	6213148	IL33, GTF3API	3 x 10-59	-	0.9341	0.9814
rs1612986	10	9022753	LINC00709, AC044784.1	2 x 10-24	-	0.09027	1.282
rs7918084	10	92669710	EIF2S2P3	8 x 10-12	-	0.287	0.8193
rs1444782	10	9016708	LINC00709, AC044784.1	4 x 10-18	-	0.4688	0.8828
rs2017759	11	76405941	GVQW3	2 x 10-15	-	0.006308	1.328
rs6592651	11	76574378	AP001189.2, EMSY	9 x 10-12	-	0.08664	0.7749
rs7936275	11	10639293	MRV11	3 x 10-9	-	0.131	5.019
rs10836538	11	36343703	PRR5L	2 x 10-8	-	0.8583	0.9824
rs1696390	12	120920841	HNF1A-AS1, RPL12P33	5 x 10-12	-	0.07525	1.245
rs11065286	12	120833931	SPPL3	2 x 10-13	-	0.3328	1.145
rs3024971	12	57099944	STAT6	4 x 10-15	-	0.6045	0.8799
rs912425	13	42423188	LINC02341	2 x 10-9	-	0.7106	0.9561
rs4772189	13	99342319	UBAC2	3 x 10-12	-	0.7922	0.9733
rs1965139	15	41244154	CHP1	1 x 10-8	-	0.3556	0.9101
rs34986765	15	60777002	RORA	5 x 10-18	-	0.6205	0.8844
rs6498169	16	11155472	CLEC16A, AC007220.2	9 x 10-12	-	0.6801	0.9393
rs36045143	16	11131109	CLEC16A	3 x 10-20	-	0.6805	1.07
rs11651596	17	39899863	GSDMB, ZBPB2	2 x 10-124	-	7.49E-08	1.8181818
rs4795402	17	39929132	AC090844.2	6 x 10-30	-	1.62E-05	1.8268177
rs3764354	17	39760570	IKZF3	2 x 10-22	-	0.1247	1.4647722
rs12600751	17	39397398	FBXL20	1 x 10-21	-	0.2887	1.12
rs10468514	17	45378874	AC003070.2, ARHGAP27	2 x 10-11	-	0.3684	1.115
rs6503533	17	40028327	MED24	7 x 10-30	-	0.4792	1.07
rs939348	17	40075600	THRA	3 x 10-11	-	0.6908	1.053
rs11658582	17	40606948	AC004585.2, SMARCE1	6 x 10-13	-	0.9561	1.006
rs1044977	17	45149847	HEXIM1	3 x 10-8	-	0.9857	1.003
rs115515961	18	54309883	POLI	3 x 10-8	-	0.7932	1.084
rs1893958	18	54303259	POLI	3 x 10-10	-	0.9476	1.007
rs2918300	19	8677192	LINC01862	1 x 10-8	-	0.2504	1.121
rs117710327	19	33235672	AC008738.6, SLC7A10	5 x 10-12	-	0.2969	0.5966
rs9611573	22	41391672	TEF	3 x 10-8	-	0.706	1.096
rs77582594	1	88756513	PKN2	8 x 10-7	-	0.1955	0.7747
rs2729117	3	1075549	RN7SL120P, CNTN6	9 x 10-6	-	0.2099	1.215
rs7691998	4	23917905	DHX15, PPARGC1A	8 x 10-6	-	0.8026	1.135
rs7751224	6	5589406	FARS2	8 x 10-6	-	0.201	0.8853
rs17801625	8	25664618	AC009623.1	5 x 10-6	-	0.7272	0.9468
rs194326	16	10265732	ATF7IP2, AC022168.1	1 x 10-6	-	0.5728	1.072
rs1480090	15	98172432	AC022523.1	7 x 10-6	-	0.3896	1.163
rs12933955	16	27743124	KIAA0556	1 x 10-6	-	0.2401	0.7475

GCST009277

GCST009276

rs12930749	16	27716458	<i>AC016597.2, KIAA0556</i>	1 x 10 ⁻⁶	-	GCST009270	0.2802	0.766
rs8132375	21	37763184	<i>KCNJ6</i>	9 x 10 ⁻⁶	-		0.9641	0.9952
rs232542	2	38101036	<i>CYP11B1-AS1, CYP11B1</i>	4 x 10 ⁻⁶	1.33	GCST009238	0.8486	1.036
rs7493885	14	50850700	<i>AL358334.1</i>	3 x 10 ⁻⁶	1.37		0.8189	1.022
rs13037508	20	14948299	<i>MACROD2</i>	8 x 10 ⁻⁶	0.81	GCST009237	0.8285	1.049
rs3117006	6	33128931	<i>HLA-DPB2</i>	2 x 10 ⁻⁶	-	GCST008917	0.6543	1.045
rs958144	3	88945522	<i>ICE2P2, NDUFA5P5</i>	5 x 10 ⁻⁶	-		0.4535	0.9226
rs4571247	3	89017438	<i>GAPDHP50, ICE2P2</i>	6 x 10 ⁻⁶	-		0.6551	0.9522
rs13090972	3	89027746	<i>GAPDHP50, ICE2P2</i>	1 x 10 ⁻⁶	-	GCST008273	0.8994	0.9825
rs13157529	5	107985181	<i>FBXL17</i>	6 x 10 ⁻⁶	-		0.7727	0.9625
rs7041938	9	110329243	<i>TXNDC8</i>	7 x 10 ⁻⁶	-		0.02266	0.5398
rs11656155	17	51593949	<i>LINC02073, CA10</i>	6 x 10 ⁻⁶	-		0.2882	0.8948
rs4915866	1	63022557	<i>LINC01739, AL162400.1</i>	6 x 10 ⁻⁶	-		0.577	0.9106
rs883398	1	63023669	<i>AL162400.1, LINC01739</i>	2 x 10 ⁻⁶	-		0.6494	0.9269
rs1861415	2	58626423	<i>LINC01122</i>	9 x 10 ⁻⁶	-	GCST008272	0.1786	0.8815
rs6569651	6	130082936	<i>L3MBTL3</i>	9 x 10 ⁻⁶	-		0.02714	0.7195
rs1986254	11	19972258	<i>NAV2</i>	8 x 10 ⁻⁶	-		0.6878	0.9322
rs2403547	11	19966866	<i>NAV2</i>	6 x 10 ⁻⁶	-		0.7625	0.9513
rs12023876	1	203124073	<i>ADORA1, AC105940.2</i>	1 x 10 ⁻⁹	1.102		0.1228	0.8137
rs7518129	1	173194429	<i>TNFSF4</i>	2 x 10 ⁻¹¹	1.111		0.8383	0.9665
rs1723018	1	167464183	<i>CD247</i>	8 x 10 ⁻⁶	-		0.8638	0.973
rs10208293	2	102349850	<i>IL18R1, IL1RL1</i>	4 x 10 ⁻³⁸	1.14		0.1205	0.816
rs13416555	2	8301605	<i>LINC00299</i>	2 x 10 ⁻¹³	1.13		0.5944	1.059
rs12634152	3	188403231	<i>LPP</i>	1 x 10 ⁻¹⁶	1.133		0.04631	1.211
rs2069763	4	122456327	<i>IL2</i>	2 x 10 ⁻¹⁴	1.126		0.01542	0.7885
rs5743618	4	38797027	<i>TLR1</i>	3 x 10 ⁻³²	1.249		0.5262	0.7676
rs1837253	5	111066174	<i>TSLP, AC010395.1</i>	2 x 10 ⁻²⁷	1.211		0.02711	1.246
rs10036789	5	72400091	<i>AC093278.1, YBX1P5</i>	5 x 10 ⁻⁸	1.085		0.8241	1.058
rs7705042	5	142112854	<i>NDFIPI</i>	4 x 10 ⁻⁷	-		0.8711	0.9841
rs2051809	5	132721182	<i>AC004039.1, KIF3A</i>	3 x 10 ⁻²²	1.175		0.9967	1.001
rs1117490	6	30202733	<i>TRIM26</i>	3 x 10 ⁻⁸	1.1		0.06117	1.298
rs28407950	6	32658571	<i>HLA-DQB1, HLA-DQA1</i>	1 x 10 ⁻⁵⁹	1.354		0.1236	0.7867
rs9272346	6	32636595	<i>HLA-DQA1</i>	4 x 10 ⁻³⁷	1.13		0.293	0.8534
rs2428494	6	31354420	<i>HLA-B</i>	8 x 10 ⁻²³	1.157		0.3005	1.104
rs9391997	6	409119	<i>IRF4</i>	7 x 10 ⁻¹¹	1.102		0.8132	1.025
rs6461503	7	20521373	<i>EEF1A1P27, ITGB8</i>	9 x 10 ⁻⁸	-		0.1138	0.84
rs917115	7	28132967	<i>JAZF1</i>	2 x 10 ⁻⁹	1.112		0.2294	0.6377
rs34880821	7	22735831	<i>IL6, MTCYBP42</i>	5 x 10 ⁻¹⁰	1.106		0.6082	0.8522
rs13277355	8	127765473	<i>MYC, PVT1</i>	2 x 10 ⁻¹⁰	1.11		0.3843	1.097
rs4739738	8	80379410	<i>AC034114.2</i>	3 x 10 ⁻¹³	1.117		0.6177	1.051
rs928413	9	6213387	<i>IL33, GTF3API</i>	2 x 10 ⁻⁴⁰	1.19	GCST007995	0.6755	1.074
rs992969	9	6209697	<i>GTF3API, IL33</i>	7 x 10 ⁻⁴²	1.248		0.7652	0.9353
rs1775554	10	9012377	<i>LINC00709, AC044784.1</i>	3 x 10 ⁻¹³	1.117		0.4688	0.8828
rs479844	11	65784486	<i>AP5B1, OVOL1</i>	1 x 10 ⁻¹¹	1.106		0.3612	0.8746
rs7936312	11	76582682	<i>AP001189.2, EMSY</i>	5 x 10 ⁻³³	1.194		0.6192	1.049
rs3122929	12	57115319	<i>STAT6</i>	7 x 10 ⁻¹⁷	1.134		0.003384	1.731
rs10774625	12	111472415	<i>ATXN2</i>	2 x 10 ⁻⁸	1.087		0.2998	0.4905
rs1696361	12	120926020	<i>RPL12P33, HNF1A-AS1</i>	1 x 10 ⁻¹¹	1.109		0.309	1.154
rs11178648	12	71139430	<i>TSPAN8</i>	4 x 10 ⁻⁸	1.087		0.3578	0.8579
rs705699	12	55991020	<i>RAB5B</i>	1 x 10 ⁻¹¹	1.106		0.4262	1.096
rs1887704	13	99322238	<i>UBAC2</i>	5 x 10 ⁻¹³	1.124		0.9117	0.9892
rs1950897	14	68293424	<i>RAD51B</i>	1 x 10 ⁻⁸	1.096		0.1062	1.258
rs11071559	15	60777789	<i>RORA</i>	3 x 10 ⁻¹⁵	1.205		0.4407	0.8376
rs56062135	15	67163292	<i>SMAD3</i>	3 x 10 ⁻²⁶	1.194		0.5572	0.8306
rs3785356	16	27337847	<i>IL4R</i>	6 x 10 ⁻¹³	1.122		0.648	1.075

rs35032408	16	11121567	<i>CLEC16A</i>	5 x 10-14	1.152		0.867	1.027
rs9901146	17	39887090	<i>GSDMB, ZPBP2</i>	8 x 10-99	1.18		3.10E-08	1.8456995
rs4795399	17	39905186	<i>GSDMB</i>	1 x 10-111	1.406		5.35E-08	1.8251506
rs28406364	17	49377145	<i>AC091180.5, AC091180.6</i>	1 x 10-11	1.108		0.02759	1.365
rs56308324	17	47741840	<i>TBX21</i>	3 x 10-9	1.132		0.9726	0.9938
rs4574025	18	62342581	<i>TNFRSF11A</i>	9 x 10-9	1.09		0.7023	1.038
rs10414065	19	33230549	<i>AC008738.6, SLC7A10</i>	6 x 10-9	1.207		0.4336	0.6862
rs1623866	20	63701670	<i>ARFRP1</i>	9 x 10-6	-		0.7261	1.047
rs10158467	1	173162354	<i>GOT2P2, AL022310.1</i>	8 x 10-29	1.093		0.626	1.093
rs1617333	1	167467033	<i>CD247</i>	3 x 10-22	1.075		0.6955	0.9396
rs3856439	2	8319274	<i>LINC00299</i>	6 x 10-28	1.087		0.1817	0.876
rs1861245	2	102350446	<i>IL18R1, IL1RL1</i>	2 x 10-69	1.15		0.2382	0.8498
rs78545931	2	102265892	<i>FAM183DP, IL1RL1</i>	9 x 10-59	1.398		0.4051	0.901
rs143326447	2	111511155	<i>3, MIR4435-2HG, AC017002.</i>	2 x 10-9	1.071		0.5463	0.5352
rs9860547	3	188411191	<i>LPP</i>	4 x 10-42	1.105		0.1202	1.167
rs7625643	3	141431184	<i>ZBTB38</i>	5 x 10-9	1.044		0.3936	1.114
rs11412402	3	128194004	<i>AL449214.1, EEFSEC</i>	4 x 10-14	1.057		0.4967	0.937
rs17454584	4	122432277	<i>IL2, ADAD1</i>	6 x 10-36	1.114		0.2497	1.193
rs2299012	5	132581248	<i>AC116366.3, RAD50</i>	1 x 10-49	1.141		0.2165	1.161
rs7734635	5	110823145	<i>AC008782.1, SLC25A46</i>	2 x 10-30	1.116		0.2795	1.234
rs3749833	5	132463934	<i>IRF1-AS1, AC116366.3</i>	1 x 10-19	1.077		0.6732	1.043
rs449454	5	142153497	<i>NDFIP1</i>	2 x 10-22	1.076		0.7833	0.966
rs6594499	5	111134439	<i>WDR36, AC010468.2</i>	4 x 10-66	1.134		0.8335	1.021
rs114444221	6	31335547	<i>HLA-B</i>	9 x 10-18	1.133		0.3535	0.6449
rs3116989	6	33131761	<i>HLA-DPA3</i>	3 x 10-17	1.096		0.4307	1.244
rs28522747	6	35166952	<i>SCUBE3, TCP11</i>	1 x 10-7	1.06		0.6173	1.057
rs62408233	6	90266890	<i>BACH2</i>	3 x 10-38	1.103		0.8471	0.9529
rs111789468	6	33066047	<i>HLA-DPA1</i>	2 x 10-13	1.092	GCST007800	0.8765	1.024
rs12531500	7	20504586	<i>EEF1A1P27, ITGB8</i>	7 x 10-22	1.073		0.02762	0.783
rs4722758	7	28116987	<i>JAZF1</i>	3 x 10-28	1.103		0.02802	0.7941
rs2221641	8	80382467	<i>AC034114.2</i>	2 x 10-30	1.088		0.5204	1.065
rs2450083	8	119051303	<i>COLEC10</i>	8 x 10-11	1.049		0.88	0.9755
rs340934	9	6081804	<i>GTF3AP1, AL162384.1</i>	3 x 10-62	1.167		0.3314	1.28
rs7848215	9	6213468	<i>IL33, GTF3AP1</i>	5 x 10-115	1.206		0.9218	1.018
rs2052690	11	10642486	<i>MRV11</i>	1 x 10-11	1.056		0.1016	5.059
rs188074962	12	120927628	<i>RPL12P33, HNF1A-AS1</i>	2 x 10-20	1.073		0.3196	1.151
rs1716183	12	123150549	<i>PITPNM2, MPHOSPH9</i>	4 x 10-11	1.067		0.3745	1.32
rs11065979	12	111621753	<i>BRAP, ATXN2-AS</i>	5 x 10-18	1.066		0.6527	0.7139
rs1885013	14	68287978	<i>RAD51B</i>	3 x 10-25	1.085		0.04527	1.321
rs71421264	14	102777733	<i>TRAF3</i>	3 x 10-11	1.05		0.7852	0.9679
rs72743461	15	67149412	<i>SMAD3</i>	6 x 10-63	1.152		0.586	0.8419
rs12935657	16	11125184	<i>CLEC16A</i>	1 x 10-49	1.133		0.9609	1.008
rs12952581	17	49370984	<i>AC091180.6</i>	4 x 10-24	1.078		0.03049	1.352
rs9893132	17	40598769	<i>AC004585.2, SMARCE1</i>	3 x 10-17	1.065		0.9784	1.003
rs1893380	18	51121270	<i>SMAD4, SRSF10P1</i>	4 x 10-13	1.055		0.5344	0.9433
rs2918302	19	8675909	<i>LINC01862</i>	5 x 10-10	1.064		0.1376	1.23
rs2766667	20	53555865	<i>AL157838.1</i>	1 x 10-7	1.046		0.502	1.091
rs4679858	3	159428036	<i>IQCJ-SCHIP1</i>	2 x 10-7	1.48	GCST007508	0.3168	1.117
rs439399	5	31696629	<i>PDZD2</i>	4 x 10-7	1.52		0.1742	0.8458
rs4988958	2	102351825	<i>IL1RL1, IL18R1</i>	5 x 10-13	1.1764705		0.1289	0.8197
rs1295685	5	132660753	<i>IL13, TH2LCRR</i>	2 x 10-9	1.1627907		0.3082	1.143
rs2596464	6	31445184	<i>LINC01149, AL645933.5</i>	1 x 10-8	1.12	GCST005213	0.05972	1.19
rs12551256	9	6231239	<i>IL33</i>	3 x 10-8	1.1235955		0.3652	0.9161
rs8069176	17	39900944	<i>ZPBP2, GSDMB</i>	4 x 10-26	1.25		5.99E-08	1.8208303
rs660498	10	27452030	<i>PTCHD3, RAB18</i>	2 x 10-7	1.62	GCST003482	0.9599	1.018

rs12081541	1	152468890	<i>LCE5A, FLG-AS1</i>	9 x 10-11	1.61		0.0001524	0.5867
rs17690965	5	132694975	<i>AC004039.1, KIF3A</i>	5 x 10-8	1.24		0.7619	0.9574
rs9357733	6	52427338	<i>EFHC1</i>	2 x 10-8	1.27	GCST003180	0.6116	1.055
rs2155219	11	76588150	<i>EMSY, AP001189.2</i>	2 x 10-15	1.33		0.4954	1.067
rs10445308	17	39781794	<i>IKZF3</i>	5 x 10-8	1.22		3.11E-07	1.7190992
rs6871536	5	132634182	<i>AD50, AC116366.3, TH2LCR</i>	8 x 10-7	1.17		0.181	1.178
rs6967330	7	106018005	<i>CDHR3</i>	3 x 10-14	1.26	GCST002275	0.6716	1.128
rs2305480	17	39905943	<i>GSDMB</i>	6 x 10-23	1.32		0.007652	1.6123831
rs3894194	17	39965740	<i>GSDMA</i>	3 x 10-21	1.59		0.02804	1.3070187
rs17033506	3	35598334	<i>RNU6-243P, ARPP21</i>	4 x 10-7	-		0.0643	0.6968
rs2705520	3	112550440	<i>ATG3</i>	2 x 10-6	-		0.6921	1.184
rs17218161	4	58347679	<i>LINC02494, AC096725.1</i>	2 x 10-8	-	GCST002088	0.3673	0.7868
rs2473967	6	113158133	<i>AL049695.1, SOCS5P5</i>	2 x 10-6	-		0.2535	0.8551
rs9297216	8	34187743	<i>AC087855.2</i>	1 x 10-6	-		0.3787	0.9192
rs12570188	10	99095945	<i>HPSE2</i>	5 x 10-8	-		0.4831	1.144
rs4658627	1	244347874	<i>Clorf100, AL358177.1</i>	6 x 10-6	-		0.7768	1.06
rs9815663	3	3573203	<i>AC034195.1</i>	2 x 10-8	-		0.8945	1.017
rs7927044	11	127891771	<i>AP001000.1, AP003532.1</i>	7 x 10-9	-	GCST001502	0.6899	1.05
rs7328278	13	35777629	<i>DCLK1</i>	3 x 10-6	-		0.8933	1.016
rs10521233	17	13655763	<i>COX10-AS1, HS3ST3A1</i>	3 x 10-6	-		0.7403	1.05
rs2378383	9	79424447	<i>CHCHD2P9, LNCARSR</i>	7 x 10-7	1.64	GCST000468	0.9644	0.9916

Legend to table:

“EFO_0004591”, the GWAS Catalog, and the date the summary statistics of childhood onset asthma GWAS were downloaded on 01/28/2021. Among 427 SNPs in EFO_0004591, 238 SNPs which available on our GWAS were displayed.

Supporting Methods

Study population

A discovery set of 1,881 Korean subjects was included in this GWAS to identify variants associated with childhood asthma. The discovery group included 741 children with both persistent asthma and allergic sensitization and the two control groups comprised 589 healthy children and 551 healthy adults, without a history of allergic disease or evidence of allergic sensitization (Table 1). All children were recruited from Severance Children's Hospital, Seoul, Korea, and the study was approved by the institutional review board (IRB) of Severance Hospital (Seoul, Korea; IRB no. 4-2004-0036). Adults without a history of allergic disease or evidence of allergic sensitization were selected as additional controls from the Ansung population-based cohort (N = 5,108), which was established as part of the Korean Genome and Epidemiology Study (KoGES) by the Korea Center for Disease Control and Prevention.¹ These additional controls were included to increase the power of the GWAS. All subjects were unrelated, and written informed consent was provided by them or their parents.

Genotyping, imputation, and quality control in the GWAS

The study subjects in the discovery group were genotyped using the Infinium® HumanCoreExome-24 BeadChip (Illumina Inc., San Diego, CA, USA) for 498 asthmatic and 481 control children (cohort 1) and Affymetrix Axiom array (Affymetrix Inc., Santa Clara, CA, USA) for 243 asthmatic and 108 control children (cohort 2) (Table 1). The adult controls were genotyped with the Affymetrix Genome-Wide Human SNP Array 5.0 (Affymetrix Inc., Santa Clara, CA, USA). In brief, genotypes on autosomal chromosomes were first pre-phased using HapMap phase II NCBI GRCh37/hg19 genetic maps with SHAPEIT2 (v.2.20).² Thereafter, genome-wide imputation was carried out for each platform using the 1000 Genomes Project

phase III as a cosmopolitan reference panel with IMPUTE2 (v.2.3.2).³ Single nucleotide polymorphisms (SNPs) were excluded during quality control filtering if they fulfilled one of the following criteria in both the discovery samples: 1) total call rate <95%; 2) minor allele frequency < 0.5%; and 3) Hardy–Weinberg equilibrium $P < 1.0 \times 10^{-6}$. Additionally, imputed variants for which the imputation information score (r^2_{info}) was < 0.9 were excluded using QCTOOL (v.1.4) and converted into PLINK format using GTOOL (v.0.7.5) (Figure S1).⁴ We also confirmed that allele frequencies of single nucleotide polymorphisms (SNPs) did not differ between control samples obtained from adults and children ($P > 0.001$). Finally, 4,559,629 SNPs were used for the GWAS analysis in the discovery groups. LD calculations were performed using the PLINK software, and the candidate loci, including variants significantly associated with childhood asthma were plotted using Haploview (v.4.2.).

Genotype cis-expression quantitative trait loci (cis-eQTL) analysis for rs7856856 in human tissues

In subsequent analyses, we evaluated the genotype-specific expression (GSE) of rs7856856 in six human tissues via cis-eQTL analysis through the Genotype-Tissue Expression (GTEx, release v8 and human genome build 37) portal (<https://gtexportal.org/home/>).⁵ Violin plots of the GSE were constructed to visualize normalized gene expressions among three variant genotypes (TT, TC, and CC; T and C alleles indicate the reference and alternative allele types, respectively). The Genotype-Tissue Expression (GTEx) Project was supported by the Common Fund of the Office of the Director of the National Institutes of Health, and by NCI, NHGRI, NHLBI, NIDA, NIMH, and NINDS. The data used for the analyses described in this manuscript were obtained from [rs7856856, Multi-tissue eQTL Plot and eQTL violin plot] the GTEx Portal on August 10, 2020.

Enzyme-Linked Immunosorbent Assay (ELISA)

For those whose serum sample was available in childhood cohort 1 and childhood cohort 2, the levels of TNFSF15 were determined using an ELISA kit (cat# DY1319-05, R&D Systems, Minneapolis, USA). Briefly, serum samples or standards were added to a 96-well coated with the capture antibody and incubated for 2 h at room temperature. Thereafter, the detection antibody, streptavidin-HRP, and substrate were added sequentially and incubated for 20 minutes. Optical density was measured at 455 nm using microplate reader. Each sample was measured twice.

Single cell RNA seq data

In subsequent analyses, we evaluated the expression of *TNFSF15* in lung airway stromal cells by utilizing public single cell RNA seq data (PanglaoDB: a web server for exploration of mouse and human single-cell RNA sequencing data, Database, Volume 2019, 2019, baz046, <https://doi.org/10.1093/database/baz046>). The datasets for proximal airway stromal cells were obtained from the study GSM2894835 (adult human lung proximal airway stromal cells) and the datasets for distal airway stromal cells were obtained from the study GSM2894834 (adult human lung distal alveolar stromal cells) on 01/28/2021.

Supporting References

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