Pathway discovery using transcriptomic profiles in adult-onset severe asthma

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Abstract

Rationale: Adult-onset severe asthma is characterized by highly symptomatic disease despite high intensity asthma treatments. Understanding of the underlying pathways of this heterogeneous disease needed for the development of targeted treatments. Gene Set Variation Analysis (GSVA) is a statistical technique to identify gene profiles in heterogeneous samples.

Objective: To identify gene profiles associated with adult-onset severe asthma.

Methods: This was a cross-sectional, observational study in which adult patients with adult-onset of asthma (defined as starting at ≥18yrs old) as compared to childhood-onset severe asthma (<18 yrs) were selected from the U-BIOPRED cohort. Gene expression was assessed on the total RNA of induced sputum (n=83), nasal brushings (n=41), and endobronchial brushings (n=65) and biopsies (n=47) (Affymetrix HT HG-U133+ PM). GSVA was used to identify differentially enriched pre-defined gene signatures of leukocyte lineage, inflammatory and induced lung injury pathways.

Results: Significant differentially enriched gene signatures in patients with adult-onset as compared to childhood-onset severe asthma were identified in nasal brushings (5 signatures), sputum (3 signatures) and endobronchial brushings (6 signatures). Signatures associated with eosinophilic airway inflammation, mast cells and group 3 innate lymphoid cells (ILC3) were more enriched in adult-onset severe asthma, whereas signatures associated with induced lung injury were less enriched in adult-onset severe asthma.

Conclusions: Adult-onset severe asthma is characterized by inflammatory pathways involving eosinophils, mast cells and ILC3s. These pathways could represent useful targets for the treatment of adult-onset severe asthma.

Key Messages (2-3)

- Expression of gene signatures is significantly different in adult-onset severe asthma as compared to childhood-onset severe asthma, indicating distinct underlying mechanisms.
- Gene profiles identified in adult-onset severe asthma include those associated with eosinophilia, mast cells and group 3 innate lymphoid cells (ILC3).

Capsule Summary (MAX 35 words) NOW 35

This study elucidates distinct gene profiles in adult-onset severe asthma compared to childhood-onset severe asthma. Identified gene profiles include those associated with eosinophils, ILC3s and mast cells, and may represent targets for new treatments.

Keywords: (MAX 10) NOW 10

Adult-onset asthma, severe asthma, Gene Set Variation Analysis, Phenotyping, Transcriptomics, Mechanisms, Eosinophils, Mast Cells, ILC3

Abbreviations

GSVA	Gene Set Variation Analysis
ILC3	Group 3 Innate Lymphoid Cells
T_H2	T-Helper 2 cells
OCS	Oral corticosteroids
SOPs	Standard Operating Procedures
FEV_1	Forced Expiratory Volume in one second
BMI	Body Mass Index
ACQ	Asthma Control Questionnaire
AQLQ	Asthma Quality of Life Questionnaire
GLM	Generalized Linear Model
IQR	Interquartile Range

ES	Enrichment Score
dES	difference in Enrichment Scores
GM-CSF	Granulocyte Macrophage Colony Stimulating Factor

Introduction

Severe asthma, affecting 3.6% of asthma patients,[1] is a heterogeneous disease that remains uncontrolled despite treatment with high dose systemic corticosteroids, or the need of oral steroids or biologicals to achieve disease control.[2] This group accounts for a disproportional part of the economic and health burden of asthma emphasizing the need for the development of novel treatments.[3] A better insight in the underlying mechanisms of severe asthma and its phenotypes is therefore needed.[4]

Age of onset of asthma has been recognized as an important determinant of severe asthma phenotypes with the delineation of childhood-onset versus an adult-onset phenotype.[5] Using cluster analysis of clinically-available disease markers in mild to severe asthma populations has led to conflicting observations, with adult-onset asthma being either predominantly characterized by female gender and obesity, or by active airway inflammation, fixed airflow limitation and male gender.[6-8] In addition, patients with adult-onset severe asthma were not only found to be highly symptomatic, but were also more often non-atopic with the presence of eosinophilic airway inflammation or higher circulating neutrophil counts.[5, 9] Hence, adult-onset severe asthma could present with various bio-clinical phenotypes.[10] Contradictory underlying mechanisms have been suggested, including T-helper 2 cells-low inflammation (T_H2-low) on the one hand[11] and T_H2-high inflammation based on associations with specific IgE in a subgroup of adult-onset severe asthma patients on the other.[12] Therefore, it is likely that multiple mechanistic pathways are involved in adult-onset severe asthma.

We have examined the gene networks underlying adult-onset severe asthma in order to obtain molecular phenotypes. This approach would be useful to elucidate the relevant biological pathways that may be causing late-onset asthma. In heterogeneous samples such as adult-onset severe asthma, conventional single gene expression comparison between groups may not capture subtle variations in (composite) underlying pathways. We used Gene Set Variation Analyses (GSVA), which

113 is a statistical technique that enables the discovery of inflammatory and leukocyte lineage gene
114 signatures by comparing combined enrichment scores of established and predefined gene sets,
115 especially in heterogeneous samples.[13]

116 We hypothesized that adult-onset severe asthma represents a complex phenotype, associated with
117 specific airway transcriptomic profiles defined by GSVA. We aimed to discover and describe these
118 profiles by studying the transcriptomic data obtained from nasal brushings, sputum and bronchial
119 brushings and biopsies collected in the adult severe asthma population of the multicenter pan-
120 European U-BIOPRED cohort.[14]

121

Methods:

Design and subjects

Details on the selection of patients and data collection have been published previously.[14] In short, this was a cross-sectional, observational study using the baseline visits of the U-BIOPRED cohort from 16 clinical centers in 11 countries across Europe. 421 Adult patients (≥18 years) with severe asthma were included according to the IMI consensus statement.[15] This comprised a confirmed diagnosis of asthma and either uncontrolled disease despite treatment with high dose inhalation medication (≥1000µg Fluticasone eq.) and a second controller, or the need of systemic oral corticosteroids (OCS) or omalizumab to achieve asthma control, regardless of smoking history. The U-BIOPRED study was registered at ClinicalTrials.gov (identifier: NCT01976767) and was approved by all Medical Ethics Boards. All patients provided written informed consent.

Data collection

All data and samples were collected according to predefined standard operating procedures (SOPs).[14] Clinical data, such as age, gender, body mass index (BMI), age of onset of the disease, oral corticosteroid usage and smoking history were collected by history taking. Control of the disease was assessed with the Asthma Control Questionnaire (ACQ7)[16] and quality of life with the Asthma Quality of Life questionnaire (AQLQ).[17] Lung function was measured pre- and post-bronchodilator according to standardized procedures.[18] Atopy was defined as the presence of sensitisation to one or more common aero-allergens, identified either by a positive skin prick test (wheal diameter ≥3 mm) to an allergen extract or positive testing by analysis of allergen-specific IgE in serum (≥0.35 kU/L). Eosinophil and neutrophil counts were assessed in blood and induced sputum according to ERS recommendations.[19]

Adult-onset asthma

Patients were qualified as adult-onset severe asthma patients when they had their first diagnosis of asthma or onset of symptoms when they were 18 years or older, whereas childhood-onset severe asthma was defined as first symptoms on <18 years of age.[5]

RNA Sampling

For details on sampling of the nasal brushings, sputum induction and bronchial brushings and biopsies see online repository.

Microarray analyses of mRNA

Gene expression was assessed on the total RNA from all available samples from nasal brushings (n=41), sputum (n=83), bronchial brushings (n=65) or bronchial biopsies (n=47) in U-BIOPRED severe asthma cohort. There was incomplete overlap between the various samples per patient (Fig. 1). The Affymetrix HT HG-U133+ PM microarray platform (Affymetrix, Santa Clara, Ca) was used for analysis. Pre-processing and quality control were performed with multi-array average normalization (Almac, Craiganvond, United Kingdom). Subsequently, acquired CEL files were normalized, quality control was applied to exclude technical outliers (chip image analysis, Affymetrix GeneChip QC, RNA degradation analysis, distribution analysis, principal components analysis, and correlation analysis), and re-normalized using the robust multi-array (RMA) method. Technical batch effects (e.g., from microarray hybridization date/lot, RNA processing batch) were adjusted in the data matrices using linear modeling of batch (as random factor).

Statistical analyses

Group comparison of clinical variables

Normally distributed variables were summarized by mean ± standard deviation, skewed variables by median (interquartile range) and categorical variables were summarized by their frequencies and

proportions. Group comparisons were done with independent t-tests, Mann-Whitney U tests and Chi square test, as appropriate. Variables with a $P<0.05$ were considered significantly different.

Gene Set Variation Analysis (GSVA)

Gene set variation analysis is a statistical technique for the exploration of the variation of underlying mechanisms between groups.[13] A priori, 105 sets of genes were selected, based on all available gene expression publications and data on airways disease obtained from *in vivo* and *in vitro* human sample studies and *in vitro* murine models. These included gene sets associated with the presence of asthma, leukocytes and those associated with induced lung injury. The latter contained sets of genes that were identified after admission of poly(I:C) (an analogue of the double stranded RNA that is produced by respiratory viruses during infection and therefore can be used as a model for exacerbations) and bleomycin (used in murine models in research of the course of lung fibrosis).[20] (Table E-VI)

Enrichment scores and false discovery

Enrichment scores (ES) were calculated for each of these gene sets, based on the expression of each of the genes within these sets, for each patient. Subsequently, mean ES were calculated for each group (i.e. adult-onset severe asthma and childhood-onset severe asthma). Generalized linear models (GLM), including correction for smoking status and corticosteroid usage, were used to compare ES between the groups, with the estimate ranging from -1 to 1. In order to restrain false discovery, standard criteria were used by only considering gene signatures with differences of ≥0.2 ES (dES) between the groups and $P<0.05$ significantly differentially expressed and meaningful. This procedure follows the Microarray Consortium for Quality Control (MACQC) recommendations for the importance of applying group-difference thresholds.[21]

Results

Of all 421 adult severe asthma patients in the U-BIOPRED cohort, 253 (60.1%) had adult-onset severe asthma and 158 (37.5%) had childhood-onset severe asthma. Data on age of onset was lacking in 10 (2.4%) patients and these were excluded in subsequent analysis. Adult-onset severe asthma patients had a mean age of 56.2 (± 11.1) years and the majority (59.3%) were female (Table I). Furthermore, patients with adult-onset severe asthma had a significantly higher number of pack years as compared to patients with childhood-onset and included significantly more ex- and current smokers. Finally, the adult-onset patients were less often atopic and had higher absolute eosinophil blood counts and higher eosinophil percentage in sputum (Table I).

As expected, and in line with the patient characteristics of the complete U-BIOPRED severe asthma cohort (Table I), adult-onset severe asthma patients in all 4 compartment subsets were significantly older than patients with childhood onset. In addition, eosinophil percentage in sputum was significantly higher in all subsets of patients with severe adult-onset asthma. Blood eosinophil count was only significantly higher in the subset of patients from whom sputum was collected, whilst it tended to be higher in the subsets of patients from whom bronchial biopsies were collected (Table II, Tables E-I to E-IV).

Significant different gene signatures

In nasal brushings 5 significant different gene signatures were identified, in sputum 3 and in endobronchial brushings 6 (Table III, Fig. E1).

Asthma gene signatures

In nasal brushings a gene signature was identified that consists of genes that are down-regulated following fluticasone treatment in asthma (Table E-V, signature #12).[25] This signature had a significant higher enrichment score (ES) in patients with adult-onset versus childhood-onset severe asthma (dES=0.30; $P<0.01$)(Table III, Fig. 2), indicating a different response to treatment with ICS. In

addition, in bronchial brushings three different gene signatures that are associated with the presence of asthma were significantly differentially enriched in patients with adult-onset compared to childhood-onset severe asthma (Table III, Fig. 4). First, a gene signature that is up-regulated in association with asthma (Table E-V, signature #9)[22] was more enriched in adult-onset severe asthma (dES=0.23; *P*=0.02). Second, a corresponding set of genes that is down-regulated in association with asthma (Table E-V, signature #10)[22] was suppressed in adult-onset asthma (dES=-0.21; *P*=0.03), and, third, a gene signature associated with the presence of house dust mite induced asthma (Table E-V, signature #8)[23] was also more enriched in adult-onset severe asthma (dES=0.21; *P*=0.01). These data help validate the GSVA approach undertaken here.

Leukocyte gene signatures

Gene signatures associated with the presence or absence of leukocyte subtypes were differentially enriched in nasal brushings, sputum and bronchial brushings in patients with adult-onset compared to childhood-onset severe asthma (Table III, Fig. 2-4). In bronchial brushings a gene signature associated with eosinophilia (Table E-V, signature #56)[24] was significantly more enriched (dES=0.30; *P*<0.01) in adult-onset compared to childhood-onset asthma. In addition, a set of genes specific for mast cells (Table E-V, signature #52)[24], was more enriched both in sputum (dES=0.33; *P*=0.01) and endobronchial brushings (dES=0.27; *P*=0.02) of adult-onset severe asthma patients (Table III, Fig. 3-4,). However, a wide scatter of enrichment scores of this mast cell gene signature was observed amongst patients with adult-onset severe asthma especially in sputum (Fig. 3). Furthermore, two gene signatures associated with the activation cascade of macrophages were differentially enriched in adult-onset asthma: first, a set of up-regulated genes in macrophages stimulated with GM-CSF and IFN-γ (Table E-V, signature #87)[25], which corresponded to M1-like macrophages was less enriched in sputum of adult-onset severe asthma(dES=-0.20; *P*<0.01), whereas a signature of down-regulated genes in GM-CSF differentiated monocyte derived macrophages (Table E-V, signature #98)[25] was more enriched in nasal brushings (dES=0.20; *P*=0.01) of patients with adult-onset severe asthma,

239 suggesting lower levels of macrophage activation. Finally, the gene signature associated with the
240 presence of group 3 innate lymphoid cells (ILC3s) in a murine model (Table E-V, signature #104)[26] was
241 significantly more enriched in nasal brushings (dES=0.31; *P*<0.01). Notably, two gene signatures
242 associated with Type 2-high inflammation in asthma tended to be significantly more enriched in
243 bronchial brushings of patients with adult-onset severe asthma (i.e. Type 2-high inflammation in
244 asthma (dES=0.19; *P*<0.01)(Table E-V, signature #13)[27] and IL-13 inflammation (dES=0.18; *P*=0.02)
245 (Table E-V, #101) (Fig. 5).

246 Induced lung inflammation gene signatures

247 Finally, gene signatures consisting of a set of down-regulated genes identified in a murine model
248 after bleomycin-induced injury, were significantly more enriched in nasal brushings and bronchial
249 brushings of patients with adult-onset severe asthma (Table III, Table E-V signatures #10-12).[22]
250 Furthermore, a set of genes that is up-regulated in mice after administration of Poly(I:C) (Table E-V,
251 signature #13)[28] was found to be less enriched in the sputum of patients with adult-onset severe
252 asthma (dES=-0.21; *P*=0.01).

253

Discussion

This study shows that differentially enriched gene signatures can be identified in nasal brushings, sputum and endobronchial brushings in adult-onset severe asthma patients as compared to childhood-onset severe asthma patients. These gene signatures suggest that multiple underlying pathways play a role in adult-onset severe asthma. Identified gene networks are associated with well recognized inflammatory characterizations, such as eosinophilic airway inflammation, but also newly-recognized inflammatory pathways, such as ILC3 pathways. Furthermore, the remarkably polarized differentiation of the gene signature associated with mast cells suggests that these inflammatory cells may be an important cell that contributes to adult-onset severe asthma.

This study is the first to assess gene networks associated with adult-onset severe asthma. We have used GSVA, a technique that allows identification of gene signatures even in heterogeneous samples, with adjustments for major confounding factors such as smoking status and oral corticosteroid usage.[13] This approach has identified newly recognized as well as previously described pathways[5, 9, 29, 30] that distinguish adult-onset severe asthma from childhood-onset asthma. First, this included gene signatures in adult-onset severe asthma that are associated with eosinophilic airway inflammation. This corroborates with findings in patients with mild/moderate and severe asthma with onset during adulthood.[6, 9, 31] Second, ILC3 associated gene signatures were identified. Previous studies have shown that ILC3s may play a role in subsets of asthma, such as obesity associated asthma and neutrophilic asthma.[32] However, this is the first study to find an association between adult-onset (severe) asthma and ILC3. Third, our data are strongly pointing towards the presence of mast cells in a subset of patients with adult-onset severe asthma. A role for mast cells in asthma has been described before,[33-35] but, never before an association with adult-onset severe asthma in particular was shown.

The strengths of this study are the following. In the U-BIOPRED study processing and analysis of mRNA was performed centrally in order to provide optimal final data. By using a statistical technique

(GSVA) that allows detection of underlying mechanisms, especially in heterogeneous samples, we were able to identify gene networks associated with pathways that have not been described before. This technique enabled detection of pathways, such as mast cell involvement, that could not be detected by conventional cell count methods in sputum. On the other hand, gene signatures associated with leukocytes that can be detected by these conventional techniques, such as eosinophils, were identified by GSVA, validating this technique. In addition, potential selection bias in this analysis was limited by correcting for smoking status and steroid usage. On the other hand, no correction for cell counts (*e.g.* eosinophils) was applied, as this could result in under detection of actual pathways involved in adult-onset severe asthma.

Nevertheless the study also has particular limitations. The categorizing of patients as adult- versus childhood-onset asthma was based on questions in the eCRF, potentially including recall bias. This was inevitable in the present cross-sectional design. Moreover, even though we corrected for steroid usage, we cannot exclude differences in adherence to steroids between patients with adult- and childhood onset asthma. The MARS questionnaire (Medication Adherence Rating Scale) was obtained in all patients in this study, and did not differ between patients with adult-onset severe asthma and childhood-onset severe asthma ($p=0.79$). This may provide an indication that compliance was comparable between the groups, thereby not affecting the results. We have assessed gene signatures in different compartments from patients within the U-BIOPRED cohort which did not fully overlap (Fig. 2). This may have caused incomplete concordance of identified gene signatures between the sample types (Table III). However, the fact that some of the gene signatures were identified in multiple tissues strengthen our observations and the discovery of potentially underlying mechanisms. Furthermore, GSVA is a bio-informatics technique that uses predefined sets of genes derived from previously published studies to form gene signatures. Obviously, these studies have had inevitable flaws in their experiments, which could not be taken into account in the present analysis. In addition, some of the gene signatures were derived from murine model studies, which can only be extrapolated very cautiously to human severe asthma. However, by *a priori* allowing all available

gene signatures in the analysis, including those derived from murine models, potential identification of previously unrecognized underlying pathways was purposely enabled by recommended selection criteria of significant and meaningful signatures. It needs to be emphasized that murine models will certainly deviate from human disease and it remains to be established whether the murine signatures can be used to identify phenotypic differences in severe asthma. Different gene networks have been identified in the different airway compartments (*e.g.* nasal brush and bronchial brush), implying variable disease mechanisms within patients with adult-onset severe asthma. However, the lack of complete overlap between samples makes it impossible to reject the hypothesis of "united airways" in this disease.[36] Finally, the present study population did not include an independent test set or split-half analysis for validation purposes. The sample size of the biological specimens did not allow this. However, we took stringent measures to restrain false discovery by following the standardized Microarray Consortium for Quality Control (MACQC) recommendations for the importance of applying group-difference thresholds for gaining best reproducible results.[21] This has resulted in a rejection of over 70% of the gene signatures with a p-value <0.05 due to a difference in enrichment scores (dES) <0.2, as shown in Figure E1.

Based on the nature of this discovery study, we can only speculate about the potential involvement of the identified pathways in adult-onset severe asthma. We have for the first time associated group 3 innate lymphoid cells (ILC3s) with adult-onset severe asthma. The meaning of this result remains to be established, because of the recently observed plasticity of innate lymphoid cells,[37] and, IL-17 (promoted by ILC3)[38] associated gene signatures were not identified to be significantly associated with adult-onset severe asthma. Our results, however, are strongly indicative of mast cell involvement in a subset of adult-onset severe asthma, which goes beyond a general role for mast cells in refractory asthma.[35] This may fit in with recent observations by Wang *et al*[39] who showed that mast cell phenotypes as measured by RNA expression profiles are associated with clinical expression of the disease. Elucidating the role of mast cells in adult-onset severe asthma could result in novel targets for subgroups of this difficult-to-treat disease. Notably, both eosinophils and mast cells are

331 characterized by IL-33 receptors,[40, 41] which have been associated with asthma and progression of the
332 disease.[42] This generates the hypothesis of IL-33 pathways to be involved in adult-onset severe
333 asthma in particular.

334 We did not identify induced lung-injury and/or fibrosis associated gene signatures in adult-onset but
335 rather in childhood-onset severe asthma. It has been hypothesized that the epithelial vulnerability
336 and impaired injury repair are important drivers in the onset and course of asthma.[43] Low
337 enrichment of these gene signatures, which we identified in adult-onset severe asthma, may result in
338 impaired injury and repair, which could lead to increased airway inflammation and remodeling. This
339 would corroborate with recent findings of a clinical study in severe asthma in which eosinophilic
340 inflammation and remodeling were associated with late-onset disease.[44] Finally, no significantly
341 differentially enriched gene signatures were identified in bronchial biopsies. This may seem
342 unexpected, but could be underlined by the heterogeneity of cell types within the bronchial biopsies
343 precluding detection of gene expression profiles, in contrast to the more homogeneous samples
344 from the nasal and bronchial brushings and sputum.

345 What is the clinical relevance of our data? Unraveling the underlying mechanisms of severe asthma
346 and its subtypes is needed to improve treatment of severe asthma.[45] This particularly holds for adult-
347 onset severe asthma, which often does not respond to regular treatment options such as steroids.
348 Targeted treatments are becoming available for blocking IL-4, IL-5[46] and IL-13 of the T2 pathways.[4, 47]
349 Our results of this explorative study are suggestive that other pathways could be examined for
350 targeted treatment in patients with adult-onset severe asthma, including mast cells in a subset of
351 these patients, ILC3 and IL-33.

352 In conclusion, adult-onset severe asthma not only represents a clinically heterogeneous phenotype,
353 but also is associated with multiple gene expression profiles that are indicate complex underlying
354 pathways involving eosinophils, ILC3s and mast cells. These point towards possible new targets that
355 could represent targeted treatments for subgroups of adult-onset severe asthma.

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Figure Legends:

Figure 1: Venn diagram indicating overlap of patients of which samples have been collected.

Figure 2: Gene signatures that have been identified to be differentially enriched in nasal brushings between patients with adult-onset severe asthma and childhood-onset severe asthma. Enrichment scores range from -1 to 1.

Figure 3: Gene signatures that have been identified to be differentially enriched in sputum between patients with adult-onset severe asthma and childhood-onset severe asthma. Enrichment scores range from -1 to 1.

Figure 4: Gene signatures that have been identified to be differentially enriched in endobronchial brushings between patients with adult-onset severe asthma and childhood-onset severe asthma. Enrichment scores range from -1 to 1.

Figure 5: Type 2 signatures in bronchial brushings that are significantly borderline enriched in adult-onset severe asthma as compared to childhood-onset severe asthma. Enrichment scores range from -1 to 1.

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Table I: Patient characteristics of patients with adult-onset severe asthma

	Onset <18 years	**Onset ≥18 years**	*P*-value
N	158	253	
Gender - Female ‡	107 (67.7%)	150 (59.3%)	0.09
Age *	44.7 ± 13.9	56.2 ± 11.1	**<0.01**
BMI (Kg/m^2) *	29.92 ± 6.6	28.65 ± 6.1	0.05
Age of onset †	5.0 (2.0 - 11.0)	38.0 (28.0 - 48.0)	**<0.01**
Smoking Status ‡			**<0.01**
Never smoker	118 (74.7%)	138 (54.5%)	
Ex-smoker	25 (15.8%)	88 (34.8%)	
Current smoker	15 (9.5%)	27 (10.7%)	
Pack years† *(in ex/current smokers)*	8.0 (1.7 - 17.8)	14.0 (5.0 - 22.5)	**0.03**
Oral corticosteroid dose† *(in OCS users)*	10.0 (7.9 - 20.0)	10.0 (7.5 - 15.0)	0.27
Atopy – Positive ‡	124 (78.5%)	146 (57.7%)	**<0.01**
ACQ 7*	2.9 ± 1.3	2.5 ± 1.2	**<0.01**
Post bronchodilator FEV1 % pred*	76.0 ± 23.3	75.5 ± 20.0	0.82
Blood Eosinophils† (x10^9/L)	0.20 (0.1 - 0.3)	0.27 (0.1 - 0.5)	**<0.01**
Blood Neutrophils* (x10^9/L)	5.76 ± 2.7	5.36 ± 2.3	0.11
Sputum Eosinophils % †	1.36 (0.2 - 4.8)	5.3 (1.2 - 24.4)	**<0.01**
Sputum Neutrophils %*	55.9 ± 26.1	51.8 ± 26.1	0.31

** Mean ± SD, † Median (interquartile range), ‡ Number (percentage)*

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Table II: Patient characteristics of patients with adult-onset and childhood-onset severe asthma according to site of mRNA collection

	Nasal Brushings		Sputum		Endobronchial Brushings		Endobronchial Biopsies	
	Onset <18 years	**Onset ≥18 years**	**Onset <18 years**	**Onset ≥18 years**	**Onset <18 years**	**Onset ≥18 years**	**Onset <18 years**	**Onset ≥18 years**
N	21	20	32	51	32	33	28	24
Gender - Female ‡	14 (66.7%)	8 (40.0%)	18 (56.2%)	31 (60.8%)	19 (59.4%)	13 (39.4%)	17 (60.7%)	11 (45.8%)
Age⁺	**43.5 ± 14.4***	**58.4 ± 7.7***	**47.16 ± 11.90***	**57.45 ± 10.09***	**43.3 ± 13.9***	**55.8 ± 7.6***	**44.6 ± 13.0***	**57.3 ± 7.0***
BMI (Kg/m^2)⁺	32.8 ± 7.1	30.7 ± 5.4	27.46 ± 5.56	28.80 ± 4.99	31.0 ± 6.6	29.4 ± 6.1	30.3 ± 6.7	28.6 ± 5.3
Age of onset †	**5.0 (2.0 - 9.0)***	**42.0 (34.5 - 49.3)***	**5.0 (3.0 - 10.3)***	**39.0 (27.0 - 50.0)***	**5.0 (2.0 - 9.0)***	**43.0 (32.0 - 49.0)***	**2.5 (2.0 - 6.0)***	**43.0 (36.5 - 48.5)***
Smoking Status ‡								
Never smoker	15 (71.4%)	10 (50.0%)	25 (78.1%)	22 (43.1%)	22 (68.8)	16 (48.5)	19 (67.9%)	14 (58.3%)
Ex-smokers	5 (23.8%)	8 (40.0%)	4 (12.5%)	24 (47.1%)	8 (25.0)	13 (39.4)	7 (25.0%)	5 (20.8%)
Current smokers	1 (4.8%)	2 (10.0%)	3 (9.4%)	5 (9.8%)	2 (6.2)	4 (12.1)	2 (7.1%)	5 (20.8%)
Pack years †	12.6 (3.6 - 20.4)	16.0 (5.5 - 38.8)	15.0 (8.5 - 22.4)	10.0 (2.3 - 17.0)	4.1 (1.6 - 20.4)	16.4 (5.5 - 33.0)	3.0 (1.5 - 20.5)	20.5 (16.1 - 30.8)
Atopy – Positive ‡	18 (82.1%)	12 (60.0%)	**29 (90.6%)***	**27 (52.9%)***	25 (78.1%)	21 (63.6%)	**23 (82.1%)***	**12 (50.0%)***
OCS dose †	20.0 (10.0 - 25.0)	10.0 (7.6 - 10.0)	10.0 (6.9 - 10.0)	10.0 (7.5 - 15.0)	10.0 (7.7 - 23.8)	10.0 (7.5 - 11.3)	10.0 (7.8 - 20.0)	10.0 (7.6 - 10.0)
ACQ 7*	2.07 ± 1.2	2.21 ± 1.0	2.9 ± 1.5	2.4 ± 1.2	2.3 (1.2)	2.4 (1.1)	2.3 ± 1.3	2.3 ± 1.1
$pbFEV_1$ % pred⁺	**90.5 ± 20.3***	**76.7 ± 21.9***	68.0 ± 24.3	72.1 ± 19.9	84.3 ± 19.4)	75.0 ± 20.8	79.4 ± 19.5	78.2 ± 20.0
Blood Eosinophils †	0.20 (0.10 - 0.22)	0.21 (0.10 - 0.46)	**0.20 (0.14 - 0.30)***	**0.37 (0.20 - 0.50)***	0.20 (0.10 - 0.30)	0.20 (0.14 - 0.30)	0.20 (0.10 - 0.30)	0.25 (0.18 - 0.45)
Blood Neutrophils⁺	5.4 ± 2.4	5.1 ± 1.9	5.46 ± 2.74	5.41 ± 2.20	5.15 ± 2.59	5.64 ± 2.42	5.32 ± 2.64	5.31 ± 2.34
Sputum Eosinophils % †	**0.49 (0.15 - 1.70)***	**8.52 (1.10 - 18.62)***	**2.32 (0.20 - 5.30)***	**7.93 (1.23 - 25.92)***	**0.58 (0.24 - 1.27)***	**12.42 (1.58 - 24.61)***	**0.71 (0.28 - 2.71)***	**8.01 (3.32 - 20.20)***
Sputum Neutrophils %⁺	55.3 ± 22.2	54.2 ± 18.9	65.1 ± 25.4	54.9 ± 25.6	52.1 ± 23.4	55.3 ± 22.3	54.5 ± 22.6	48.7 ± 22.8

** Significant different between groups within sample (p<0.05), for p-values see online repository; BMI: body mass index; OCS: oral corticosteroids; ACQ: asthma control questionnaire; $pbFEV_1$: Post-bronchodilator Forced Expiratory Volume in 1 second % predicted.*

⁺Mean ± SD, †Median (interquartile range), ‡ Number (percentage)

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Table III: Summary of identified significantly different enriched gene signatures in adult-onset severe asthma patients

	Gene signature asociated with:	Nasal brushings	Sputum	Bronchial brushings
Asthma gene signatures	Asthma - UP[2]			+0.23
	Asthma - DOWN[2]			***-0.21***
	Asthma (House dust mite rhesus induced model) - UP[2]			+0.21
	Fluticasone treatment in asthma - DOWN[2]	+0.30		
Leukocyte genesignatures	Macrophage / GM-CSF - DOWN[1]	+0.20		
	Macrophage / GM-CSF / IFNgamma - UP[1]		***-0.20***	
	Eosinophil - UP[2]			+0.30
	Mast cell - UP[2]		+0.33	+0.27
	ILC3 - UP[3]	+0.31		
Induced lung injury gene signatures	Bleomycin induced lung injury (day 14) - DOWN[3]	+0.24		
	Bleomycin induced lung injury (day 21) - DOWN[3]	+0.31		
	Bleomycin induced lung injury (day 28) - DOWN[3]			+0.20
	Poly(I:C) induced inflammation - UP[3]		***-0.21***	

Differences in mean gene signature enrichment scores (dES) between adult- and childhood-onset severe asthma and childhood-onset severe asthma are shown, (BOLD/ITALIC are lower in adult-onset severe asthma). Enrichment scores range from -1 to 1.

[1]In vitro model in human sample; [2]In vivo model in human sample; [3]In vivo model in murine model

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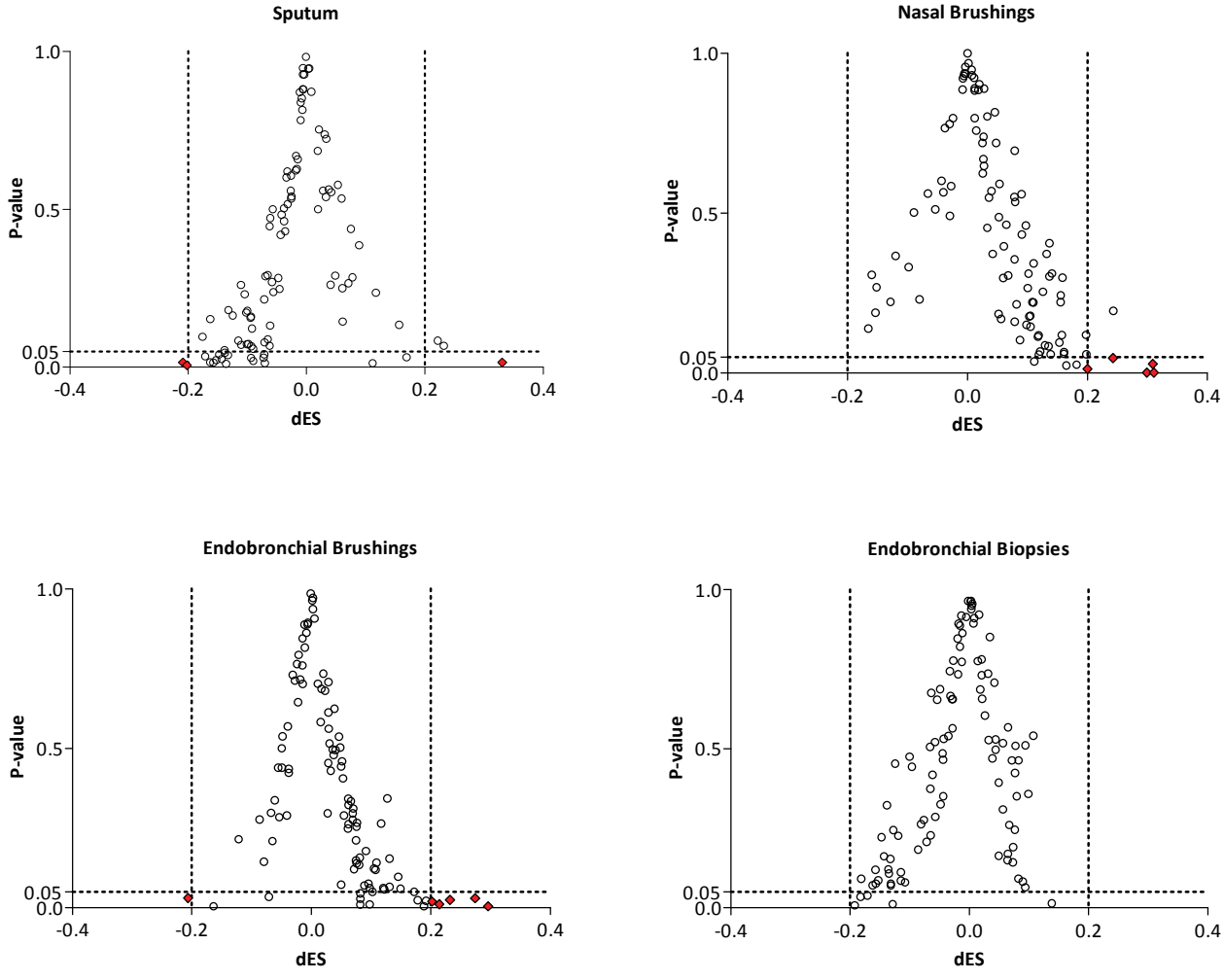
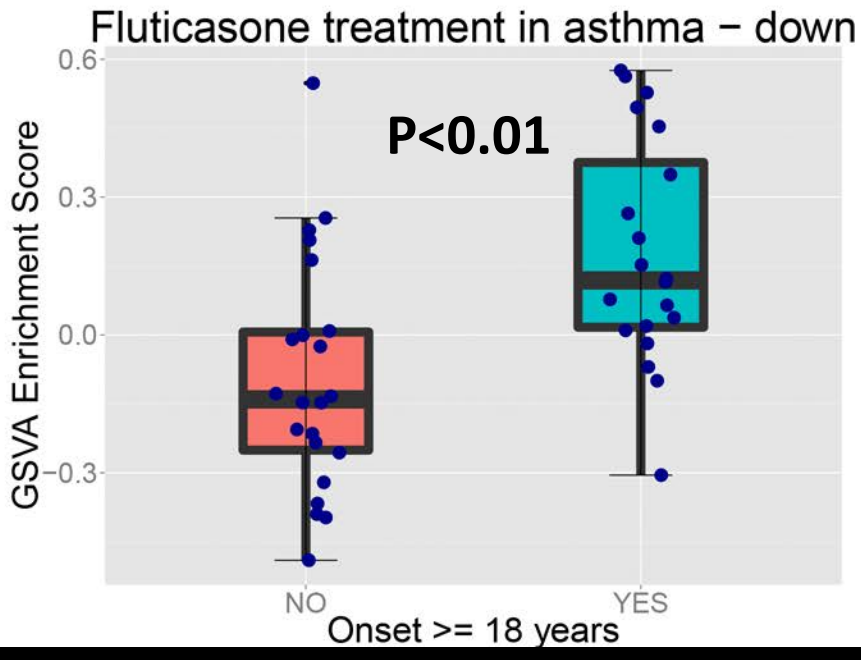
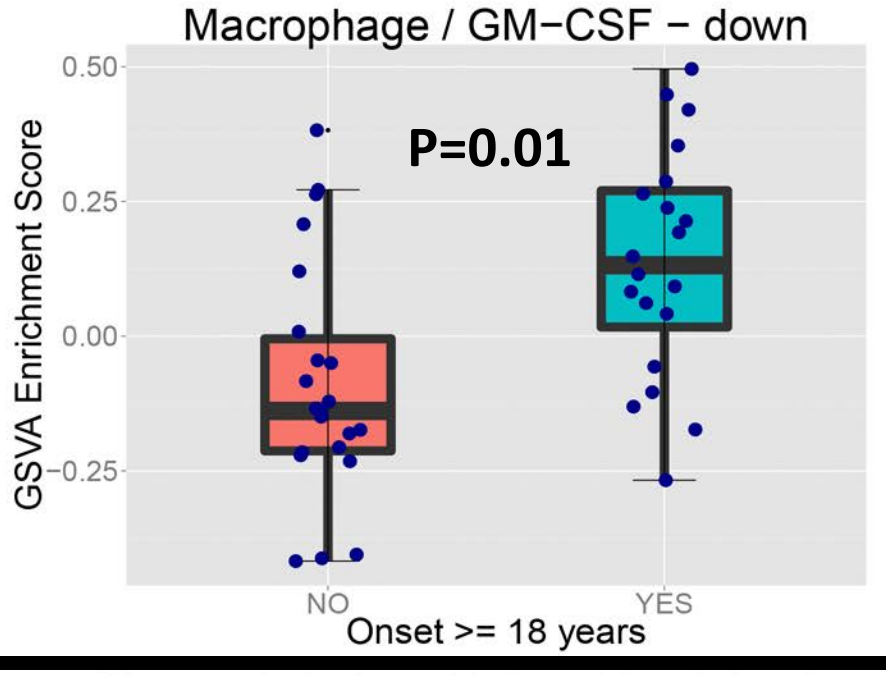

Sputum
Nasal Brushings
Endobronchial Brushings
Endobronchial Biopsies
P-value
dES
1.0
0.5
0.05
0.0
-0.4
-0.2
0.0
0.2
0.4
Non-significant Gene signatures
Significant Gene signatures

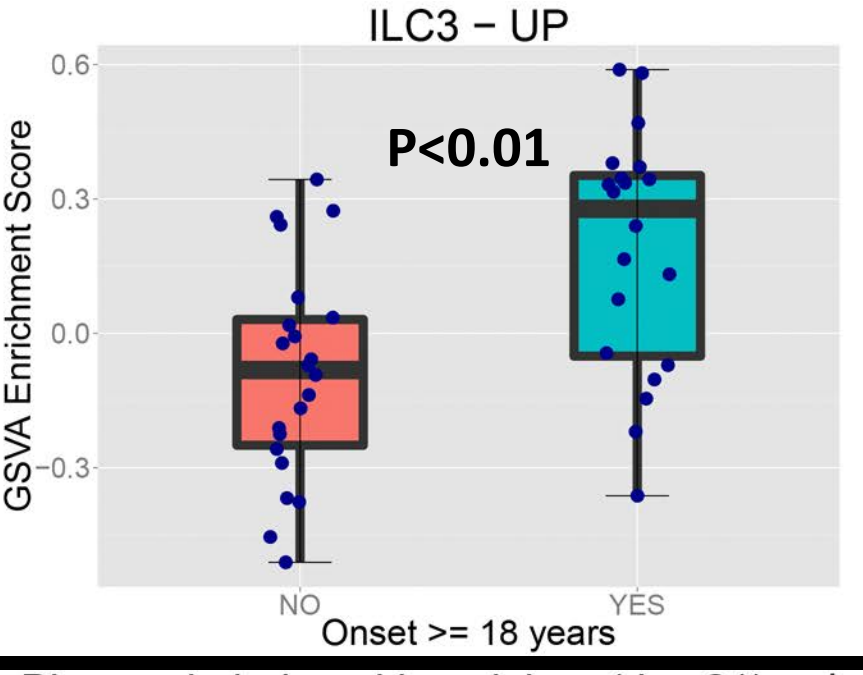
Figure 2: significant gene signatures in nasal brushings

Asthma Gene Signatures

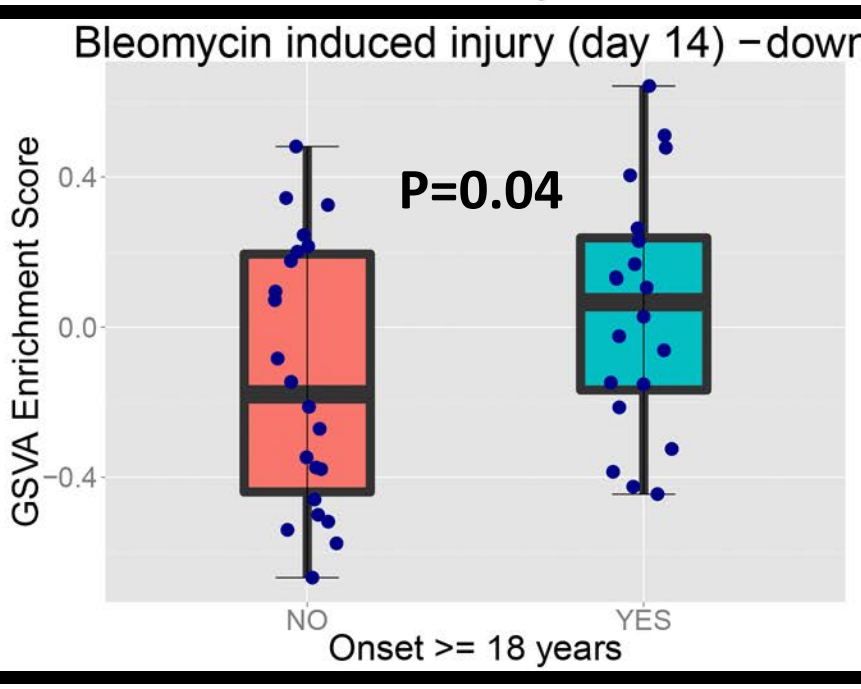


Leukocyte Gene Signatures





Induced Lung injury Gene Signatures



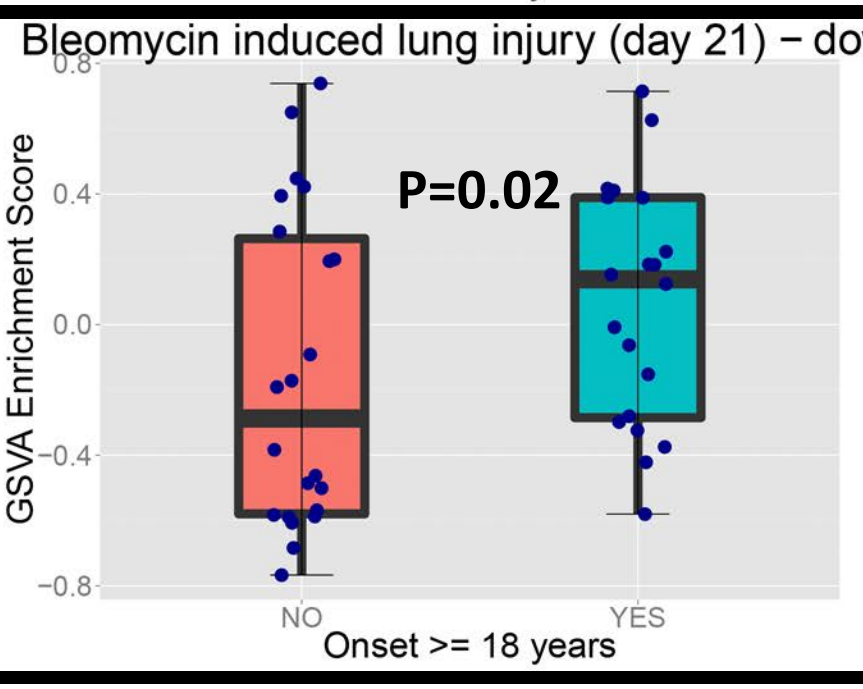
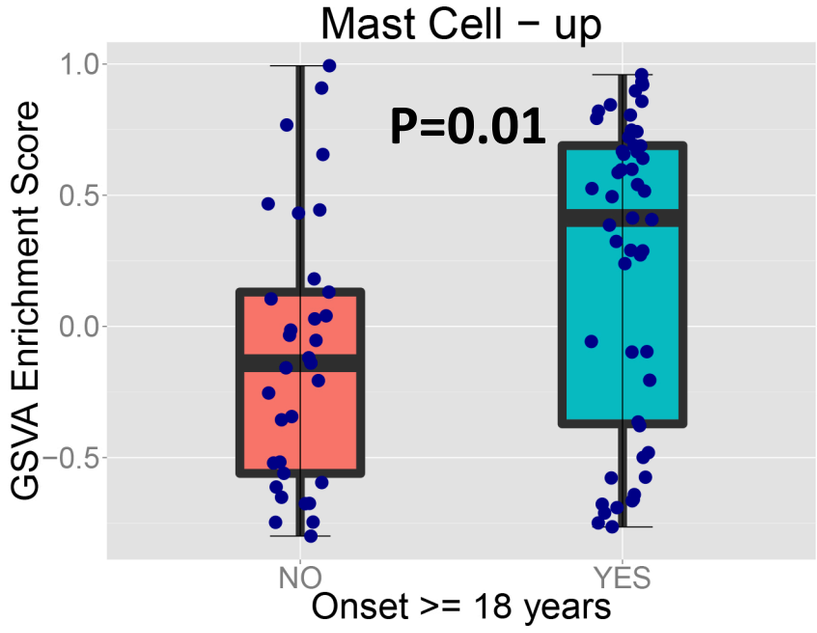
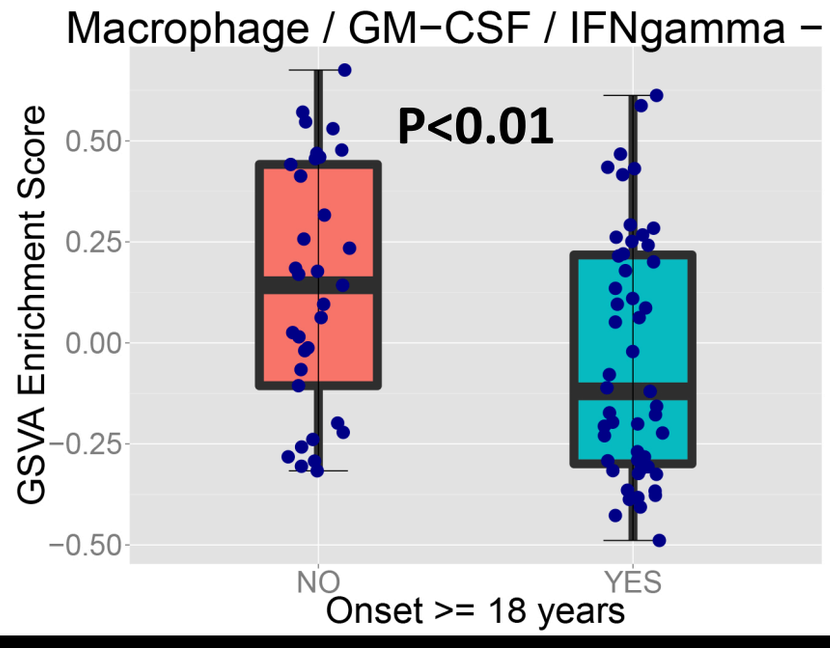


Figure 3: significant gene signatures in sputum

Leukocyte Gene Signatures





Induced Lung injury Gene Signatures

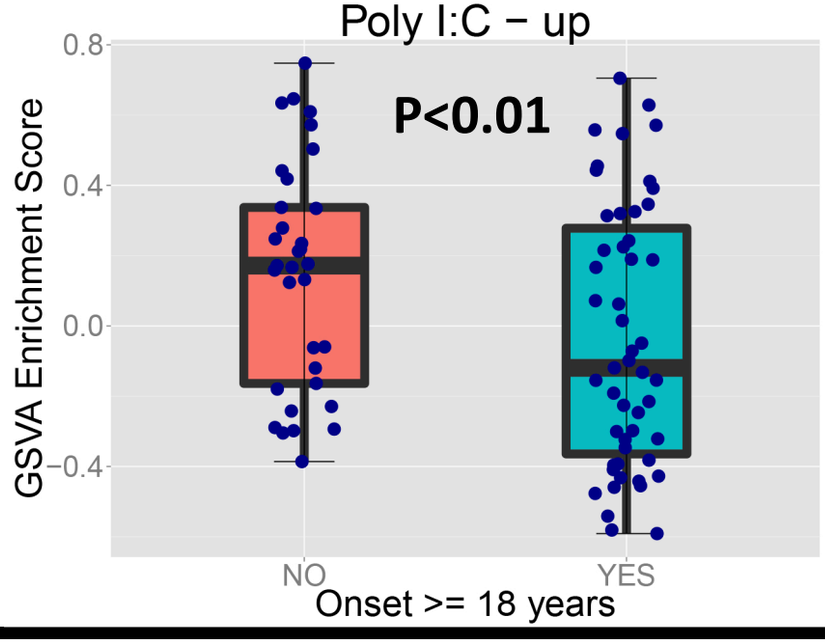
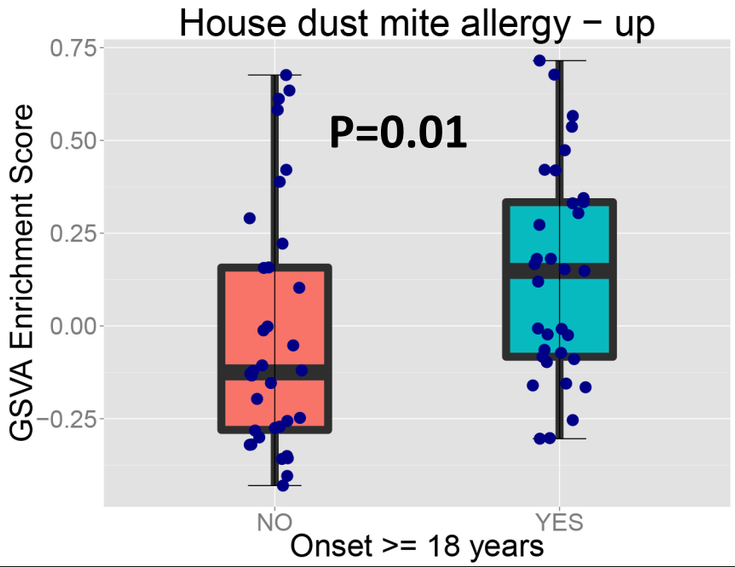
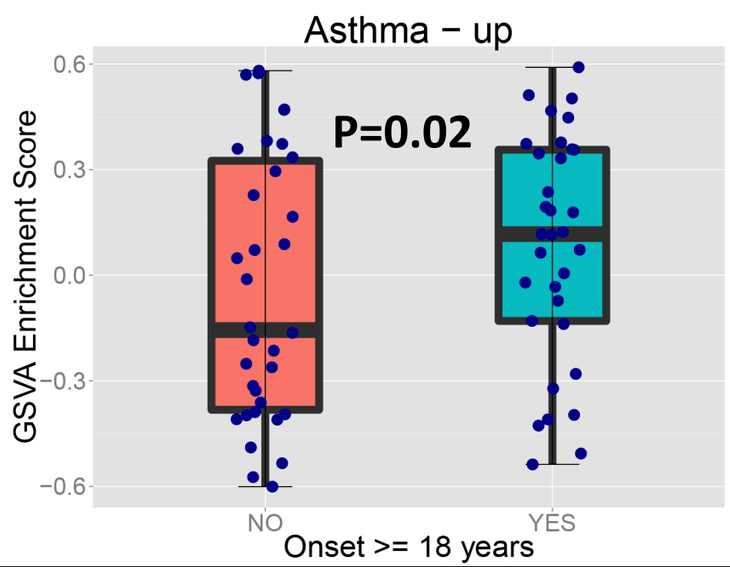
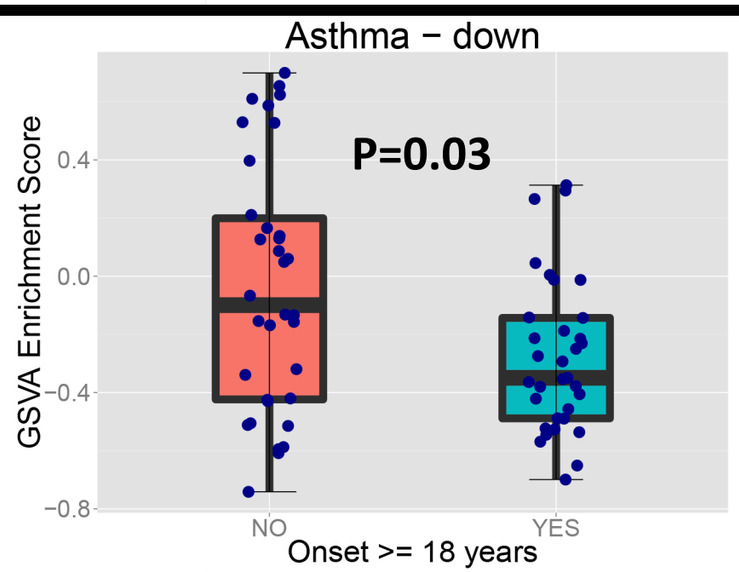


Figure 4: significant gene signatures in endobronchial brushings

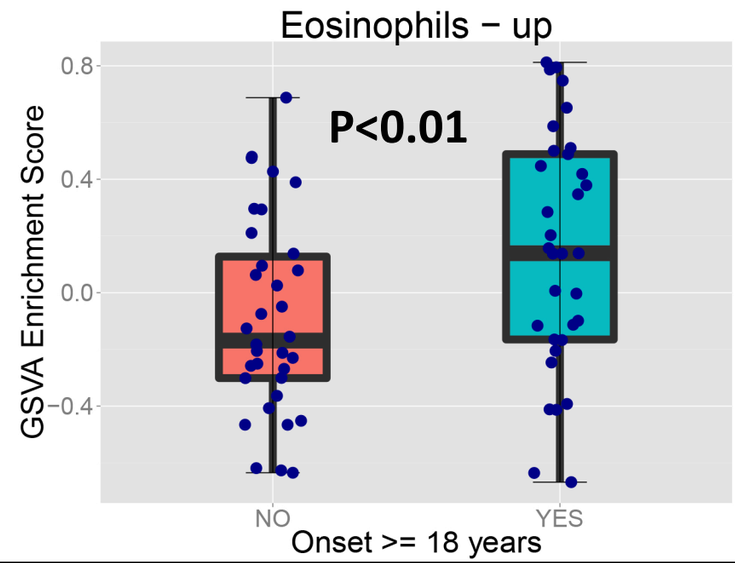
Asthma Gene Signatures

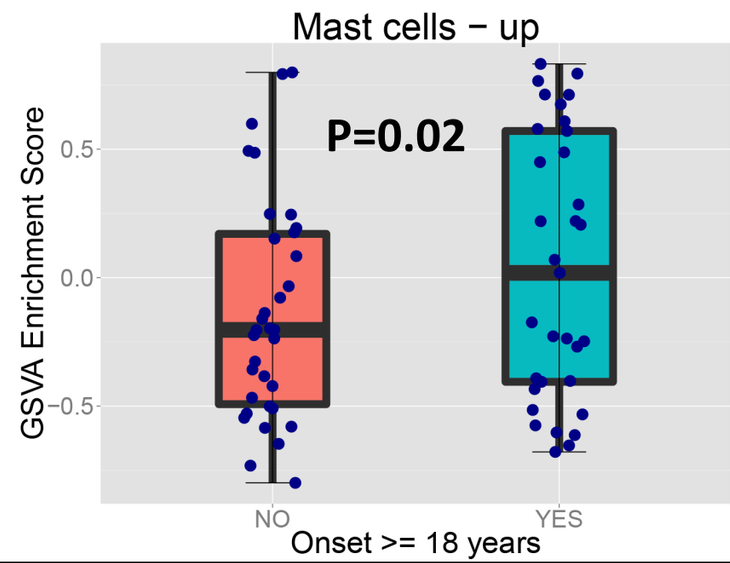






Leukocyte Gene Signatures





Induced Lung injury Gene Signatures

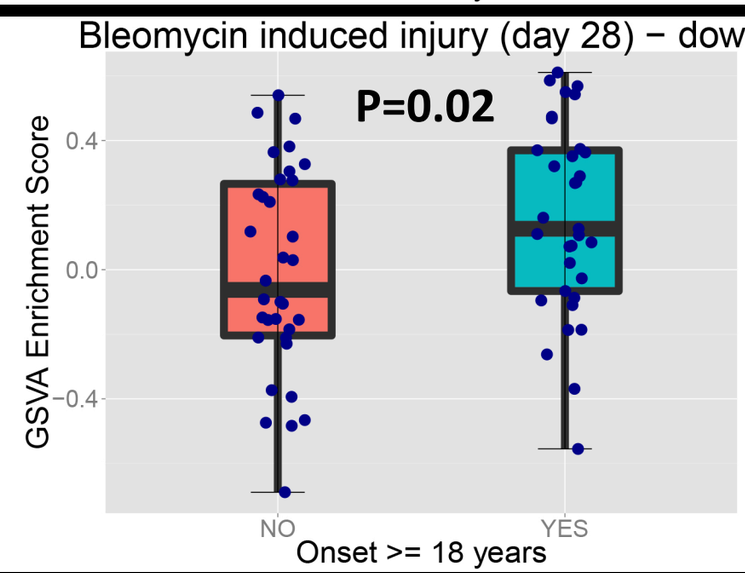
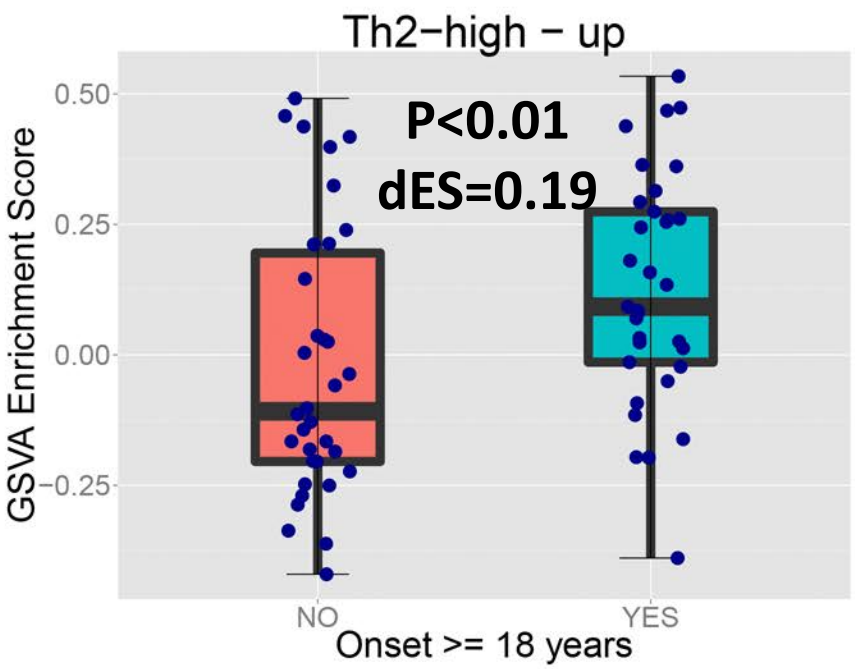
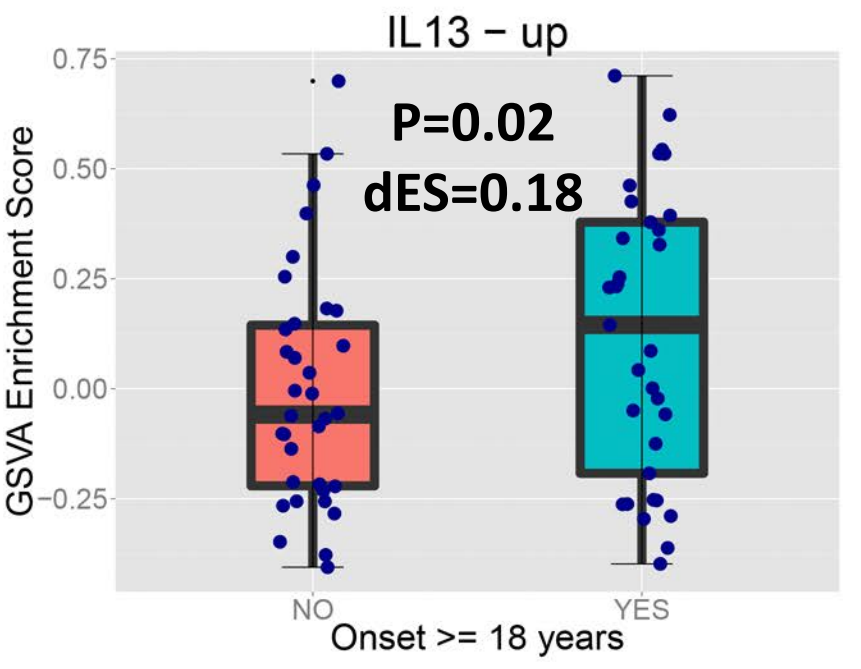
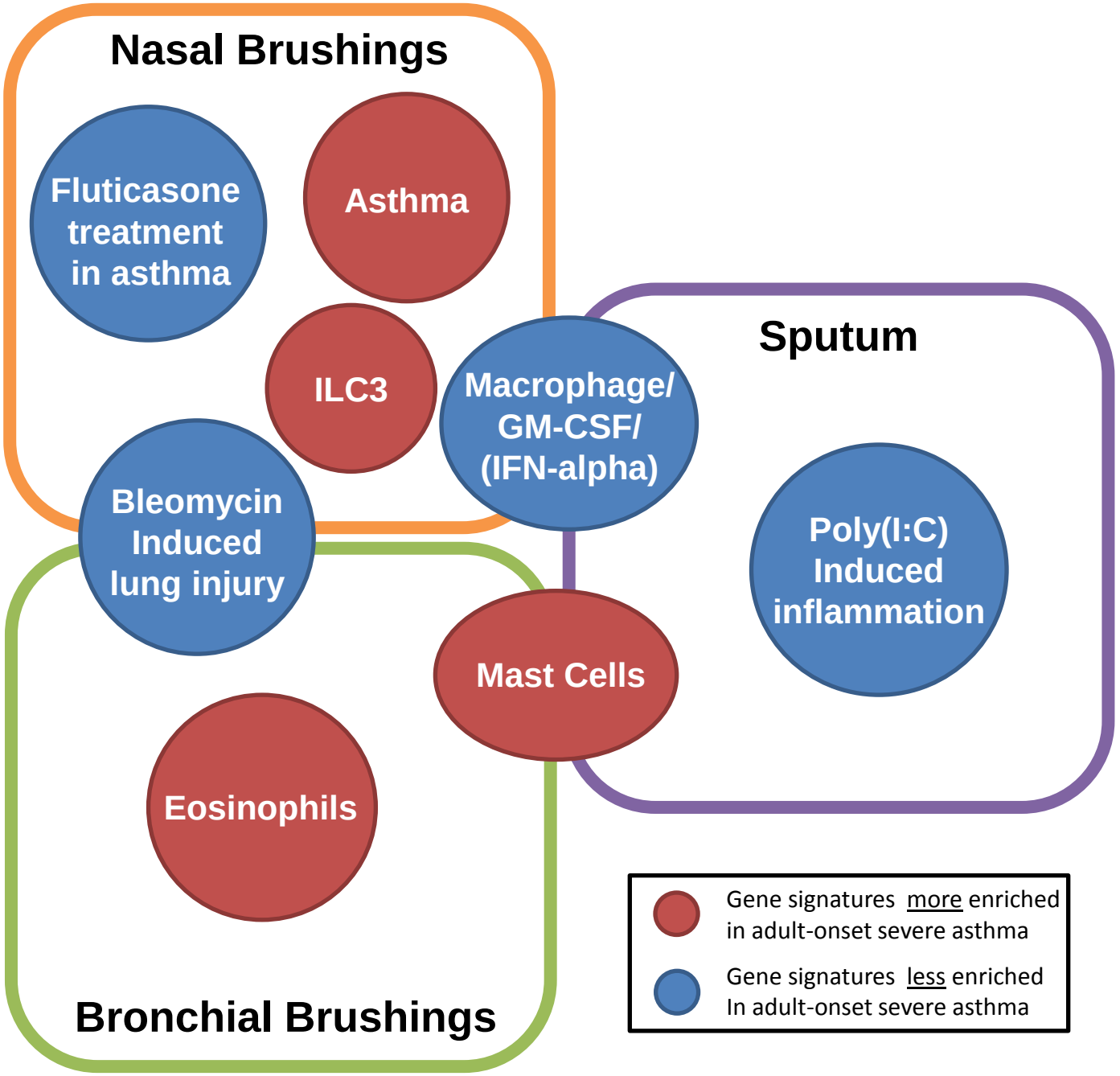


Figure 5: Type 2 signatures in endobronchial brushings

Leukocyte Gene Signatures






Nasal Brushings
Fluticasone treatment in asthma
Asthma
ILC3
Bleomycin Induced lung injury
Macrophage/ GM-CSF/ (IFN-alpha)
Sputum
Poly(I:C) Induced inflammation
Mast Cells
Eosinophils
Bronchial Brushings
Gene signatures more enriched in adult-onset severe asthma
Gene signatures less enriched In adult-onset severe asthma

Online Repository

RNA Sampling

Transcriptomic data are available at Gene Expression Omnibus (GEO), accessible at www.ncbi.nlm.nih.gov/geo. (Nasal brushings = GSE76226; Sputum = GSE76262; Endobronchial brushings = SE76226 ; Endobronchial biopsies = GSE76225)

Nasal brushing

Nasal brush (4mm plastic coated wire interdental brush (DENT.O.CARE Limited, 7 Cygnus Business Centre, Dalmeyer Road, London, UK)) was introduced in one nostril. In case of previous bronchoscopy for this study, the other nostril was used. Samples were embedded in phosphate buffer saline (PBS) directly after the procedure.

Sputum induction

Sputum was induced by inhalation of hypertonic saline according to the ERS recommendations. Samples were processed with 0.1% DTT by using the selected sample (plug) technique.[E1] Sputum was processed within 2 hours after collection and processed suspension was preserved in RNAlater® solution and then maintained at -80°C. Nasal brushings and endobronchial biopsies and brushings were immediately preserved in RNAlater® solution and then maintained at -80°C. RNA was extracted using Qiagen miRNeasy kit (Qiagen; Germantown, MD) and amplified with NuGen ovation pico WTA kit (NuGen Technologies; San Carlos, CA).

Bronchial brushing and biopsy

Bronchoscopy procedures were based on the U-BIOPRED Standard Operating Procedures and were performed according to recent safety standards.[E2] Patients refrained smoking for ≥6 hours prior to the procedure. After receiving bronchodilator medication and local anesthesia, bronchoscopy was done with a flexible bronchoscope (type of scope depending on preferences of physician and clinical

center). First, four bronchial brushings (with e.g. Olympus REF: BC-202D-2010 (2mm brush size) or BC-202D-3010 (3mm brush size), KeyMed (Medical & Industrial Equipment, Ltd OLYMPUS Group Company) were performed in a large airway (bronchus intermedius) contacting the wall at least 4 times. Second, up to 8 endobronchial biopsies were taken from the 2nd and 4th airway carinae of the right or left lower and middle lobes, working upwards. This was done with a disposable 1.8 mm cupped biopsy forceps and were embedded in glycol methacrylate resin.

References

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E2. Moore WC, Evans MD, Bleecker ER, Busse WW, Calhoun WJ, Castro M, et al. Safety of investigative bronchoscopy in the Severe Asthma Research Program. J Allergy Clin Immunol 2011; 128:328-36.e3.

Figure E1: Plots showing statistical significant gene signatures that meet stringent criteria: P-value <0.05 and difference in enrichment score (dES) >0.2 or < -0.2.

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Table E-I: Patient characteristics of Nasal Brushing Samples

	Onset <18 years	**Onset ≥18 years**	***P*-value**
N =	21	20	
Gender - Female ‡	14 (66.7%)	8 (40.0%)	0.12
Age *	43.5 ± 14.4	58.4 ± 7.7	**<0.01**
BMI (Kg/m^2) *	32.8 ± 7.1	30.7 ± 5.4	0.30
Age of onset †	5.0 (2.0 - 9.0)	42.0 (34.5 - 49.3)	**<0.01**
Smoking Status ‡			0.41
Never smoker	15 (71.4%)	10 (50.0%)	
Ex-smokers	5 (23.8%)	8 (40.0%)	
Current smokers	1 (4.8%)	2 (10.0%)	
Pack years † *(in ex/current smokers)*	12.6 (3.6 - 20.4)	16.0 (5.5 - 38.8)	0.55
Atopy – Positive ‡	18 (85.7%)	(60.0%)	0.13
Oral corticosteroid dose† *(in OCS users)*	20.0 (10.0 - 25.0)	10.0 (7.6 - 10.0)	0.15
ACQ 7*	2.07 ± 1.2	2.21 ± 1.0	0.72
Post bronchodilator FEV1 % pred*	90.5 ± 20.3	76.7 ± 21.9	**0.04**
Blood Eosinophils †	0.20 (0.10 - 0.22)	0.21 (0.10 - 0.46)	0.40
Blood Neutrophils*	5.4 ± 2.4	5.1 ± 1.9	0.74
Sputum Eosinophils % †	0.49 (0.15 - 1.70)	8.52 (1.10 - 18.62)	**0.02**
Sputum Neutrophils %*	55.3 ± 22.2	54.2 ± 18.9	0.90

BMI: Body Mass index; ACQ: Asthma Control Questionnaire

**Mean ± SD, † Median (interquartile range), ‡ Number (percentage)*

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Table E-II: Patient characteristics of Sputum samples

	Onset <18 years	**Onset ≥18 years**	***P*-value**
N =	32	51	
Gender - Female ‡	18 (56.2%)	31 (60.8%)	0.82
Age *	47.16 ± 11.90	57.45 ± 10.09	**<0.01**
BMI (Kg/m^2) *	27.46 ± 5.56	28.80 ± 4.99	0.26
Age of onset †	5.0 (3.0 - 10.3)	39.0 (27.0 - 50.0)	**<0.01**
Smoking Status ‡			**<0.01**
Never smoker	25 (78.1%)	22 (43.1%)	
Ex-smokers	4 (12.5%)	24 (47.1%)	
Current smokers	3 (9.4%)	5 (9.8%)	
Pack years† *(in ex/current smokers)*	15.0 (8.5 - 22.4)	10.0 (2.3 - 17.0)	0.39
Atopy – Positive ‡	29 (90.6%)	27 (52.9%)	**<0.01**
Oral corticosteroid dose† *(in OCS users)*	10.0 (6.9 - 10.0)	10.0 (7.5 - 15.0)	0.43
ACQ 7*	2.9 ± 1.5	2.4 ± 1.2	0.12
Post bronchodilator FEV1 % pred*	68.0 ± 24.3	72.1 ± 19.9	0.40
Blood Eosinophils †	0.20 (0.14 - 0.30)	0.37 (0.20 - 0.50)	**0.03**
Blood Neutrophils*	5.46 ± 2.74	5.41 ± 2.20	0.93
Sputum Eosinophils % †	2.32 (0.20 - 5.30)	7.93 (1.23 - 25.92)	**0.02**
Sputum Neutrophils %*	65.1 ± 25.4	54.9 ± 25.6	0.08

BMI: Body Mass index; ACQ: Asthma Control Questionnaire

**Mean ± SD, † Median (interquartile range), ‡ Number (percentage)*

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Table E-III: Patient characteristics of Bronchial Brush samples

	Onset <18 years	**Onset ≥18 years**	***P*-value**
N =	32	33	
Gender - Female ‡	19 (59.4%)	13 (39.4%)	0.14
Age *	43.3 ± 13.9	55.8 ± 7.6	**<0.01**
BMI (Kg/m^2) *	31.0 ± 6.6	29.4 ± 6.1	0.30
Age of onset †	5.0 (2.0 - 9.0)	43.0 (32.0 - 49.0)	**<0.01**
Smoking Status ‡			0.30
Never smoker	22 (68.8)	16 (48.5)	
Ex-smokers	8 (25.0)	13 (39.4)	
Current smokers	2 (6.2)	4 (12.1)	
Pack years† *(in ex/current smokers)*	4.1 (1.6 - 20.4)	16.4 (5.5 - 33.0)	0.14
Atopy – Positive ‡	25 (78.1%)	21 (63.6%)	0.31
Oral corticosteroid dose† *(in OCS users)*	10.0 (7.7 - 23.8)	10.0 (7.5 - 11.3)	0.67
ACQ 7*	2.3 (1.2)	2.4 (1.1)	0.81
Post bronchodilator FEV1 % pred*	84.3 ± 19.4)	75.0 ± 20.8	0.07
Blood Eosinophils †	0.20 (0.10 - 0.30)	0.20 (0.14 - 0.30)	0.31
Blood Neutrophils*	5.15 ± 2.59	5.64 ± 2.42	0.43
Sputum Eosinophils % †	0.58 (0.24 - 1.27)	12.42 (1.58 - 24.61)	**0.01**
Sputum Neutrophils %*	52.1 ± 23.4	55.3 ± 22.3	0.71

BMI: Body Mass index; ACQ: Asthma Control Questionnaire

**Mean ± SD, † Median (interquartile range), ‡ Number (percentage)*

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Table E-IV: Patient characteristics Bronchial Biopsy samples

	Onset <18 years	**Onset ≥18 years**	***P*-value**
n	28	24	
Gender - Female ‡	17 (60.7%)	11 (45.8%)	0.40
Age *	44.6 ± 13.0	57.3 ± 7.0	**<0.01**
BMI (Kg/m^2) *	30.3 ± 6.7	28.6 ± 5.3	0.29
Age of onset †	2.5 (2.0 - 6.0)	43.0 (36.5 - 48.5)	**<0.01**
Smoking Status ‡			0.39
Never smoker	19 (67.9%)	14 (58.3%)	
Ex-smokers	7 (25.0%)	5 (20.8%)	
Current smokers	2 (7.1%)	5 (20.8%)	
Pack years† *(in ex/current smokers)*	3.0 (1.5 - 20.5)	20.5 (16.1 - 30.8)	0.13
Atopy – Positive ‡	23 (82.1%)	12 (50.0%)	**0.03**
Oral corticosteroid dose† *(in OCS users)*	10.0 (7.8 - 20.0)	10.0 (7.6 - 10.0)	0.46
ACQ 7*	2.3 ± 1.3	2.3 ± 1.1	0.99
Post bronchodilator FEV1 % pred*	79.4 ± 19.5	78.2 ± 20.0	0.84
Blood Eosinophils †	0.20 (0.10 - 0.30)	0.25 (0.18 - 0.45)	0.06
Blood Neutrophils*	5.32 ± 2.64	5.31 ± 2.34	0.99
Sputum Eosinophils % †	0.71 (0.28 - 2.71)	8.01 (3.32 - 20.20)	**0.01**
Sputum Neutrophils %*	54.5 ± 22.6	48.7 ± 22.8	0.53

BMI: Body Mass index; ACQ: Asthma Control Questionnaire

**Mean ± SD, † Median (interquartile range), ‡ Number (percentage)*

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Table E-V: Details of significantly different enriched gene signatures

#	Tissue	Trigger	Species	Direction
8	**Lung Biopsies**	HDM	Rhesus	UP
9	**Lung brushings**	Asthma	HS	UP
10	**Lung brushings**	Asthma	HS	DOWN
12	**Bronchial Epithelia**	Fluticasone	HS	DOWN
13	**Lung biopsies**	T_H2 High asthma	HS	UP
52	**Nasal Brushings**	Mast cells	HS	UP
56	**Nasal Brushings**	Eosinophils	HS	UP
57	**Lung Biopsy**	Poly(I:C) 2hrs	MM	UP
73	**lung biopsy**	Bleomycin - Day 14	MM	DOWN
75	**lung biopsy**	Bleomycin - Day 21	MM	DOWN
77	**lung biopsy**	Bleomycin - Day 28	MM	DOWN

87	**Periferal Blood (Macrophage - GM_CSF)**	Interferron-gamma	HS	UP
98	**Periferal Blood (Macrophage - GM_CSF)**	LPS	HS	DOWN
101				
104	**Small intestine lamina propria**	ILC3 genes uniquely upregulated at least 2-fold compared to compared to ILC1, ILC2, and LTi-like	MM	UP

HS: Human sample, IVV: In vitro sample; MM: Murine model

Gene Set	Source
CCL26, LOXL4, NOS2, CD36, CDH13, JAM2, HIGD1B, CLCA1, FZD5, CST2, IGHE, ATP5J, ALOX15, FETUB, AADAC, TOX2, LYPD1, CYYR1, HS3ST4, CST1, KRT31, IL1R2, NKX1-2, TUBAL3, PRKD1	http://www.ncbi.nlm.nih.gov/pubmed/21819959
CLCA1, POSTN, PRR4, SERPINB2, CPA3, TPSB2, TPSAB1, C16orf54, STOM, ZMAT2, AHDC1, EVC2	http://www.ncbi.nlm.nih.gov/pubmed/17898169
GPR115, DMXL2, STEAP4, MUC5B, SCNN1G, TMEM45A, SCGB3A1	http://www.ncbi.nlm.nih.gov/pubmed/17898169
TFCP2L1, HBB, MUC13, POSTN, SERPINB2	http://www.ncbi.nlm.nih.gov/pubmed/17898169
CCL26, PTCHD4, CLCA1, CST1, TUBAL3, CST2, CDH13, JAM2, NOS2, NTRK1, TMEM132B, PTGDR2, ZNF436, IL1R2, IGHE, FETUB, HIGD1B, TOX2, GRM8, NAGS, KRT31, KRT34, ATP5J, FZD5, LOXL4, NKX1-2, AADAC, DOK1, HRH1, CYYR1, CTDSPL, NOVA2, WWC2-AS2, PRKD1, CEP72, SLCO2A1, CD36, DISP1, LYPD1, ADM5, ALOX15, FAM124B	http://www.ncbi.nlm.nih.gov/pubmed/21187436
MS4A2, TPSAB1, TPSAB2, CPA3, RGS13, C1orf186	http://www.ncbi.nlm.nih.gov/pubmed/27677865
CLC, SIGLEC8, EMR1, EMR4P, LGAL312, HRH4, CEBPE, DACH1, VSTM1	http://www.ncbi.nlm.nih.gov/pubmed/27677865
CXCL10, IFIT1B, MX1, MX1, OASL, IFIT2, CMPK2, HAS2, RSAD2, HAS1, RSAD2, CXCL11, CSF1, TNFAIP6, IFIT1B, GBP2, RSAD2, RTP4, IRGM, RND1, GBP4, RTP4, IFIH1, IRGM, CMPK2, HAS2, CXCL9, IRGM, IFNB1, CSF1, IL6, ADAMTS4, STAT1, PTX3, GEM, TNFAIP3, PARP14, GBP6, ADAMTS4, DDX58, PYHIN1, FAM26F, TNFAIP2, USP18, MMP13, CCL4, CCL8, CCL11, PYHIN1, MT1H, PLSCR2, TNFAIP3, VCAM1, ADM, CXCL11, C12orf75, ATF3, CP, CCL20, CXCL9, TIMP1, SLFN11, HPX, SAA1, IFI44L, CCL22, NTS, CH25H, IRG1, IFI44L, FGG, MT1A, RGS16, CXCL3, CXCL3, CXCL3, CXCL6, CXCL8, LEP	http://www.ncbi.nlm.nih.gov/pubmed/22990623
IGFBP3, ASGR1, BEX2, TMEM132D, SLC7A10, CYP1A1, NRN1, KCNA2, FABP12, FABP1, CST8, GRIA1, ANKRD63, KRT79, CIDEC, CYP2E1, CA3, RETN, ADIPOQ, PCK1, CFD, TMEM45B, SMPX, NPPA	http://www.ncbi.nlm.nih.gov/pubmed/23565148
CNN1, BEX2, GRIA1, ANKRD63, NR4A1, TNNT3	http://www.ncbi.nlm.nih.gov/pubmed/23565148
BEX2, TMEM132D, SLC4A1, FABP1, TBX20, KCNJ3, TRDN	http://www.ncbi.nlm.nih.gov/pubmed/23565148

CD69, HAPLN3, C15orf48, DUSP5, LGALS3BP, ISG20, LILRA3, AARS, C1orf228, IRF8, TMEM38B, SERPING1, MTHFD2, HCAR3, APOBEC3A, AIM2, PTPN1, JAK2, LAP3, B4GALT5, MT2A, NCOA7, CCND1, STAT1, BATF2, STAT2, MT1A, RHBDF2, PARP14, PSAT1, NCF1, MAP3K7CL, GBP1, RARRES3, SCO2, IFIT3, CD274, CPD, FEM1C, TGM2, LONRF1, BTG3, SLC1A5, IRF1, EXOG, C2, SLAMF7, CD86, ADAMDEC1, SIK1, C18orf8, SLC7A5, STX11, ARID5B, ASCL2, IL15, LYSMD2, GK, BHLHE41, SLCO4A1, WARS, PARP9, HIST2H2BE, TMEM140, KYNU, IFIT2, TAGAP, CXCL9, TSC22D3, TAP1, GREM1, APOL3, PTRF, RIPK2, P2RX7, HPS3, HLA-F, BPI, HIST2H2AC, UBE2L6, SLAMF1, GBP4, CCL8, GBP2, CFB, SSPN, IL1B, LRRK2, SCML1, ITGB7, TAP2, KLF9, FAM126B, SLC6A12, IFIH1, PDE4B, LILRB3, GPR84, TNFAIP6, PSME2, HELZ2, TSC22D1, GPC4, CRISPLD2, CXCL10, DDX60, PLEK, ASNS, IRF7, SAMD9L, ANKRD22, TNFSF10, BTN3A1, RHBDF1, XRN1, VAMP5, MYOF, FAM129A, C12orf57, GCH1, NINJ1, SCG5, FAM26F, CCL5, NCF1C, GBP5, HLA-H, MT1IP, AKIRIN2, SNX10, MT1E, HLA-A, PPARGC1B, CD38, AK4, LILRB4, ATF3, PSMB9, PSMB8, DUSP10, LAT, SOD2	http://www.ncbi.nlm.nih.gov/pubmed/24530056
ANKRD33, CTSD, CCNL1, PPIA, FABP5, ANXA2P1, SAP30, JAKMIP2, UBE2C, NFKBIZ, NUSAP1, LDHB, BOK, KLF2, DBI, CLTC, PLTP, TMEM236, CFD, FABP5P3, IMMT,40787,MGMT, PTGER4, STK17B, HMGB1, NUPR1, POTEKP, HLA-DRB6, CKS2, RPL5, YBX1, SKAP2, KLF4, NBPF10, KANSL1, SRP14, MYADM, ILK, MS4A4A, UGP2	http://www.ncbi.nlm.nih.gov/pubmed/24530056
ADAMTS9, ALOX15, BCL2L15, C1QTNF1, CA2, CCBL1, CCL26, CD274, CD44, CDH26, CISH, CST1, CST2, CST4, CTSC, DPP4, FAM26E, FETUB, GGH, HS3ST1, LRRC31, NTRK1, NABP1, PCSK6, POSTN, SERPINB4, SH2D1B, SIDT1, SLC26A4, SLC39A8, SLC5A1, SOCS1, SUSD2, USP54	ADEPT cohort
GSTM3, UPP1, EPS8L3, IL1R2, CXorf23, F2RL2, CAPG, FAH, DUSP4, GDA, NMBR, CCNE2, GJB2, RYK, TMTC2, DPEP2, B3GALT2	http://www.ncbi.nlm.nih.gov/pubmed/25621825

Table E-VI: All prefefined gene sets entered into gene set variation analysis

#	Gene Set	Source
1	LDLRAP1, ASPM, BCL11B, MIS18A, CAMK4, CCNA2, CCNB1, CCNB2, CD3D, CD3E, CD3G, CD5, CD6, CD8A, CD8BP, CD8B, CDK1, CPOX, CTLA4, CXCR6, DGKA, DNAJB1, DUSP2, EGLN3, PRR11, GPR15, GZMK, H2AFX, HDGFRP3, PIK3IP1, HMMR, ICOS, IL22, IL9, INPP4B, KIF14, LAG3, LEF1, LEPROTL1, LRRN3, MELK, TAF1D, MKI67, PAICS, PRC1, ATAD2, DUSP4, RRM1, DEPDC1, AURKA, TCF7, TRAC, TOP2A, TPX2, TRAT1, UBE2C, UBE2S, ZBED2, ZWINT, HAUS1, NUF2, CDCA2, CDCA5, DHX33, STAMBPL1, MTFR2, TRDV3, AC017002.1, GPATCH4, MTHFD1L, UBE2T, IL17F, OXNAD1, ZBED6CL, NDFIP2, NDNL2, TRAV12-1, TRIM59, ZNRF1	http://www.ncbi.nlm.nih.gov/pubmed/15789058
2	AMPD1, PPOX, BANK1, BCL11A, TNFRSF17, BLK, BLNK, BMP8B, STAP1, VCPKMT, C19orf10, EDEM2, CD19, MS4A1, CD79A, CD79B, KLF6, DDOST, EAF2, EIF2AK3, ELL2, PDIA4, FCRL2, FKBP11, FAM46C, TXNDC15, TMEM156, GNG7, GPRC5D, WHSC1L1, SPCS2, SEL1L3, LZTFL1, MAN1A1, MANEA, NXPE3, NGLY1, OSBPL10, MZB1, PAX5, SUB1, PNOC, POU2AF1, QRSL1, RPN1, SEC24A, KDM5D, SPATS2, SPIB, SSR1, HSPA13, TCF3, TCL1A, SEC62, HSP90B1, TRAM1, TRAM2, UBE2G1, UBE2J1, EZR, VPREB3, FAM129C, PRDM15, CPNE5, LINC00926, ERN1, FBXO18, FCRL1, EME1, DERL3, FCRLA, PPAPDC1B, FCRL5, KLHL14, TXNDC11, NLRP7, RALGPS2, TLR10, WNT10A	http://www.ncbi.nlm.nih.gov/pubmed/15789058
3	ATP13A3, AP1S2, BHLHE41, CASP1, CCL24, CCRL2, CD1D, CDK5RAP2, CLEC5A, VCAN, CTSD, CTSL, CXCL1, CXCL3, CXCL5, CYBB, DFNA5, HBEGF, DUSP6, EREG, THBS1, PID1, GNA15, HS3ST3B1, IER3, IL19, IL1A, IL1B, IL36G, IL1RN, IL24, IL3RA, IL6, MTF1, MMP1, MMP14, MMP19, MMP9, NPC1, NRIP3, PFKFB3, PLAUR, PLD3, PPBP, PPIF, PTX3, RNU2-1, PHACTR1, SERPINB2, SERPINB7, SLC28A3, SLC31A1, SLC3A2, SRC, TCIRG1, TFPI2, NEAT1, TNFSF15, ZFYVE16, POMZP3, LINC00158, LINC00936, RP11-384O8.1, GJB2, GPR84, PNPLA8, IRAK2, DNAJC5B, MPEG1, MS4A6A, GLIS3, PLD1, PRAM1, SGPP2, SNX9	http://www.ncbi.nlm.nih.gov/pubmed/15789058
4	CD244, CHST12, CLIC3, IVNS1ABP, IVNS1ABP, KIR3DL2, KIR3DL1, KIR2DL2, KIR2DL4, KIR2DS4, KIR2DS5, KIR2DS5, KIR3DS1, KLRF1, NS1-BP, PTGDR, TGFBR1, YPEL1	http://www.ncbi.nlm.nih.gov/pubmed/15789058
5	ABTB2, ADAM12, ALOX15, CBR3, CCL13, CCL17, CD1A, CD1B, CD1E, CD86, N4BP2L1, CHST7, CLEC10A, CLIC2, CRLF2, CXCL11, EHD4, TRAFD1, FSCN1, IFI6, GRSF1, H6PD, HLA-DQA1, HLA-DQB1, HMG20B, HMOX1, IFIT1, CD209, CERS6, IFIH1, POGLUT1, MFSD12, MMP12, MX1, NAGPA, NR4A3, OAS1, SLCO5A1, PDCD1LG2, RAB30, RAB9A, RASSF4, ARHGAP22, SLC27A3, SIGLEC1, SPRED2, TBC1D13, UBD, CNOT10, TIFAB, MAP3K13, WFDC21P, NAA25, GPR157, L3MBTL4, KDM2B, SRGAP2, NFXL1, ZNFX1, C17orf58, NEURL3, MOB1B, NT5C3AP1, AKT1S1, NUB1, BLOC1S6, PVRL2, TTYH2	http://www.ncbi.nlm.nih.gov/pubmed/15789058

6	ABTB1, AMPD2, FAM53C, CCR3, CDA, CMTM2, CLC, CREB5, CTBS, CTBS, DICER1, MSL1, FCGR2B, FCGR3B, FCGR3B, MANSC1, FPR2, FRAT2, GPR27, FFAR2, HSPA6, CXCR1, CXCR2, TMCC1, SLC45A4, KRT23, MBOAT7, TSEN34, MXD1, YPEL3, CEP19, R3HDM4, MPPE1, SLC25A37, NCF4, NRBF2, PHC2, PROK2, RALB, RNF141, SEC14L1, MSRB1, STX3, TSPAN16, VMP1, VNN2, XPO6	http://www.ncbi.nlm.nih.gov/pubmed/15789058
7	FCGR2A, FCGR2C, CXCR1, CXCR2, FPR1, MME	http://www.ncbi.nlm.nih.gov/pubmed/27677865
8	CCL26, LOXL4, NOS2, CD36, CDH13, JAM2, HIGD1B, CLCA1, FZD5, CST2, IGHE, ATP5J, ALOX15, FETUB, AADAC, TOX2, LYPD1, CYYR1, HS3ST4, CST1, KRT31, IL1R2, NKX1-2, TUBAL3, PRKD1	http://www.ncbi.nlm.nih.gov/pubmed/21819959
9	CLCA1, POSTN, PRR4, SERPINB2, CPA3, TPSB2, TPSAB1, C16orf54, STOM, ZMAT2, AHDC1, EVC2	http://www.ncbi.nlm.nih.gov/pubmed/17898169
10	GPR115, DMXL2, STEAP4, MUC5B, SCNN1G, TMEM45A, SCGB3A1	http://www.ncbi.nlm.nih.gov/pubmed/17898169
11	FKBP5, GAS1, PHACTR3, FAM107A, HIF3A, TSC22D3, KLF9, HCAR3, PER1, C6, SORD, LINC00964, FXYD1, AHNAK2, WIPI1, CST1, CLCA1	http://www.ncbi.nlm.nih.gov/pubmed/17898169
12	TFCP2L1, HBB, MUC13, POSTN, SERPINB2	http://www.ncbi.nlm.nih.gov/pubmed/17898169
13	CCL26, PTCHD4, CLCA1, CST1, TUBAL3, CST2, CDH13, JAM2, NOS2, NTRK1, TMEM132B, PTGDR2, ZNF436, IL1R2, IGHE, FETUB, HIGD1B, TOX2, GRM8, NAGS, KRT31, KRT34, ATP5J, FZD5, LOXL4, NKX1-2, AADAC, DOK1, HRH1, CYYR1, CTDSPL, NOVA2, WWC2-AS2, PRKD1, CEP72, SLCO2A1, CD36, DISP1, LYPD1, ADM5, ALOX15, FAM124B	http://www.ncbi.nlm.nih.gov/pubmed/21187436
14	IRS2, CXCL6, FOLR1, DUSP1, DUSP4, MUC5B, SAA4, GLRB, HS3ST4, PROS1, TMEM45A, NR1I2, CSF3, AKR1C1, ACHE, CLGN, GUSBP4, GJB7, HGD, PIP5K1B, NA, SLC13A3, ZNF331, PGLYRP4, C11orf63, KIAA0232, PTP4A1, NSUN7, TSPAN6, HNF1A-AS1, RHOV, LRRC37B, PCYT2, LRWD1, ODC1, GK5, OSBPL6, ACTA1, CES4A, TCTN1, CCDC30	http://www.ncbi.nlm.nih.gov/pubmed/21187436
15	HBG1, CAMKK2, CAV1, DUSP1, DUSP5, FLNC, TNFRSF17, ALPL, TRIB1, SGK1, MME, SOCS3, PTGS2, IL1RAP, IL1R2, LIFR, COL18A1, ITGB8, GPC1, SLIT1, POMZP3, KCNJ4, SELL, PABPC4, TRIM9, PDLIM4, IGKC, IGH, GYPC, CDKN2C, CCL11, CABP1, RAMP3, RRM2, RBFOX2, CXCL8, MMP9, CXCL2, CD38, FPR1, TOP2A, AKAP8L, TRIP6, BCL3, RB1, CDC45, CREBBP, EGR1, TFDP1, ADCY3, SAT1, CCL3, FOS, MXD1, NA	http://www.ncbi.nlm.nih.gov/pubmed/23190644
16	NCK1, FASLG, ABI1, PSTPIP1, ARNTL, CLTC, RPS6KB1, FEZ1, CD247, GNAI1, HLA-F, HLA-B, KLRD1, KLRC1, KLRC1, EIF3C, EIF3A, HTRA2, ITGAL, SMAD7, CUL4A, SF3B3, MLH1, CDC7, SNUPN, HNRNPAB, SYT11, PRF1, MAS1, IFNG, NUP210, CDK13, SLC4A4, KIAA1279, VPS4B, XCL1, C14orf1, NFE2L1, CTCF, BRD8, RAB9A, ID3, PRSS23, PSMA3, GZMA, TAF1A, ATF2, STAT4, CEBPG,	http://www.ncbi.nlm.nih.gov/pubmed/23190644

17	COPB2, S1PR4, GNB1, ARHGEF2, CAMKK2, RABAC1, KIF3B, MKNK1, FLOT2, GRAP, MINK1, MAP3K14, MAP2K4, FMNL1, PGAM1, GLS, MTOR, NEDD4L, PTPN6, CSK, STAT5B, PIK3CD, HCLS1, RPA1, PRDX1, RPA2, HADHB, PRDX4, FZD7, LIMK2, AP3D1, VAMP2, VAPB, CFL1, WIPF1, DDB1, STX12, GPSM3, S100A9, IFNGR2, DLGAP5, ARF3, TPD52L2, PHC2, MAP4K4, GPI, AIMP2, ENO1, AKAP8L, RXRA, MBD2, ACVR1, SPEN, ICAM3, TRIP12, S100A8, RBPJ, PPP4R1, TM9SF2, BAG1, USP4, MTA1, SMAD4, NUP98, MAML1, ANP32A, ARFIP2, PCMT1, RAC2, ALDOA, NFYC, TP53TG1, DNPEP, MAPK14	http://www.ncbi.nlm.nih.gov/pubmed/23190644
18	CYCS, CALD1, SLC25A4, PNO1, METAP2, FASLG, PKN2, AKT2, FGF2, RNF216, SSX2IP, RHEB, PIK3R1, GNAI1, TFRC, SH2B3, NCR1, HSPA5, LIPC, GUCY1A2, DLG2, SMAD7, ARF6, IFNG, SLC4A4, TIMM17A, YES1, JUND, MED1, GTF2B, ARID4A, RORA, CDKN1B, ENC1, ID2, MATK, ID3, ID1, KRR1, TNPO1, ANXA1, SKI, SRSF7, CHD1, SRSF3, MXD4, HIST1H1B	http://www.ncbi.nlm.nih.gov/pubmed/23190644
19	GNA12, MINK1, MAP3K14, RIPK1, GRB14, BCL10, SNTA1, HMOX1, SDC4, NEDD4L, PRG2, TGFBR2, CD5, PTGS2, LIFR, TLR6, IGF2, FURIN, ITGB8, CCL7, SORT1, LCT, FZD7, PABPC4, BMP6, GYPC, CDKN2C, CXCL9, CXCR3, MCM6, Mar-02, RAMP3, DLGAP5, RBFOX2, REPS2, CXCL3, CXCL2, HAPLN1, LCN2, CTSL, GEMIN4, TRIP6, BMP2, TRIP12, PHLDA1, TAB2, HMGA1, MSC, NUP98, EGR1, ADCY3, PRDM1, DNPEP, MAX, CCL3, ZFP36L1,	http://www.ncbi.nlm.nih.gov/pubmed/23190644
20	CYCS, SOS1, PSTPIP1, CRELD1, TARS, SSX2IP, ACD, P2RX7, MAP2K5, SYK, BLNK, PLCG2, HLA-B, NCR1, SEBOX, ATP2B4, IL2RG, ZRSR2, ARF6, TESK1, SF3B3, FANCA, VPS4B, ITGB1BP1, ITGA4, IRF8, NFE2L1, IRF1, HDAC3, STX8, MNAT1, GTF2H4, ANXA1, ARFRP1, HIST1H1B	http://www.ncbi.nlm.nih.gov/pubmed/23190644

21	YWHAE, SNCA, GPRIN2, APLP2, GRK5, CNN1, GNA12, KLK6, COPB2, CYB5R3, HBG1, NRGN, RGS2, S1PR4, GNAQ, TBXA2R, TOR1A, TUBA1A, GNB1, ARHGEF2, CTNNAL1, ADRBK2, GNG10, BDKRB2, SFN, NTRK2, MAPK3, CAV1, RIN2, RABAC1, DUSP1, RAB4A, SYN1, NOS1AP, PAK2, MKNK1, NCK2, WASF1, DUSP5, NTRK3, TNFRSF1B, MINK1, BST1, SOD2, SNCG, LTA, DUSP6, BUB1B, LSM1, GRB14, MAP2K4, CLIC1, FLNC, TRAF3, PCBP1, CSF2RA, ALPL, LDHA, BCL10, EIF6, TRIB1, LSM5, TNIP1, ACTN1, PDLIM1, FBP1, ADORA2A, PICALM, POR, TOM1, SNTA1, PGAM1, HMOX1, SVIL, TGFB1I1, SGK1, RAP1A, PTPN12, TNFRSF10C, SDCBP, BRAF, SDC4, FKBP1A, NEDD4L, BSG, SLC16A3, PRG2, PSEN1, PDLIM7, GAB2, ADM, MME, CSK, TLR2, PIK3CB, CSF2RB, LILRB2, FCAR, FCGR1A, CSF3R, SOCS3, STAT5B, FCER1G, WASF3, NDN, PTGS2, PECAM1, GAST, IL1RAP, MYD88, SLA, IL1R2, SSTR2, NUCB1, LILRB1, LY96, FCGR2A, GABARAP, TLR6, CD14, HCLS1, IGF2, NOV, GSN, LRP1, LRPAP1, APP, CR1, C4A, DMC1, RPA1, FURIN, GAPDH, TG, NOTCH2, ITGB8, HADHB, MMP14, TIMP2, CASP4, PGK1, CST3, BGN, CCL7, C4A, GPC4, CTSD, DSG3, SERPINA3, CHM, SORT1, NUMB, ITGB5, ADAM9, FLOT1, PRDX4, F5, LCT, RAB11A, GPC1, SLIT1, ITM2B, POMZP3, F8, C3AR1, ANXA5, PSAP, ICAM1, KCNJ4, LIN7A, CHP1, KIF1B, KCNJ2, S100P, SDC2, CAPNS1, LIMK2, ACTC1, ABLIM3, AP3D1, VAPB, VASP, STXBP2, DMTN, PIP5K1C, SSH1, CDC42BPA, LASP1, XPO6, VAMP7, ZYX, SRSF9, WIPF1, WDR1, TRIM9, TESK2, HIST1H2BD, PDLIM4, SF3B4, BMP6, UBOX5, EXO1, FCGR3A, TLR1, NAPA, STX12, MPP1, CDKN2A, UBE2C, ENSA, SMARCD3, CXCL9, CCL11, MCM6, STX6, Mar-02, BID, CD101, CD80, CD86, TYR, TYRP1, PITPNA, F2RL1, ST14, IL1RN, ABI2, ACVR2B, PDHA2, TPM4, GPSM3, ADRA2A, CABP1, CHST15, RRAGD, RAMP3, LAMP2, CTSA, IRAK3, IFNGR2, CP, DLGAP5, GYPA, RHAG, ARF3, CENPB, RNASE2, APOBEC1, RBFOX2, CA4, GP1BA, CDC42EP2, REPS2, ANXA3, TPD52L2, PLP2, HP, CD163, DPEP1, CHMP1A, C2, AQP1, PHC2, AFG3L2, S100A2, TPM1, ITGB1, MAP4K4, CXCL3, CXCR2, AMFR, GPI, COL4A4, TGFBI, CD36, CD93, CXCL8, CXCR1, MMP9, TIMP1, CXCL2, AIMP2, HAPLN1, CXCL1, CCL2, VCAN, CD63, EPS8, CD9, LCN2, COL1A1, SAA1, TLN1, ENO1, FPR1, UBE2E3, IRF2, GATA2, AKAP8L, MAPK7, THRB, CRMP1, CTSL, SPRY2, BCL6, RXRA, BMP7, PLSCR1, CUX1, NCOR2, TRIP6, ARNT, SERPINB3, MBD2, ACVR1, BMP2, SPEN, TRIP12, PHLDA1, SLPI, ANXA11, S100A8, RBPJ, FHL2, PPP4R1, KLHL35, RNF11, TAB2, CDK14, TM9SF2, RB1, RNF40, CREG1, BAG1, HMGA1, FRK, POU3F1, CAT, LILRA3, RBPMS, ZDHHC3, PRUNE2, MVK, CALM1, KCNMB1, SALL2, TPGS2, TFE3, ALDH2, NUP214, MAML1, ANP32A, H3F3A, TGM2, SMAD2, FTL, HIST2H2BE, MCF2L, RHOG, EGR1, HIST1H4A, S100A11, PCMT1, ZEB2, ALDOA, SPR, TFDP1, PRDM1, HDGF, NFYC, RAB13, AGT, SAT1, GBP2, TP53TG1, B4GALT3, NFATC4, ELK3, MAPK14, MAPKAPK3, ELK1, MAPK11, MAX, CEBPB, RBM42, MAPK10, KCNK1, CCR4, TRIM29, HOMER3, FOS, CCR1, SPAG9, USF2, MXD1, CASP5, ZBED1, CDC25C	http://www.ncbi.nlm.nih.gov/pubmed/23190644

22	CALM1, SIAH1, PIK3CA, AKAP13, TTN, MRAS, FDX1, SLC25A4, PNO1, NCK1, METAP2, BIN1, CYFIP2, ABI1, AKAP1, EIF4A2, EIF4G2, EXOSC8, FBL, HSP90AB1, RPS6, TNFRSF10B, CDC37, HSP90AA1, HNRNPD, CAPN3, CHUK, AKT2, HARS, RPL5, RPSA, AIP, DDX39A, EXOSC9, CRELD1, OFD1, RPL6, ARNTL, SNRPN, RPL4, XRCC6, GSE1, UTRN, ACD, NCALD, RHEB, SOX4, RPS6KB1, RASGRP2, YWHAQ, MAGOH, KIF5B, TRAF4, P2RX7, PRKCZ, MAP2K5, FEZ1, DAPK3, YME1L1, CD247, PIK3R1, HNRNPU, BLNK, HLA-F, TRAC, CD72, FOLR1, IL6ST, KLRD1, INPP4A, KLRC1, SH2B3, NPM1, KLRB1, NCR1, EIF3G, EIF3H, EIF3E, EIF1AX, EIF3A, EIF3K, EIF5B, HSPA5, RECQL, XPA, RABGGTB, LRP8, PTP4A2, HMOX2, ITGAL, DLG1, EZR, ATP2B4, IL2RG, PIAS4, PRPF40A, RIF1, CLK1, SRSF6, U2AF2, ZRSR2, PPIG, SYNE1, SNRPD2, DYNC1LI2, NOL3, VAMP1, TRA2B, TWF1, SKP2, CUL4A, BRAP, CAND1, ZMYND11, BMPR1A, SF3B2, SF3B3, SF3B1, MLH1, SNRNP200, NONO, SFPQ, HSPA9, MVD, MPHOSPH10, IMP4, CD40LG, ZNF337, ATP5C1, ORC4, PSMC3, CDC7, ENO2, SNUPN, RPL17, SYNCRIP, SYT11, CSE1L, KPNA6, DPP4, STX16, GZMB, PRF1, SRSF5, SRRM1, IL12RB2, PI4KA, FBLN5, MAS1, PDHB, KPNA5, RPS19, ITPR3, ACIN1, AKR1C3, SRSF10, TRA2A, RRM1, AK1, CD48, IFNG, PARP2, NUP210, ABCE1, CELF2, CDK13, SLC4A4, OSGEP, 39326, TIMM17A, TIMM44, KIF22, REPS1, EMG1, SMARCC2, SMARCE1, TPD52, CCT4, RPL14, RPL7, TNNT2, ITGB1BP1, YES1, IGFBP3, EEF1B2, KARS, ITGA4, RPL10, XCL1, DFFB, NACA, TBP, C14orf1, ZNF24, ZBTB16, IRF8, COPS2, LAMTOR5, JUND, HMGB1, MED1, GTF2B, DHX9, ILF3, CTCF, TAF5, DPM1, POLR3F, PSMC2, STX8, SEPHS1, TRRAP, NDUFV2, KLF6, ARID4A, BRD8, HNRNPH3, CBFA2T2, RAB9A, EEF1D, DLST, DLG5, GATA3, CIR1, ILF2, SRRT, PMAIP1, RORA, ATM, TMPO, REL, PURA, CDKN1B, CCNE1, POLA1, DDX18, RAD17, GTF2H4, ELF1, CCNT2, NKRF, ENC1, MDM4, HBP1, CCND2, THOC1, PRDM2, AKAP8, TCOF1, UBTF, ERCC5, NOP56, RBBP5, PHB, EEF1E1, EWSR1, TRIM37, ID2, TCF4, MATK, ID3, ID1, PRSS23, RPS15A, ZMIZ2, KRR1, DDX5, PSMA3, GZMA, SET, NUP88, TNPO1, HSPD1, MAP3K12, RAN, ARF1, ANXA1, AES, PTMA, CAMK2G, MCF2, NXF1, MED6, SS18L1, E2F5, SRSF7, HIRIP3, TLE2, PPP2R1B, SMARCA5, TAF1A, RAE1, RPS7, HMGN1, ATF2, HNRNPK, MAPKAPK5, RAD52, UBE2I, CHD1, SRSF3, MKNK2, NOLC1, RPS6KA5, AIMP1, HOMER1, MXD4, STAT4, HSF2, CEBPG, MATR3	http://www.ncbi.nlm.nih.gov/pubmed/23190644

23	YWHAE, SNCA, GPRIN2, APLP2, GRK5, CNN1, GNA12, KLK6, CYB5R3, NRGN, GNAQ, TBXA2R, TOR1A, TUBA1A, GNB1, CTNNAL1, ADRBK2, GNG10, BDKRB2, SFN, NTRK2, MAPK3, RIN2, RABAC1, DUSP1, RAB4A, SYN1, NOS1AP, PAK2, MKNK1, NCK2, WASF1, FLOT2, NTRK3, TNFRSF1B, MINK1, BST1, SOD2, SNCG, LTA, DUSP6, BUB1B, LSM1, GRB14, MAP2K4, CLIC1, TNFRSF17, TRAF3, PCBP1, CSF2RA, ALPL, LDHA, EIF6, TRIB1, LSM5, TNIP1, ACTN1, PDLIM1, FBP1, ADORA2A, PICALM, POR, FMNL1, TOM1, PGAM1, HMOX1, SVIL, TGFB1I1, SGK1, RAP1A, PTPN12, TNFRSF10C, SDCBP, BRAF, SDC4, FKBP1A, MTOR, NEDD4L, BSG, SLC16A3, PDLIM7, GAB2, ADM, MME, CD5, TLR2, PIK3CB, CSF2RB, LILRB2, FCAR, FCGR1A, CSF3R, SOCS3, FCER1G, WASF3, NDN, PTGS2, PECAM1, GAST, IL1RAP, MYD88, IL1R2, SSTR2, NUCB1, LILRB1, LY96, FCGR2A, GABARAP, TLR6, CD14, HCLS1, IGF2, NOV, GSN, LRP1, LRPAP1, APP, CR1, C4A, DMC1, FURIN, GAPDH, PRDX1, TG, NOTCH2, ITGB8, MMP14, TIMP2, CASP4, PGK1, CST3, BGN, CCL7, GPC4, CTSD, DSG3, SERPINA3, SORT1, NUMB, ITGB5, ADAM9, PRDX4, F5, RAB11A, ITM2B, F8, C3AR1, ANXA5, PSAP, ICAM1, LIN7A, CHP1, KIF1B, KCNJ2, S100P, SDC2, CAPNS1, SELL, LIMK2, ACTC1, ABLIM3, VAMP2, VASP, STXBP2, DMTN, PIP5K1C, SSH1, CDC42BPA, LASP1, XPO6, VAMP7, ZYX, SRSF9, WIPF1, WDR1, TESK2, HIST1H2BD, SF3B4, BMP6, UBOX5, EXO1, IGK, FCGR3A, IGH, TLR1, NAPA, MPP1, CDKN2A, UBE2C, ENSA, SMARCD3, CXCL9, MCM6, STX6, Mar-02, BID, CD101, CD80, CD86, TYRP1, PITPNA, IL1RN, ABI2, ACVR2B, PDHA2, TPM4, GPSM3, ADRA2A, RRAGD, RAMP3, S100A9, LAMP2, CTSA, IRAK3, RRM2, IFNGR2, CP, DLGAP5, GYPA, RHAG, ARF3, CENPB, RNASE2, APOBEC1, CA4, GP1BA, CDC42EP2, REPS2, ANXA3, TPD52L2, PLP2, HP, CD163, DPEP1, CHMP1A, C2, AQP1, PHC2, AFG3L2, S100A2, TPM1, ITGB1, CXCR2, AMFR, GPI, TGFBI, CD36, CD93, CXCL8, CXCR1, MMP9, TIMP1, CXCL2, CXCL1, VCAN, CD63, EPS8, CD9, LCN2, COL1A1, CD38, SAA1, TLN1, ENO1, FPR1, UBE2E3, TOP2A, IRF2, GATA2, AKAP8L, MAPK7, THRB, CRMP1, CTSL, SPRY2, BCL6, RXRA, BMP7, PLSCR1, CUX1, NCOR2, ARNT, SERPINB3, MBD2, ACVR1, PHLDA1, BCL3, SLPI, ANXA11, S100A8, FHL2, PPP4R1, KLHL35, RNF11, TM9SF2, RNF40, CREG1, HMGA1, FRK, CDC45, MTA1, POU3F1, CAT, MSC, LILRA3, RBPMS, ZDHHC3, PRUNE2, MVK, CALM1, KCNMB1, SALL2, TPGS2, CREBBP, SMAD4, TFE3, ALDH2, NUP214, MAML1, ANP32A, H3F3A, TGM2, SMAD2, FTL, HIST2H2BE, MCF2L, RHOG, EGR1, HIST1H4A, S100A11, ZEB2, ALDOA, SPR, TFDP1, HDGF, NFYC, RAB13, AGT, SAT1, GBP2, NFATC4, ELK3, MAPK14, MAPKAPK3, ELK1, MAPK11, CEBPB, RBM42, MAPK10, KCNK1, ZFP36L1, CCR4, TRIM29, HOMER3, FOS, CCR1, SPAG9, USF2, MXD1, CASP5, ZBED1,	http://www.ncbi.nlm.nih.gov/pubmed/23190644

24	CALM1, PIK3CA, PRKCE, AKAP13, TTN, MRAS, CALD1, FDX1, NCK1, SOS1, METAP2, BIN1, CYFIP2, PKN2, AKAP1, EIF4A2, EXOSC8, FBL, HSP90AB1, RPS6, TNFRSF10B, CDC37, HSP90AA1, CAPN3, CHUK, AKT2, HARS, RPL5, RPSA, MAP2K7, AIP, FGF2, DDX39A, EXOSC9, OFD1, RPL6, TARS, SNRPN, RNF216, RPL4, CLTC, XRCC6, UTRN, ACD, NCALD, SOX4, RPS6KB1, RASGRP2, MAGOH, KIF5B, TRAF4, P2RX7, PRKCZ, DAPK3, YME1L1, CD247, HNRNPU, BLNK, HLA-F, TRAC, CD72, FOLR1, PLCG2, IL6ST, KLRD1, INPP4A, TFRC, KLRC1, SH2B3, NPM1, KLRB1, EIF3G, EIF3H, EIF3J, EIF3E, EIF1AX, EIF3K, EIF5B, RECQL, HTRA2, RABGGTB, LIPC, LRP8, PSEN2, HMOX2, DLG1, EZR, MYO6, PIAS4, PRPF40A, RIF1, CLK1, SRSF6, U2AF2, ZRSR2, PPIG, SYNE1, SNRPD2, DYNC1LI2, NOL3, VAMP1, TESK1, SKP2, BRAP, CAND1, ZMYND11, BMPR1A, SF3B2, SF3B1, SNRNP200, NONO, SFPQ, HSPA9, MVD, MPHOSPH10, IMP4, CD40LG, ZNF337, ORC4, PSMC3, ENO2, SNUPN, RPL17, SYNCRIP, HNRNPAB, CSE1L, KPNA6, DPP4, PSMA1, STX16, GZMB, SRSF5, PI4KA, FBLN5, PDHB, KPNA5, RPS19, ITPR3, ACIN1, AKR1C3, SRSF10, TRA2A, AK1, CD48, PARP2, NUP210, ABCE1, CELF2, OSGEP, 39326, TIMM44, KIF22, REPS1, EMG1, SMARCC2, TPD52, KIAA1279, CCT4, RPL14, RPL7, TNNT2, IGFBP3, EEF1B2, KARS, RPL10, XCL1, DFFB, TBP, ZNF24, ZBTB16, IRF8, COPS2, LAMTOR5, HMGB1, IRF1, HDAC3, MED1, GTF2B, DHX9, ILF3, TAF5, DPM1, POLR3F, PSMC2, SEPHS1, TRRAP, RPS27A, NDUFV2, KLF6, ARID4A, BRD8, HNRNPH3, CBFA2T2, EEF1D, DLST, DLG5, GATA3, CIR1, ILF2, SRRT, PMAIP1, ATM, TMPO, REL, PURA, MNAT1, POLA1, DDX18, RAD17, GTF2H4, ELF1, CCNT2, NKRF, MDM4, HBP1, CCND2, THOC1, PRDM2, AKAP8, TCOF1, UBTF, ERCC5, NOP56, RBBP5, PHB, EEF1E1, EWSR1, TRIM37, ID2, TCF4, MATK, TCF12, RPS15A, ZMIZ2, KRR1, DDX5, PSMA3, SET, NUP88, TNPO1, HSPD1, MAP3K12, RAN, ARF1, ARFRP1, AES, PTMA, CAMK2G, NXF1, MED6, SS18L1, E2F5, SRSF7, HIRIP3, DDX19A, PPP2R1B, SMARCA5, TAF1A, RAE1, RPS7, HMGN1, HNRNPK, RAD52, SRSF3, MKNK2, NOLC1, RPS6KA5, AIMP1, HOMER1, MXD4, STAT4, HSF2, CEBPG, MATR3,	http://www.ncbi.nlm.nih.gov/pubmed/23190644
25	RGS2, S1PR4, RABAC1, DUSP1, KIF3B, FLOT2, GRAP, SOD2, DUSP6, RIPK1, TNFRSF17, TRAF3, ALPL, TRIB1, ADORA2A, GLS, SVIL, SGK1, TNFRSF10C, SLC16A3, PRG2, PSEN1, TGFBR2, MME, PTPN6, FCAR, CSF3R, SOCS3, STAT5B, PTGS2, PIK3CD, SLA, IL1R2, TLR6, CD14, HCLS1, NOV, RPA2, COL18A1, CHM, FLOT1, C3AR1, S100P, SELL, LIMK2, CFL1, XPO6, DDB1, IGK, IGH, TLR1, CXCR3, STX6, CD80, TYR, F2RL1, ST14, CHST15, IFNGR2, PLP2, PHC2, CXCL3, CXCR2, COL4A4, CXCL8, CXCR1, MMP9, CXCL2, CXCL1, CCL2, FPR1, IRF2, BCL6, GEMIN4, ARNT, ICAM3, SLPI, S100A8, CDK14, USP4, NUP214, ARFIP2, EGR1, S100A11, RAC2, PRDM1, B4GALT3, CCL3, CCR4, FOS, CCR1, MXD1	http://www.ncbi.nlm.nih.gov/pubmed/23190644

26	SIAH1, PRKCE, EIF4G2, HNRNPD, MAP2K7, OFD1, RPL4, SSX2IP, XRCC6, GSE1, YWHAQ, P2RX7, YME1L1, SYK, KLRD1, KLRB1, EIF3H, EIF3J, EIF3E, EIF3C, EIF3K, SEBOX, XPA, LRP8, PSEN2, PTP4A2, GUCY1A2, DLG2, MYO6, SYNE1, DYNC1LI2, NOL3, TRA2B, TWF1, CUL4A, ATP5C1, RPL17, FANCA, PSMA1, GZMB, SRRM1, IL12RB2, ITPR3, AKR1C3, SRSF10, TRA2A, RRM1, IFNG, 39326, REPS1, SMARCE1, TNNT2, KARS, NACA, ZBTB16, HMGB1, POLR3F, PSMC2, STX8, RPS27A, HNRNPH3, CBFA2T2, RAB9A, CIR1, CCNE1, MDM4, HBP1, TCF12, RPS15A, KRR1, TNPO1, SKI, MCF2, TLE2, DDX19A, RPS7, MAPKAPK5, UBE2I, HOMER1	http://www.ncbi.nlm.nih.gov/pubmed/23190644
27	BCL3, SOCS3, PIM1, SBNO2, LDHA, CMAHP, PDCD1, IGFL1, LOC731186, MUC1, GPRIN3	http://www.ncbi.nlm.nih.gov/pubmed/22532634
28	CFH, CFLAR, PLXND1, CYB561, TYMP, ANK1, RORA, TRIB2, TXK, PLD1, MCAM, IL12RB2, P2RX5, MAP3K4, ABCB1, TBC1D2, IL12RB1, TNFSF13B, CTSH, CA2, TRPS1, KCNN4, IMPDH1, SPOCK2, HLF, IL26, KLRB1, IL17A, IL17F, CCL20, ITGA4, IL1R1, EPAS1, ELOVL4, CCR2, APOL3, PALLD, ARNTL, SCRN1, FURIN, ITGAX, TOB1, RORC, SLC4A10, ADAM12, DST, GBP5, AUTS2, ACE, ZFYVE28, CCR5, IL23R, B3GALT2, ANTXR2, PTPN13, ANXA5, HPGD, CTSB, AQP3, KIF5C, LIMS1, CXCR6, DAB1, PTPRM, LONRF3, GREM2, FES, ZNRF1, GIMAP5, DPP4, LINGO4, TNFRSF25, LINC00299, LGALS3, ALPK1, PFKFB3, RNASET2, PDCD4, MAGED4, MAST4, ITGA6, CITED2, OSBP2, CERK, VDR, AK3, CDH4, S100A6, LRP12, MAPK10, RUNX1, MXD1, EMP1, SMOX, DTX1, AGPAT4, MYC, PCBP4, SPG20, PDE4D, NR1D2, NPDC1, CEBPD, ATP6V0A1, RCL1, LATS2, RAB11FIP5, RARG, GRAMD1B, SLC35G1, IL6R, GABBR1, ENTPD6, IL7R, SSBP3, GNA15, YBX3, TTC39C, FHL1, MLLT4, FLOT1, CCDC65, PERP, ADAM15, RPS6KA3, TGFBR2, STOM, NEO1, IL4I1, IL18RAP, TDRKH, AGO4, PHLDA1, PPP4R1, LIMS3, GAB3, CLIC3, ADTRP, EVA1C, SEC31B, ME1, FLT3LG, NMRK1, MVP, EPG5, MAN2A2, C3AR1, ZNF652, PLEKHF1, DSE, CD274, CASK, FKBP11, OBFC1, ELOVL6, PXK, PPP2R2B, GALNT10, CYP27B1, PPT1, MAPK3, METRNL, SETD7, THBS1, NR1D1, C14orf182, LTBP4, SLAMF1, SRD5A3, ADCY3, ACKR3, ABCD1, CLOCK, MCF2L2, JUN, RNF144B, SFXN3, VSIG1, AMPD2, IFI44, ZDHHC9, KCNA2, LMO4, ECE1, FEZ1, TMEM184B, NCF4, TRADD, UNC93B1, MB21D2, PPAP2C, LST1, MYO5A, C4orf26, CYFIP1, PLAUR, MAST1, METTL21B, NUAK2, FAM159A, CRYBG3, SH2B2, MDM2, CSNK1E, ADA, SLC38A5, CFHR1, MAML3, SOX5, SMAD3, RIPK2, NPHP4, GLA, MAP3K7CL, PAG1, CFP, LAPTM4B, PITPNC1, MPI, SFXN2, ZFP36L1, CDC42EP3, TSHZ3, ROPN1L, SIAE, NPC1, LPCAT4, MINA, NT5E, ARL3, TANC2, USP30, ITGA3, THOC3, B3GALNT2, MAP3K3, GIMAP1, BOP1, PGS1, C10orf2, DHX32, TNFRSF10B, TCEAL3, IRF1, KCNA3, PLSCR3, PLXNC1, ADPRH, PRKCD, ANKRD28, DHX58, NDRG1, EXT1, PHF11, CHN1, RANBP9, WDR59, RNF19A, CORO2A, CACNB3, OSTF1, MKNK2, ENPP2	http://www.ncbi.nlm.nih.gov/pubmed/22715389

29	MCM8, CDKN2AIPNL, MMP25, CD74, CFLAR, FOXK1, CSNK1G2, ZNF250, DMC1, MAGT1, ZNF14, HLA-E, FAM115A, SSTR2, SPTLC1, NA, METTL21A, NLRP8, NCF1C, NA, ZFYVE20, ZNF321P, YRDC, ITGA2, NA, IL10, OCIAD1, STAT1, C5orf28, ALPP, RNF24, IL17RD, GABPB2, DDX51, C8orf37, KCNH6, ITPK1-AS1, GPR1, CASP4, NA, EID2B, ZNF682, TNFSF13B, HSD17B7, N4BP2, CDAN1, FKBP14, TUBA3FP, BLZF1, HYPK, SPI1, XPNPEP3, DTWD2, ADAR, SDHAP1, AK1, PDE4C, GJC1, FKTN, GGA1, RBCK1, ZNF549, SLC16A12, MCMDC2, DHFR, MBOAT7, INIP, MSRB3, SHISA5, MSH3, SLC35E1, MIF, ZNF430, MTMR12, CFAP74, NA, AUNIP, EIF2AK2, XRCC2, FAM73A, ZNF814, PNPT1, VCAN, VIM, ZNF69, RASGRP2, NUBPL, PARP14, SLC44A2, SORL1, AFF3, ZNF530, NA, ORC6, FBXO40, USP49, IFI35, AKNA, ZMAT3, NPIPB3, PPA2, FCGR1A, MLKL, ARL16, SLC44A4, GPSM3, LILRB1, PSME2, ZYX, TAPBP, PLIN3, NA, ARHGDIA, SEMA3E, CORO1A, CEP19, IRF9, ZNF652, SERPING1, MAP3K11, GNAI2, EXO5, SERPINA1, ACAP1, SLC25A44, CYB5RL, VHL, MVP, IL4R, PSMB8, ZNF394, TDP1, RHBDF2, LRRC47, ERAP2, IRF7, HLA-G, PARP10, ZNF683, TNFSF14, MBD4, AHR, CREB1, PLEKHO2, CATSPER2, ZNFX1, ZNF786, SNRNP70, RPL7L1, AKT1, LPAR2, SLC16A3, INTS7, CMTM7, ATHL1, PDCD7, SYAP1, CCR6, CTDSP1, TIAF1, MYO1F, C17orf62, LAP3, STAT5A, ADRM1, IL18, BCYRN1, KIAA0101, ARF3, FAM177A1, CSF2RA, CTSW, CAPZB, C15orf39, PDPR, PPP2R1A, TCIRG1, MAST3, SP110, AKR1D1, ISG15, IL17RA, UNC93B1, CFD, HNRNPU, JUP, NOP56, DAPP1, RN7SL1, ANKRD22, PTPN6, CD27, MBD6, TRPC4AP, CD97, MKNK2, MYO1G, TRANK1, ATG16L2, NDE1, LAPTM5, CPT2, AHCYL1, CD37, SLC25A28, PLCB2, NCOR2, MICAL1, ZNF483, NBEAL2, PIGR, GAPDH, ITIH5, PGS1, ACADVL, IRF2BPL, RBM23, TMEM17, RNF167, VPS9D1, MED22, SBNO2, PRKD2, LAT2, LILRB3, SDF2L1, CNDP2, GRIPAP1	http://www.ncbi.nlm.nih.gov/pubmed/21357945

30	GPR183, CD300LF, UBE2A, CRLF3, 37500, PRDX5, RSBN1, TPM1, C5orf15, DNAJB6, SMOX, ADSS, ZMAT2, HMBS, INSIG1, TRIM33, TMEM183B, H2AFY, CEPT1, DNAJA4, TOR1AIP1, ANP32B, SCAMP1, GPX4, RGS10, KIAA0430, KIAA1551, LBR, XPO7, CCNI, TM6SF1, HNRNPK, RPL6, SLC44A1, TLE4, SLC40A1, VEZF1, SRP14, MS4A7, PNRC2, EFR3A, ARRDC3, HPS1, CDKN1B, TMBIM4, SNX3, TMEM87A, OGT, BCL2L1, ATP6V0C, MBP, XK, CD47, ANXA5, TFDP1, PRDX6, NPRL3, SIAH1, CHMP3, FGL2, IGF2BP2, OPTN, BAZ2B, CD302, ARPC3, GLO1, SNRK, PRKRIR, UBE2D3, PGRMC1, ATP6V1A, PAPD4, PRNP, FAM60A, TMED5, EVI2B, PELI1, KLHDC8B, PRDX3, PTEN, DAZAP2, OR2W3, SUZ12, VMP1, EEF1A1, BPGM, LST1, GUCD1, JTB, UBXN4, NDUFB5, TNS1, F2RL1, SRP9, MAP3K7CL, YPEL5, OLR1, ACP1, FBXO33, FTL, YOD1, ETS1, ATP5L, Mar-08, MPP1, CMTM6, AP1S2, BTF3, PRDX2, C2orf88, SH3BGRL, DPM2, CAB39, GYPB, RIOK3, RAB10, GOLGA7, RAB31, ITGB1, CLK1, EEF1A1P12, EIF3E, YBX1, ACTR2, SLC6A10P, CCNDBP1, CXCR4, ATP5E, DCAF6, PTBP3, HAGH, TMSB4X, POLR1D, C9orf78, CD46, CHPT1, YWHAH, ATP5EP2, LYZ, PTGS2, YBX3, TMEM71, PIP4K2A, OXR1, GNG11, ARL6IP1, IFIT1B, CAPZA2, GRINA, RGCC, TMEM123, MMD, NPTN, TMOD1, SDPR, SGK1, IFNGR1, HIST1H2AC, RPL30, RNF11, SERF2, CXCL8, TRAM1, GYPC, PCNP, PRKAR1A, RAB11A, PAIP2, PSMF1, SESN3, ZFAND5, FBXO7, SRGN, CHURC1, FAM104A, UBXN6, GABARAPL2, Mar-07, TPGS2, PPM1A, HBA2, MS4A3, OAZ1, HBB, UBB, ASCC2, ADIPOR1, SELENBP1, NINJ2, VNN2, CA2, ODC1, TSPAN5, SLC25A39, E2F2, TPT1, TRIM58, DCAF12, NCOA4, MBNL3, CEACAM8, RAB2B, GSPT1, OLFM4, RAP1GAP, SNCA, EPB42, MKRN1, RGS18, GYPE, ELANE, SLC4A1, GLRX5, PITHD1, VWCE, BNIP3L, AHSP, STRADB, HBD, ALAS2, YBX3P1, CAMP, FAM46C, DEFA4, DEFA1B	http://www.ncbi.nlm.nih.gov/pubmed/21357945
31	BCL11A, CCR7, KIAA0125, RBP5, CD22, FAIM3, DHRS9, ATP2C2, FCRLA, KBTBD12, CES3, C8orf34, GPR110, CR2, C5orf20, LOC130576, ZFYVE19, IGDCC4, DERL3, OSBPL3, MZB1, UNQ6228, SIGLEC6, CXCL13, MAN1C1, UGT8, CD79A, DMRT2, TMEM200A, GPR110, LRRC75A, TMEM9, SLC4A8, CALB2, RALGPS2, FAM129C, FOLH1, KLHL6, PDGFRL, TMEM182, ANKS1B, PRDM15, PRRX1, SLC45A3, IRF4, PNMAL1, CD79B, AMPD1	http://www.ncbi.nlm.nih.gov/pubmed/23925644
32	PAPSS2, WFDC1, NOSTRIN, NDEL1, NEDD9, STARD13, ASRGL1, EDNRB, KLF13, STOM, GPR4, MT1JP, SYN2, TMEM2, STX12, COL4A2, PAG1, RTN4, ABTB2, FCN3, ACVRL1, NES, PLXNA2, PODXL, PECAM1, RGCC, S100A8, TACC1, ENG, TPST2, KRT7, SYCP2L, MYH9, CYP4Z1, PHLDB1, WNT2B, BTNL3, SMAD6, RCOR1, LUZP1, PRKCE, ARHGEF10, HPCAL1, QKI, HERC3, COL4A1, GABARAPL1, CTTNBP2NL, KL, RIC1, CELF2, FOXF1, TMBIM1, BRINP1, CSPG4, SH3BP5, STXBP6, ATOH8, TAL1, CRMP1, RAI2, S1PR1, LPHN2, MAP2, CMTM8, SDE2, VIPR1, PKN1, ECHDC3, ADRB1, GREB1L, GPR133, ZNF358, PTPN12, LRRC8A, MAOA, TGFBR2, EPAS1	http://www.ncbi.nlm.nih.gov/pubmed/23925644
33	FKBP5, PDK4, RHOBTB3, ART3, PPM1K, HIF3A, KLF9, SLC39A8, PDE4DIP, JADE1, KLF15, KCNAB1, PRPH, TMX4	http://www.ncbi.nlm.nih.gov/pubmed/23925644

34	TMPRSS11D, SERPINB13, SPINK5, KRT4, TMPRSS11A, CSTA, GABRP, TYMS, GPR87, TMPRSS4, ATP10B, CH25H, SRPX2, IGKC, BNIPL, RAB38, CAPNS2, FANCD2, ABCC1, TENM2, BNC1, KLK10, PTAFR, CRABP2, TENM4, TRIM16, EYA2, GNA15, SMAGP, BICD2, EXOSC7, SCO1, BID, RHNO1, ITPA, TSPAN17	http://www.ncbi.nlm.nih.gov/pubmed/23925644
35	PPP2R1B, SCUBE3, ADAM22, GCC2, ACTA2, KIAA0319, FAM129A, MYOCD, NTN1, SYNPO2, CCDC30	http://www.ncbi.nlm.nih.gov/pubmed/23491407
36	IFI35, IRF7, MX1, MX2, XIAP, IFI44L, OAS2, LY6E, AGRN, IFIT1, RSAD2, ISG15, IFIT3, CCL2, TDRD7, PLSCR1, ACSL1, TNFSF10, OAS1, GBP1, SERPING1, FCGR1A, C2, TYMP, STAT1, LAMP3, LGALS3BP, IFITM3, TAP1, IFI6, APOBEC3F, APOBEC3C, APOBEC3B, APOBEC3A, APOBEC3D, APOBEC3G, G6PD	http://www.ncbi.nlm.nih.gov/pubmed/12642603
37	CD3D, DLEU1, COX11, HNRNPDL, DAP3, SORL1, PRNP, SLC25A6, EIF4B, PABPC4, RAB4A, CD3G	http://www.ncbi.nlm.nih.gov/pubmed/12642603
38	CCL5, GZMA, GZMK, PDCD1, IFNG, PACSIN1, CLIC3, TIGIT, CD70, TBX21, LYAR, ST8SIA1, CFH, IRF5, CTSH, OSM, LMO4, CCR4	http://www.ncbi.nlm.nih.gov/pubmed/23870669
39	SEMA5A, LOC729041, GATA3-AS1, NEFL, GAB2, KLRB1, NRIP3, ZP1, METRNL, TPPP, CAPG, ITPRIPL1, GATA3, ZDHHC11B, TNFRSF18, CADM1, ZDHHC11, NOD2, FANK1, LOC100131176, ABCA2, SUSD4, BEGAIN, HOMER3, MRC2, ZBTB16, DUSP23, SNED1, C16orf45, BAI2, PPP1R9B, GALT, SNTN, ASPH, PRMT9, LMCD1, BEST4, RORC, NOS3, SLC25A33, PPAPDC1B, ARHGAP42, SEMA5A, LOC729041, GATA3-AS1, NEFL, GAB2, KLRB1, NRIP3, ZP1, METRNL, TPPP, CAPG, ITPRIPL1, GATA3, ZDHHC11B, TNFRSF18, CADM1, ZDHHC11, NOD2, FANK1, LOC100131176, ABCA2, SUSD4, BEGAIN, HOMER3, MRC2, ZBTB16, DUSP23, SNED1, C16orf45, BAI2, PPP1R9B, GALT, SNTN, ASPH, PRMT9, LMCD1, BEST4, RORC, NOS3, SLC25A33, PPAPDC1B, ARHGAP42,	http://www.ncbi.nlm.nih.gov/pubmed/23870669
40	BCL2L11, FLJ46446, NECAB3, TULP4, NXPE3, E2F3, TMEM2, CD27, LOC100128031, MBD5, GBP5, SLC12A6, PELI2, KBTBD11, CCR7, NRIP1, SNN, GPA33, PRAGMIN, TXK, ACTN1, IGF1R, BTBD11, ADTRP, TMIGD2,	http://www.ncbi.nlm.nih.gov/pubmed/23870669
41	KLRB1, RORC, PLXND1, CTSH, ALOX5, PTPN13, IL4I1, SMCO4, NEFL, HLF, JAKMIP2, DSE, LIMS1, HLA-DRB1, LTK, HLA-DRB4, USP10, NR1D1	http://www.ncbi.nlm.nih.gov/pubmed/23870669

42	MYO1F, MIAT, ADAM19, LINC00152, E2F2, FAM129A, RP3-527F8.2, TESC, PDCD1, ANXA2, PRDM1, FAM46C, HLA-DRB1, LOC541471, ITGB1, NPDC1, ANXA2P1, HLA-DRB4, LOC338620, NCF4, TNFRSF4, LGALS1, TIGIT, MPST, SAP30, OASL, CPNE7, CALHM2, CD70, SRXN1, PMAIP1, GPR68, C12orf75, PLA2G16, PTGER2, PTTG1, PERP, HNRNPLL, FAS, IER5, MAF, ACTN4, RPL39L, SYT11, ANXA4, CDKN2C, AHNAK, LRFN4, RP11-374F3.4, APOBEC3C, IRF5, CHST7, DNAI2, PREX1, RNF214, S100A11, ATXN1, TNFRSF1B, SMCO4, S100A4, TUBB4B, TP53INP1, CYSTM1, CCR10, ANXA5, LOC284475, NDC80, TBK1, CREM, GALM, NBEAL2, PPP1R15A, ODF3B, ZC3H12A, CLIC5, TST, CD82, PRDM8, IL10RA, DLG3, PIEZO1, AIM2, YWHAH, HN1, CAPG, CTSH, PHACTR2, CD58, ACOT9, AAED1, CD99, GGTLC1, CLDND1, ATP2B4, PDIA6, SLC35B2, PI16, NABP2, SAMSN1, MYO1G, CLIC1, EZR, SLAMF1, CHST11, FAM53B, OSBPL3, LMNA, RILPL2, RALGDS, ARPC1B, GLIPR1, TRIM59, CRIP1, GATA3, SRGAP2, IL32, CDKN2A, BTG3, CCDC167, RUNX2, SRGN, ANTXR2, NLRP3, ADAM8, TPM4, GLIPR2, TXN, SSBP4, NABP1, CD63, OPTN, ASNA1, MTHFD2, RGS2, SURF4, CREB3L2, CD84, IDS, ZFYVE28, FLNA, COTL1, RAB11FIP1, COMMD5, SQRDL, PDP1, PANX1, RNF135, AQP3, FAM45A, SMC4, BNIP1, HERPUD1, GLB1, CAPN1, SHKBP1, SLC9A9, HSPA1A, SCO2, GDE1, TUBB2A, RABGAP1L, EAF1, SLC25A24, PRKCD, TRIM47, CAPN2, CCR4, SLCO3A1, PFKP, S1PR2, REEP5, SNAI3, PMVK, S100A10, GGTLC2, CTSA, AHR	http://www.ncbi.nlm.nih.gov/pubmed/23870669
43	TPCN1, ZSCAN18, DBH-AS1, CDCA7L, ZNF204P, CITED4, TCTN1, NAA16, GHRLOS, MYH3, LRRC24, ACVR1C, hCG_1990547, SLC12A7, LOC100128670, MYL5, CAPN5, GPRASP1, LAMB2P1, SMIM1, PCED1B, PPP1R3E, TXK, ROBO3, NUCB2, MEIS3P1, TLE2, MPZL1, CHI3L2, IL6ST, ACSS2, MPP1, ZNF573, PPT2, CCR7, FAM117B, SNN, EPHX2, AMIGO1, PLAG1, NET1, CHKA, MAN1C1, FBP1, SATB1, MDS2, GSAP, LOC100132345, LOC100131662, NLGN2, ITGA6, TRABD2A, TSPAN3, SCARNA16, B4GALT4, ACTN1, CERS6, NUAK2, GPC2, FBXO15, FLJ41649, BCAS4, TNFRSF10D, PDE9A, GNG7, GSTM2, CCDC106, FAM153A, PRAGMIN, AK5, PTPRS, LOC650392, APBA2, SOX8, IGF1R, BACH2, EPHB4, MYO15B, RIN1, FAM153B, AEBP1, PCSK5, AIF1, FAM213A, FHIT, LOC100129534, COL18A1, TMIGD2, CELA1, HSPG2, CLEC11A, NOG, LRRN3,	http://www.ncbi.nlm.nih.gov/pubmed/23870669
44	TRIB1, FANK1, HLA-DRB1, HLA-DRB4, LOC541471, DUSP4, CD70, TIGIT, IL2RA, FOXP3, PMAIP1, CKS2, IKZF2, ICA1, SMPD3, CPNE2, RORC, PTPLA, BFSP2, MGST2, RPL39L, CTLA4, TNFRSF1B, NUSAP1, VAV3, DUSP10, SLC2A8, TOX, KLRB1, SPATS2L, CTNNAL1, LOC284475, F5, IKZF4, PCTP, BASP1, LMCD1, RHOXF1, SETD7, TRIM16L, SHMT2, CXCR5, RP3-527F8.2, HLA-DMB, GBP5, HLA-DOA, FLJ46446, SMC6, HLA-DMA, IRF4, LOC730631, HS3ST3B1	http://www.ncbi.nlm.nih.gov/pubmed/23870669
45	AP3M2, TSPAN18, ZFP36L2, GPR35, LOC100131646, DPP4, SOS2, NLRP3, ASPH, MSX2P1, WNT10B, TMEM71, IL7R, WNT7A, STAT4, NOSIP, NR3C2, NOG, PDIA5, RBMS1, RECK, ACSL6, LOC643988, APP, CD40LG, VIPR1, WNT7B, CACNA1I, THEMIS, ID2, C1orf228, SCML4, LOC100132345, SOX8, DENND5A, AXIN2, ANK3, LOC650392, SLC40A1, NELL2	http://www.ncbi.nlm.nih.gov/pubmed/23870669

46	ALOX5, ANXA4, BIVM, BPI, BRD7, CAMP, CASK, CD63, CEACAM6, CEACAM8, CFLAR, DEFA4, GCA, LCN2, LOC23117, LOC728358, LTF, MBOAT1, MMP8, MNDA, PDE4D, POLR2J2, PPP1R16B, PRKCB, RETN, RNASE3, RUNX2, S100A12, S100A8, S100A9, S100P, SLC38A2, SPATA13, SRGN, SRGN, STOM, TNIP1, TTYH2, UGCG, ZNF749	http://www.ncbi.nlm.nih.gov/pubmed/21917308
47	AGPS, AKIRIN1, ANAPC5, ANKRD12, ANKRD17, ANXA3, ARFGEF2, ARG1, ARIH1, AZU1, BAG2, BPI, CASD1, CASP2, CASP6, CD24, CEACAM1, CEACAM6, CEACAM6, CEACAM8, CFLAR, CHI3L1, CHI3L1, CPEB4, CSNK1A1, CYCS, DOCK9, EHBP1L1, ELANE, FAM20B, FAS, FLJ10038, FLJ38717, GCA, GGA1, GNAQ, HERPUD2, HP, HP1BP3, KDM4B, KLF9, LCN2, LOC23117, LOC728358, LRRC8C, LTF, MINA, KMT2A, MPO, MS4A3, MSI2, NBPF11, NIPSNAP1, NMT2, NUP160, OXR1, MTPAP, PGLYRP1, PLP2, PLRG1, POGK, POLR2J2, POLR2J2, PRKX, PTER, PTPLAD1, RBM6, RECQL, RNASE3, RNPC3, RPL37A, RPS10, RSL1D1, S100P, SAMHD1, 38961, SF1, SMARCC2, SNRPN, SPEN, SRP72, TAF15, TCN1, TMEM106B, TMEM63A, TMF1, TNRC6B, UBE2H, UGCG, UGCG, YTHDC2, ZFP90, ZNF131, ZNF195, ZNF749	http://www.ncbi.nlm.nih.gov/pubmed/21917308
48	ABCC3, ABCC8, ABLIM2, ACTL6B, ADAM19, ADAMTS7, ADO, ALPPL2, APOBEC3F, APOBEC3G, APOC3, APOE, AQP2, ARTN, ARTN, ASCL2, BIRC7, BOC, CD1C, CD74, CDKN1C, CHRNA2, CLDN9, CLEC10A, CLEC2L, CLEC7A, COL11A2, COX6A1, CSF1R, CSPG5, CST3, DKFZp761P0212, DNALI1, EIF3B, ENPP7, C2CD4B, FAM71A, FCER1G, FGD2, FGFR1, FGL2, FLJ20021, RTP5, GALNT9, GDF9, GNPTAB, GP1BB, GPR114, GPR20, GPR39, GPRC5B, HAB1, HBA1, HBA2, HBA2, hCG_2007354, HES4, HLA-DQB1, HMOX1, IFI30, IGHA1, IGHA1, IL18RAP, IRF8, NMRK2, KDM8, KCNC4, KIAA1598, KIAA1648, PLIN4, KIF26B, KLF4, KLK13, KLRB1, KRT8, LGALS1, LILRA4, LMNA, GPAT2, LOC283177, FBXL19-AS1, SSC5D, LOC284837, LOC349114, LPAR3, LRRC16B, LRRC25, LRRN4, LRTM2, LST1, LST1, LST1, LST1, LST1, MAFB, MNT, Mar-02, MPEG1, MPEG1, MS4A6A, MUC4, MUC5AC, NF1, NFIX, NPPB, NUPR1, NYX, OXCT2, PALLD, PAPLN, PARD6G, PIK3AP1, PILRA, PRDM12, PRDM8, PRKD2, PSG5, RAB40B, RAPGEF3, RASGRF1, RHOV, RIF1, RUNX1T1, SAT1, SIGLEC10, SLC22A7, SLC7A7, SMARCB1, SMTNL1, SNCA, SNCA, SNCG, SNX22, SPON2, TBC1D9, TBX1, TBXA2R, TGFBI, TLE6, TMEM132A, TMEM151B, TMEM176B, TMEM198, TNFSF13B, TPCN1, TRAJ17, TRIM29, TTBK2, TYROBP, USP2, VASH1, VENTX, WIZ, WNK2, WNT6, ZFP36L2, ZNF20, ZNF703	http://www.ncbi.nlm.nih.gov/pubmed/21917308
49	NFKBIZ, ZC3H12A, RELB, BIRC3, CXCL1, ZC3H12C, TNFAIP3, MAP3K8, CXCL2, CASZ1, IER3, LENG1, SOD2, RRAD, NFKB2, ID2, TATDN1, CBR3, CCL3, ICAM1, PIK3R6, GADD45B, ADAM21, ZBTB25	http://www.ncbi.nlm.nih.gov/pubmed/24393021
50	MAP3K8, OPLAH, OR13C2, IER3, TMA16, KRTAP8-1, ZC3H12A, RIMBP3, OR2T10, GPIHBP1, HNRNPCL1, NFKBIZ, PTTG1, BDKRB1, CXCL1, F13A1, IL6, LTF, CXCL10, LRMP, TLR5, NFKBIA, CXCL2, GDPGP1	http://www.ncbi.nlm.nih.gov/pubmed/24393021

51	IL1B, IL6, CSF1, IL1R1, IL27RA, TNFRSF9, TNFRSF12A, IL1RN, CCL4, CXCL1, CCL7, CXCL3, CCL5, CCRL2, CXCL8, RGS1, LIF, CD69, LAT, CD83, ADORA2A, CRIP1, HLA-DQB1, PFDN6, TRAF1, NKG7, PTX3, FCGR2B, TNFAIP6, PTGER2, CLEC5A, GPR183, TREM1, BIRC3, FCAR, TLR2, HIVEP1, FOSB, FOS, EGR3, PHLDA2, SERPINB2, FGFR1, EGR2, INSIG1, PDGFA, IER3, PDGFB, BTG2, KLF10, PLK3, NAMPT, TNFAIP3, TNFAIP8, MARCKSL1, CRABP2, IRF2, RASAL1, FLRT2, SMARCD3, RND3, KAL1, FLNB, CD151, ARF6, ALCAM, MAFF, MSC, NFKB1, BCL6, NFATC1, ATF3, NFKBIA, NFKBIE, MYC, EMP1, ELL2, TOP2A, GTF2H2, DUSP2, THBD, NR4A2, GEM, OLR1, GCH1, SPHK1, NDUFA7, HBEGF, JAG1, LDLR, SMAD7, MALT1, SPRY2, DUSP6, MAP2K3, CREM, DUSP1, MAP3K14, FUT4, JUN, CYTIP, FYN, PGGT1B, VRK2, AKAP13, TTK, ENC1, SLC16A6, HIST2H2AA3, CYP3A4, HIST1H1C, NDC80, STK17A, PELI1, KCNAB1, B4GALT4	http://www.ncbi.nlm.nih.gov/pubmed/16911805
52	MS4A2, TPSAB1, TPSAB2, CPA3, RGS13, C1orf186	http://www.ncbi.nlm.nih.gov/pubmed/27677865
53	CLC, CPA3, DNASE1L3, IL1B, ALPL, CXCR2	http://www.ncbi.nlm.nih.gov/pubmed/24582314
54	CD83, JMJD6, STAT4, TRAF1, SLC7A5, TBCD, NFKB1, CD44, DESI1, NELFE, XCL2, IL4R, DUSP2, DUSP4, NUP188	http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1253826/
55	ADAM28, CNR2, FFAR3, LGALS12, PRSS33, SPNS3, ADAM8, CORO1A, FHL3, LTC4S, RAB37, TESC, ARAP3, CYP4F12, GGT5, MCTP2, RAB3D, TNFSF14, ASB2, DACH1, GPR56, MMP25, RD3, TREML2, ATP2A3, DAPK2, GPR97, NHSL2, RNASE2, TRPM6, CASS4, DGKD, ICAM3, P2RY2, RNASE3, TSPAN18, CD300LB, EMP4P, IFITM1, PADI2, SIGLEC10, VSTM1, CD69, FAM101B, IL1RL1, PADI4, SIGLEC8, CDA, FAM65B, IL5RA, PGLYRP1, SLC24A3, CHST15, FFAR2, KIF21B, PIK3R6, SORL1	http://www.ncbi.nlm.nih.gov/pubmed/23844029
56	CLC, SIGLEC8, EMR1, EMR4P, LGAL312, HRH4, CEBPE, DACH1, VSTM1	http://www.ncbi.nlm.nih.gov/pubmed/27677865
57	CXCL10, IFIT1B, MX1, MX1, OASL, IFIT2, CMPK2, HAS2, RSAD2, HAS1, RSAD2, CXCL11, CSF1, TNFAIP6, IFIT1B, GBP2, RSAD2, RTP4, IRGM, RND1, GBP4, RTP4, IFIH1, IRGM, CMPK2, HAS2, CXCL9, IRGM, IFNB1, CSF1, IL6, ADAMTS4, STAT1, PTX3, GEM, TNFAIP3, PARP14, GBP6, ADAMTS4, DDX58, PYHIN1, FAM26F, TNFAIP2, USP18, MMP13, CCL4, CCL8, CCL11, PYHIN1, MT1H, PLSCR2, TNFAIP3, VCAM1, ADM, CXCL11, C12orf75, ATF3, CP, CCL20, CXCL9, TIMP1, SLFN11, HPX, SAA1, IFI44L, CCL22, NTS, CH25H, IRG1, IFI44L, FGG, MT1A, RGS16, CXCL3, CXCL3, CXCL3, CXCL6, CXCL8, LEP,	http://www.ncbi.nlm.nih.gov/pubmed/22990623

58	NHLH1, CMPK2, IFIT2, CMPK2, GBP4, MX1, RSAD2, TOR3A, CD274, HERC6, DDX58, HERC6, HERC6, SAMD9L, STAT1, HERC6, GBP4, GBP2, GBP4, RNF213, MX1, ZNFX1, MITD1, PARP14, CXCL10, IRGM, GBP2, SETDB2, STAT1, IFIT1B, EIF2AK2, ENPP4, WARS, IRGM, IRGM, ATM, ASB13, WDR19, OASL, PML, PML, TLR3, IFIH1, RTP4, TOR3A, IFIT1B, SLFN11, ASB13, DDX60, STAT2, PARP11, TRIM5, STAT2, STAT1, TOR3A, TRIM6, RBL1, CXCL11, WDR19, DDX58, PARP9, TRIM21, USP18, WARS, DDX60, GBP2, DTX3L, IL15, GBP6, ENPP4, SLFN11, SECTM1, ADAR, MLKL, XAF1, RSAD2, INPP1, ZUFSP, WARS, MITD1, TRAFD1, RTP4, DHX58, UBE2L6, IDO1, LY6E, STAT1, IFI35, RSAD2, TRIM34, NAMPT, GNB4, CXCL9, NMI, IFI35, CXCL9, PLSCR2, PNPT1, HAS2, TRIM14, NLRC5, CXCL11, PYHIN1, DDX58, IRF9, HAP1, ZBP1, BATF2, IRF7, PYHIN1, DTX3L, DAXX, ZBP1, IFI44, KATNA1, SPATS2L, ADAR, Mar-05, PNP, NCOA7, SLFN5, FAM26F, SP100, IFI44L, RAB19, CX3CL1, ZNF836, PLEKHA4, SLFN11, ISG20, MISP, IFI44L, SERPINA3, CD40, SPPL2A, IFNB1, AIM1, MMP13, UBA7, ADAR, VCAM1, ZC3HAV1, SPATS2L, IFI44L, ATM, TOR1AIP2, TTC39B, DHX58, TMEM171, MOV10, CD40, PAPD7, TNFAIP6, SLFN12, PSMB8, LGALS9C, PARP14, ASAP3, TTC39B, HAS2, PSMB9, TAPBPL, ZSWIM5, CCRL2, CD40, CASP4, ATP10A, AREL1, DCP2, IL6, CCL5, UPP1, SLFN5, ECE2, APOL6, GCH1, CTRL, SP100, CX3CL1, CSF1, LAG3, IL18BP, TTC39B, TMEM106A, PNPT1, SPATS2L, TRIM25, RNF114, PLAC8, FCGR1A, SLC15A3, USP25, NAMPT, SLFN12, EPSTI1, GGT5, XAF1, CD69, CACNB4, SOCS1, MS4A4A, TLR2, ATF3, OAS3, SAMHD1, PYHIN1, GCH1, PPP1R14D, ASB13, TRIM5, LYPD8, NFKBIE, ARHGAP8, CSF1, CASP1, ZC3HAV1, PLA1A, BRIP1, CD86, SOCS1, CCL8, LGALS3BP, OSMR, CCL4, ETNK1, OAS2, TIFA, EPSTI1, ARID5A, PPA1, XDH, TNFAIP3, CNR1, NFKBIE, MS4A4A, ERVFRD-1, CA13, PARP11, MARCKSL1, VCAM1, GLIPR2, LRRC4, SECTM1, GEM, RND1, PTX3, ARSI, AFTPH, NPC2, VCAN, GLIPR2, DNASE1L3, ABTB2, MS4A6A, SLC2A6, CA13, FRAS1, PAPSS2, MXD1, HSPBAP1, B2M, FAP, SLFN5, PCGF5, VCAM1, EPSTI1, MB21D1, ADAMTS4, PTPN2, IFNG, FCGR1A, GZMB, VCAN, POU3F1, CA13, TFPI2, TNFAIP3, VNN1, PML, IAPP, UBD, IRG1, ADAMTS6, IAPP, IAPP, RTN4RL2, DCK, TNFAIP2, RGS1, BCL3, CSRNP1, SLFN12, ADAMTS4, MT1H, KLRK1, VNN1, MSR1, IL12B, CH25H, NTS, CCL22, PYHIN1, IL1RN, TNF, CP, SOCS3, RAD54B, CCR2, TIMD4, TIMP1, XCL2, NAV3, IFITM1, HPX, DDX4, MS4A6A, GZMA, DCK, FCGR3B, CXorf21, NCR2, GPR84, MBD1, MSR1, IL1RN, SELP, IL1RN, MSR1, NCR1, SAA1, SLFN12, CCL3L1, MT1A, CXCL3, FGG, CXCL3, RGS16, CXCL3, ORM2, C15orf48, CXCL8	http://www.ncbi.nlm.nih.gov/pubmed/22990623
59	KIF26B, CXXC4, DCDK1, FMO3, SPTSSB, 37865, HMGCS2, ADH7, RAB17, ASGR1, HEPACAM2, CCDC176, CLDN8, SYT17, PCLO, TMEM232, GDF10, ATP6V1B1, C11orf87, CDH26	http://www.ncbi.nlm.nih.gov/pubmed/22990623

60	IFIT2, CMPK2, CXCL9, IL18BP, CXCL10, STAT1, CXCL11, CD274, GBP4, HERC6, HERC6, MX1, HERC6, ZBP1, RNF213, RSAD2, TRIM5, BST2, IRF7, GBP2, LAG3, IRGM, IRGM, TOR3A, SAMD9L, OASL, MX1, XAF1, IFI44L, STAT2, IDO1, SPPL2A, ZNFX1, HERC6, STAT2, IRGM, CXCL9, GBP4, IFIT1B, PARP11, UBE2L6, ZBP1, PYHIN1, IFI27, IFI35, TOR3A, CMPK2, PYHIN1, USP18, LGALS3BP, DDX60, RTP4, RSAD2, MLKL, GBP2, STAT1, COL11A2, MS4A6A, UBA7, ISG20, GBP2, ADAR, DTX3L, IFIT1B, DHX58, GBP6, DHX58, TRIM34, RTP4, MS4A4A, OAS3, RSAD2, DDX58, IFI44L, MTHFD2, IFI44, IFI44L, TRIM6, DDX60, IRF9, PML, IFIH1, FCGR1A, PLA1A, PSMB8, CXCL11, CNGB3, EIF2AK2, PARP9, FCGR1A, NMI, MS4A4A, LYPD8, SECTM1, GZMB, NLRC5, APOD, MS4A6A, TRIM5, PLEKHA4, CLEC4A, CCR2, PSMB9, APOL6, DNASE1L3, MTHFD2, SLFN11, EPSTI1, PLAC8, ACP2, LAIR2, LGALS9C, TMEM106A, SIGLEC1, PML, FAM26F, IL1RN, GPR84, TAPBP, C2, LY6E, TMEM106A, HAP1, LAIR2, XCL2, SPATS2L, IL1RN, AIM1, OAS2, HCK, BATF2, EPSTI1, TRIM14, SLFN12, STAT1, IL1RN, CCL5, SLAMF9, UBD, MSR1, HPSE, OCSTAMP, FCER1G, AIF1, PYHIN1, DNASE1L3, LAIR2, MSR1, EVI2A, SCT, NAIP, ZC3HAV1, KLRK1, CST7, DCK, CCL8, MSR1, DAXX, SLC39A2, TLR3, CASP4, TGFBI, SLFN12, PYCARD, ADAR, TREML4, SLC2A6, SETDB2, THEMIS2, MSR1, SERPINA3, TIMP1, IL6, GNGT2, SLC15A3, VCAN, FCGR2A, NCR2, CCL4, CCR2, TRIM21, CYBB, SIRPG, IKBKG, BEX4, CA13, CYBB, FGR, VCAM1, CASP1, CCR2, SLFN11, SLC7A5, IRG1, CLEC5A, DDX58, SLFN5, FCGR3B, DCK, KLK1, CA13, RUNX3, TIFAB, APOBEC1, PARP14, MYO1F, AFTPH, MISP, EMR3, TLR7, XDH, SLAMF7, SEMA4D, PLEK, PRF1, AFTPH, DCP2, CYBB, TNFRSF1B, CD86, SLAMF8, HAVCR2, GLIPR2, KLK1, FPR2, IGSF6, NAMPT, CD180, SPI1, VCAN, TGFBI, SLFN11, TRIM25, HPX, LST1, CXorf21, SLFN12, XAF1, GLIPR2, BID, VCAN, PTPN6, NFKBIE, NFKBIE, C3AR1, MILR1, CD69, IFI27, PLD4, PPA1, ORM2, UPP1, PLEK, C3AR1, Mar-01, TLR2, GCH1, FASLG, VCAM1, SPIC, FASLG, CXCL13, P2RY13, GPR35, IL12B, CD48, DDX4, GZMB, SPIC, CA13, IL2RB, SFRP1, CD68, CLEC4A, PARP11, CTSW, SERPINA3, ABCB1, PILRB, CD80, CD40, KLRB1, TIFAB, GPR65, LCP2, FCGR2A, RGS1, VNN1, EPSTI1, C15orf48, EMR3, LILRB2, CCR9, GPR114, FOSL1, CD300A, SAA1, MS4A4A, CH25H, VAV1, FCGR2A, DCLK1, CD33, B2M, GZMA, MS4A7, CCR9, NKG7, IL12B, CCR2, CXCL13, SAMSN1, HAVCR1, KLRB1, RASA4, COCH, PTPRO, GPR171, C3AR1, FGR, NCR1, NCF4, CCL8, POU3F1, PLA2G7, CLEC4E, F10, FCGR2A, IFITM1, SLFN12, CD8A, LCP2, CLEC6A, CD8A, CXCL3, TLR1, GZMK, LPXN, ITIH1, DUSP2, TBX21, SELP, CD72, CD8A, SELL, FYB, ADM, UPB1, CLEC4E, RNASE6, KLK1, TNFRSF9, LAT2, OOEP, VNN1, PTPN2, CXCL3, CLEC6A, IL2RB, PIWIL2, CXCL3, TNF, CCR2, TNFRSF9, MAB21L3, TNFAIP2, ATF3, LCN2, ERVFRD-1, IL18RAP, AOAH, SECTM1, CCR2, ZC3H12A, IFNG, IFNB1, CXCL6, CD244, TLR7, CCR1, IL10RA, CSF3, CCL3L1, CD53, GIMAP7, TNFAIP6, FST, NOXO1, RGS16, CCR1, RFPL3, CXCL8, EOMES, CCL15, ADAMTS4, KLRC2, SLA2, GPR176	http://www.ncbi.nlm.nih.gov/pubmed/22990623

61	GLS, HEPACAM2, RELN, GRIA1, GPC6, ACAA1, GRIA1, DIRAS2, GSTA1, LRRC17, HTRA3, FCRL2, GDF10, GPC6, ASGR1, DNAH6, SLC7A10, PON1, RYR3, DNER, NOTUM, KIF26B, GNG4, RBFOX3, FAT3, CD207, BCAN, CD163, SYT17, PER1, SHISA9, CES2, DCDK1, NTM, ATP6V1B1, SCARA5, DNER, KLF15, FMO3, CNTN4, GLB1L3, CYP1A1, ANGPTL7, OLFM2, CD209, C11orf87, FABP1, FABP1, HPCAL4, NTRK2, DHRS7C, TTN, TMEM182, TTN, TTN, MB,	http://www.ncbi.nlm.nih.gov/pubmed/22990623
62	IRF7, APOD, ZBP1, IFI44L, CXCL10, GBP4, PYHIN1, PYHIN1, ZBP1, IFI44, CXCL9, IFIT1B, CXCL11, LY6E, LGALS3BP, USP18, DDX60, SIGLEC1, GBP6, RTP4, LAIR2, MX1, IFI44L, BST2, MX1, RTP4, MS4A6A, XAF1, C3AR1, DDX60, SLAMF9, C3AR1, CMPK2, STAT1, CCR2, FCGR1A, OASL, IFIT2, MS4A4A, FCGR1A, OAS3, C3AR1, LAIR2, IL18BP, OAS2, AIF1, DHX58, LAIR2, CCR2, IRGM, HERC6, TM4SF5, APOC2, SLFN12, MS4A7, CNGB3, MS4A4A, MS4A6A, HERC6, IFI44L, APOBEC1, CCR2, FCGR2A, HERC6, RSAD2, PLA1A, MSR1, CXCL9, GDF3, TIMP1, IL12B, RSAD2, SLFN11, CLEC4A, CCR2, SIRPG, HERC6, B2M, SAA1, IFI27, NLRC5, CLEC4A, CCR2, FCGR2A, EPSTI1, CCL5, CLEC5A, BEX4, CCR2, CD72, SLFN12, MSR1, EPSTI1, TRIM5, MILR1, STAT1, XCL2, FCGR2A, FCGR2A, LPXN, DCK, GPR114, GPR65, MSR1, LST1, VNN1, DHX58, FAM26F, RSAD2, CCR1, MSR1, SAA4, CCL4, CCL8, NCR2, CXCL3, PYHIN1, CCR9, KLRK1, GZMK, IRG1, HAVCR1, PARP14, CCR2, MS4A7, RGS1, CXCL3, CXCL3, KLK1, CH25H, FYB, CXorf21, HPX, GPR35, CD180, FCGR3B, CXCL13, SLFN12, IL6, TLR1, KLK1, CXCL6, ORM2, TNFRSF9, CA13, KLK1, KLRB1, GZMB, C15orf48, EMR3, RGS16, CXCL13, ADAMTS4, CYBB, CXCL11, IL1RN, RFPL3, SLC26A4, CXCL8, UBD, CCL3L1, IFNG, IL1RN, ORM2	http://www.ncbi.nlm.nih.gov/pubmed/22990623
63	GRIA1, GRIA1, HEPACAM2, ACAA1, CNTN1, ASGR1, CD207, CD209, SCARA5, FABP1, FABP1, ITGB1BP2, SLC47A1, MYL3, MYL3, MYL3, MB, MYL7, TNNC1, MYL4, SMPX, RYR2, TTN, TTN, CASQ2, PGAM2, CKMT2, SRL, TTN, DHRS7C, CA3, TRDN, TCAP, TTN, TNNT2, LDB3, CFD, MYOZ2, TNNI3, TNNT2, MYBPHL, CSRP3, TXLNB	http://www.ncbi.nlm.nih.gov/pubmed/22990623
64	IRF7, APOD, CCNA1, PYHIN1, IFI44L, TOMM20L, PYHIN1, IFI44, IFI27, IFI44L, IFIT1B, MS4A7, OAS2, CXCL10, MX1, DDX60, ZBP1, CCR2, C3AR1, ZBP1, SPAG5, CXCL9, SAA1, CCDC67, CCR2, FCGR1A, KLK1, KLK1, OAS3, MX1, MS4A4A, SRSF11, NCAPG, CDK10, CEP55, MS4A4A, CCR2, ESCO2, CCR2, OASL, RGS1, SLFN12, IL12B, KLK1, ORM2, CXCL11, CXCL8, IRG1, CXCL3, CXCL3, CXCL3, SLC26A4, AGR2, CLCA1	http://www.ncbi.nlm.nih.gov/pubmed/22990623
65	APOD, IRF7, MS4A7, PYHIN1, C3AR1, C3AR1, CCL8, CCR2, MS4A7, PYHIN1, CCR2, C3AR1, CCNA1, IFI44L, SPAG5, TOMM20L, MX1, CDK10, CXCL9, IFI27, IL12B, SAA1, CEP55, OAS2, HAL, IFI44L, ESCO2, CXCL10, RGS1, HMMR, CH25H, CXCL11, ESCO2, C15orf48, ORM2, CXCL8, IRG1, AGR2	http://www.ncbi.nlm.nih.gov/pubmed/22990623
66	CNTN1, CD209, FABP1, FOSB, ZBTB16,	http://www.ncbi.nlm.nih.gov/pubmed/22990623
67	GDF15, AEN, CCNG1, CDKN1A, EDA2R, CELF5, DDIAS, PSRC1, THEM5, PSAPL1, SAA1, CXCL3, CXCL10, RSAD2, ORM2, CCL20, CXCL6, TIMP1, CXCL8, CCL8, SLC26A4, IL6, ADAMTS4, CXCL9	http://www.ncbi.nlm.nih.gov/pubmed/23565148

68	HERC6, VCAN, RSAD2, MX1, IFIT1B, DHX58, IFI44, IRF7, CXCL11, CXCL10, OAS3, FCGR1A, GDF15, MS4A6A, CXCL8, ZBP1, OASL, CYP7B1, DDIAS, SAA1, EDA2R, OAS2, APOD, SERPINA3, CELF5, CXCL3, TIMP1, PSRC1, CCL8, SECTM1, C15orf48, CCR2, CH25H, ORM2, MSR1, FOSL1, IRG1, CXCL6, SPINK1, LIF, SLFN12, IL6, CXCL9, IL1RN, EREG, MORC1, CXCL13, TNC, CHL1, CD177, BCAT1, ADAMTS4, SPRR1B,	http://www.ncbi.nlm.nih.gov/pubmed/23565148
69	BEX2, ATP6V1B1, ASGR1, ACVR1C, PCK1, ADIPOQ, CA3, TMEM45B, CFD	http://www.ncbi.nlm.nih.gov/pubmed/23565148
70	CWH43, NTM, SFRP1, IL23A, SPRR1B, FCGR2A, PSRC1, CLDN4, GPNMB, CLEC5A, CDCA8, ATG9B, C3AR1, DCSTAMP, CCNG1, TREM2, CENPH, EXO1, TPX2, DDIAS, CPA4, CHODL, C1QA, NRIP3, AURKB, PIF1, C1QB, TFPI2, PLA1A, FST, PKHD1, GAS2L3, MSR1, SPP1, SHCBP1, C1QC, CCNB2, WFDC12, CLDN6, CCNA2, LRR1, FIGNL1, CHL1, FCRL2, NRCAM, CDCA3, BRINP1, SPC25, CLSPN, STIL, KIAA0101, TRIP13, CEP55, CD200R1L, CDCA5, SKA1, PTGER4, KIF11, VCAN, MMP10, CLEC4A, KIF2C, CCR2, SERPINB2, KIAA1524, CYP7B1, HTR7, C15orf48, GTSE1, VSIG4, PARPBP, CLEC6A, EDA2R, SERPINA3, NCAPG, MIS18BP1, CERS3, KIF18B, SPAG5, RAD51, COL24A1, MS4A6A, CGREF1, CDKN3, TK1, S100A14, NUSAP1, CDK1, GPR85, ELN, CCL17, TNC, FN1, CCL8, TIMP1, DTL, CENPE, P4HA3, CHSY3, E2F8, DEPDC1, ASPM, CENPP, CDK10, TTK, GPR176, GJB4, GATM, DMP1, EREG, THBS4, IQGAP3, CHEK1, FAM3B, RGS16, ESCO2, GJB5, CA13, CASC5, RTN4RL2, UBE2C, FCGR1A, HTR4, HMMR, KLHDC8A, RAD51AP1, MS4A7, TGM1, CCL15, AADAC, PBK, FBN1, DDIT4L, WISP1, LIF, PRSS22, E2F7, HAS2, GDF15, FXYD4, GLOD5, ADAMTS12, GCNT3, LAMA1, CSMD1, HNF4A, FKBP5, CDKN1A, MMP13, CENPF, CXCL10, FOSL1, ACKR1, ALDH1A3, SLC26A4, CCR1, SAA1, SECTM1, CEMIP, TUBB3, CILP, RHBDL2, BCL2L15, BCAT1, PTX3, CALCA, CELF5, CXCL9, ADAMTS4, IL1RL1, SPINK1, CLDN2, CH25H, IL1RN, CXCL13, TFAP2A, MORC1, ORM2, CD177, IL6	http://www.ncbi.nlm.nih.gov/pubmed/23565148
71	IGFBP3, ECM2, ASGR1, SLC7A10, CYP1A1, KIAA0408, FABP1, BCAN, CST8, SNCA, ALAS2	http://www.ncbi.nlm.nih.gov/pubmed/23565148
72	THBS4, ANKRD34B, PSRC1, FN1, ELN, SFRP1, TREM2, COL24A1, NRCAM, EXO1, KIF11, PIF1, CDCA8, CD200R1L, COL5A2, FXYD4, CDCA2, PKHD1, THBS2, CHODL, AURKB, CCNA2, P4HA3, KIAA0101, STIL, ZRANB3, C3AR1, C1QB, AADAC, LHFPL2, GAS2L3, GLOD5, ADAMTS12, ILDR2, CTHRC1, C1QA, TPX2, TNC, CLEC6A, FBN2, C1QC, CCNB2, CEP55, CDK10, TTK, LRR1, CENPF, CFI, CDCA3, ADAM12, SPP1, SYT13, DEPDC1, CTSK, CCR2, CDK1, CASC5, SKA1, KIF18B, PTX3, CSMD1, FMOD, LAMA1, MIS18BP1, NCAPG, ASPM, CLSPN, CILP, DCSTAMP, GPNMB, SPAG5, CLEC5A, RAD51, FRZB, MS4A7, BRINP1, EDA2R, DDIAS, KIF2C, ATG9B, CHSY3, DTL, FST, E2F8, SHCBP1, IQGAP3, CERS3, GPR176, SPRR1B, PARPBP, UBE2C, CDCA5, CEMIP, CENPP, CDKN1A, MMP10, DMP1, HAS2, TMEM26, PBK, FBN1, CDKN3, E2F7, MSR1, CENPE, PLA1A, NUSAP1, CHL1, COL5A3, ESCO2, CLDN4, RAD51AP1, TUBB3, IGF1, IL1RL1, HMMR, MS4A6A, MEGF10, EREG, TIMP1, WFDC12, PDCD1, MMP13, CTLA4, FCGR1A, C15orf48, TFAP2A, CELF5, ADAMTS4, ACKR1, CCL8, IBSP, RGS16, LIF, PRND, IL1RN, GREM1, BCAT1, FOSL1, CXCL10, SAA1, SLC26A4, CXCL9, IGJ, IL6	http://www.ncbi.nlm.nih.gov/pubmed/23565148

73	IGFBP3, ASGR1, BEX2, TMEM132D, SLC7A10, CYP1A1, NRN1, KCNA2, FABP12, FABP1, CST8, GRIA1, ANKRD63, KRT79, CIDEC, CYP2E1, CA3, RETN, ADIPOQ, PCK1, CFD, TMEM45B, SMPX, NPPA,	http://www.ncbi.nlm.nih.gov/pubmed/23565148
74	CD200R1L, CLEC6A, ATP6V0D2, LHFPL2, PSRC1, ANKRD34B, FXYD4, ZRANB3, AADAC, CTSK, OLR1, TREM2, F7, GPNMB, MS4A6A, SLC26A4, CCR2, MSR1, EDA2R, MMP13, EREG, COL24A1, MS4A7, CDKN1A, CCL3L1, TNC, SPRR1B, IL1RL1, CEP55, PTX3, C3AR1, IL1RN, ESCO2, DMP1, CCL8, RGS16, CHODL, SAA1, CHL1, IGJ, ADAMTS4, ORM2, GP2, IL6	http://www.ncbi.nlm.nih.gov/pubmed/23565148
75	CNN1, BEX2, GRIA1, ANKRD63, NR4A1, TNNT3	http://www.ncbi.nlm.nih.gov/pubmed/23565148
76	TREM2, ZRANB3, ANKRD34B, CLEC6A, PSRC1, GPNMB, FXYD4, COL24A1, THBS4, MS4A7, MSR1, DMP1, SERPINB5, CLEC4D, IL1RN, SPRR1B, CHODL, IGJ, TNC, EREG, PKP1, CHL1, SAA1	http://www.ncbi.nlm.nih.gov/pubmed/23565148
77	BEX2, TMEM132D, SLC4A1, FABP1, TBX20, KCNJ3, TRDN	http://www.ncbi.nlm.nih.gov/pubmed/23565148
78	PSRC1, TREM2, ZRANB3, CLEC6A, SLC26A4, FXYD4, CDKN1A, TNC, MS4A7, MS4A6A, GPR176, EREG, COL24A1, NTRK2, GPNMB, C3AR1, IGJ, CCL8, SPRR1B, RGS16, TFAP2A, DMP1, CHL1, CHODL, SAA1, IGHM, ADAMTS4, CXCL9	http://www.ncbi.nlm.nih.gov/pubmed/23565148
79	ABLIM3, ADAMDEC1, ADM, ADORA3, ALOX15B, ANGPTL4, ARID5B, BIN1, C1QB, CAMP, CCL7, CCL8, CD163, CES1, CES1P1, CYFIP2, DAAM2, DDIT4, DHRS9, DPYSL3, FBLN5, FKBP1A, FKBP5, FLVCR2, GADD45B, GLDN, HIPK2, HPGD, HS3ST2, HTRA1, IL1R2, IRS2, KCNMA1, KLF9, MERTK, METTL7A, METTL7B, MFGE8, MMP19, MS4A6E, MT1A, MT2A, MTMR11, MTSS1, NAPSB, OLFML2B, PAPSS2, PCOLCE2, PDK4, PHLDA1, PLIN2, PMP22, PPARGC1A, PTGER2, RBP7, RCAN1, RNASE1, SDC4, SERPINE1, SERPINF1, SESN1, SH3PXD2B, SLA, SLC16A10, SLC16A6, SLC1A3, SLC29A1, SPRY1, SRPX, TBC1D16, TCN2, TFCP2L1, TFPI, THBS1, TIAM2, TMEM236, TPST1, TSC22D3, VSIG4, ZCCHC6	http://www.ncbi.nlm.nih.gov/pubmed/24395918
80	ABCG1, ACAT2, ATP8B4, BCL11A, CCL22, CD4, CD74, CD93, CDH23, CHI3L1, CHST13, CIR1, CLEC4A, CYB561A3, CYP27B1, ENTPD1, EPSTI1, FAIM, FCN1, FSCN1, GAL, GBP5, GIMAP4, GJB2, GM2A, GREM1, GSTM1, GSTM2, H2AFY2, HAMP, HCP5, HK3, HLA-DOA, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DRA, HLA-DRB3, HLA-DRB4, HLA-DRB6, HLA-F, HMG20B, HPSE, HSD11B1, HTRA4, IFI27, IFIT1, IL18BP, KIAA0101, LILRA3, LILRA5, LST1, LXN, MMP7, MMP9, MX1, NBEAL2, OAS2, PGD, PLAU, PTGS1, PTTG1, PTTG3P, RARRES1, RARRES3, RASSF4, RGS12, RHBDF1, SCG5, SLC2A5, ST6GAL1, STAT1, TAP1, TDRD9, TGFBI, TGM2, TIMP3, TMEM138, TNFSF13B, TNNI2, TSC22D1, TSPAN32, TXNRD1, VWF, WARS	http://www.ncbi.nlm.nih.gov/pubmed/24395918

81	DUSP1, NFKBIA, TFCP2L1, SRGN, TNFAIP3, AGPAT2, SH2D4A, METTL7A, RHOU, PRDM1, ISG20, ITGB1, CITED2, RABAC1, TXNIP, ABHD5, ERMAP, KLF9, CEBPD, FKBP5, MAL, PDK4, ERRFI1, DDIT4, PERP, AHNAK, ADHFE1, TMEM56, CYSTM1, LYPD6B, ADORA2B, ALOX5AP, KLF5, TSPO, CAPG, CD9, COL4A3, FCER1G, GLRX, LMO7, LOX, RGS1, S100A6, SDC1, RASSF7, VAMP8, MAP3K6, CYTIP, SPRY1, TIPARP, HILPDA, FXYD5, PNPLA2, NCEH1, TMEM243, HOPX, PARD6B, BIRC3, GLUL, SOCS1, TBC1D2, EMILIN2, PRDX6, ANG, ERN1, OLR1, MMRN1, CGN, CCND3, LTB4R, IL6ST, MT1X, MT2A, PER1, PYGB, IL1R2, HOMER2, CCHCR1, CHPT1, DEPTOR, SFXN5, CYP4V2, SEC14L1, SOD2, HRASLS2, TMEM62, ZC3H12A, SLC41A2, TMEM116, RHOB, ATP6V0A1, C5AR1, KLF6, GADD45A, FCGR2A, GCNT1, GCLC, HAGH, FOXN2, KCNK1, MYH6, POU5F1, MAPK13, PXN, MARCO, IL18RAP, PER2, P4HA2, LPIN2, HERPUD1, SPRY2, FSTL3, SERINC3, ELL2, ZNF281, PIK3R5, MKRN1, RASD1, SLC37A1, EPB41L4B, TRIB3, TMEM8A, PLEKHF2, SLC16A10, SLC25A29, RNF149,	http://www.ncbi.nlm.nih.gov/pubmed/25192440
82	HLA-DRB1, MDK, PASK, CDKN2C, E2F7, TNFSF10, AURKA, ADAM19, CKAP4, SPDL1, CDK1, VCAN, DBN1, IGFBP4, KIF20B, DEPDC1, CENPK, BORA, HLA-DMA, ST8SIA4, C12orf75, CAMK4, CYP1A1, DDIT3, DNMT3A, GEM, GUCY1A3, ITGA1, LCK, PDE4B, PDGFRB, PLK1, SOX4, SPIB, ZEB1, ZNF207, FZD3, ENC1, BHLHE40, IER3, NREP, GDF15, IER2, ZEB2, PLK2, FNBP4, ANGPTL2, SLC39A6, PARM1, RND1, UBE2T, DACT1, ARRDC3, MARCKSL1, C1orf54, VASH2, NETO2, CDCA3, AFAP1L2, SGOL1, TUBB2B, TCF7, BCL2, HES1, PHIP, PKIA, TIA1, GIT2, CCDC88A, ABLIM1, SLC5A3, WIPI1, MAP3K8, SMARCC1, MAP3K14, INTS6, EPHB1, HOXB2, ID3, ITGA4, MEF2D, NAB2, CDK17, POLB, ST3GAL2, TNFSF9, SUCLA2, TRAF4, CLCF1, PPP1R15A, RASGRP3, MOXD1, SERTAD3, EVL, DPH5, ZFR, BCL11A, ACKR3, PELI1, PLEKHG1, TGIF2, DOCK7, L3HYPDH, MB21D1, RHOV, ARL5B,	http://www.ncbi.nlm.nih.gov/pubmed/25192440
83	DUSP1, NFKBIA, TFCP2L1, SRGN, TNFAIP3, AGPAT2, SH2D4A, METTL7A, RHOU, PRDM1, ISG20, ITGB1, CITED2, RABAC1, TXNIP, ABHD5, ERMAP, KLF9, CEBPD, FKBP5, MAL, PDK4, ERRFI1, DDIT4, PERP, AHNAK, ADHFE1, TMEM56, CYSTM1, LYPD6B, ADORA2B, ALOX5AP, KLF5, TSPO, CAPG, CD9, COL4A3, FCER1G, GLRX, LMO7, LOX, RGS1, S100A6, SDC1, RASSF7, VAMP8, MAP3K6, CYTIP, SPRY1, TIPARP, HILPDA, FXYD5, PNPLA2, NCEH1, TMEM243, HOPX, PARD6B,	http://www.ncbi.nlm.nih.gov/pubmed/25192440
84	HLA-DRB1, MDK, PASK, CDKN2C, E2F7, TNFSF10, AURKA, ADAM19, CKAP4, SPDL1, CDK1, VCAN, DBN1, IGFBP4, KIF20B, DEPDC1, CENPK, BORA, HLA-DMA, ST8SIA4, C12orf75, CAMK4, CYP1A1, DDIT3, DNMT3A, GEM, GUCY1A3, ITGA1, LCK, PDE4B, PDGFRB, PLK1, SOX4, SPIB, ZEB1, ZNF207, FZD3, ENC1, BHLHE40, IER3, NREP, GDF15, IER2, ZEB2, PLK2, FNBP4, ANGPTL2, SLC39A6, PARM1, RND1, UBE2T, DACT1, ARRDC3, MARCKSL1, C1orf54, VASH2, NETO2, CDCA3, AFAP1L2, SGOL1, TUBB2B	http://www.ncbi.nlm.nih.gov/pubmed/25192440

85	MLLT4, ELL2, NMT2, SLC43A3, IL4I1, MCOLN2, MAOA, ZFP36L1, APOBEC3A, TXN, FTH1, CCL7, ACSL1, CCL23, VWA8, RBM47, RPLP1, HSP90B3P, RHBDF2, RPN2, HNRNPC, HMGN2P46, SDF4, FABP5, ANXA2P1, TNIP1, TNIP3, LILRB1, TIMP1, PSTPIP2, MARCKSL1, ADAMDEC1, SLC3A2, SRC, NMI, CYP27B1, KYNU, WSB2, SLC41A2, IL3RA, S100A12, VRK2, YWHAG, CXCL5, ATP2C1, NFS1, BID, MTF1, PPBP, PPP2CB, PDE4DIP, CCL5, SLC2A6, CXCL6, CD40, FABP5P3, IFIH1, LAD1, SDC2, GPR84, C1orf122, LILRA3, CFLAR, CAPZA1, LGALS3, GCH1, EIF1AX, P2RX4, NFE2L3, SLBP, CLIC4, MMP12, ACP2, MYC, ARL6IP1, ATP11B, ZSWIM4, VPS37A, SRGN, FTH1P3, TDP2, OAS3, C6orf211, SMAD7, SMARCA5, HSPA13, GPBP1, PARP10, BOLA2, NUP62, IL7R, G3BP1, LARP4, LILRB4, ILK, SLC16A3, GRINA, C1QTNF1, SOD2, FAM129B, RPS29, TPI1, LOC440704, HSPB1, MT1H, EXOG, CD68, PTMA, MT1X, KIAA1147, PDIA3P1, MT1IP, MT1E, GYPC, TPT1, SLC29A1	http://www.ncbi.nlm.nih.gov/pubmed/24530056
86	DCK, CAT, EIF4B, P2RY13, SLC2A9, CPED1, ATP2B4, HENMT1, FGL2, EEF1B2, SRSF6, QPRT, PTEN, ACAT2, RNF7, RAB11A, CUTA, RAB7A, AGTPBP1, TSPAN32, ETFA, HADH, C14orf159, GSTK1, FLOT2, PRKAR1A, GNS, C5, ALAD, TMEM131, AP1S2, BHLHE40, GPN1, CPNE3, MPPE1, NDUFA1, ATP6V0E2, DOCK2, MGST2, ARHGEF6, HCP5, LRMP, HEXB, NDUFB5, LY86, PBX3, PQLC3, RNF125, ESYT2, RGS18, RPS4X, VAMP8, TMEM256, ARHGAP15, ERP29, NUDT1, ACACA, ATP5A1, NAA20, ACTR2, CHN2, FBXO33, SLC25A3, PLEK, ALG13, SNCA	http://www.ncbi.nlm.nih.gov/pubmed/24530056
87	CD69, HAPLN3, C15orf48, DUSP5, LGALS3BP, ISG20, LILRA3, AARS, C1orf228, IRF8, TMEM38B, SERPING1, MTHFD2, HCAR3, APOBEC3A, AIM2, PTPN1, JAK2, LAP3, B4GALT5, MT2A, NCOA7, CCND1, STAT1, BATF2, STAT2, MT1A, RHBDF2, PARP14, PSAT1, NCF1, MAP3K7CL, GBP1, RARRES3, SCO2, IFIT3, CD274, CPD, FEM1C, TGM2, LONRF1, BTG3, SLC1A5, IRF1, EXOG, C2, SLAMF7, CD86, ADAMDEC1, SIK1, C18orf8, SLC7A5, STX11, ARID5B, ASCL2, IL15, LYSMD2, GK, BHLHE41, SLCO4A1, WARS, PARP9, HIST2H2BE, TMEM140, KYNU, IFIT2, TAGAP, CXCL9, TSC22D3, TAP1, GREM1, APOL3, PTRF, RIPK2, P2RX7, HPS3, HLA-F, BPI, HIST2H2AC, UBE2L6, SLAMF1, GBP4, CCL8, GBP2, CFB, SSPN, IL1B, LRRK2, SCML1, ITGB7, TAP2, KLF9, FAM126B, SLC6A12, IFIH1, PDE4B, LILRB3, GPR84, TNFAIP6, PSME2, HELZ2, TSC22D1, GPC4, CRISPLD2, CXCL10, DDX60, PLEK, ASNS, IRF7, SAMD9L, ANKRD22, TNFSF10, BTN3A1, RHBDF1, XRN1, VAMP5, MYOF, FAM129A, C12orf57, GCH1, NINJ1, SCG5, FAM26F, CCL5, NCF1C, GBP5, HLA-H, MT1IP, AKIRIN2, SNX10, MT1E, HLA-A, PPARGC1B, CD38, AK4, LILRB4, ATF3, PSMB9, PSMB8, DUSP10, LAT, SOD2	http://www.ncbi.nlm.nih.gov/pubmed/24530056

88	CAT, FHOD1, ZNF428, STAB1, PLAU, RBP1, STMN1, TGFBI, ITGB5, NUDT14, SLC18B1, DCAF6, SVIL, FAM198B, CTSD, APMAP, LINC00857, EPDR1, RGS19, GSTP1, NREP, CPVL, PDGFC, TNFSF12, TOP2A, CCL23, S100A4, COLEC12, SNX2, GPR34, EPAS1, FCGRT, NRGN, CLEC4A, SUSD1, CYBRD1, PCED1B, PFN1, CORO1A, PON2, AGRP, F13A1, PEPD, TSPAN4, HADH, MS4A6A, CD163, TLR5, NUSAP1, LDHB, YWHAH, ID3, MMD, CHST13, APOE, RAB3IL1, FOLR2, PCOLCE2, TCEAL4, FUCA1, PLA2G15, SORL1, SLCO2B1, ADAMTSL4, MFNG, PPBP, RAB7B, PLTP, TMEM236, CFD, ATP8B4, CD36, SEPP1, APOC1, MFSD1, DDIAS, RNASE1, ALOX5AP, PNPLA6, NME4, NAIP, MGST2, MYL6, POTEKP, ACTG1, RGS18, TMEM173, ACTB, CXCL5, CYTL1, PPIA, HNMT, DBI, TSPO, NGFRAP1, MS4A4A, AKR1A1, CTSH, CTDSPL	http://www.ncbi.nlm.nih.gov/pubmed/24530056
89	CBR3, CLEC10A, FZD2, CD1C, SIGLEC10, PARM1, CCL26, FCER2, MAOA, MAP4K1, FOXQ1, HOMER2, PDXK, GALNT18, NAGPA, CD209, INSIG2, RTKN, SUCNR1, NFXL1, FAM60A, FCER1A, DUOX1, ASAP1, CXCR2P1, FGL2, GPD1L, PALLD, QPRT, C17orf58, C1orf54, CMTM8, CARD9, ADAM19, LIPA, SLC27A3, CTNNAL1, ASCL2, CD1A, RAB33A, DHRS2, RASGRP3, GATM, DTNA, RASSF7, ZNF366, BLOC1S6, PTPRE, ACOT7, STARD7, CCDC6, RASL10A, INTS3, ST6GAL1, DHRS11, ADAM15, PTRF, SGK223, PPP1R14A, BATF3, RAMP1, CERK, MMP12, SLAMF1, IL1R2, KIAA1671, SOCS1, RAP1GAP, ALOX15, CD1E, CDKN1A, SOX8, DENND1B, VCL, SPINT2, PFKP, RHBDF1, FSCN1, RRP1B, SNX8, LOC283070, PPM1F, GOLGA8B, ESPNL, CDR2L, NMNAT3, CCL22, TTC9C, CLEC4G, AUH, PTPRO, CLEC4A, CHN2	http://www.ncbi.nlm.nih.gov/pubmed/24530056
90	RBP1, LRPAP1, NUP214, CXCL8, ANKRD33, MLKL, FCN1, DRAM1, VSIG4, DFNA5, TCF7L2, CTSD, GAPT, NCEH1, CPED1, DUSP6, CTSG, CYBB, CXCL2, PGAM4, TOP2A, C5AR1, LTA4H, RHBDF2, CEBPB, GCHFR, JAKMIP2, CYP27A1, AKR1C3, AGRP, AQP9, ADAMDEC1, NFKBIZ, CCL2, STX11, CD163, OLR1, NUSAP1, S100A8, BOK, FOLR3, GLRX, CD14, APOE, SLC11A1, PLSCR1, ITGAL, S100A9, CXCL5, HDDC2, FAM213A, ENG, MCEMP1, PPBP, SCPEP1, TBC1D2, LAPTM5, PLTP, PNKD, IL1B, CLEC5A, ENPP4, CEBPD, CD37, APOC1, SNTB1, PGD, DNASE2, SPARC, ALOX5AP, PLIN2, GPNMB, S100P, FKBP15, IFI30, SLC7A7, NUPR1, SCARB2, PIM1, LYZ, ALDH1A1, CD300LF, HBEGF, FCER1G, DAB2, TMEM173, CYTL1, CD68, WLS, FAM89A, NCF4, SERPINA1, IL7R, NGFRAP1, CTSL, PLAUR, FCGR1B	http://www.ncbi.nlm.nih.gov/pubmed/24530056

91	SELM, EHD1, IL10RA, NAMPT, MCTP1, C15orf48, SLC7A11, SIGLEC10, CDK5RAP2, EREG, TERF2IP, IL1A, ISG20, MYH11, MCOLN2, CLCF1, DDIT4, ANKRD12, AARS, SQSTM1, FLNB, NUB1, DCUN1D3, CXCL8, RILPL2, DRAM1, ATOX1, PTGS2, MAP3K4, UPB1, ADARB1, CREG1, PTPN1, RNF19B, IER3, NKG7, FAM60A, IL2RA, SLC7A1, MT1H, SAMSN1, ASCC1, FYN, MT2A, ETS1, PPP3CC, MT1A, LAT, RHBDF2, G0S2, CEP135, PANX2, C5orf15, HMGN2P46, ORM1, TRAF1, C17orf58, MB21D2, LPAR1, TRAF3IP2, TNFAIP3, SEMA4A, ARHGEF2, LMO4, TNIP1, TBC1D9, ACSL5, CYP2S1, BTG3, TNIP3, EXOG, NLRP3, SEMA6B, PSTPIP2, PTGES, MARCKSL1, CD86, NFKB1, LSS, AQP9, TANK, CCR7, MT1G, LAMB3, SLC25A37, RUNX2, ADAMDEC1, NFKBIE, SYT11, PVRL2, MLLT6, MT1F, ETS2, SLC7A5, CA12, MRPS6, GK, SLC3A2, BHLHE41, WARS, TNFAIP2, CXCL16, PILRA, CCDC115, TMEM205, HIST2H2BE, SIK3, ITGB8, PPP1R18, PTPRE, NBN, HIVEP1, GRAMD1A, KYNU, SLC1A3, NFE2L1, PCNX, CD14, CYP27B1, APBB3, FPR2, CEP350, CTTN, IRAK2, DDX59, CCM2L, PIM2, TSPAN33, ACO1, TAP1, RNF144B, CXCL5, IKBKE, EMR3, APOL3, H1F0, NADK, ZMIZ2, NFS1, HLA-F, BATF3, HIF1A, MTF1, YARS, STOM, RASGRP1, HIST2H2AC, GJB2, SLAMF1, CLEC4E, CCL5, KIAA0226L, GNA15, CFB, AMPD3, PNKD, MT1X, SMOX, IL1B, BIRC3, MAP1LC3A, ZMYND15, SLC2A6, SPECC1L, OSM, PRKCH, C1S, LAD1, PDE4B, STAT4, GPR84, TNFAIP6, C1orf122, PLAGL2, SLC43A2, HELZ2, TSC22D1, SLC5A3, CXCL1, HEY1, ABHD17C, CRISPLD2, DNAJB6, PGD, NDP, MMP9, ASNS, IRF7, ACKR3, RCN1, SLC9A1, RFTN1, EBI3, TGFA, PPA1, ADORA2A, CLEC4D, MUCL1, GPR132, RELB, FAM20A, GCH1, CTSL, NINJ1, ST3GAL1, SMAP2, MYO1B, TYMP, TNFRSF4, NCF1C, GBP5, HBEGF, CYB561A3, MT1IP, ZSWIM4, IL36G, LAMP3, MT1E, ZHX2, PFKFB3, N4BP1, MXD1, GNA12, CD38, PARP10, DTX2, LILRB2, TMEM132A, EMR2, SPHK1, SIRPA, PLAUR, VEGFA, PTPRF, C1QTNF1, STEAP3, MPZL1, CD82, CLEC4A, DUSP10, GLIS3, SOD2, ISCU	http://www.ncbi.nlm.nih.gov/pubmed/24530056
92	CD69, SPP1, CAT, LSP1, NUCB2, CRIP1, ATP1B1, DUSP23, RPSAP52, LAMP2, PAQR4, BTK, GCNT1, SULF2, ANKRD33, FCN1, H2AFY, CTSD, COL8A2, LINC00857, ADCY3, CTSG, NREP, PGAM4, PDGFC, S100A4, ITGAM, TOP2A, COLEC12, DPEP2, SCD, FGL2, CD300A, GCHFR, CD9, PYGL, FABP5, VAT1, SAP30, TREM2, ATP5C1, GPR34, JAKMIP2, ADORA2B, NRGN, PLBD1, RBPJ, NFE2, CYBRD1, PCED1B, PON2, AGRP, CEBPA, F13A1, LIPA, TSPAN32, HADH, PTPRO, MS4A6A, TLR5, GRAMD4, CD1B, NUSAP1, VEGFB, MPC2, EVL, DHRS9, CHST13, ME1, MNDA, CHCHD10, APOE, SLFN11, FUCA1, PLXDC2, MGAT4A, PLA2G15, CSTB, HHEX, MFNG, HSPD1, SCPEP1, IQGAP2, RAB7B, HLA-DPA1, PHYH, PLTP, NDUFS5, TMEM236, CFD, FABP5P3, CD36, SEPP1, CD37, LPL, APOC1, DDIAS, SIDT2, RNASE1, MGMT, C1QB, S100A10, TUBA1B, CST3, PLIN2, GPNMB, S100P, APBB1IP, CCDC109B, NTAN1, MGST2, NNT, RPL7A, NUPR1, CORO2A, CKS2, ACP5, SERINC2, AP1S2, KLF4, CAMK1, RCBTB2, CHPT1, CD52, CD68, UBE2C, GPBAR1, SLC29A1, NGFRAP1, MS4A4A, FCGR2B,	http://www.ncbi.nlm.nih.gov/pubmed/24530056

93	ZFYVE16, HNRNPDL, MCTP1, SLC7A11, Mar-03, IL1A, MCOLN2, NEK6, DDIT4, MAOA, NUB1, PHLDB1, TNS3, DRAM1, COX10, SLC20A1, VNN1, INSIG2, OCSTAMP, PTPN1, FAM60A, IL2RA, SLC7A1, ETS1, RHBDF2, G0S2, TSC22D1, EEF1B2, IDH3A, C17orf58, TRAF3IP2, PACSIN2, LMO4, TNIP1, MPO, ACSL5, CS, KLHL5, BTG3, OTUD4, PLGRKT, F5, SIAH1, NFKB1, AQP9, LAMB3, RPL32, ADAMDEC1, PFDN1, SYT11, MT1F, TNC, SLC7A5, CA12, METTL21B, MRPS6, GK, BHLHE41, WARS, EFTUD1, SRC, CCDC115, FILIP1L, ARFGAP3, ATP1A1, PTPRE, NBN, HIVEP1, GRAMD1A, KYNU, SLC1A3, NFE2L1, PCNX, CYP27B1, ANXA5, QPCT, SH3PXD2A, SERPINE1, CTTN, CLINT1, TTC13, IRAK2, SLC41A2, TSPAN33, ACO1, RNF144B, HNRNPA0, FAM213A, NFS1, MTF1, BCAT1, UCK2, SLAMF1, STRN3, GPR124, CCL5, IL1B, BIRC3, SLC50A1, SLC2A6, CLEC5A, LINC00938, PRKCH, LAD1, SLC25A3, GPR84, DENND5A, TNFAIP6, SLC35F2, CRISPLD2, PRKCDBP, DNAJB6, NDP, PLEK, MMP9, SPARC, F3, ANKRD22, SLC9A1, RFTN1, TSKU, EBI3, PPA1, ADORA2A, RGS16, MYOF, ATP5L, METTL1, TNPO1, AK4, ESYT2, SCG5, COA1, FNBP4, TNFRSF4, HBEGF, MT1H, TMEM194A, ZSWIM4, IL36G, RPS4X, ACVR1B, BCL2, FYN, DTX2, HOPX, TMEM132A, PTGES2, EMR2, SPHK1, SFXN4, BID, VEGFA, PTPRF, C1QTNF1, HSD11B1, C6orf48, CD82, FMNL3, MTHFD2, SOD2	http://www.ncbi.nlm.nih.gov/pubmed/24530056
94	LSP1, NUCB2, STAB1, METTL7A, GFRA2, RBP1, LAMP2, BTK, SOD1, TGFBI, ANKRD33, FCN1, FOS, LOC440704, CTSD, LINC00857, GAPT, RGS19, TLR7, NREP, CXCL2, CPVL, PDGFC, CCNL1, TNFSF12, S100A4, COLEC12, DPEP2, HSP90B3P, CD300A, FES, GCHFR, KLHDC8B, PYGL, FABP5, ANKRD36B, LGMN, ANXA2P1, C1orf85, TREM2, GPR34, JAKMIP2, B3GNT5, CYP27A1, NRGN, TLR4, EIF2AK2, GMFG, NFE2, PCED1B, AGRP, CD68, F13A1, HLA-DRB3, LIPA, GADD45B, MAF, ZFP36, MS4A6A, TLR5, MAP3K1, NUSAP1, RNF130, S100A8, BOK, ARHGDIA, KLF6, KLF2, IFI27L2, RAB3IL1, FOLR2, PCOLCE2, ITPRIPL2, OTUD1, FUCA1, MPZL2, C1orf162, HEBP2, CLTC, PLA2G15, SLCO2B1, MAFB, SCPEP1, RAB7B, PHYH, TMEM236, CFD, FABP5P3, CEBPD, NPL, CCL13, CD36, SEPP1, CD37, FAM102B, AIF1, RNASE1, PTGER4, C1QB, BLVRB, STK17B, CST3, HMOX1, GPNMB, S100P, NAIP, CCDC109B, NTAN1, CAPZA1, LGALS3, IFI30, HMGB1, NUPR1, GRN, CORO2A, ADD3, POTEKP, HLA-DRB6, HIST1H4C, ACP5, ALDH1A1, SERINC2, KLF4, SHISA5, MAN2A1, RCBTB2, CAT, NBPF10, SLFN11, ECHDC1, HLA-A, CHPT1, CD52, SRP14, TUBA3D, LYL1, HMGB2, PRMT2, FAM89A, ITGB5, GPBAR1, RTN3, LILRB5, PON2, ILK, NGFRAP1, MS4A4A, LTB, DHRS9, TGFBR2, ARRB2, HNRNPUL1, OSBPL1A	http://www.ncbi.nlm.nih.gov/pubmed/24530056

95	SELM, CYP26A1, EHD1, IL10RA, HNRNPDL, NAMPT, SAP25, MCTP1, C15orf48, PRDM1, SLC7A11, SIGLEC10, ELL2, DUSP5, EREG, IL1A, ISG20, MCOLN2, PFKFB3, CSF2RA, DDIT4, LILRA3, IRAK3, TFDP1, SQSTM1, TFPI, BANP, VAMP4, NUB1, RAB27A, CXCL8, FCGR2A, PID1, ZC3H12A, TMEM71, VNN1, YPEL2, PTGS2, MAP3K4, RILPL2, UPB1, VNN2, ADARB1, MAMLD1, HIF1A, PTPN1, FOXO3, IER3, NKG7, ZNF281, ST3GAL1, FAM60A, IL2RA, SAMSN1, THBS1, FYN, ETS1, UIMC1, LAT, RHBDF2, G0S2, SPRY1, CEP135, GADD45A, CYTH1, PANX2, TNFRSF10B, TNFRSF21, C17orf58, SLC44A1, MB21D2, TRAF3IP2, AKR1B1, TNFAIP3, SEMA4A, CPD, ETV3, TNIP1, PTGER2, CD93, ULK1, ACSL5, CYP2S1, DMXL2, BTG3, TNIP3, LILRB1, ADAM8, IRF1, RNF145, NLRP3, SEMA6B, PTGES, MARCKSL1, CD86, NFKB1, AQP9, TANK, CCR7, MET, LAMB3, SLC25A37, ADAMDEC1, SYT11, LOR, MLLT6, MT1F, ETS2, SLC7A5, CA12, ARID5B, RYBP, MRPS6, SESTD1, GK, MS4A14, BHLHE41, CXCL16, SLC16A6, TMEM205, GPR162, CHST7, PTPRE, NBN, A4GALT, TBC1D8, HIVEP1, VMO1, GRAMD1A, KYNU, SLC1A3, TBK1, PCNX, CD14, APBB3, FPR2, CEP350, DLL1, PLSCR1, IRAK2, FJX1, BMP6, PIM2, S100A12, TSPAN33, RNF144B, CXCL5, EMR3, APOL3, ST8SIA4, RIPK2, THBD, STX1A, SRGN, ZMIZ2, MEF2D, MTF1, BCAT1, IL13RA1, HIST2H2AC, GJB2, RAPGEF1, TM4SF1, SLAMF1, CLEC4E, NFKBIA, CCL5, DNAJB9, GNA15, IL24, SMOX, IL1B, BTG1, BIRC3, MAP1LC3A, CREBRF, ZMYND15, SLC2A6, CXCL6, PELI2, OSM, PRKCH, LAD1, PDE4B, SLC16A10, RFX8, STAT4, GPR84, DENND5A, TNFAIP6, SLC43A2, RUNX3, SLC5A3, CXCL1, HEY1, ABHD17C, CRISPLD2, PDE4D, SOD2, DNAJB6, CRLF2, HIST1H2BK, SMPDL3A, PTPRF, ACKR3, RFTN1, CXCR4, PRDM8, EBI3, VEGFA, VNN3, TGFA, ADORA2A, XBP1, LAMC1, CYP3A5, GCH1, ANKDD1A, CEMIP, NINJ1, AK4, TXN, PGS1, SMAP2, IRS2, MYO1B, NUAK2, FNBP4, EPB41L3, TNFRSF4, GBP5, HBEGF, ZSWIM4, IL36G, ITGAV, LAMP3, ZHX2, ARRDC3, NSUN7, MXD1, TMCO3, PILRA, DTX2, WTAP, C9orf72, LILRB2, HOPX, TGIF1, IL7R, GPR64, KL, BTN2A1, FCAR, PLAUR	http://www.ncbi.nlm.nih.gov/pubmed/24530056

96	CD69, SPP1, ATP5D, BCL2L1, CD1C, LSP1, STAB1, METTL7A, GFRA2, MDH1, CRIP1, STMN1, DUSP23, RPSAP52, RNH1, APEX1, AP2S1, CLEC12A, UQCRQ, GCNT1, RBX1, PLD3, ANKRD33, PPT1, VSIG4, NUDT14, HK3, ALCAM, GALM, ATP5F1, QDPR, ATIC, H2AFY, CTSD, COL8A2, HSPB1, ADCY3, CTSG, NREP, PGAM4, FKBP1A, LAP3, S100A4, ITGAM, TOP2A, IFI6, LST1, CDK4, DPEP2, SCD, ITGB1BP1, HSP90AA1, SNX2, FGL2, EIF3K, PCNA, GCHFR, LY6E, CD9, PYGL, FABP5, IDH1, SLC38A6, ANXA2P1, C1orf85, PYCARD, HCST, VAT1, TREM2, ATP5C1, GPR34, JAKMIP2, AIF1, TUBB, NRGN, PLBD1, RBPJ, IFI16, GMFG, NFE2, ANXA2, PCED1B, CARD9, HSPH1, PFN1, CORO1A, PON2, AGRP, AHNAK, CEBPA, F13A1, LIPA, TSPAN32, HADH, CCL2, PTPRO, TECR, MSMO1, MS4A6A, C14orf159, CD163, SLC29A1, LGALS1, GRN, CD1B, NUSAP1, LDHB, FBP1, BOK, ATP1B1, EVL, MARCO, ID3, RGS10, DHRS9, CHST13, ARHGDIA, ME1, CALR, SH3BGRL3, PSMD14, C1QA, MNDA, CHCHD10, ACOT7, IFI27L2, APOE, NME1, RAB3IL1, TUBA1A, EGR2, A2M, CORO1C, FOLR2, S100A11, IDH2, CECR1, DHRS3, FUCA1, PLXDC2, NDUFS3, PLA2G15, ADAM15, HCFC1R1, IFI44, SEPN1, ESYT1, CSTB, HHEX, HSPD1, SCPEP1, IQGAP2, RAB7B, HLA-DPA1, PHYH, PLTP, TMEM236, CFD, ITGB7, BSG, FABP5P3, IMMT, CCL13, CD36, SEPP1, C1QC, CD37, LPL, 40787, APOC1, MFSD1, DDIAS, UQCC2, SIDT2, DCSTAMP, RNASE1, PTGER4, DNASE2, C1QB, S100A10, MCM6, ACAT1, TUBA1B, CST3, NME4, GPNMB, S100P, EMP1, APBB1IP, CCDC109B, NTAN1, MGST2, HIBADH, IFI30, SLC7A8, NUPR1, POTEKP, ACTB, ACTG1, CKS2, ACP5, GGCT, MRPL15, PGAM1, CISD1, YBX1, LRP3, CTNNAL1, KLF4, CAMK1, TMEM173, SLFN11, NDUFAB1, BANF1, COX7B, CYTL1, PPIA, CD52, LYL1, MRPL18, TSPO, KCNMA1, ITGB5, HMGA1, GPBAR1, CD1E, YIF1B, CD276, ALG8, NGFRAP1, MS4A4A, ZYX, CD74, FCGR1B, CTDSPL, OSBPL1A, LGALS9,	http://www.ncbi.nlm.nih.gov/pubmed/24530056
97	ZBTB34, SLC7A11, OAS2, IFNGR1, FAM60A, STAT2, CENPBD1, VMP1, LPAR1, TLR8, CD86, ADAMDEC1, CXCL16, PARP9, VMO1, PRKAR1A, PCNX, MKLN1, MAPK13, CFB, TRIM22, HELZ2, BCDIN3D, MOB3C, ZNF22, HCP5, CCDC117, SAMD9, ISG15, SMAP2, FNBP4, BCL2L13, MX2, PTPRE	http://www.ncbi.nlm.nih.gov/pubmed/24530056
98	ANKRD33, CTSD, CCNL1, PPIA, FABP5, ANXA2P1, SAP30, JAKMIP2, UBE2C, NFKBIZ, NUSAP1, LDHB, BOK, KLF2, DBI, CLTC, PLTP, TMEM236, CFD, FABP5P3, IMMT, 40787, MGMT, PTGER4, STK17B, HMGB1, NUPR1, POTEKP, HLA-DRB6, CKS2, RPL5, YBX1, SKAP2, KLF4, NBPF10, KANSL1, SRP14, MYADM, ILK, MS4A4A, UGP2	http://www.ncbi.nlm.nih.gov/pubmed/24530056

99	KCTD12, SOX4, NOV, LRRC17, TBX18, SCD, BDKRB2, WNT2, SLC7A14, FER1L6, CLDN11, VCAM1, ADAMTS14, CCKAR, CREB5, TNFAIP6, CRABP2, IGDCC4, TMEM35, GDF15, TSLP, ADAM12, AQP3, FST, PER3, PRSS35, PIEZO2, TNFRSF11B, RND2, CDH6, LIF, ITGA11, ADCY1, SIPA1L2, PHGDH, AMOT, HMOX1, PGBD5, CDON, MXRA5, PLA2G4A, FAM171B, CPA4, AIF1L, GPR68, HSD17B6, LHFPL2, SLC6A9, C4orf46, OLFML2A, EPHB2, GXYLT2, SLC14A1, LRRC15, ODZ4, BDKRB1, BMPER, FAM46C, MARCKS, WARS, ARHGAP28, RCAN2, TMEM119, RAP2B, CDKN2B, MEST, IFIT1, SLC39A10, EPHB3, TUBB, RPS6KA5, LDB2, TUBA1A, C14orf132, TMEM200A, NCKAP5, TUBB3, NEK10, PHLDA1, LOC148145, NYNRIN, RN5-8S1, SLC6A6, RHOJ, FLRT3, TRIM45, CIT, PDE5A, RTKN2, ARSI, G0S2, VEGFA, FAM46A, SEMA3A, JUN, SAMD12, CLIC2, SOX9, GRAMD4,	http://www.ncbi.nlm.nih.gov/pubmed/24926665
100	C7, CCDC69, DUSP1, FKBP5, GPX3, KLF15, MAOA, SAMHD1, SERPINA3, SPARCL1, RGCC, TSC22D3, CRISPLD2, PER1, ERRFI1, STEAP4, MT2A, METTL7A, IRS2, RASL11A, FGD4, INHBB, NNMT, KCNK6, GLUL, KLF9, NA, ITGA10, CORO6, ADRA1B, IMPA2, ZBTB16, FOXO1, ADAMTS5, PDK4, ENDOD1, SORT1, CACNB2, ADARB1, NEXN, NAV3, DCXR, STC1, TRNP1, IGFBP2, MAMDC2, SUN2, FSTL3, PTX3, GPRC5B, HSPA2, FAM107A, TJP2, PPP1R14A, MTSS1, CYR61, USP53, GPM6B, ADAMTS1, TRPC6, RASL11B, LMCD1, MMD, ACSL1, PKDCC, STEAP1, ACSS1, TIMP4, COL11A1, PLXNA4, MT1X, APCDD1, DNAJB4, ACTG2, GGT5, LEP, CD302, MT1E, AOX1, CEBPD, DAAM2, TEX2, TCEAL4, SAT1, PHC2, SPON1, KLF5, AFAP1L1, NKD1, PIK3R1, CDC42EP3, CTPS1, INPP5A, PRODH, FBN2, PXDC1, NID1, ALPK3, NR4A3, HPS5, PDPN, EPHB6, ATF3, OXTR, RAB11FIP1, CITED2, RAPGEF5, COL4A1, NEGR1, PRKAG2, SLC16A12, SMARCD2, NEDD9, GALNT15, MYADM, FZD8, CILP, GFPT2, AHCTF1, EOGT, SSH2, SMIM3, DLL4, C10orf10, CHST7, GCNT4, SCARA5, STON1, SLC7A6, ABLIM1, NCOA3, TGFBR2, MOB3B, COL4A4, RNF144B, FOXO3, GCLM, DAPK2, MAP1LC3C, COL7A1, CYTH3, FIBIN, DIO2, HIGD1A, CPM, NFIL3, RHOB, HSPB3, CD82, STARD7, WFDC1, ZCCHC5, ANXA4, RAI2, KANK1, SCN7A, ABHD5, STOM, SYNPO2, LBH, RASD1, CALCOCO2, POTEE, C1QTNF1, CADPS2, LAMA3, ZHX3, LGI3, ZCCHC6, TSPAN8, CORIN, ENPP1, GADD45B, SAMD4A, LRRC16A, DHRS3, PREB, HMGB2, MAFF, NAMPT, JADE1, ARMC8, NUAK1, ARHGAP29, DDAH1, MICAL2, ANPEP, PNPLA2, KLF6, AASS, CBS, WASF3, LMOD1, RSPO1, AP1M1, FAM43A, FAM46B, SQRDL, LINC00312, FZD5, SAP30, VGLL3, ING2, TM4SF1, DUSP5, FADS3, CTGF, RWDD4, KLHL42, STK17B, REV3L, EBF1, APBB2, HSD11B1, AXIN2, TXNRD1, ABCA6	http://www.ncbi.nlm.nih.gov/pubmed/24926665
101	ADAMTS9, ALOX15, BCL2L15, C1QTNF1, CA2, CCBL1, CCL26, CD274, CD44, CDH26, CISH, CST1, CST2, CST4, CTSC, DPP4, FAM26E, FETUB, GGH, HS3ST1, LRRC31, NTRK1, NABP1, PCSK6, POSTN, SERPINB4, SH2D1B, SIDT1, SLC26A4, SLC39A8, SLC5A1, SOCS1, SUSD2, USP54	ADEPT cohort

102	KLRC4, CCL3L3, IL12RB2, CCL5, KLRD1, GZMA, KLRC4, GZMB, CCL4, CCR2, PLEK, SULF2, ENTPD1, ITGAX, MS4A4A, GPR55, IL21R, GRAMD3, DENND4A, PRF1, IRG1, TIGIT, CD2, SYTL2, MMP9, UGCG, CST7, CPNE7, CD28, C1orf21, SH2D2A, KLRB1, PMEPA1, CHSY1, SAMD3, SEPN1, GAS7, NCF1, HOPX, CDH1, MCTP2, SULT2B1, BCL2L11, GPR18, TRAT1, GPR174, ICAM1, PIK3R5, ADAMTS14, ZDHHC15, PADI2, GPC1, SEMA6D, SATB1, ITM2A, KDM2B, LYST, GLP1R, LRRC8D, EOMES, SELL, BAIAP3, BAIAP2	http://www.ncbi.nlm.nih.gov/pubmed/25621825
103	CCR8, CCR4, IL5, KLRG1, IL17RB, HS3ST1, IL1RL1, IL13, SLC7A8, CD27, NEB, RXRG, CALCA, IL6, IL4, PTPN13, PDCD1, NPNT, HLA-DOA, HES1, LPCAT2, IL9R, PPARG, TPH1, STXBP6, CYBB, BMP7, INPP4B, CCL1, BMP2, AR, MC5R, ATP8A2, PPP2R3A, KCNN4, DGAT2, NMUR1, KCNQ5, RAB27B, LRRC52, ALOX5, PTGIR, ZC3H12C, TGM2, IL10RA, ACER2, HBA2, GATA3, CHDH, NCK2, BZW2, NAIP, MRAS, C19orf38, HBA2, TSPAN13, AREG, EBI3, KLF5, PLAUR, ADAM19, IRF4, EEPD1, PDLIM1, NCKAP5, TANC2, SERPINE1, FBXL21, UBE2E2, RNF128, IPMK, CA13, MED12L, CXorf57, PARD3, CHD7, PDE7B, PCSK1, MAP4K3, LGMN, TAF1D, RPS19, CACNA1D, SPCS3, ST6GALNAC5, RPLP1, NFKB1, GALNT3, CXCL1, NAIP, SNORA45A, LPHN2, DHX40, STAB2, PLK2, GLB1, PTPN9, RAB4A, NFIX, BAMBI, UBE2L6, NAV2, ACBD7, SNORD8, FAM71F2, APBB2, MBOAT1, C9orf72, ARL5C, RUNX1T1, HLF, CSF2, EMP3, HOMER2, CYP51A1, SPRY1, GRIN2D, CYP2D7, FOXP3, UNC5B, SPECC1, DUSP10, C21orf62, KRT80, KLF4,	http://www.ncbi.nlm.nih.gov/pubmed/25621825
104	GSTM3, UPP1, EPS8L3, IL1R2, CXorf23, F2RL2, CAPG, FAH, DUSP4, GDA, NMBR, CCNE2, GJB2, RYK, TMTC2, DPEP2, B3GALT2	http://www.ncbi.nlm.nih.gov/pubmed/25621825
105	CXCR5, IL1R1, STOM, PTGES, CNTN1, NRP1, VIPR2, HMGN3, CTSH, CCR6, APOBEC1, CD2AP, MAPK10, P2RY1, GUCY1A3, IGFBP4, LINGO4, DLL1, TIFA, PTGER2, SDC4, HS6ST2, IGF1R, CX3CL1, IL17RE, GRIA3, GALM, NPL, SDC2, KIAA1598, ATRNL1, PPAP2B, SNORD14C, SLC6A13, CACNA1G, DNAJC6, ERMP1, RNASE6, OR4C12, PDE6D, PDGFRB, DDC, NAPEPLD, EEF2K, TUBA8, ADK, FAM184B, TRAPPC2, TOX2, HELLS, SLC41A3, KHDRBS3, BATF3, ALG14, MSRB3, FLRT2, TTYH2, SDC1, LTB, DSG2, TMEM60, CITED4, LDHB, SLC6A7, ACTR6, ACAT1, HLA-DQA1, ABCA3, SRR, IRGM, HK3, DNAJB1, GOLPH3L, HTRA2, PARVB, TM9SF2, FERMT2, PLB1, CDC14A, ABHD15, DENND3, MED21, TMEM70, RHOB, FANCL, PMPCB, GDPD5, DSCAM, TMEM229B, P2RX1, APOA1, EID1, LSM10, ZNF43, TMEM126B, ABCA1,	http://www.ncbi.nlm.nih.gov/pubmed/25621825