# Acute Viral Respiratory Infection Rapidly Induces a CD8$^+$ T Cell Exhaustion–like Phenotype

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**Acute viral infections typically generate functional effector CD8$^+$ T cells ($T_{CD8}$) that aid in pathogen clearance. However, during acute viral lower respiratory infection, lung $T_{CD8}$ are functionally impaired and do not optimally control viral replication. T cells also become unresponsive to Ag during chronic infections and cancer via signaling by inhibitory receptors such as programmed cell death-1 (PD-1). PD-1 also contributes to $T_{CD8}$ impairment during viral lower respiratory infection, but how it regulates $T_{CD8}$ impairment and the connection between this state and T cell exhaustion during chronic infections are unknown. In this study, we show that PD-1 operates in a cell-intrinsic manner to impair lung $T_{CD8}$. In light of this, we compared global gene expression profiles of impaired epitope-specific lung $T_{CD8}$ to functional spleen $T_{CD8}$ in the same human metapneumovirus–infected mice. These two populations differentially regulate hundreds of genes, including the upregulation of numerous inhibitory receptors by lung $T_{CD8}$. We then compared the gene expression of $T_{CD8}$ during human metapneumovirus infection to those in acute or chronic lymphocytic choriomeningitis virus infection. We find that the immunophenotype of lung $T_{CD8}$ more closely resembles T cell exhaustion late into chronic infection than do functional effector T cells arising early in acute infection. Finally, we demonstrate that trafficking to the infected lung alone is insufficient for $T_{CD8}$ impairment or inhibitory receptor upregulation, but that viral Ag–induced TCR signaling is also required. Our results indicate that viral Ag in infected lungs rapidly induces an exhaustion-like state in lung $T_{CD8}$ characterized by progressive functional impairment and upregulation of numerous inhibitory receptors.** *The Journal of Immunology*, **2015, 195: 4319–4330.**

CD8$^+$ T cells ($T_{CD8}$) possess critical functions that protect against intracellular pathogens and cancer, including cytotoxicity, cytokine production, and long-lived memory potential (1, 2). During acute infection, naive $T_{CD8}$ encounter Ag, acquire effector functions, and proliferate to clear the infection, after which 90–95% die whereas the remaining few become memory cells (2). Memory $T_{CD8}$ can rapidly reactivate their effector functions and proliferate upon pathogen re-encounter, contributing to protective immunity (3). During chronic infection, a different sequence of events occurs: pathogen-specific $T_{CD8}$ initially acquire effector functions, but they gradually become exhausted and fail to eliminate the infection (4). Proliferation and IL-2 production are lost early, followed by TNF, with IFN-γ production failing weeks into exhaustion (5). Prolonged TCR stimulation by persistent viral or tumor Ags is thought to transcriptionally reprogram exhausted $T_{CD8}$, resulting in these functional changes (6).

The paradigm that acute infection generates functional effector T cells followed by memory development, while chronic infection causes T cell exhaustion, is not generalizable to all infections. During acute viral lower respiratory infection (LRI) in mice, pulmonary $T_{CD8}$ become functionally impaired, rapidly losing cytotoxicity and cytokine production (7–11). In contrast to exhaustion, lung $T_{CD8}$ impairment during LRI occurs rapidly, with IFN-γ production waning as early as day 7 (7). Additionally, only $T_{CD8}$ in the respiratory tract become impaired; $T_{CD8}$ in lymphoid organs maintain their effector functions, suggesting that the infected lung environment is critical for the development of impairment (12). LRI are typically cleared within 7–12 d even in the face of $T_{CD8}$ impairment, but the generation of protective immunity may be compromised by the rapid impairment of the primary and secondary anti-viral $T_{CD8}$ effector responses (13). Failure to generate a quality memory $T_{CD8}$ response may help explain the ability of respiratory viruses and other pathogens to repeatedly reinfect individuals despite minimal antigenic drift (14–16). A better understanding of the phenotype, functions, and mechanisms

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Abbreviations used in this article: A34R, A34R$_{82–90}$; Arm, lymphocytic choriomeningitis virus Armstrong; B6, C57BL/6; Cl-13, lymphocytic choriomeningitis virus clone 13; DC, dendritic cell; F528, H2-D$^b$/F$_{528–536}$ (SGVTNNGFI); FDR, false discovery rate; HMPV, human metapneumovirus; ICS, intracellular cytokine staining; i.n., intranasal(ly); LCMV, lymphocytic choriomeningitis virus; LRI, lower respiratory infection; M195, HLA-B*0702/M$_{195–203}$ (APYAGLIMI); N11, H2-K$^b$/N$_{11–18}$ (LSYKHAIL); PD-1, programmed cell death-1; PD-L1, programmed cell death ligand-1; p.i., postinfection; RSV, respiratory syncytial virus; $T_{CD8}$, CD8$^+$ T cell; WT, wild-type.

controlling lung $T_{CD8}$ activity during LRI is needed to design new and effective therapeutics and vaccines.

We previously uncovered a role for the inhibitory receptor programmed cell death-1 (PD-1) in mediating lung $T_{CD8}$ impairment during human metapneumovirus (HMPV) and influenza virus infection (12). Blocking PD-1 during LRI resulted in increased $T_{CD8}$ degranulation, IFN-γ production, and ability to clear the infection. A recent study showed that during respiratory syncytial virus (RSV) infection, PD ligand-1 (PD-L1) expression by lung dendritic cells (DCs) primarily mediated lung $T_{CD8}$ impairment (17). PD-1 has been proposed to play a role during other acute infections, including rabies (18), histoplasmosis (19), and bacterial sepsis (20, 21). However, PD-1 expression by APCs (e.g., microglia, macrophages, DCs) was found to be primarily important in mediating early susceptibility to these pathogens. Recently, it was shown that PD-1 expression on lung $T_{CD8}$ correlated with disease severity caused by different strains of influenza virus and PD-1 blockade improved survival, but this was not associated with restored $T_{CD8}$ functionality (22). Therefore, the intrinsic ability of PD-1 to regulate adaptive immune responses during acute LRI remains unclear.

PD-1 blockade restores function to exhausted $T_{CD8}$ during HIV infection in humans (23) and chronic lymphocytic choriomeningitis virus (LCMV) clone 13 infection of mice (24). PD-1 is not the sole mediator of exhaustion, however, as additionally inhibitory receptors, including TIM-3 (25), LAG-3 (26), 2B4 (27), and others (28), also contribute. The PD-1–mediated functional impairment in both acute viral LRI and chronic systemic infection suggests that additional similarities may exist during these seemingly disparate infections. However, whether additional inhibitory receptors are expressed, what drives their expression, and whether they play a role in lung $T_{CD8}$ impairment during acute viral LRI are unknown.

We addressed these issues by first determining that PD-1 regulates lung $T_{CD8}$ in a cell-intrinsic manner during HMPV infection. This then allowed us to more directly study the phenotype of impaired lung $T_{CD8}$. We compared the global gene expression profiles of impaired virus-specific lung $T_{CD8}$ to unimpaired spleen $T_{CD8}$ in the same HMPV-infected mice. Gene expression analysis has uncovered numerous pathways regulating effector and memory $T_{CD8}$ development during acute infection (29) and exhaustion during chronic infection (4, 30). Given the functional differences that exist between effector $T_{CD8}$ present during most acute infections, exhausted $T_{CD8}$ during chronic infections, and impaired lung $T_{CD8}$ during LRI, we hypothesized that each population would possess a unique gene expression profile that may provide insights into the mechanisms governing each functional state. Surprisingly, we found that the lung $T_{CD8}$ gene expression signature was similar to $T_{CD8}$ early in the exhaustion process; however, when focusing solely on genes with known immune functions, impaired lung $T_{CD8}$ were most similar to fully exhausted cells. We confirmed that impaired lung $T_{CD8}$ coexpress these inhibitory receptors to a greater degree than do spleen $T_{CD8}$. Finally, we show that $T_{CD8}$ inhibitory receptor expression is driven by Ag-dependent TCR signaling, and without TCR stimulation, $T_{CD8}$ remain functional with very low inhibitory receptor expression. Our results indicate that acute viral LRI induces an exhaustion-like state in lung $T_{CD8}$ characterized by rapid functional impairment and Ag-dependent upregulation of numerous inhibitory receptors.

## Materials and Methods

### *Mice and viral infection*

C57BL/6 (B6) and congenic Thy1.1$^+$ mice were purchased from The Jackson Laboratory. B6-$Kb^0Db^0$;B7.2 transgenic mice were obtained with permission from Drs. Alexander Sette (La Jolla Institute for Allergy and Immunology, La Jolla, CA) and François Lemonnier (Institut Pasteur, Paris, France). PD-$1^{-/-}$ mice were obtained with permission from Dr. Tasuku Honjo (Kyoto University, Kyoto, Japan). All animals were bred and maintained in specific pathogen-free conditions in accordance with the Vanderbilt Institutional Animal Care and Use Committee. Six- to twelve-week-old age- and gender-matched animals were used in all experiments. Mixed bone marrow chimeric mice were generated by irradiating Thy1.1$^+$ recipients with two doses of 5 Gy, 4 h apart, followed by reconstitution with $1 \times 10^6$ wild-type (WT; Thy1.1$^+$) and $1 \times 10^6$ PD-$1^{-/-}$ (Thy1.2$^+$) bonemarrow cells 24 h later. Mice were rested for 8 wk and then bled to check reconstitution before use in experiments. HMPV (pathogenic clinical strain TN/94-49, genotype A2) was grown and titered in LLC-MK2 cells as previously described (31). For all experiments, mice were anesthetized with ketamine-xylazine and infected intranasally (i.n.) with $1 \times 10^6$ PFU HMPV.

### *Flow cytometry staining*

Tetramers were generated for the following viral epitopes as previously described (12, 32): HLA-B*0702/$M_{195–203}$ (M195) (APYAGLIMI), H2-$D^b$/$F_{528–536}$ (F528) (SGVTNNGFI), and H2-$K^b$/$N_{11–18}$ (N11) (LSYKHAIL). Lymphocytes were isolated from spleens and lungs of infected animals and stained as previously described (12). Cells were stained with PE- or allophycocyanin-labeled tetramers (0.1–1 μg/ml), anti-CD8α (clone 53-6.7, BD Biosciences), and anti-CD19 (clone 1D3, iCyt). In some experiments, cells were also stained for the inhibitory receptors PD-1 (clone RMP1-30), TIM-3 (clone RMT3-23), LAG-3 (clone C9B7W), and 2B4 [clone m2B4 (B6)458.1] or with appropriate isotype controls (all from BioLegend). For mixed bone marrow chimera experiments, cells were stained for Thy1.1 (clone OX-7, BD Biosciences) and Thy1.2 (clone 53-2.1, BD Biosciences). Surface/tetramer staining was performed for 1 h at room temperature in PBS containing 1% FBS and 50 nM dasatinib. Intracellular cytokine staining (ICS) was performed in parallel with tetramer staining as previously described (12). Flow cytometric data were collected using an LSR II or LSRFortessa (BD Biosciences) and analyzed with FlowJo software (Tree Star). Boolean gating in FlowJo was used to assess inhibitory receptor coexpression, and patterns were visualized using the SPICE program (National Institute of Allergy and Infectious Diseases).

### *Generation of bone marrow–derived DCs and immunizations*

Bone marrow-derived DCs were generated as previously described (12). To obtain secondary M195-specific $T_{CD8}$, mice were primed i.n. with $2 \times 10^6$ M195-loaded, LPS-matured DCs and then challenged with HMPV 3 wk later. For generation of lung-infiltrating vaccinia virus A34R$_{82–90}$ (A34R)-specific $T_{CD8}$, mice were immunized i.n. with A34R DCs and then challenged 7 d later with HMPV and were treated daily i.n. during the infection with either 50 μg A34R peptide or an irrelevant HLA-B*0702–restricted peptide. To study splenic $T_{CD8}$ response to systemically administered Ag, mice were immunized s.c. with A34R-specific DCs, challenged 7 d later with HMPV, and injected daily s.c. and i.p. during the infection with either 50 μg (via each route) A34R peptide or mock peptide.

### *Cell sorting*

To obtain sufficient quantities of primary epitope-specific $T_{CD8}$, on day 7 after HMPV infection the spleens and lungs from three mice were pooled together after processing. Samples were stained, sorted, and RNA purified on separate days in independent experiments. Cells were processed in ice-cold R10 media containing 10 nM dasatinib to prevent activation and TCR signaling. Lung cells were processed as before. Splenocytes were depleted of B cells by incubation on goat anti-mouse IgG- and IgM-coated (100 μg/ml) (SouthernBiotech) T-75 flasks at $10^6$ cells/ml for 1 h at 37°C and then processed as before. Both lung and spleen cells were stained for viability, CD19, CD8, and M195 tetramers (both PE and allophycocyanin conjugated). Splenocytes were also stained for CD44 (clone IM-7; BD Biosciences) and CD62L (MEL-14; BD Biosciences) to obtain control naive cells. Dual tetramer$^+$ $T_{CD8}$ were sorted using a BD FACSAria III. Samples were maintained at 4°C for the entirety of the sort and purity was 97–99% for all populations.

### *RNA amplification and hybridization*

Total RNA was isolated from sorted naive, spleen, lung, and secondary lung M195-specific $T_{CD8}$ using an RNeasy kit (Qiagen) according to the manufacturer's instructions. On-column DNase digestion was performed, and eluted RNA was quantified and checked for integrity using an Agilent 2100 Bioanalyzer. RNA was amplified using a WT Ovation Pico kit (NuGEN) and then converted to cDNA. Amplified samples were again checked for

integrity and then hybridized to mouse gene 1.1 ST microarrays (Affymetrix) and scanned on the GeneTitan instrument (Affymetrix).

### *Microarray data analysis*

*HMPV $T_{CD8}$ data analysis.* Microarray data were processed using the oligonucleotide package implementation of rma in R software (33). For microarray analysis, four groups (naive, spleen, lung, and secondary lung) were compared using the limma package (34). Significantly changed probes were identified by ANOVA. The *p* values were adjusted for multiple comparisons using the false discovery rate (FDR) method (35). The thresholds for significance were set to control the expected FDR at values <10% and the fold-change at 2.

*HMPV data versus LCMV data.* GSE41867 data (26) were downloaded from the National Center for Biotechnology Information Gene Expression Omnibus database. The microarray data files from the present study and GSE41867 were processed separately using the oligonucleotide package implementation of rma in R software. The batch effect of two data sets was corrected using ComBat package (36). In one analysis, five groups (spleen and lung are from the HMPV data set and the additional three groups are from GSE41867 data) were selected to a subset (top 50% based on the coefficient of variation) of the original data and 10 pairwise comparisons were done using the limma package in BioConductor (34). The differentially expressed probes/genes were refined to the gene list based on two criteria: adjusted *p* value <0.1 and fold-change >2. Analysis of similarity was also performed as previously described (37). In a separate analysis, all groups were compared using ANOVA with the same cutoffs for significance and a heat map was generated.

### *Ingenuity Pathway Analysis*

Ingenuity Pathway Analysis (http://www.ingenuity.com) was used to compare different biological processes in spleen versus lung $T_{CD8}$ and to identify all immune genes present in each data set.

### *Accession numbers*

The microarray data have been submitted to the Gene Expression Omnibus database (http://www.ncbi.nlm.nih.gov/gds) under the accession number GSE53349.

### *Statistical analysis*

Comparisons between tetramer staining and ICS within the same animals were performed using a paired *t* test or Wilcoxon signed rank test. Comparisons between two independent groups were performed using an unpaired Student *t* test or Wilcoxon rank sum test. Multiple group comparisons were performed using one-way ANOVA with a Bonferroni posttest for comparison of individual groups. A *p* value <0.05 was considered statistically significant by convention. All *p* values should be for two-sided tests and unadjusted for multiple comparisons unless otherwise noted. Error bars on each graph represented the SEM unless otherwise noted. All analyses were conducted using R software version 2.16.

### *Study approval*

All animals were maintained in accordance with the National Institutes of Health *Guide for the Care and Use of Laboratory Animals* and were handled according to protocols approved by the Vanderbilt University subcommittee on animal care (Institutional Animal Care and Use Committee).

## Results

### *Lung $T_{CD8}$ impairment is cell-intrinsically regulated by PD-1*

We have previously shown that blockade or genetic ablation of PD-1 reverses functional impairment (12). However, it was unclear whether PD-1 caused impairment via direct signaling on the $T_{CD8}$ surface or whether its effects were indirectly mediated by other immune cells. To answer this question, we generated WT:PD-$1^{-/-}$ bone marrow chimeric mice. After reconstitution of irradiated recipients with either 1:1 WT (Thy1.1$^+$):PD-$1^{-/-}$ (Thy1.2$^+$) donor bone marrow cells (Fig. 1) or 4:1 WT:PD-$1^{-/-}$ cells (not shown), the $T_{CD8}$ compartment consisted of approximately twice as many PD-$1^{-/-}$ as WT cells (Fig. 1A). This was true in both the preinfection blood and the postinfection lung compartments (Fig. 1A), indicating a stable ratio of WT:PD-$1^{-/-}$ T cells following HMPV infection.

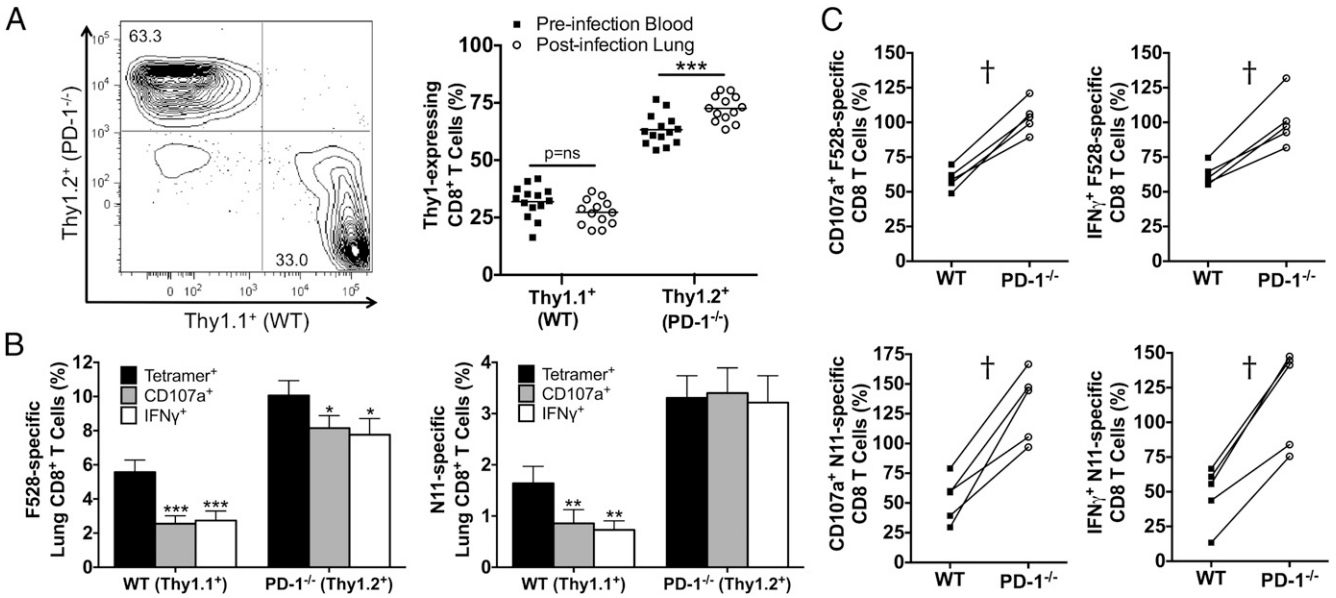


**FIGURE 1.** Lung $T_{CD8}$ impairment is cell-intrinsically regulated by PD-1. (**A**–**C**) WT (Thy1.1$^+$):PD-$1^{-/-}$ (Thy1.2$^+$) mixed bone marrow chimeric mice were checked for immune reconstitution in the blood before and in the lung after HMPV infection. (A) A representative flow cytometry plot gated on live/CD19$^-$/CD3$^+$/CD8$^+$ lymphocytes is shown. In the graph, each symbol represents an individual mouse and the horizontal bar indicates the mean. Ratios of WT:PD-$1^{-/-}$ $T_{CD8}$ in preinfection blood (■) and postinfection lungs (○) sum to 100%. (B) Mixed bone marrow chimeric mice were infected with HMPV and the lung F528- and N11-specific $T_{CD8}$ responses were quantified via tetramer staining (black bars), CD107a mobilization (gray bars), and intracellular IFN-γ production (white bars) at day 7 p.i. Data are combined from three independent experiments with four to five mice per experiment. (C) The percentage of functional HMPV-specific $T_{CD8}$ was calculated by dividing the percentage that degranulated or made IFN-γ by the percentage that stained tetramer$^+$. Lines connect data points from WT and PD-$1^{-/-}$ $T_{CD8}$ within the same mouse. Data are representative of one out of three independent experiments with five mice per experiment. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, unpaired *t* test; $^{\dagger}p < 0.05$, paired *t* test.

We quantified the total F528 and N11 epitope-specific $T_{CD8}$ response on day 7 postinfection (p.i.) via tetramer staining, and in parallel their effector functions via brief peptide restimulation followed by intracellular cytokine staining. We have previously shown that direct comparison of these assays allows for the accurate quantification of the functionality of epitope-specific lung $T_{CD8}$ in a manner that is not influenced by variations in lung APCs or in vitro stimulation conditions (12, 13, 38). The percentage of tetramer$^+$ $T_{CD8}$ was greater among PD-1$^{-/-}$ cells (Fig. 1B), likely reflecting the increased precursor frequencies due to greater overall numbers of cells. More importantly, we observed greater frequencies of degranulating (i.e., CD107a$^+$) or IFN-γ–producing PD-1$^{-/-}$ versus WT $T_{CD8}$. To control for the greater overall $T_{CD8}$ response by PD-1$^{-/-}$ cells, we calculated the percentage of $T_{CD8}$ capable of degranulating or making IFN-γ and compared WT and PD-1$^{-/-}$ cells within the same mouse. Lung $T_{CD8}$ were more functional in PD-1$^{-/-}$ compared with WT cells for both epitopes and both effector functions measured (Fig. 1C). WT $T_{CD8}$ remained impaired in this experiment despite the presence of PD-1$^{-/-}$ hematopoietic cells of different lineages, namely APCs such as DCs. Therefore, these data show that PD-1 functions in a cell-intrinsic manner to impair lung $T_{CD8}$ during viral LRI.

### *Gene expression analysis of impaired lung $T_{CD8}$ and unimpaired spleen $T_{CD8}$*

Given the cell-intrinsic nature of PD-1–mediated lung $T_{CD8}$ impairment, we reasoned that a more thorough examination of anti-viral $T_{CD8}$ might reveal other mechanisms regulating their function in the respiratory tract. We previously showed that HMPV-specific $T_{CD8}$ in different environments within the same infected mouse have different levels of functionality (12). We found that HMPV-specific lung $T_{CD8}$ rapidly lose the ability to produce IFN-γ (Fig. 2A) or degranulate (not shown), although these effector functions are maintained in the spleen over time. HMPV is cleared from the lungs by day 10 (12), yet $T_{CD8}$ exhibited progressive functional decline long after infection. Secondary lung $T_{CD8}$ are also highly impaired in their ability to degranulate or make cytokines following challenge of previously infected mice or mice immunized with HMPV-specific class I–restricted epitopes (12, 13).

We hypothesized that the infected lung environment influences $T_{CD8}$ functionality at a transcriptional level to balance the need for viral control with prevention of immune-mediated pathology. To test this, we compared global gene expression differences between virus-specific, impaired lung $T_{CD8}$ and functional spleen $T_{CD8}$ from the same HMPV-infected mice. We infected B6-Kb$^0$Db$^0$;B7.2 transgenic mice, in which $T_{CD8}$ only recognize epitopes restricted by the human MHC class I molecule HLA-B**0702* (39). The $T_{CD8}$ response in B6-Kb$^0$Db$^0$;B7.2 transgenic mice is dominated by cells recognizing the M195 epitope, which accounts for ~60% of anti-viral $T_{CD8}$ (12). At day 7 p.i., the time at which lung $T_{CD8}$ impairment begins (Fig. 2A), we sorted spleen and lung M195-specific $T_{CD8}$ as well as secondary lung M195-specific $T_{CD8}$ from mice primed with M195-loaded DCs then challenged with HMPV. M195-specific $T_{CD8}$ were sorted to high purity (Fig. 2B) and gene expression analysis was performed. Two samples were deemed outliers based on principal component analysis and excluded from further study (Supplemental Fig. 1).

We quantified the gene expression differences of these populations and compared them to naive $T_{CD8}$ to make direct comparisons between the three groups. Approximately 900 genes were up- or downregulated by all three populations of M195-specific $T_{CD8}$ compared with naive $T_{CD8}$ (Fig. 2C), which reflect many genes associated with T cell activation and differentiation (Table I). More than 1300 genes were differentially expressed by both primary and secondary lung $T_{CD8}$ (Supplemental Table I). Despite large numbers of overlapping genes between these groups, each population contained numerous genes uniquely identifying them: 173 for spleen, 319 for primary lung, and 652 for secondary lung $T_{CD8}$ (Fig. 2C). A total of 370 genes differed between the impaired lung and unimpaired spleen $T_{CD8}$ from the same infected mice, indicating that lung anti-viral $T_{CD8}$ exhibit a unique gene expression profile while combating infection.

Activated spleen and lung $T_{CD8}$ up- and downregulated numerous genes compared with naive $T_{CD8}$ (Fig. 3A, Table I) in concordance with previous studies (29, 40). Some of these genes were shared by both spleen and lung $T_{CD8}$, but lung $T_{CD8}$ also upregulated numerous unique genes. Gene clustering demonstrated that primary and secondary lung $T_{CD8}$ were most closely related, with numerous additional genes only expressed during challenge infection (Fig. 3A). To broadly compare which biological processes were altered in lung compared with spleen anti-viral $T_{CD8}$, we performed gene ontology analysis (Fig. 3B). Numerous pathways were substantially altered in primary lung $T_{CD8}$; "cellular function and maintenance" was the most significantly changed. Other pathways with known immune functions were altered in lung $T_{CD8}$, including "hematological system development and function," "immune cell trafficking," "inflammatory response," and "cell death and survival." Genes were then sorted by functional classification and biological process so that just the

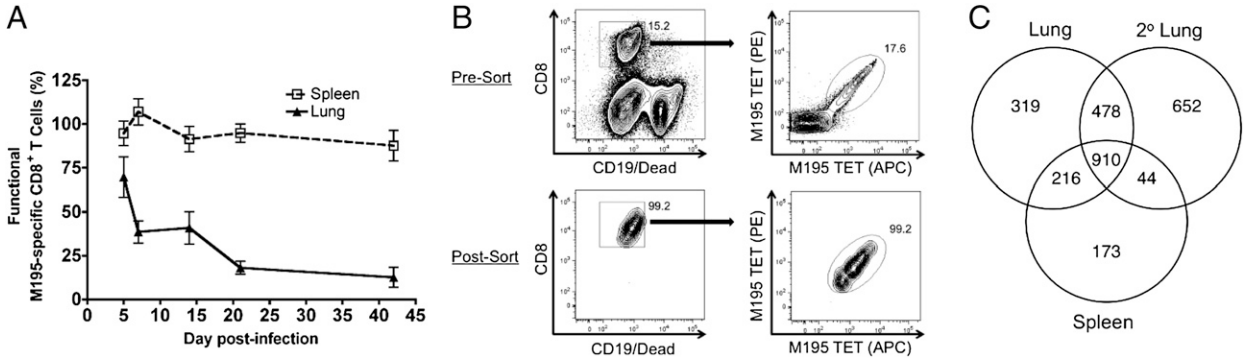


**FIGURE 2.** Isolation of epitope-specific lung and spleen $T_{CD8}$ and comparison of gene expression. (**A**) Time course of HMPV M195-specific $T_{CD8}$ functionality (IFN-γ production) in the lung and the spleen. (**B**) Pre- and postsort analysis of lung M195-specific $T_{CD8}$ at day 7 p.i. (**C**) Total number of genes differentially expressed for the indicated M195-specific $T_{CD8}$ populations compared with naive $T_{CD8}$. Naive spleen $T_{CD8}$, spleen M195-specific $T_{CD8}$, lung M195-specific $T_{CD8}$, and 2° lung M195-specific $T_{CD8}$ are shown. Genes were considered significantly different when the fold-change was >2 and the FDR was <10%.

Table I. Genes differentially regulated between M195-specific $T_{CD8}$ compared with naive $T_{CD8}$

| Gene | Other Names | Spl | Lu 1o | Lu 2o |
|---|---|---|---|---|
| **I. Activating/Inhibitory Receptors** | | | | |
| CD200 | OX2 | 1.6 | 4.2 | 4.6 |
| CD244 | 2B4 | 1.5 | 4.4 | 15.1 |
| FGL2 | | 5.1 | 39.4 | 84.5 |
| HAVCR2 | TIM-3 | 11.0 | 34.8 | 23.8 |
| LAG3 | CD223 | 18.9 | 50.8 | 39.2 |
| PDCD1 | PD-1 | 26.4 | 29.3 | 23.7 |
| TNFRSF4 | OX40 | 1.0 | 2.2 | 1.4 |
| TNFRSF9 | 4-1BB | 4.4 | 9.7 | 1.2 |
| TREML2 | | 10.5 | 5.2 | 9.8 |
| **II. Adhesion** | | | | |
| AMICA1 | | 2.8 | 8.4 | 7.0 |
| BGN | | 1.1 | 3.3 | 3.0 |
| CD93 | | 1.1 | 2.4 | 2.0 |
| CDH1 | | 1.4 | 4.6 | 32.4 |
| CDH5 | | 1.2 | 3.3 | 2.1 |
| SPARC | Osteonectin | 1.1 | 5.7 | 11.0 |
| **III. Apoptosis** | | | | |
| BCL2L11 | | 1.2 | 2.0 | 3.7 |
| BCL3 | | 1.4 | 2.9 | 1.2 |
| CDKN1A | | 3.3 | 8.1 | 5.2 |
| IER3 | | 3.2 | 11.2 | 9.2 |
| PLAC8 | | 1.5 | 3.6 | 2.5 |
| PRMT2 | | 1.5 | 1.3 | 3.0 |
| TNFSF10 | TRAIL | 1.6 | 7.2 | 15.8 |
| **IV. Cellular Growth** | | | | |
| CCND3 | Cyclin D3 | 1.7 | 3.4 | 3.5 |
| CDC20 | | 2.1 | 4.4 | 3.1 |
| CD63 | | 1.6 | 6.8 | 32.3 |
| CD81 | | 1.3 | 2.2 | 3.6 |
| GRN | Granulin | 2.0 | 4.7 | 6.8 |
| P2RX7 | | 1.1 | 2.1 | 14.4 |
| S1PR1 | | 1.4 | 3.2 | 7.2 |
| **V. Chemotaxis/Movement** | | | | |
| CAPG | | 7.0 | 14.7 | 25.3 |
| CCL1 | | 1.0 | 8.1 | 21.2 |
| CCL4 | | 11.1 | 73.6 | 60.1 |
| CCL7 | | 1.1 | 2.2 | 1.8 |
| CCR7 | | 3.3 | 11.1 | 40.5 |
| CCR8 | | 1.6 | 6.8 | 47.9 |
| CCRL2 | | 2.8 | 9.7 | 5.9 |
| CXCL3 | | 1.0 | 1.2 | 1.8 |
| CXCL9 | | 1.4 | 8.7 | 1.5 |
| CXCL10 | | 8.4 | 26.8 | 2.2 |
| HRH4 | | 7.1 | 3.3 | 3.9 |
| XCL1 | | 3.9 | 26.2 | 25.2 |
| **VI. Cytokines** | | | | |
| IFNG | | 43.1 | 125 | 84.0 |
| IL10 | | 2.2 | 25.7 | 3.2 |
| IL10RA | | 7.4 | 17.7 | 10.1 |
| IL12RB1 | | 2.8 | 5.8 | 5.2 |
| IL12RB2 | | 4.3 | 1.8 | 1.1 |
| IL2 | | 1.5 | 3.9 | 4.1 |
| IL2RA | | 14.9 | 34.9 | 18.8 |
| IL7R | | 2.4 | 6.6 | 1.8 |
| LIF | | 1.1 | 2.1 | 1.6 |
| OSM | | 1.1 | 2.2 | 3.4 |
| TGFBI | | 1.2 | 3.5 | 4.4 |
| TNF | | 2.3 | 5.6 | 7.5 |
| **VII. Cytokine Signlaing** | | | | |
| CISH | | 3.5 | 10.7 | 16.4 |
| ENG | Endoglin | 4.3 | 1.8 | 3.5 |
| SFTPA1 | | 1.1 | 4.0 | 3.3 |
| TIMP3 | | 1.1 | 2.8 | 1.7 |
| **VIII. Innate Immunity** | | | | |
| BST2 | Tethrin | 1.3 | 4.2 | 1.5 |
| CD14 | | 1.6 | 3.4 | 4.2 |
| CYBB | | 1.9 | 6.3 | 5.2 |
| CYSLTR2 | | 2.6 | 5.5 | 5.6 |
| HP | Haptoglobin | 1.0 | 3.2 | 1.9 |
| ISG15 | | 3.2 | 12.2 | 2.7 |
| ISG20 | | 1.9 | 9.9 | 8.4 |
| MGST1 | | 1.1 | 3.1 | 3.6 |
| RSAD2 | Viperin | 2.3 | 10.3 | 2.3 |
| SCGB1A1 | Uteroglobin | 1.4 | 207 | 69.2 |
| TLR7 | | 1.6 | 1.5 | 1.2 |
| UBE2L6 | | 2.6 | 6.3 | 2.7 |
| **IX. Signaling** | | | | |
| CD38 | | 3.7 | 8.7 | 10.5 |
| FGR | | 1.9 | 4.5 | 3.9 |
| LAT2 | | 1.5 | 3.0 | 7.3 |
| MUC1 | | 1.5 | 3.8 | 2.2 |
| RGS16 | | 6.5 | 21.1 | 14.5 |
| TNIP1 | | 1.1 | 2.5 | 2.5 |
| GADD45B | | 1.8 | 6.8 | 5.0 |
| GADD45G | | 1.6 | 13.1 | 9.8 |
| TYROBP | | 2.4 | 5.6 | 7.3 |
| **X. Transcriptional Regulation** | | | | |
| AFF1 | | 1.8 | 4.4 | 6.3 |
| ATF3 | | 0.6 | 6.6 | 12.8 |
| BACH2 | | 2.8 | 6.4 | 7.6 |
| BATF3 | | 1.2 | 2.1 | 1.6 |
| EGR2 | | 1.5 | 1.8 | 3.4 |
| EPAS1 | HIF-2A | 2.1 | 5.0 | 5.8 |
| FOS | | 3.2 | 1.5 | 1.8 |
| ID3 | | 2.6 | 1.7 | 1.2 |
| **X. Transcriptional Regulation (cont.)** | | | | |
| IRF4 | | 4.9 | 10.7 | 6.7 |
| IRF7 | | 1.2 | 2.5 | 0.8 |
| IRF8 | | 1.9 | 10.5 | 3.4 |
| JUN | | 6.5 | 1.1 | 2.1 |
| MYB | | 1.4 | 3.1 | 15.5 |
| MYC | | 1.3 | 2.8 | 2.0 |
| PRDM1 | BLIMP-1 | 4.4 | 12.4 | 7.3 |
| RBPJ | | 1.3 | 1.6 | 2.5 |
| SOCS2 | | 2.0 | 4.5 | 9.0 |
| STAT2 | | 1.2 | 3.3 | 1.9 |
| TCF7 | | 1.8 | 3.9 | 4.6 |
| **XI. Miscellaneous** | | | | |
| ATP6V0D2 | | 1.1 | 2.0 | 8.6 |
| C3 | | 1.0 | 4.1 | 5.4 |
| CD36 | | 1.1 | 5.4 | 9.6 |
| CD74 | | 2.5 | 5.1 | 8.3 |
| FABP5 | | 1.1 | 2.5 | 4.0 |
| FCER1G | | 2.1 | 6.9 | 12.9 |
| GCNT1 | | 2.8 | 8.8 | 2.7 |
| PLSCR1 | | 8.3 | 18.3 | 15.1 |
| PRF1 | Perforin | 2.3 | 6.0 | 3.5 |
| RORA | | 4.2 | 2.0 | 2.2 |
| SERPING1 | | 1.1 | 7.7 | 3.4 |
| THBD | | 1.1 | 3.1 | 2.3 |
| ZBTB32 | | 16.6 | 33.7 | 8.1 |

GREEN = Downregulated
RED = Upregulated

Green indicates downregulated; red indicates upregulated.

subset of immune genes could be compared. This analysis revealed that spleen $T_{CD8}$ very closely resemble naive $T_{CD8}$, indicating a state of immune immaturity (Fig. 3C). Conversely, lung $T_{CD8}$ upregulated the expression of dozens of additional immune genes, suggesting that lung-homing virus-specific $T_{CD8}$ adopt a significantly more differentiated state to combat viral infection. These results indicate that lung $T_{CD8}$ are immunologically more mature than spleen $T_{CD8}$ and display a distinct gene expression profile.

*Genes encoding several inhibitory receptors and pathways are upregulated in impaired lung $T_{CD8}$*

Several genes encoding inhibitory receptors, which can contribute to T cell exhaustion during chronic infection, were highly expressed by impaired lung $T_{CD8}$ (Fig. 3C, Table I). These genes encode the receptors TIM-3 (*Havcr2*), LAG-3 (*Cd233*), and 2B4 (*Cd244*). *Pdcd1*, the gene that encodes PD-1, was not differentially expressed between spleen and lung $T_{CD8}$, which may reflect either recent activation of spleen $T_{CD8}$ or migration from the infected lung where they had encountered Ag. FGL2, an inhibitory molecule expressed by regulatory T cells that has been shown to inhibit adaptive immunity (41) and also promote T cell exhaustion during chronic LCMV infection (42), was also highly upregulated by lung $T_{CD8}$. Interestingly, other known inhibitory receptors, such as CTLA-4, CD160, and BTLA, were not different between any of the groups. The activating receptors OX40 and 4-1BB were upregulated in the lung compared with the spleen, but not as dramatically. Of note, many genes encoding adhesion molecules, cytokines, chemokines, and various others were also significantly different (Supplemental Table I, Table I). In summary, impaired lung $T_{CD8}$ displayed coordinated upregulation of several genes associated with T cell exhaustion.

*Impaired lung $T_{CD8}$ adopt an exhaustion-like state during viral LRI*

Functional impairment in association with upregulation of inhibitory receptors has also been observed in exhausted $T_{CD8}$ during chronic infection. However, important differences exist, including the speed with which lung $T_{CD8}$ impairment versus exhaustion develops (days versus weeks). We sought to determine whether

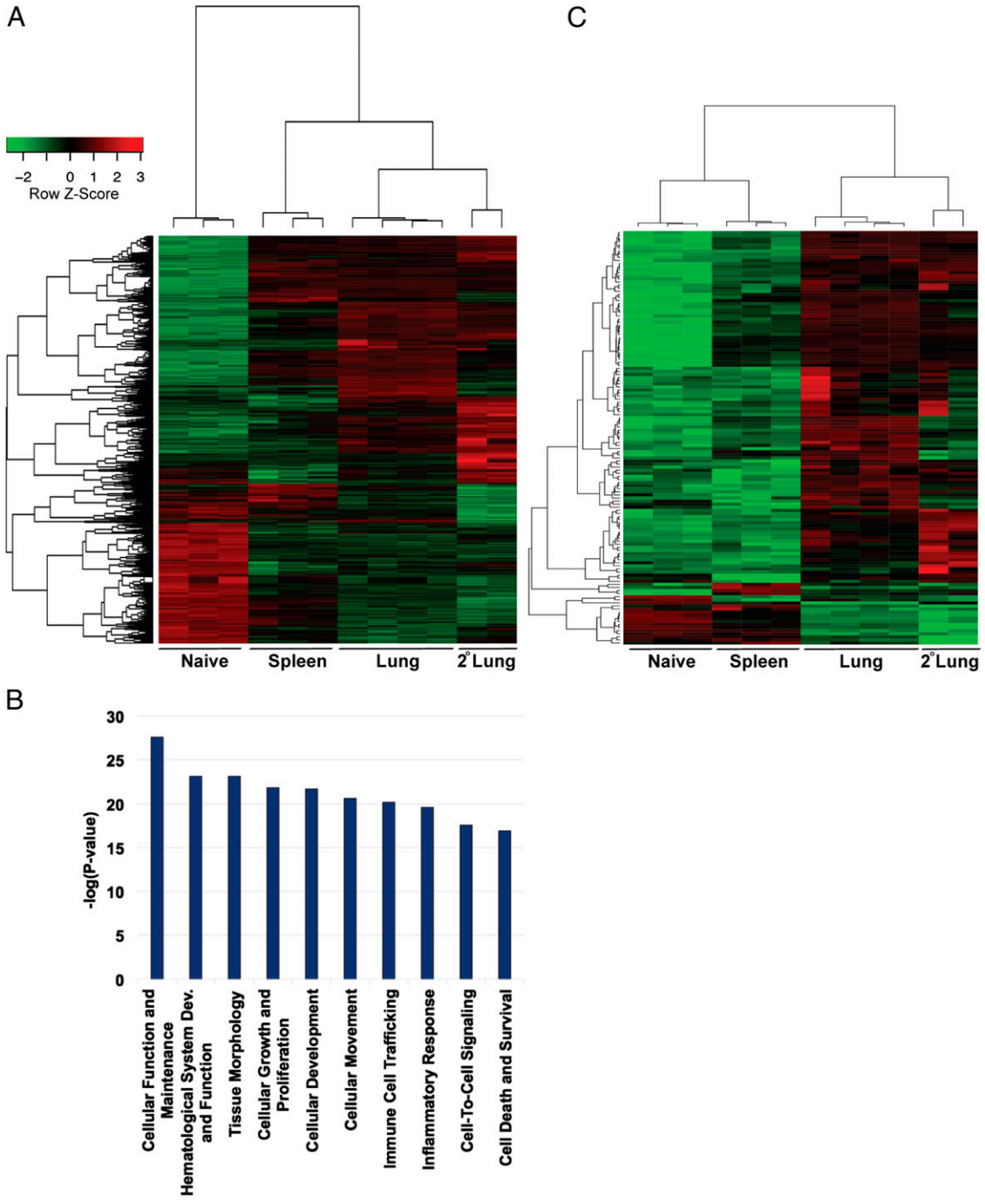


**FIGURE 3.** Lung $T_{CD8}$ differentially regulate numerous immune-related genes compared with spleen $T_{CD8}$. (**A**) Heat map of ANOVA analysis of the gene expression profiles of naive $T_{CD8}$ as well as spleen, lung, and secondary lung (2° lung) M195-specific $T_{CD8}$. Each row represents a unique gene whereas each column is an individual sample. (**B**) Enrichment of gene ontology categories (biological processes) for genes differentially expressed in the lung versus the spleen. The top 10 categories are shown. (**C**) Immunity-related genes were identified using Ingenuity Pathway Analysis and are displayed in a heat map comparing all four groups. Genes were considered significantly different when the fold-change was >2 and the FDR was <10%.

impaired lung $T_{CD8}$ resemble exhausted T cells at a global transcriptional level by comparing the gene expression differences of lung $T_{CD8}$ during acute viral LRI to functional effector $T_{CD8}$ during acute LCMV Armstrong (Arm) infection as well as exhausted $T_{CD8}$ during chronic LCMV clone 13 (Cl-13) infection (30). We found that anti-HMPV spleen and lung $T_{CD8}$ gene expression differed by 257 genes ($R = 0.70$) in this analysis, whereas anti-LCMV $T_{CD8}$ at day 8 during Arm infection and day 30 during Cl-13 infection differed by 337 genes ($R = 0.43$) (Fig. 4A). Interestingly, anti-HMPV lung $T_{CD8}$ differed by only 34 genes compared with anti-LCMV $T_{CD8}$ at day 8 during Cl-13 infection ($R = 0.48$), which increased to 161 genes at day 30 p.i. ($R = 0.63$). Compared to effector $T_{CD8}$ at day 8 after Arm infection, anti-HMPV lung $T_{CD8}$ differed by 83 genes ($R = 0.31$) whereas anti-HMPV spleen $T_{CD8}$ differed by only 5 genes ($R = 0.06$). These results suggest that impaired lung $T_{CD8}$ gene expression most closely resembles exhausted $T_{CD8}$ early during chronic infection.

In a separate analysis, we compared each $T_{CD8}$ population based on patterns of gene expression. This experiment also revealed that lung $T_{CD8}$ most closely resemble $T_{CD8}$ early during Cl-13 infec-

A

| | R value | No. of Probes | No. of Unique Genes |
|---|---|---|---|
| HMPV Spleen vs HMPV Lung | 0.70 | 485 | 257 |
| HMPV Lung vs D30 Cl-13 | 0.63 | 268 | 161 |
| D8 Cl-13 vs D30 Cl-13 | 0.55 | 566 | 337 |
| HMPV Spleen vs D8 Cl-13 | 0.52 | 136 | 106 |
| HMPV Lung vs D8 Cl-13 | 0.48 | 54 | 34 |
| D8 Arm vs D30 Cl-13 | 0.43 | 550 | 315 |
| HMPV Lung vs D8 Arm | 0.30 | 107 | 83 |
| D8 Arm vs D8 Cl-13 | 0.20 | 90 | 61 |
| HMPV Spleen vs D30 Cl-13 | 0.19 | 132 | 96 |
| HMPV Spleen vs D8 Arm | 0.06 | 7 | 5 |

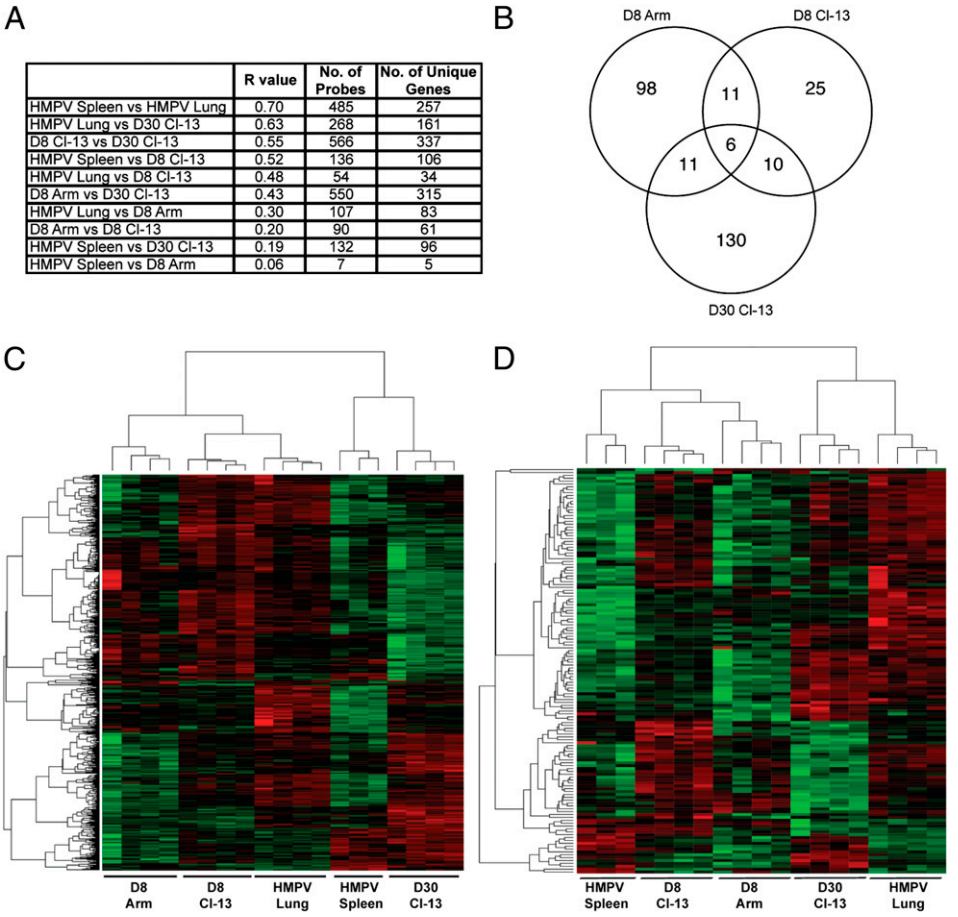


**FIGURE 4.** Lung $T_{CD8}$ possess an exhaustion-like gene expression profile. Lung and spleen M195-specific $T_{CD8}$ gene expression was directly compared with that of spleen gp33-specific $T_{CD8}$ during acute (Arm) or chronic (Cl-13) LCMV infection (data from Doering et al. in Ref. 30). LCMV samples include early acute (day 8 [D8] Arm), early chronic (D8 Cl-13), and late chronic (day 30 [D30] Cl-13). Batch effect was compensated for before further analysis. Genes were considered significantly different when the fold change was >2 and the FDR was <10%. (**A**) Pairwise comparisons were made based on the coefficient of variation. The total number of probes, genes, and unique genes plus corresponding similarity score (*R* value) are shown. (**B**) In a separate analysis, all groups were compared using ANOVA, and the total number of genes found differentially expressed for the indicated anti-LCMV $T_{CD8}$ populations compared with lung M195-specific $T_{CD8}$ is shown. (**C**) Heat map resulting from the analysis in (B) shows the gene expression profiles of each $T_{CD8}$ population. (**D**) Immune genes were identified using Ingenuity Pathway Analysis and are displayed in a heat map for each group of anti-HMPV or -LCMV $T_{CD8}$.

tion (day 8 p.i.), followed by functional effectors during Arm infection (Fig. 4B). However, each LCMV group differentially regulated numerous genes compared with lung $T_{CD8}$. The number of genes differentially expressed in these groups was similar to what we found when comparing the groups head-to-head, which showed that lung $T_{CD8}$ exhibited gene regulation patterns with features of both early CL-13 and late Cl-13 (Fig. 4C). Out of the total gene set for this analysis, we next compared only the genes with known immune functions. We found that anti-HMPV lung $T_{CD8}$ most closely resemble exhausted anti-LCMV $T_{CD8}$ at day 30 after Cl-13 infection (Fig. 4D). In this analysis, anti-HMPV spleen $T_{CD8}$ were more closely related to D8 Cl-13 and Arm $T_{CD8}$. Of note, when comparing all genes or just immune genes, anti-HMPV lung $T_{CD8}$ also uniquely express numerous genes that are not shared by any of the other populations (Fig. 4B, 4C, Supplemental Table II). These results indicate that lung $T_{CD8}$ global gene expression closely resembles $T_{CD8}$ that are destined to become exhausted (day 8 Cl-13), whereas the lung $T_{CD8}$ immunophenotype most closely resembles fully exhausted $T_{CD8}$ (day 30 Cl-13). Therefore, the infected lung environment rapidly induces a transcriptional state associated with exhaustion in lung $T_{CD8}$.

To confirm that increased inhibitory receptor gene expression during acute LRI corresponds to increased cell surface expression, we performed flow cytometric analysis of lung and spleen M195-specific $T_{CD8}$ at day 7 after HMPV infection. Despite similar *Pdcd1* mRNA levels (Table I), surface PD-1 expression was greater on lung $T_{CD8}$ at day 7 (Fig. 5A). The same was true for TIM-3 and LAG-3. 2B4 expression was also higher in the lung. Additionally, we found considerable coexpression of these inhibitory receptors on lung $T_{CD8}$, with most lung $T_{CD8}$ expressing two or more inhibitory receptors by day 7 p.i.; in contrast, most splenic $T_{CD8}$ expressed one or no inhibitory receptors (Fig. 5B). Thus, impaired lung $T_{CD8}$ are associated with the coexpression of multiple inhibitory receptors.

### *Viral Ag-mediated $T_{CD8}$ functional impairment is lung specific*

Ag-induced TCR signaling is associated with PD-1 upregulation during chronic infections (23, 24, 43, 44). To determine whether viral Ag is necessary for lung $T_{CD8}$ impairment and inhibitory receptor upregulation, we took advantage of the fact that i.n. DC immunization elicits unimpaired, PD-$1^{low}$ $T_{CD8}$ directly in the lung (12). We immunized mice i.n. with LPS-maturated bone marrow–derived DCs loaded with the vaccinia virus–derived

epitope A34R, challenged them with HMPV a week later, and delivered cognate A34R peptide i.n. to induce TCR signaling or a control (mock) HLA-B*0702–restricted peptide (Fig. 6A). Of note, mice receiving mock peptide did not lose weight during the infection (HMPV does not cause clinical disease in mice), whereas those receiving A34R peptide lost nearly 25% of their body weight (Fig. 6B). The endogenous M195 response was greatly diminished in A34R-treated mice and so was not included in the following analysis. Heterologous A34R-specific $T_{CD8}$ in mice receiving mock peptide were minimally impaired, whhereas M195-specific $T_{CD8}$ in the same infected lungs were impaired (Fig. 6C). In contrast, A34R-specific $T_{CD8}$ in mice receiving cognate peptide expanded in number but were severely impaired (Fig. 6C).

Compared to M195-specific cells, fewer A34R-specific $T_{CD8}$ in mock-treated mice expressed PD-1, TIM-3, LAG-3 (Fig. 7A), or 2B4 (not shown). However, A34R-specific $T_{CD8}$ expressed very high levels of inhibitory receptors in mice treated with cognate Ag A34R peptide (Fig. 7A). Furthermore, in the mock peptide–treated mice, inhibitory receptor coexpression was low in A34R-specifc $T_{CD8}$ (Fig. 7B), with most cells expressing one or no receptors. A34R-specific $T_{CD8}$ in A34R peptide–treated mice highly coexpressed all four of the inhibitory receptors we analyzed. Their expression eclipsed that of even the M195-specific $T_{CD8}$ that also were exposed to the presence of cognate Ag due to HMPV infection. Therefore, the large degree of functional impairment observed in A34R peptide-treated mice (Fig. 6) was associated with a dramatic increase in inhibitory receptor coexpression. Thus, cognate Ag-induced TCR signaling in the context of pulmonary infection promotes lung $T_{CD8}$ impairment and inhibitory receptor coexpression.

To show that this phenomenon is specific to the lung environment, we systemically immunized mice with A34R-specific DCs via the s.c. route and then injected them daily s.c. and i.p. with either A34R or mock peptide during HMPV infection (Fig. 8A). In mice treated with either mock or A34R peptide, the A34R-specific spleen $T_{CD8}$ were equally functional as measured by CD107a mobilization and IFN-γ production (Fig. 8B). Splenic $T_{CD8}$ specific for the HMPV epitope M195 were unimpaired, as shown previously (12, 45). A34R-specific $T_{CD8}$ in mice treated with mock peptide had low expression of PD-1, TIM-3, LAG-3, and 2B4 (Fig. 8C and not shown) and most of these cells expressed one or no inhibitory receptors (Fig. 8D). Splenic M195-specific $T_{CD8}$ treated with mock peptide (but exposed to cognate Ag through HMPV infection) upregulated inhibitory receptor expression despite retaining functionality. However, A34R-specific $T_{CD8}$ in mice treated with cognate A34R peptide increased expression of PD-1, TIM-3, LAG-3, and 2B4. As in the lung (Fig. 7A), A34R-specific $T_{CD8}$ in mice treated with Ag A34R peptide expressed higher levels of TIM-3 and LAG-3 than did M195-specific $T_{CD8}$. Moreover, these cells exhibited substantial coexpression of multiple inhibitory receptors, with 70% coexpressing two or more inhibitory receptors. These results confirm that Ag-induced TCR signaling mediates inhibitory receptor expression, but more conclusively demonstrate that the location of $T_{CD8}$ in the lung is critical for the development of the exhaustion-like phenotype, because splenic $T_{CD8}$ remain functional despite Ag stimulation and upregulation of inhibitory receptors.

## Discussion

In this study, we sought to further elucidate mechanisms of $T_{CD8}$ impairment during acute viral LRI and better define the dysfunctional effector state observed in pulmonary $T_{CD8}$. We first determined that lung $T_{CD8}$ impairment was cell-intrinsically regulated by PD-1. Importantly, this excluded a role for other PD-1–expressing cell types in mediating $T_{CD8}$ functional impairment. PD-1 signaling has been shown to affect multiple immune cells (e.g., macrophages and DCs) during other acute infections (20, 21). A $T_{CD8}$-intrinsic role for PD-1 was suggested by in vitro studies showing that blocking PD-L1 on epithelial cells during RSV infection (46) or microglial cells during coronavirus infection (47) resulted in increased IFN-γ production by memory $T_{CD8}$. Bone marrow chimeric experiments confirmed an intrinsic role for PD-1 in impairing $T_{CD8}$ memory development and secondary responses after VACV infection (48). In the present study, we used bone marrow chimeric mice to show that PD-1 cell-intrinsically regulates $T_{CD8}$ functions during acute viral LRI. The contribution of $T_{CD8}$-intrinsic PD-1 signaling to viral clearance cannot be assessed using this model, so the possibility exists that PD-1 expression by other immune cells is responsible for the increased viral replication observed in PD-1–expressing mice (12).

Several studies have shown that HMPV and RSV infection of DCs impaired the ability of these DCs to prime an effective T cell response; however, none of these studies reported on inhibitory ligand expression by DCs (49–52). We found previously that PD-L1 and other inhibitory receptors are expressed at substantially different levels by different subsets of APCs in the lung, and this expression was partially modulated by type I IFN expression (38). Yao et al. (17) recently reported that during RSV infection, inflammatory DC-derived PD-L1 directly inhibits cytokine production by effector T cells in vitro and in vivo. Thus, inhibitory

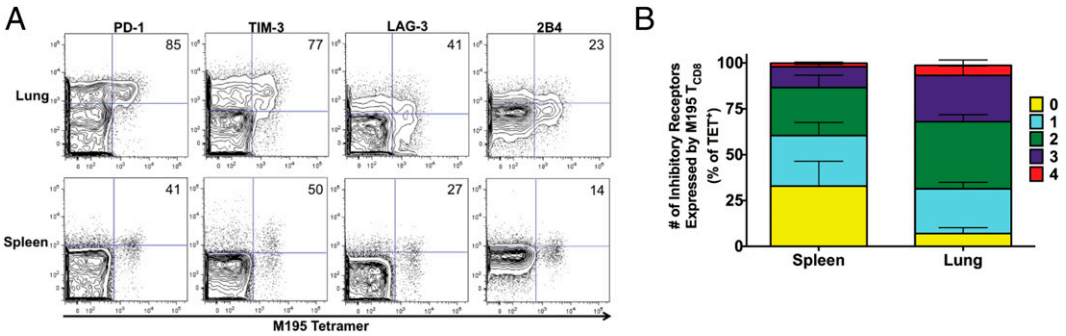


**FIGURE 5.** Lung $T_{CD8}$ coexpress numerous inhibitory receptors. (**A**) Multiparameter flow cytometry was used to quantify expression of the inhibitory receptors PD-1, TIM-3, LAG-3, and 2B4 on M195-specific lung and spleen $T_{CD8}$ at day 7 after HMPV infection. Numbers indicate percentage tetramer$^+$ $T_{CD8}$ expressing the receptor in the lung or spleen. Representative flow plots are shown. (**B**) Boolean gating analysis for the coexpression of inhibitory receptors on M195-specific $T_{CD8}$ at day 7 p.i. The number of receptors expressed by lung and spleen $T_{CD8}$ is shown. Data are representative of one out of independent experiments.

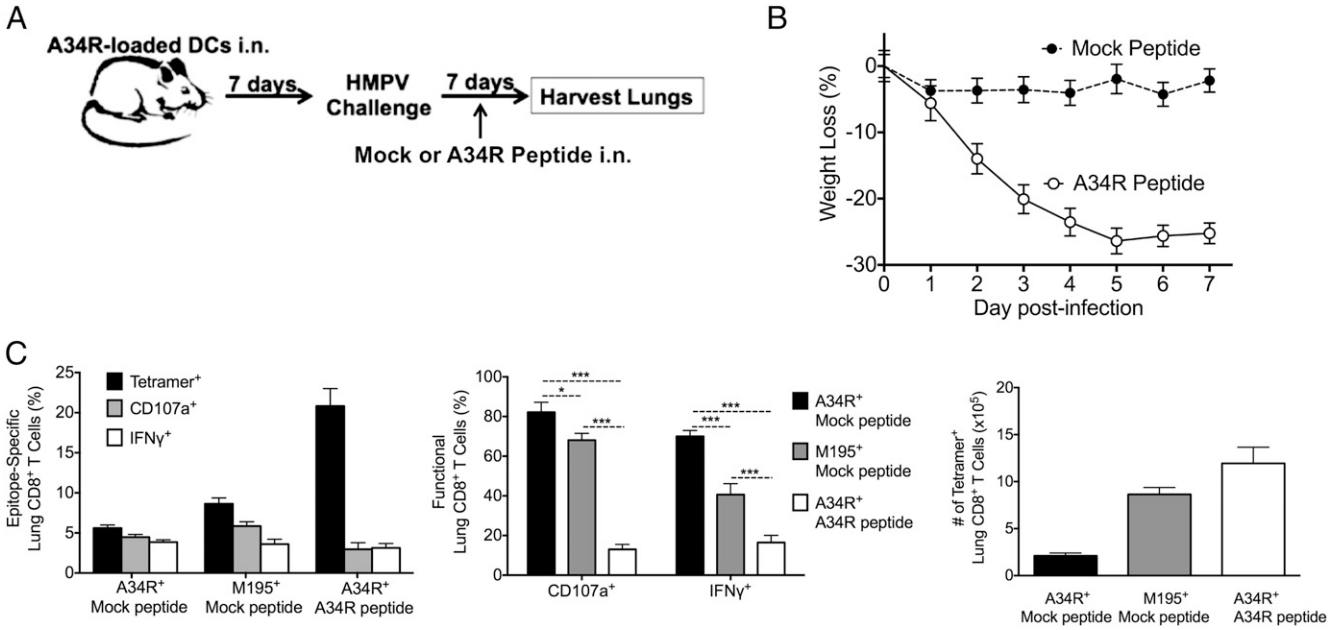


**FIGURE 6.** Cognate Ag is required for lung $T_{CD8}$ impairment. (**A**) Experimental design: mice were immunized i.n. with A34R-loaded DCs and challenged 7 d later with HMPV. During infection, mice were given either cognate (A34R) or mock (irrelevant HLA-B7–restricted epitope) peptide i.n. daily. Lung $T_{CD8}$ response was quantified at day 7 p.i. (**B**) Weight loss during HMPV infection of DC-immunized, peptide-treated mice. (**C**) Tetramer staining and ICS for the A34R and M195 $T_{CD8}$ epitopes at day 7 p.i. The percentage of tetramer$^+$/IFN-$\gamma^+$/CD107a$^+$ (*left*), functional epitope-specific $T_{CD8}$ (*middle*), and the total number of tetramer$^+$ $T_{CD8}$ (*right*) were calculated. For each bar, the epitope analyzed is given with the treatment directly below. A34R$^+$ and M195$^+$ $T_{CD8}$ responses in mock-treated mice are from the same infected animals. Results are combined from three independent experiments with five mice per group. $*p < 0.05$, $***p < 0.001$, unpaired *t* test.

ligand expression by APCs may contribute to lung $T_{CD8}$ impairment. However, several lines of evidence support persistence of the intrinsic $T_{CD8}$ impaired phenotype induced by respiratory virus infection. First, in our initial study describing lung $T_{CD8}$ impairment, we showed that HMPV-specific lung $T_{CD8}$ were impaired at numerous time points after infection and after reinfection, whereas splenic $T_{CD8}$ remained functional at all time points (12). However, mice i.n. immunized with bone marrow–derived DCs did not exhibit lung $T_{CD8}$ impairment. Additionally, mice infected with HMPV and subsequently challenged with either HMPV or peptide-loaded bone marrow–derived DCs exhibited the same degree of impairment in both groups of mice, indicating that additional DCs could not rescue the phenotype. Genetic ablation or Ab blockade of PD-1 in vivo and in vitro (which did not affect APC numbers) restored $T_{CD8}$ functionality in the ICS assay (12, 13). Taken together, these data support a cell-intrinsic role for PD-1 in lung $T_{CD8}$ impairment.

We then profiled global gene expression in impaired lung versus unimpaired spleen epitope-specific $T_{CD8}$ to identify pathways that might explain the stark difference in functionality observed between these two populations. Lung $T_{CD8}$ exhibited a more diverse pattern of gene expression, suggesting that exposure to viral Ag in the infected milieu drives further differentiation, which was confirmed by subsequent experiments showing the upregulation of inhibitory receptors in response to cognate Ag-induced TCR signaling. Lung $T_{CD8}$ exhibited a more diverse pattern of gene expression than did spleen $T_{CD8}$, expressing an additional 319 genes. They upregulated expression of numerous genes encoding chemokines, including CCL1, CCL3, CCL4, CXCL9, and CXCL15, suggesting a role for lung $T_{CD8}$ in recruiting other inflammatory cells to the infected lung. They transcribed more *Ifng*, *Tnfa*, and *Il2* mRNA despite a decreased ability to produce these cytokines, suggesting posttranscriptional regulation of gene expression, which has been observed during exhaustion (4).

Recently the transcriptional circuitry that regulates effector, memory, and exhausted $T_{CD8}$ has been defined (reviewed by Kaech and Cui in Ref. 1). T-bet, which supports effector $T_{CD8}$ function and prevents exhaustion (53), and Eomes, which promotes exhaustion

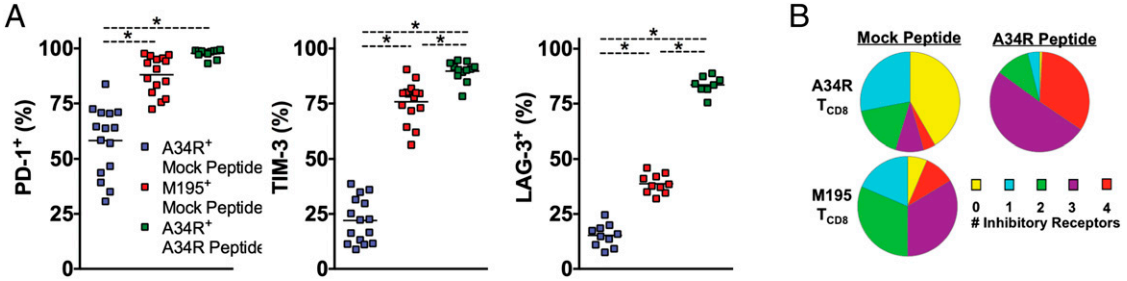


**FIGURE 7.** Viral Ag mediates lung $T_{CD8}$ inhibitory receptor expression. Mice were immunized and treated as in Fig. 6. (**A**) Inhibitory receptor expression on A34R- and M195-specific $T_{CD8}$ is shown. Each symbol represents an individual mouse. Horizontal line denotes the mean. (**B**) Inhibitory receptor coexpression was determined for both epitopes via Boolean gating. Data are displayed as a pie chart. Results are combined from three independent experiments with five mice per group. $*p < 0.05$, unpaired *t* test.

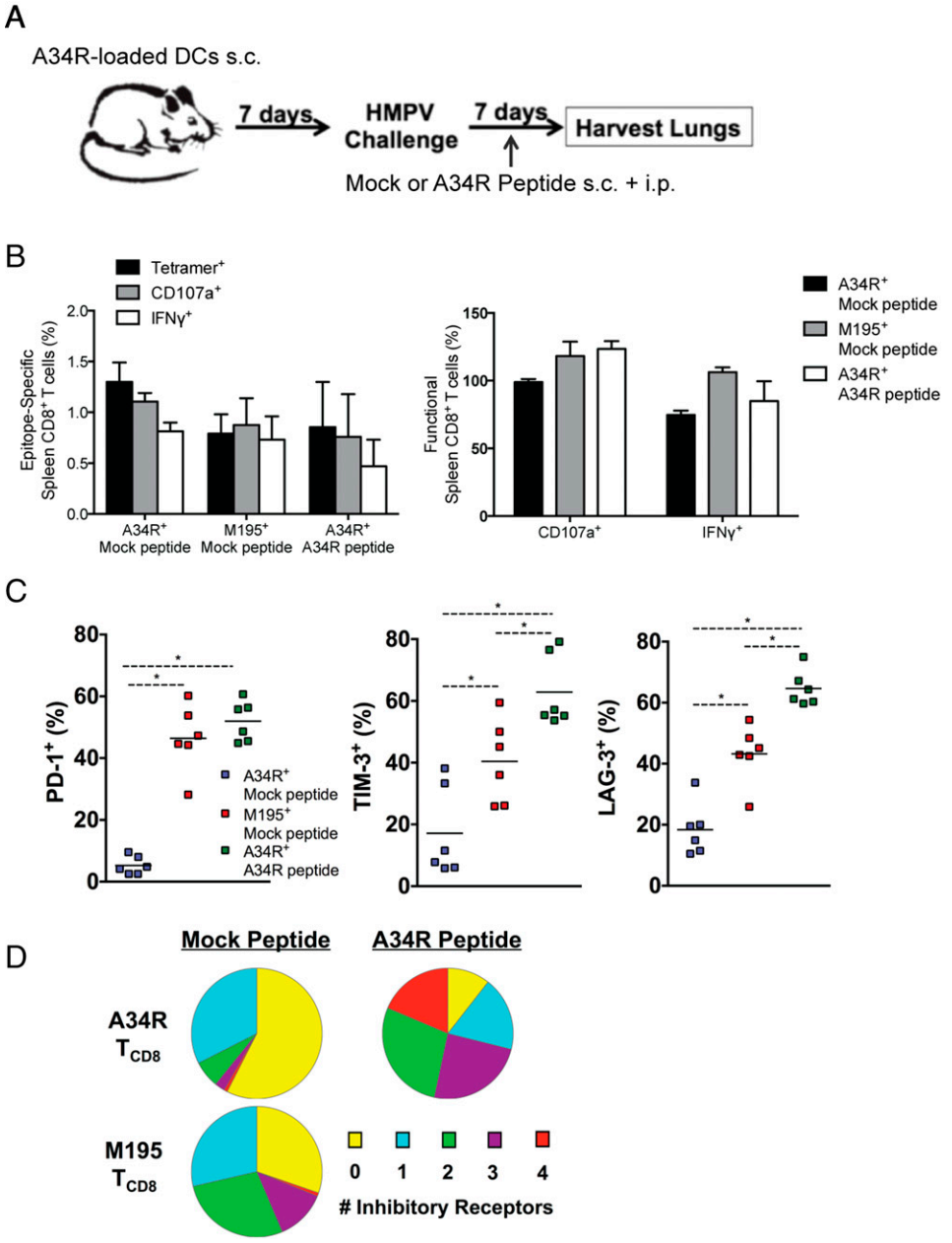


**FIGURE 8.** Viral Ag-mediated $T_{CD8}$ functional impairment does not occur in the spleen following systemic immunization and HMPV infection. (**A**) Experimental design: mice were immunized s.c. with A34R-loaded DCs and challenged 7 d later with HMPV. During infection, mice were injected with 50 μg either cognate (A34R) or mock (irrelevant HLA-B7–restricted epitope) peptide s.c. and i.p. daily. Spleen A34R- and M195-specific $T_{CD8}$ responses were quantified at day 7 p.i. (**B**) The percentage of functional epitope-specific $T_{CD8}$ was calculated based on tetramer staining and ICS. For each bar, the epitope analyzed is given with the treatment listed directly below. Results are combined from two independent experiments with five mice per group. (**C**) Inhibitory receptor expression on A34R- and M195-specific $T_{CD8}$ is shown. Each symbol represents an individual mouse. Horizontal line denotes the mean. Data are representative of two independent experiments. (**D**) Inhibitory receptor coexpression was determined using Boolean gating. Results are combined from two independent experiments with five mice per group. $^*p < 0.05$, unpaired *t* test.

(54), were not differentially expressed between spleen and lung $T_{CD8}$ in our study. Fos and Jun, two proteins that form the heterodimeric transcription factor AP-1, were both more highly expressed in lung $T_{CD8}$. AP-1 was recently described as a transcriptional activator of PD-1 (55) and so may represent a link between Ag-induced TCR signaling and PD-1. The genes encoding transcription factors *Id2* and *Id3* were more highly expressed in lung $T_{CD8}$. ID2 supports development of terminal effectors (56) whereas ID3 promotes survival of long-lived memory cells (57). ID2 could contribute during early effector differentiation of lung $T_{CD8}$, but the contribution of each of these transcriptional regulators to impairment remains to be defined. Additionally, the *Prdm1* gene, which encodes the transcriptional repressor BLIMP-1, was upregulated in lung $T_{CD8}$, whereas BCL-6, which opposes BLIMP-1 activity, was downregulated in both lung and spleen $T_{CD8}$. During acute infections, high BLIMP-1 expression enhances T cell functions and the formation of $KLRG1^{high}IL\text{-}7R^{low}$ terminal effectors (58). During chronic infection, BLIMP-1 is highly expressed in association with the upregulation of inhibitory receptors (40). During viral LRI, a role for BLIMP-1 has been described in the generation of IL-10–producing effector $T_{CD8}$ (60). Given the high expression of inhibitory receptors on lung $T_{CD8}$, BLIMP-1 in these cells may promote functional impairment, but further experiments are necessary to explore this possibility.

Lung $T_{CD8}$ expression of T-bet, BLIMP-1, AP-1, and ID2 during acute viral LRI all imply an effector phenotype. Indeed, lung $T_{CD8}$ are effectors that produce cytokines, degranulate, and kill infected cells. However, they rapidly lose these effector functions in conjunction with coordinated upregulation of several inhibitory receptors. These inhibitory receptors temper immune responses in a number of settings (54), and their roles in LRI are not well understood. TIM-3, which is coexpressed by $PD\text{-}1^+$ T cells during chronic infections (25) and cancer (61), also impairs T cell responses during acute viral infections (62, 63). 2B4 can be either inhibitory or stimulatory (64), but in the setting of chronic infection it contributes to the rapid impairment of memory $T_{CD8}$ (27). Lung $T_{CD8}$ also expressed higher levels of *Il10* and *Il10ra* mRNA. T cells are the primary producers of IL-10 during LRI

(65), and it has been proposed that their expression of IL-10R facilitates an intrinsic $T_{CD8}$ counterregulatory mechanism (60), suggesting that IL-10 may also be a key mediator of $T_{CD8}$ impairment. However, unlike during chronic infection where IL-10 blockade enables clearance of an established infection (66), blocking IL-10 during acute infection only serves to increase inflammation and not accelerate viral clearance (60), so its application in therapeutic approaches may be limited.

Interestingly, we observed a significant overlap in the gene expression profile of impaired lung $T_{CD8}$ during acute viral LRI and exhausted $T_{CD8}$ during chronic viral infection. This was especially true when examining genes with known immune functions. Notably, impaired lung $T_{CD8}$ resemble exhausted cells more than they do functional splenic cells or even effector splenic $T_{CD8}$ during acute LCMV infection. It is unlikely that lung $T_{CD8}$ exist in other states of unresponsiveness, such as anergy or senescence, as genes associated with these conditions were not upregulated. Previous reports have also described exhaustion as unique from these states (4).

The functional impairment, upregulation of similar inhibitory receptors, and overlapping gene expression profiles shared by lung $T_{CD8}$ during acute viral LRI and $T_{CD8}$ during chronic LCMV infection suggest a similar functional state. This has been described as exhaustion, which is secondary to repetitive TCR stimulation during chronic infection and cancer. However, this paradigm may need revising given our results that exhaustion can develop rapidly in the right setting, namely, acute viral infection of an organ with critical importance with regard to survival. A similar functional state of anti-viral $T_{CD8}$ may exist in acute CNS infections, such as that seen during rabies (18) and coronavirus (47) infection. A key similarity in all these settings is the exposure of $T_{CD8}$ to viral Ag during infection. However, the degree to which viral Ag alone mediates exhaustion is unclear. It is likely that varying levels of Ag are expressed at different times and in different organs during these acute infections and also during chronic infections. A key future direction will be to explore the factors present in each organ during infection that mediate exhaustion. Understanding these process will allow for more targeted therapies, especially now that PD-1 blockade is being used clinically for cancer treatment. The effects of these treatments may vary widely based on the local environment in the target tissue with differing levels of Ag, inhibitory receptors, immunomodulatory ligands, and cytokines.

Whereas the gene expression profile of lung $T_{CD8}$ shares many similarities with exhausted $T_{CD8}$, it also preserves a core signature of unique genes. For example, lung $T_{CD8}$ more highly express the transcription factors ID3, IRF8, and AP-1 than do early effector, early exhausted, or late exhausted $T_{CD8}$. Some of the unique transcripts may represent networks of genes required to exist in the lung environment, and many of them are immune genes with well-characterized functions. It will be interesting to decipher the role of these and other gene products in enforcing $T_{CD8}$ impairment versus allowing for control of respiratory virus infections.

In summary, we have shown that PD-1 cell-intrinsically regulates lung $T_{CD8}$ impairment and that lung $T_{CD8}$ rapidly acquire a gene expression profile resembling the exhausted state observed during chronic infection. Their differentiation state comprises elements of both effector and exhausted T cells that may allow them to balance control of pathogen spread with prevention of immune-mediated tissue damage. We confirmed coexpression of PD-1, TIM-3, LAG-3, and 2B4 by lung $T_{CD8}$ with a relative lack of these receptors by functional spleen $T_{CD8}$. Our results indicate that acute viral LRI induces an exhaustion-like state in lung $T_{CD8}$ characterized by rapid functional impairment and Ag-dependent upregulation of numerous inhibitory receptors. Further exploration of the roles of these inhibitory receptors in T cell impairment may yield novel targets for therapeutics or vaccine strategies against respiratory virus infections.

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## Disclosures

J.V.W. serves on the Scientific Advisory Board of Quidel, which activity has no conflict with the present work. The other authors have no financial conflicts of interest.

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**SUPPLEMENTARY FIGURE**

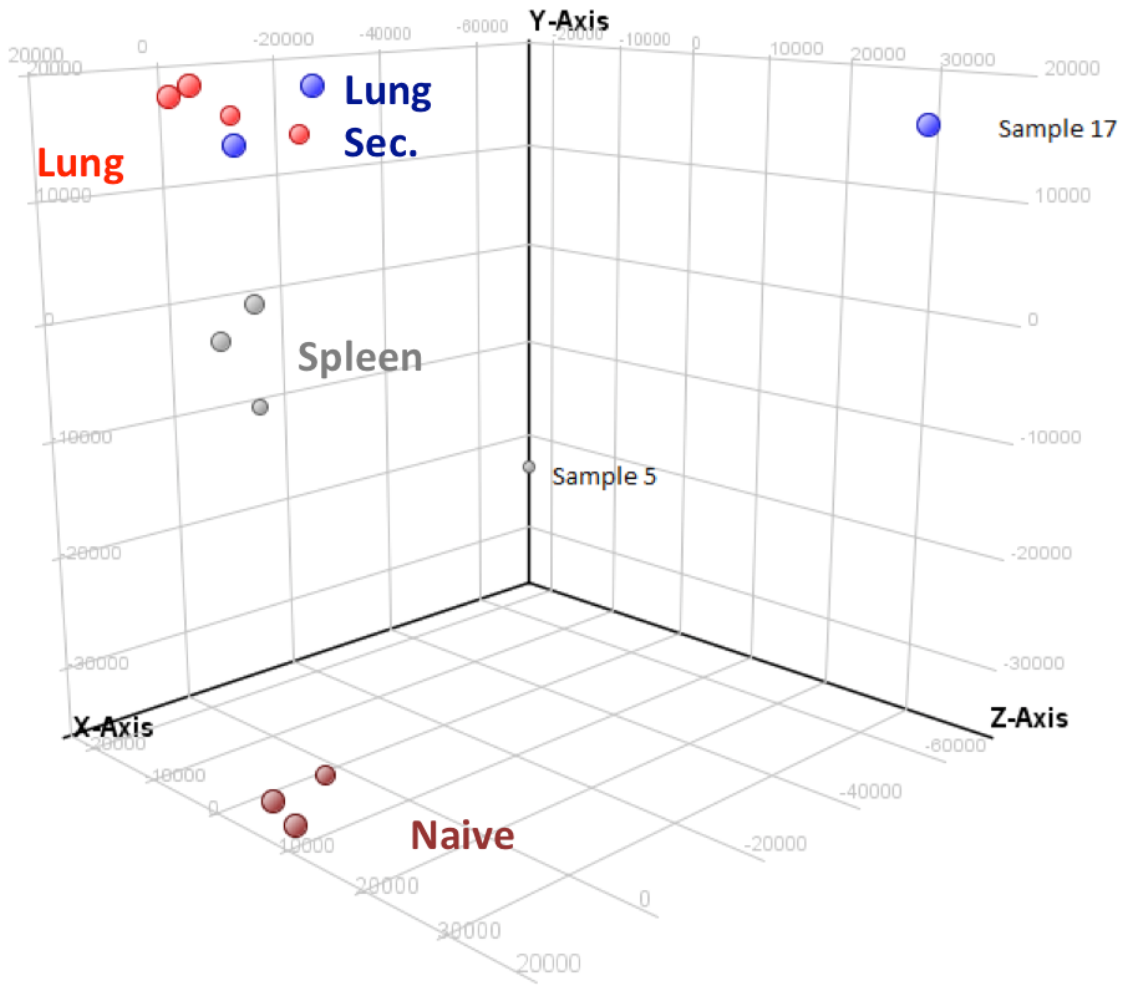


**Figure S1. Gene Expression Profile of Lung $T_{CD8}$ Is Unique Compared to Naïve, Splenic or Memory $T^{CD8}$ During HMPV Infection**

From Figure 2. Gene expression data is plotted on three principal component axes. Sample #5 (spleen M195-specific $T_{CD8}$) and Sample #17 (secondary lung M195-specific $T_{CD8}$) were excluded from further analysis.

**Supplemental Table 1.** Genes differentially expressed comparing spleen, lung primary, and lung secondary CD8 to naive CD8.

| Gene | Naïve Spl CD8 #1 | Naïve Spl CD8 #2 | Naïve Spl CD8 #3 | HMPV Spl #1 | HMPV Spl #2 | HMPV Spl #3 | HMPV Lung #1 | HMPV Lung #2 | HMPV Lung #3 | HMPV Lung #4 | HMPV Lung 2o #1 | HMPV Lung 2o #2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AFF1 | 9.626 | 9.466 | 9.164 | 8.477 | 8.637 | 8.495 | 7.284 | 7.239 | 7.403 | 7.260 | 6.677 | 6.861 |
| AMICA1 | 4.422 | 4.714 | 4.280 | 6.243 | 5.904 | 5.743 | 7.665 | 7.576 | 7.316 | 7.603 | 7.254 | 7.324 |
| ATF3 | 4.457 | 4.643 | 3.669 | 5.154 | 4.962 | 5.157 | 6.686 | 6.872 | 7.096 | 7.277 | 8.078 | 7.788 |
| ATP6V0D2 | 2.898 | 2.563 | 2.586 | 2.471 | 2.727 | 2.463 | 2.897 | 3.838 | 3.622 | 4.270 | 7.082 | 4.480 |
| BACH2 | 7.051 | 7.165 | 7.291 | 5.534 | 6.113 | 5.436 | 4.567 | 4.578 | 4.410 | 4.424 | 4.042 | 4.452 |
| BAG3 | 6.512 | 6.896 | 7.047 | 6.591 | 6.744 | 6.780 | 7.282 | 7.860 | 8.059 | 7.704 | 8.171 | 8.061 |
| BATF3 | 4.317 | 4.285 | 3.992 | 3.861 | 3.911 | 4.089 | 5.177 | 5.471 | 5.168 | 5.248 | 5.204 | 4.576 |
| BCL2L11 | 9.654 | 9.235 | 9.378 | 9.429 | 9.633 | 9.877 | 8.233 | 8.315 | 8.588 | 8.578 | 7.330 | 7.706 |
| BCL3 | 8.095 | 8.022 | 7.566 | 8.680 | 8.087 | 8.343 | 9.177 | 9.696 | 9.570 | 9.348 | 8.328 | 8.085 |
| BGN | 4.351 | 3.736 | 3.827 | 4.030 | 3.484 | 4.143 | 5.213 | 4.785 | 6.133 | 6.619 | 6.257 | 4.808 |
| BST2 | 8.214 | 8.681 | 8.719 | 9.231 | 8.513 | 9.132 | 10.686 | 10.590 | 10.450 | 10.732 | 8.968 | 9.188 |
| C3 | 4.774 | 4.672 | 4.466 | 4.379 | 4.696 | 4.798 | 6.575 | 6.291 | 6.764 | 7.111 | 7.847 | 6.318 |
| CAPG | 5.842 | 5.691 | 5.634 | 8.720 | 8.080 | 8.805 | 9.575 | 9.739 | 9.480 | 9.603 | 10.424 | 10.347 |
| CCL1 | 3.712 | 3.938 | 3.597 | 4.074 | 3.364 | 3.940 | 6.383 | 7.010 | 6.816 | 6.866 | 7.834 | 8.469 |
| CCL4 | 4.784 | 5.170 | 5.373 | 8.642 | 8.669 | 8.417 | 11.147 | 11.372 | 11.335 | 11.388 | 10.817 | 11.222 |
| CCL7 | 4.666 | 4.692 | 4.759 | 4.706 | 4.962 | 4.676 | 5.461 | 5.687 | 5.789 | 6.476 | 5.837 | 5.236 |
| CCND3 | 6.877 | 7.355 | 7.160 | 8.107 | 7.530 | 8.033 | 8.870 | 8.994 | 8.753 | 9.018 | 8.868 | 8.998 |
| CCR7 | 11.154 | 11.148 | 10.922 | 9.339 | 9.115 | 9.551 | 7.865 | 7.574 | 7.585 | 7.407 | 6.021 | 5.446 |
| CCR8 | 3.679 | 3.468 | 3.212 | 3.892 | 3.941 | 4.598 | 6.424 | 6.333 | 5.820 | 6.258 | 8.875 | 9.197 |
| CCRL2 | 3.211 | 3.563 | 4.052 | 5.545 | 4.889 | 4.908 | 6.985 | 7.050 | 6.394 | 7.147 | 6.500 | 5.841 |
| CD14 | 3.193 | 3.159 | 2.843 | 3.698 | 3.518 | 3.934 | 4.261 | 4.400 | 4.996 | 5.683 | 6.417 | 3.821 |
| CD200 | 4.281 | 4.283 | 4.266 | 5.006 | 4.936 | 4.946 | 6.369 | 6.459 | 5.940 | 6.605 | 6.366 | 6.582 |
| CD244 | 3.971 | 3.577 | 3.276 | 4.162 | 4.329 | 4.170 | 5.617 | 5.838 | 5.409 | 6.090 | 7.602 | 7.438 |
| CD36 | 2.724 | 3.002 | 2.864 | 2.713 | 3.031 | 3.117 | 4.834 | 4.572 | 5.317 | 6.420 | 6.957 | 5.301 |
| CD38 | 4.333 | 4.630 | 4.439 | 6.228 | 6.438 | 6.349 | 7.571 | 7.604 | 7.610 | 7.573 | 7.868 | 7.842 |
| CD63 | 2.798 | 3.168 | 3.078 | 3.594 | 3.230 | 4.153 | 5.713 | 5.360 | 5.380 | 6.641 | 9.054 | 6.999 |
| CD69 | 8.503 | 8.267 | 7.817 | 8.114 | 7.882 | 7.990 | 9.523 | 9.348 | 9.229 | 9.271 | 8.660 | 8.740 |
| CD7 | 9.261 | 9.397 | 9.474 | 10.282 | 10.294 | 10.482 | 9.326 | 9.103 | 9.359 | 9.084 | 9.474 | 9.199 |
| CD74 | 5.223 | 4.965 | 5.627 | 5.834 | 7.165 | 6.800 | 6.995 | 7.409 | 7.560 | 8.523 | 9.459 | 7.198 |
| CD81 | 5.021 | 4.778 | 4.910 | 3.938 | 4.261 | 5.329 | 5.512 | 5.681 | 6.122 | 6.907 | 7.018 | 6.510 |
| CD93 | 3.264 | 3.613 | 3.800 | 3.490 | 3.213 | 3.750 | 4.401 | 4.325 | 4.612 | 5.939 | 5.100 | 4.015 |
| CDC20 | 5.094 | 5.310 | 5.608 | 6.236 | 6.412 | 6.500 | 7.414 | 7.628 | 7.310 | 7.563 | 7.100 | 6.844 |
| CDH1 | 4.580 | 4.315 | 4.511 | 3.718 | 4.125 | 4.000 | 7.109 | 6.279 | 6.373 | 6.925 | 9.473 | 9.498 |
| CDH5 | 3.504 | 3.050 | 3.849 | 4.028 | 3.409 | 3.855 | 4.516 | 4.528 | 5.411 | 6.262 | 4.910 | 4.169 |
| CDKN1A | 5.893 | 6.370 | 5.625 | 7.385 | 7.670 | 7.948 | 8.816 | 8.994 | 8.924 | 9.205 | 8.593 | 8.110 |
| CDKN2D | 7.687 | 7.439 | 7.220 | 7.249 | 6.518 | 7.171 | 8.291 | 8.211 | 7.947 | 8.346 | 8.159 | 8.133 |
| CFLAR | 7.244 | 6.794 | 6.825 | 6.571 | 6.653 | 6.487 | 7.318 | 7.644 | 7.529 | 7.679 | 7.183 | 7.384 |
| CHD7 | 7.694 | 7.863 | 7.867 | 8.378 | 8.451 | 7.726 | 7.586 | 7.537 | 7.805 | 7.385 | 6.659 | 6.635 |

| Gene | Naïve Spl CD8 #1 | Naïve Spl CD8 #2 | Naïve Spl CD8 #3 | HMPV Spl #1 | HMPV Spl #2 | HMPV Spl #3 | HMPV Lung #1 | HMPV Lung #2 | HMPV Lung #3 | HMPV Lung #4 | HMPV Lung 2o #1 | HMPV Lung 2o #2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CISH | 5.125 | 5.066 | 5.329 | 7.214 | 6.807 | 6.886 | 8.706 | 8.720 | 8.542 | 8.392 | 9.146 | 9.278 |
| CLIC4 | 7.577 | 7.466 | 7.549 | 8.463 | 8.073 | 8.490 | 9.321 | 9.343 | 9.307 | 9.486 | 9.083 | 8.467 |
| CXCL10 | 4.076 | 5.089 | 5.133 | 8.260 | 7.774 | 7.473 | 9.587 | 9.764 | 9.230 | 9.469 | 5.918 | 5.933 |
| CXCL3 | 2.683 | 2.786 | 2.604 | 2.794 | 2.756 | 2.683 | 2.816 | 2.990 | 3.004 | 2.797 | 3.984 | 3.067 |
| CXCL9 | 3.735 | 4.196 | 3.225 | 4.315 | 4.123 | 4.270 | 5.922 | 6.967 | 6.529 | 7.963 | 4.852 | 3.844 |
| CYBB | 3.500 | 2.866 | 2.847 | 4.298 | 3.800 | 4.005 | 5.368 | 5.760 | 5.166 | 6.573 | 6.972 | 3.909 |
| CYSLTR2 | 5.072 | 4.601 | 4.936 | 6.369 | 5.723 | 6.576 | 7.458 | 7.142 | 7.140 | 7.546 | 7.488 | 7.224 |
| DCN | 2.904 | 3.262 | 3.232 | 3.032 | 2.943 | 3.059 | 3.619 | 3.589 | 4.332 | 4.907 | 3.923 | 3.607 |
| DDIT3 | 7.520 | 7.578 | 7.529 | 7.298 | 7.889 | 7.501 | 8.542 | 8.597 | 8.554 | 8.806 | 7.863 | 7.942 |
| DUSP1 | 9.868 | 9.867 | 9.807 | 9.367 | 9.391 | 9.115 | 10.709 | 10.290 | 10.209 | 10.759 | 10.449 | 10.678 |
| EGR2 | 6.371 | 6.600 | 6.571 | 5.867 | 5.992 | 5.999 | 7.181 | 7.437 | 7.300 | 7.660 | 8.434 | 8.136 |
| ENG | 5.967 | 6.285 | 6.167 | 3.865 | 3.832 | 4.379 | 4.730 | 5.067 | 5.681 | 5.620 | 4.537 | 4.090 |
| EPAS1 | 5.173 | 5.382 | 5.066 | 6.612 | 5.923 | 6.255 | 7.112 | 6.976 | 7.836 | 8.173 | 7.692 | 7.792 |
| FABP5 | 5.441 | 5.819 | 5.805 | 5.822 | 5.344 | 6.231 | 6.990 | 6.976 | 6.789 | 7.332 | 8.646 | 6.743 |
| FCER1G | 4.007 | 4.252 | 4.683 | 4.959 | 5.590 | 5.616 | 6.489 | 6.830 | 6.917 | 8.139 | 9.037 | 6.981 |
| FGL2 | 3.767 | 2.924 | 3.578 | 5.698 | 5.943 | 5.691 | 8.997 | 8.552 | 8.609 | 8.737 | 9.690 | 9.958 |
| FGR | 3.946 | 4.072 | 4.753 | 4.562 | 5.805 | 5.237 | 6.510 | 6.364 | 6.251 | 6.611 | 6.479 | 5.947 |
| FHL2 | 4.038 | 4.613 | 4.760 | 6.648 | 6.606 | 7.033 | 7.999 | 7.649 | 7.740 | 7.734 | 7.043 | 7.436 |
| FOS | 7.528 | 7.799 | 7.840 | 6.031 | 6.045 | 6.024 | 8.672 | 8.180 | 8.112 | 8.372 | 8.529 | 8.617 |
| GADD45B | 7.321 | 7.200 | 6.880 | 8.269 | 7.276 | 8.499 | 9.863 | 10.079 | 9.708 | 9.977 | 9.600 | 9.292 |
| GADD45G | 3.794 | 3.489 | 4.234 | 4.733 | 4.223 | 4.595 | 7.365 | 7.640 | 7.624 | 7.563 | 7.185 | 7.064 |
| GCNT1 | 3.975 | 4.232 | 4.337 | 5.772 | 5.305 | 5.949 | 7.397 | 7.492 | 7.031 | 7.358 | 5.501 | 5.687 |
| GRN | 5.664 | 5.889 | 5.770 | 6.906 | 6.908 | 6.600 | 8.115 | 7.802 | 7.786 | 8.294 | 8.996 | 8.085 |
| HAVCR2 | 4.006 | 3.018 | 3.105 | 6.990 | 6.321 | 7.211 | 8.329 | 8.688 | 8.345 | 8.630 | 7.927 | 7.966 |
| HP | 3.486 | 3.669 | 3.926 | 4.016 | 3.802 | 3.276 | 5.490 | 4.856 | 4.962 | 6.267 | 5.373 | 3.824 |
| HRH4 | 3.642 | 3.929 | 3.421 | 6.764 | 6.741 | 5.989 | 5.266 | 5.600 | 5.522 | 5.097 | 5.178 | 6.042 |
| HSPH1 | 7.538 | 7.668 | 8.014 | 8.157 | 8.170 | 8.048 | 9.237 | 9.815 | 10.233 | 9.789 | 9.742 | 9.763 |
| ID3 | 6.137 | 6.331 | 6.271 | 4.824 | 4.176 | 5.531 | 6.592 | 7.202 | 7.088 | 7.047 | 6.072 | 5.814 |
| IER3 | 4.598 | 4.514 | 4.210 | 5.750 | 6.537 | 6.035 | 7.796 | 7.934 | 8.036 | 7.914 | 7.812 | 7.465 |
| IFNG | 3.567 | 4.187 | 3.481 | 9.363 | 9.037 | 9.125 | 10.658 | 10.745 | 10.762 | 10.666 | 10.089 | 10.185 |
| IL10 | 2.905 | 3.313 | 2.979 | 4.108 | 4.062 | 4.383 | 7.548 | 7.718 | 8.098 | 7.646 | 4.660 | 4.786 |
| IL10RA | 4.009 | 4.567 | 4.068 | 6.998 | 7.340 | 6.981 | 8.386 | 8.381 | 7.923 | 8.761 | 7.557 | 7.556 |
| IL12RB1 | 4.118 | 4.232 | 4.545 | 5.772 | 5.773 | 5.851 | 6.874 | 6.894 | 6.593 | 6.960 | 6.596 | 6.730 |
| IL12RB2 | 7.224 | 6.081 | 6.701 | 8.295 | 8.900 | 9.106 | 7.595 | 7.430 | 7.754 | 7.427 | 6.470 | 7.132 |
| IL2 | 3.237 | 4.159 | 4.241 | 4.885 | 4.397 | 4.178 | 5.710 | 6.486 | 5.336 | 5.860 | 5.744 | 6.054 |
| IL2RA | 3.958 | 3.849 | 4.242 | 8.039 | 7.662 | 8.031 | 8.903 | 9.406 | 9.246 | 9.016 | 8.398 | 8.104 |
| IL7R | 10.719 | 10.588 | 10.690 | 9.263 | 9.593 | 9.350 | 8.100 | 7.948 | 8.039 | 7.717 | 9.742 | 9.902 |
| IRF1 | 7.596 | 8.061 | 7.942 | 7.287 | 7.391 | 7.040 | 8.138 | 8.504 | 8.464 | 8.309 | 7.557 | 7.546 |
| IRF4 | 4.467 | 5.177 | 4.726 | 7.748 | 7.410 | 6.119 | 8.038 | 8.324 | 8.283 | 8.185 | 7.523 | 7.535 |

| Gene | Naïve Spl CD8 #1 | Naïve Spl CD8 #2 | Naïve Spl CD8 #3 | HMPV Spl #1 | HMPV Spl #2 | HMPV Spl #3 | HMPV Lung #1 | HMPV Lung #2 | HMPV Lung #3 | HMPV Lung #4 | HMPV Lung 2o #1 | HMPV Lung 2o #2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IRF7 | 8.087 | 8.126 | 8.091 | 8.476 | 8.074 | 8.582 | 9.526 | 9.462 | 9.181 | 9.515 | 7.513 | 8.188 |
| IRF8 | 4.739 | 4.853 | 4.924 | 5.897 | 5.685 | 5.686 | 7.835 | 8.498 | 8.301 | 8.292 | 6.811 | 6.424 |
| ISG15 | 5.194 | 5.638 | 5.620 | 7.357 | 6.774 | 7.304 | 9.082 | 9.331 | 9.013 | 8.936 | 6.759 | 7.083 |
| ISG20 | 6.616 | 7.062 | 6.419 | 7.817 | 7.380 | 7.569 | 10.144 | 10.111 | 9.822 | 9.935 | 9.774 | 9.759 |
| JAK3 | 6.068 | 6.322 | 6.260 | 6.230 | 5.983 | 5.849 | 6.969 | 6.875 | 6.905 | 6.903 | 6.848 | 6.987 |
| JUN | 8.839 | 8.612 | 8.711 | 6.180 | 6.011 | 5.851 | 8.822 | 8.862 | 8.865 | 8.835 | 9.703 | 9.842 |
| LAG3 | 3.300 | 3.357 | 3.603 | 7.860 | 7.738 | 7.389 | 9.028 | 9.265 | 9.051 | 9.004 | 8.646 | 8.781 |
| LAT2 | 5.046 | 4.922 | 4.717 | 5.560 | 5.339 | 5.523 | 6.664 | 6.723 | 6.246 | 6.332 | 7.728 | 7.798 |
| LDLR | 5.157 | 5.383 | 5.647 | 4.965 | 4.843 | 4.434 | 6.356 | 5.887 | 6.062 | 6.029 | 6.430 | 5.941 |
| LIF | 3.124 | 2.655 | 3.009 | 2.743 | 2.515 | 3.004 | 4.303 | 3.753 | 3.474 | 4.370 | 3.789 | 3.378 |
| MGST1 | 2.528 | 2.822 | 2.740 | 2.468 | 2.446 | 2.937 | 4.266 | 3.511 | 4.130 | 5.458 | 6.088 | 2.978 |
| MUC1 | 3.766 | 3.975 | 3.470 | 4.576 | 4.343 | 4.167 | 5.625 | 5.569 | 5.786 | 5.670 | 5.038 | 4.751 |
| MXI1 | 8.150 | 7.703 | 7.679 | 7.815 | 7.990 | 8.475 | 7.325 | 7.055 | 7.131 | 7.160 | 7.170 | 7.348 |
| MYB | 9.284 | 9.065 | 9.066 | 8.530 | 8.643 | 8.938 | 7.411 | 7.552 | 7.692 | 7.423 | 5.207 | 5.170 |
| MYC | 7.199 | 7.987 | 7.965 | 7.641 | 7.521 | 6.797 | 9.165 | 9.373 | 9.231 | 9.043 | 8.720 | 8.704 |
| NFKB2 | 8.417 | 8.738 | 8.450 | 9.012 | 9.065 | 9.278 | 8.165 | 8.059 | 8.011 | 8.083 | 7.599 | 7.696 |
| NUDCD2 | 5.964 | 6.017 | 5.712 | 5.163 | 4.873 | 5.573 | 6.473 | 6.667 | 6.159 | 6.413 | 6.199 | 6.241 |
| OSM | 3.815 | 4.367 | 4.517 | 4.095 | 4.685 | 4.290 | 5.206 | 5.619 | 5.269 | 5.413 | 6.428 | 5.537 |
| P2RX7 | 3.673 | 4.236 | 4.120 | 3.949 | 4.355 | 3.984 | 5.138 | 4.772 | 5.214 | 5.277 | 8.028 | 7.684 |
| PLAC8 | 8.763 | 8.729 | 8.799 | 9.403 | 9.071 | 9.526 | 10.699 | 10.552 | 10.577 | 10.555 | 10.116 | 10.076 |
| PLSCR1 | 3.410 | 3.207 | 3.230 | 6.524 | 5.755 | 6.734 | 7.521 | 7.552 | 7.407 | 7.439 | 7.110 | 7.290 |
| PRDM1 | 3.749 | 3.840 | 4.245 | 6.352 | 6.163 | 5.686 | 7.590 | 7.534 | 7.619 | 7.556 | 6.800 | 6.836 |
| PRF1 | 7.118 | 6.977 | 7.219 | 8.408 | 8.129 | 8.376 | 9.678 | 9.747 | 9.654 | 9.724 | 9.224 | 8.616 |
| PRMT2 | 5.045 | 4.547 | 4.358 | 4.215 | 4.007 | 3.934 | 5.070 | 4.719 | 5.132 | 5.317 | 5.921 | 6.548 |
| RBPJ | 5.498 | 5.439 | 5.357 | 5.108 | 4.921 | 5.279 | 6.190 | 6.049 | 5.933 | 6.096 | 6.814 | 6.700 |
| RGS16 | 6.314 | 6.619 | 5.712 | 9.001 | 8.455 | 9.285 | 10.666 | 10.591 | 10.540 | 10.669 | 9.882 | 10.255 |
| RHOB | 6.064 | 5.765 | 6.256 | 3.824 | 3.572 | 4.404 | 5.322 | 5.020 | 4.734 | 5.439 | 6.356 | 6.095 |
| RORA | 6.375 | 6.377 | 6.261 | 8.563 | 8.324 | 8.351 | 7.458 | 7.200 | 7.501 | 7.239 | 7.455 | 7.473 |
| RSAD2 | 4.142 | 4.398 | 4.426 | 5.772 | 5.201 | 5.631 | 7.891 | 7.833 | 7.363 | 7.664 | 5.278 | 5.778 |
| S1PR1 | 11.140 | 10.916 | 10.973 | 10.468 | 10.408 | 10.565 | 9.442 | 9.348 | 9.133 | 9.361 | 8.101 | 8.241 |
| SCGB1A1 | 2.689 | 2.602 | 2.560 | 2.997 | 3.356 | 2.934 | 10.010 | 10.001 | 10.556 | 10.677 | 8.904 | 8.557 |
| SERPINE2 | 3.329 | 3.159 | 2.894 | 3.051 | 3.054 | 3.460 | 4.537 | 4.071 | 4.406 | 4.880 | 4.705 | 4.624 |
| SERPING1 | 3.076 | 3.156 | 2.907 | 3.099 | 3.003 | 3.386 | 5.758 | 5.344 | 5.869 | 6.976 | 5.403 | 4.182 |
| SFTPA1 | 4.156 | 3.254 | 4.041 | 3.334 | 3.960 | 3.749 | 5.711 | 4.985 | 5.726 | 6.795 | 5.882 | 5.237 |
| SLC34A2 | 2.957 | 3.281 | 3.683 | 3.423 | 3.138 | 3.228 | 4.223 | 3.830 | 4.440 | 5.823 | 4.434 | 3.642 |
| SOCS1 | 5.779 | 5.836 | 5.495 | 5.611 | 5.520 | 5.451 | 6.560 | 6.624 | 6.677 | 6.507 | 6.058 | 6.492 |
| SOCS2 | 4.337 | 4.149 | 4.142 | 5.374 | 5.127 | 5.234 | 6.093 | 6.318 | 6.774 | 6.318 | 7.366 | 7.377 |
| SPARC | 4.024 | 4.067 | 3.689 | 4.037 | 4.078 | 4.267 | 5.947 | 5.941 | 6.314 | 7.501 | 7.833 | 6.951 |
| STAT2 | 6.498 | 6.737 | 6.119 | 6.808 | 6.779 | 6.704 | 8.041 | 8.213 | 8.158 | 8.230 | 7.281 | 7.507 |

| Gene | Naïve Spl CD8 #1 | Naïve Spl CD8 #2 | Naïve Spl CD8 #3 | HMPV Spl #1 | HMPV Spl #2 | HMPV Spl #3 | HMPV Lung #1 | HMPV Lung #2 | HMPV Lung #3 | HMPV Lung #4 | HMPV Lung 2o #1 | HMPV Lung 2o #2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAF4B | 8.375 | 8.440 | 8.459 | 7.213 | 7.492 | 7.302 | 5.962 | 5.987 | 6.034 | 5.600 | 5.232 | 5.354 |
| TCF7 | 10.967 | 11.004 | 10.872 | 10.096 | 9.968 | 10.245 | 8.906 | 8.960 | 8.960 | 9.057 | 8.579 | 8.941 |
| TGFBI | 4.067 | 3.920 | 3.937 | 4.331 | 3.959 | 4.304 | 5.199 | 5.494 | 5.672 | 6.784 | 7.278 | 4.945 |
| THBD | 3.252 | 2.830 | 3.056 | 3.396 | 3.216 | 3.034 | 4.095 | 4.228 | 4.410 | 5.947 | 4.499 | 3.996 |
| TIMP3 | 4.176 | 3.752 | 3.940 | 3.747 | 4.065 | 3.723 | 4.828 | 5.434 | 5.098 | 6.494 | 5.147 | 4.240 |
| TLR7 | 3.528 | 3.175 | 3.270 | 2.675 | 2.561 | 2.597 | 4.032 | 4.216 | 3.203 | 4.082 | 3.242 | 2.920 |
| TNF | 5.978 | 5.676 | 5.902 | 7.071 | 7.177 | 6.867 | 8.448 | 8.582 | 8.254 | 8.091 | 8.699 | 8.826 |
| TNFRSF4 | 6.401 | 6.225 | 6.411 | 5.988 | 6.151 | 6.780 | 7.517 | 7.473 | 7.876 | 7.126 | 7.098 | 6.585 |
| TNFRSF9 | 5.080 | 5.412 | 5.367 | 7.418 | 6.860 | 8.015 | 8.399 | 8.831 | 8.458 | 8.539 | 5.142 | 5.861 |
| TNFSF10 | 4.169 | 4.711 | 4.277 | 5.333 | 4.790 | 5.134 | 7.436 | 7.337 | 6.796 | 7.402 | 8.217 | 8.510 |
| TNIP1 | 8.667 | 8.896 | 8.679 | 8.767 | 8.623 | 8.377 | 7.681 | 7.360 | 7.304 | 7.362 | 7.564 | 7.318 |
| TREML2 | 7.481 | 7.522 | 7.431 | 4.402 | 3.775 | 4.065 | 4.977 | 5.235 | 4.882 | 5.334 | 4.426 | 3.956 |
| TYROBP | 5.102 | 4.877 | 5.256 | 6.623 | 6.110 | 6.289 | 6.700 | 7.436 | 7.657 | 8.440 | 9.350 | 6.532 |
| UBE2L6 | 3.423 | 4.570 | 4.428 | 5.577 | 5.679 | 5.247 | 6.866 | 6.748 | 6.514 | 7.086 | 5.944 | 5.241 |
| ULK1 | 7.636 | 7.608 | 7.653 | 7.417 | 7.505 | 7.509 | 6.057 | 6.313 | 6.281 | 6.125 | 5.822 | 6.158 |
| XCL1 | 5.910 | 6.292 | 5.487 | 8.128 | 7.028 | 8.393 | 10.482 | 10.666 | 10.552 | 10.740 | 10.441 | 10.657 |
| ZBTB32 | 4.147 | 4.440 | 3.293 | 8.279 | 8.173 | 7.592 | 8.766 | 9.299 | 9.070 | 8.999 | 7.213 | 6.732 |
| ZFP36 | 8.437 | 8.424 | 8.295 | 8.142 | 8.133 | 8.023 | 9.307 | 9.286 | 9.100 | 9.209 | 8.812 | 8.808 |

**Supplemental Table 2.** Genes differentially expressed comparing HMPV spleen and lung CD8 to LCMV CD8.

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10465840 | Scgb1a1 | 1.22489924 | 1.097489037 | 0.196440685 | 7.19901952 | 0.895983116 | 0.160372934 | 5.87723405 | 0.178991023 | 6.559536609 | 36.64729391 | 9.35E-08 |
| 10403821 | Tcrg-V3 | 25.67251527 | 10.71535554 | 2.529109792 | 18.9162109 | 0.417386276 | 0.098514297 | 0.736827331 | 0.23602668 | 1.765336748 | 7.479394907 | 1.34E-07 |
| 10519983 | Fgl2 | 2.455319484 | 1.382718719 | 0.716013102 | 3.626916692 | 0.563152261 | 0.291617082 | 1.477166909 | 0.517829904 | 2.6230329 | 5.065433413 | 1.46E-07 |
| 10394054 | Cd7 | 7.738213034 | 5.031780271 | 5.348796871 | 1.549479567 | 0.650250936 | 0.691218612 | 0.200237388 | 1.06300287 | 0.307938639 | 0.289687495 | 2.47E-07 |
| 10548513 | Klra9 | 9.950055502 | 8.176211773 | 4.042649417 | 4.455294082 | 0.821725243 | 0.406294157 | 0.447765752 | 0.4944404 | 0.54490933 | 1.102072829 | 2.47E-07 |
| 10359697 | Xcl1 | 10.14102383 | 2.611025901 | 1.111656151 | 8.937049617 | 0.257471627 | 0.109619716 | 0.881276858 | 0.425754548 | 3.422811552 | 8.039401037 | 4.23E-07 |
| 10349603 | Il10 | 2.504294679 | 2.099665878 | 0.694299772 | 4.695603725 | 0.838426043 | 0.27724364 | 1.875020446 | 0.330671551 | 2.236357591 | 6.763078304 | 1.81E-06 |
| 10437224 | Mx2 | 2.276091305 | 1.781463072 | 0.710173672 | 4.091848635 | 0.782685241 | 0.31201458 | 1.797752413 | 0.398646306 | 2.296903427 | 5.761757717 | 1.81E-06 |
| 10421387 | Sftpc | 0.999298967 | 1.067890091 | 0.267814675 | 4.421806844 | 1.068639242 | 0.268002554 | 4.42490885 | 0.250788613 | 4.140694704 | 16.51069658 | 1.81E-06 |
| 10530615 | Ociad2 | 6.948335631 | 1.580656314 | 1.554003173 | 3.409081591 | 0.227487041 | 0.223651138 | 0.490632832 | 0.983137928 | 2.156750687 | 2.193741719 | 1.82E-06 |
| 10523182 | Areg | 8.08023602 | 3.880274164 | 1.694742675 | 6.462140074 | 0.480217924 | 0.209739254 | 0.79974645 | 0.436758488 | 1.665382342 | 3.813050894 | 2.47E-06 |
| 10589994 | Eomes | 2.307139857 | 2.894083932 | 1.896685622 | 1.767821195 | 1.254403335 | 0.822093908 | 0.766239285 | 0.655366488 | 0.610839643 | 0.932058099 | 2.47E-06 |
| 10574259 | Gpr56 | 1.768171898 | 1.649469468 | 0.862672894 | 2.606438848 | 0.932867144 | 0.487889721 | 1.474086796 | 0.523000219 | 1.580167986 | 3.021352435 | 2.47E-06 |
| 10554240 | Isg20 | 2.285765557 | 1.235104132 | 0.732910983 | 2.846101619 | 0.540345937 | 0.320641363 | 1.245141528 | 0.593400155 | 2.304341427 | 3.883284168 | 2.47E-06 |
| 10590620 | Ccr9 | 1.065345624 | 0.387498288 | 0.779777398 | 0.682871646 | 0.363730116 | 0.731947811 | 0.640986015 | 2.01233766 | 1.762257195 | 0.87572639 | 2.75E-06 |
| 10405211 | Gadd45g | 0.821870973 | 1.065669626 | 0.456802304 | 2.123096664 | 1.296638598 | 0.555807808 | 2.583248142 | 0.428652833 | 1.992265343 | 4.647736327 | 2.84E-06 |
| 10548879 | Mgp | 0.977996775 | 1.135837099 | 0.307750472 | 3.872981058 | 1.161391457 | 0.314674322 | 3.960116392 | 0.270945959 | 3.409803272 | 12.58480949 | 3.00E-06 |
| 10407126 | Plk2 | 1.895742583 | 1.463073943 | 1.01744548 | 2.022617986 | 0.771768254 | 0.53670023 | 1.066926493 | 0.695416308 | 1.382444131 | 1.987937463 | 3.00E-06 |
| 10521678 | Cd38 | 2.198041841 | 1.662857011 | 1.044390344 | 2.434790582 | 0.756517451 | 0.475145798 | 1.107708933 | 0.628069844 | 1.464221257 | 2.331303231 | 3.09E-06 |
| 10462618 | Ifit3 | 4.174211072 | 1.274049782 | 0.890330612 | 3.859280458 | 0.3052193 | 0.213293146 | 0.924553261 | 0.698819328 | 3.02914416 | 4.334659961 | 3.09E-06 |
| 10531724 | Plac8 | 0.572701926 | 0.474532635 | 0.446135558 | 1.029247169 | 0.828585715 | 0.779001323 | 1.797177769 | 0.9401578 | 2.168970253 | 2.307027878 | 3.09E-06 |
| 10503334 | Gem | 2.489438705 | 1.587724113 | 0.759593377 | 3.678509824 | 0.637783975 | 0.305126363 | 1.477646273 | 0.478416477 | 2.316844465 | 4.842735513 | 4.19E-06 |
| 10379721 | Ccl4 | 2.433525938 | 2.14805753 | 0.826140433 | 3.942649653 | 0.882693501 | 0.339482896 | 1.620138742 | 0.384598839 | 1.835448817 | 4.77237222 | 5.29E-06 |
| 10526410 | Hspb1 | 0.87591493 | 1.029397122 | 0.442551645 | 2.304761191 | 1.175224998 | 0.505245007 | 2.631261453 | 0.429913428 | 2.238942719 | 5.207892044 | 5.29E-06 |
| 10482795 | Ermn | 0.668656635 | 0.24601174 | 0.52927951 | 0.558658109 | 0.367919388 | 0.791556506 | 0.835493257 | 2.151440052 | 2.270859554 | 1.055506777 | 5.43E-06 |
| 10390186 | Abi3 | 1.261126057 | 1.424834539 | 0.758292553 | 2.01596544 | 1.129811354 | 0.601282123 | 1.598543959 | 0.53219692 | 1.414876876 | 2.658558932 | 5.91E-06 |
| 10477187 | Tpx2 | 0.382840776 | 0.307931751 | 0.336587152 | 0.749925899 | 0.804333736 | 0.879183131 | 1.958845417 | 1.093057634 | 2.435363989 | 2.228028891 | 5.91E-06 |
| 10548504 | Klra8 | 4.301773466 | 5.331474094 | 2.953999869 | 2.582157347 | 1.239366539 | 0.686693498 | 0.600254143 | 0.554068128 | 0.484323341 | 0.874122363 | 6.23E-06 |
| 10399710 | Rsad2 | 2.786604934 | 1.189530313 | 0.789612424 | 3.066408606 | 0.426874401 | 0.283360018 | 1.100410241 | 0.663801851 | 2.577831412 | 3.883435105 | 6.23E-06 |
| 10385248 | Hmmr | 0.366802728 | 0.28411474 | 0.313746209 | 0.753098274 | 0.774570958 | 0.855354078 | 2.053142512 | 1.10429402 | 2.650683568 | 2.400342228 | 6.38E-06 |
| 10566366 | Trim30d | 3.027029317 | 1.315911666 | 0.983435688 | 2.776321729 | 0.434720489 | 0.324884758 | 0.91717702 | 0.747341721 | 2.109808585 | 2.823084176 | 6.38E-06 |
| 10389064 | Ccl1 | 1.037582487 | 1.159091249 | 0.546561325 | 2.260391318 | 1.117107569 | 0.526764216 | 2.178517224 | 0.471542965 | 1.950140957 | 4.135659102 | 7.79E-06 |
| 10551989 | Tmem149 | 1.189516733 | 1.195026556 | 0.720959336 | 1.803878803 | 1.004631985 | 0.60609432 | 1.516480394 | 0.603299845 | 1.509488466 | 2.502053464 | 1.03E-05 |
| 10547769 | Ptpn6 | 0.450624184 | 0.449706822 | 0.408494116 | 0.877663757 | 0.997964242 | 0.906507309 | 1.947662351 | 0.908356503 | 1.951635409 | 2.148534637 | 1.09E-05 |
| 10420413 | Lats2 | 1.875400098 | 2.319723504 | 2.237795207 | 0.975332954 | 1.236921927 | 1.193236158 | 0.520066601 | 0.96468187 | 0.420452245 | 0.435845492 | 1.16E-05 |
| 10587350 | Ddx43 | 6.094543529 | 5.061960911 | 2.590422695 | 3.799919181 | 0.830572608 | 0.425039658 | 0.623495289 | 0.511742928 | 0.750681257 | 1.466910859 | 1.25E-05 |
| 10576034 | Irf8 | 0.849894718 | 0.707261379 | 0.460326035 | 1.642492499 | 0.832175285 | 0.541627128 | 1.932583489 | 0.650857022 | 2.322327427 | 3.568106893 | 1.25E-05 |
| 10350733 | Rgs16 | 3.553339008 | 0.765404169 | 0.721507141 | 2.879628994 | 0.215404206 | 0.203050466 | 0.810400862 | 0.942648565 | 3.762233226 | 3.991130275 | 1.26E-05 |
| 10516246 | Cdca8 | 0.384603755 | 0.353237571 | 0.410094996 | 0.644332878 | 0.918445456 | 1.06627923 | 1.675316138 | 1.160960864 | 1.824077987 | 1.571179566 | 1.83E-05 |
| 10351867 | Aim2 | 4.055766008 | 2.216028164 | 1.363256535 | 3.416579489 | 0.54638955 | 0.336128005 | 0.842400543 | 0.615180149 | 1.541758153 | 2.506189701 | 2.00E-05 |
| 10515836 | Ccnb1 | 0.331230807 | 0.248600145 | 0.274453687 | 0.74901073 | 0.75053449 | 0.828587441 | 2.261295488 | 1.103996487 | 3.012913487 | 2.729096988 | 2.00E-05 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10389231 | Ccl3 | 3.571793177 | 1.630686532 | 0.748198907 | 4.976924164 | 0.45654562 | 0.209474309 | 1.393396515 | 0.458824484 | 3.052042233 | 6.651873074 | 2.51E-05 |
| 10360834 | Hlx | 0.912418881 | 0.973809252 | 0.656960666 | 1.454873474 | 1.0672831 | 0.720020902 | 1.594523638 | 0.674629723 | 1.494002518 | 2.214551875 | 2.79E-05 |
| 10511416 | Tox | 7.13669789 | 1.847940017 | 1.967099137 | 2.689864228 | 0.258934881 | 0.275631555 | 0.376905996 | 1.064482136 | 1.455601482 | 1.367426876 | 2.79E-05 |
| 10369290 | Ddit4 | 1.055603161 | 0.878733944 | 0.612604938 | 1.647615715 | 0.832447246 | 0.5803364 | 1.560828706 | 0.697144958 | 1.87498813 | 2.689524051 | 3.47E-05 |
| 10533198 | Oas2 | 1.438121437 | 1.044477166 | 0.623132084 | 2.243886711 | 0.726278838 | 0.433295873 | 1.560290149 | 0.596597134 | 2.148334865 | 3.600980868 | 3.51E-05 |
| 10434778 | Rtp4 | 3.880387275 | 1.13582407 | 1.015328736 | 2.839937102 | 0.292708946 | 0.261656547 | 0.731869502 | 0.893913734 | 2.500331853 | 2.797061682 | 3.66E-05 |
| 10444890 | Ier3 | 2.245779807 | 2.374085859 | 1.011052482 | 3.234738316 | 1.057132071 | 0.450201075 | 1.440363078 | 0.425870226 | 1.362519516 | 3.199377256 | 3.84E-05 |
| 10524621 | Oasl2 | 1.6294411 | 0.830140806 | 0.667321197 | 2.003452181 | 0.509463525 | 0.409539932 | 1.229533355 | 0.803865069 | 2.413388387 | 3.002230698 | 3.84E-05 |
| 10459905 | Setbp1 | 4.082032187 | 2.074196489 | 1.129364091 | 4.171757499 | 0.508128401 | 0.27666712 | 1.02198055 | 0.544482693 | 2.011264372 | 3.693899543 | 3.84E-05 |
| 10539135 | Capg | 0.662413142 | 0.329259594 | 0.386709019 | 0.925257204 | 0.497060781 | 0.583788266 | 1.396797777 | 1.174480643 | 2.81011464 | 2.39264449 | 4.38E-05 |
| 10351644 | Cd244 | 3.977882881 | 1.88267205 | 1.176944053 | 3.657837738 | 0.473284937 | 0.295871972 | 0.91954385 | 0.625145549 | 1.942896926 | 3.107911314 | 4.83E-05 |
| 10545528 | Pigp | 3.486102049 | 2.82110984 | 1.892136253 | 2.365806961 | 0.809244767 | 0.542765595 | 0.678639618 | 0.670706339 | 0.838608596 | 1.250336469 | 5.14E-05 |
| 10557895 | Itgax | 0.24526862 | 0.325184732 | 0.396180487 | 0.434506218 | 1.325830967 | 1.615292189 | 1.771552421 | 1.218324379 | 1.336182715 | 1.096738059 | 5.30E-05 |
| 10429564 | Ly6a | 1.002397573 | 0.616871488 | 0.60481293 | 1.308525426 | 0.615396031 | 0.603366315 | 1.305395645 | 0.980452074 | 2.121228574 | 2.16352092 | 5.30E-05 |
| 10523670 | Aff1 | 2.176243053 | 1.845417858 | 2.29062628 | 0.940658542 | 0.847983342 | 1.052559951 | 0.432239653 | 1.241250739 | 0.509726584 | 0.410655614 | 5.70E-05 |
| 10428796 | Fbxo32 | 1.577809665 | 1.803624719 | 1.997221074 | 0.832978814 | 1.143119325 | 1.265818761 | 0.527933649 | 1.107337382 | 0.461835994 | 0.417068909 | 5.94E-05 |
| 10462973 | Hells | 0.633551814 | 0.46338125 | 0.533781221 | 0.88134212 | 0.731402295 | 0.84252181 | 1.39111293 | 1.15192667 | 1.901980537 | 1.651129873 | 5.94E-05 |
| 10368199 | Myb | 0.782640495 | 0.404413322 | 0.953359883 | 0.386309908 | 0.516729361 | 1.218132578 | 0.49359816 | 2.357389904 | 0.955235366 | 0.405208898 | 5.94E-05 |
| 10390763 | Ccr7 | 1.319621328 | 1.283156663 | 1.632919428 | 0.689585156 | 0.972367327 | 1.237415154 | 0.522562906 | 1.272579939 | 0.537413066 | 0.42230201 | 6.10E-05 |
| 10462866 | Cep55 | 0.484306175 | 0.402131265 | 0.497662596 | 0.684278559 | 0.830324464 | 1.027578466 | 1.412904882 | 1.237562555 | 1.701629836 | 1.374984908 | 6.49E-05 |
| 10575052 | Cdh1 | 1.132442337 | 1.260623588 | 0.620609427 | 2.13896476 | 1.113190091 | 0.548027398 | 1.888806776 | 0.492303518 | 1.696751338 | 3.446555381 | 6.76E-05 |
| 10428536 | Trps1 | 2.781621857 | 1.473402722 | 1.640518372 | 1.467886187 | 0.529691956 | 0.589770449 | 0.527708748 | 1.113421571 | 0.996255922 | 0.894769733 | 6.90E-05 |
| 10569017 | Ifitm3 | 1.797699751 | 0.904292595 | 0.601783801 | 2.67482581 | 0.503027602 | 0.334752119 | 1.48791577 | 0.665474653 | 2.957920726 | 4.44482853 | 6.97E-05 |
| 10346960 | Ccnyl1 | 2.874782781 | 1.705194166 | 1.375139488 | 2.105669267 | 0.59315583 | 0.478345528 | 0.732462042 | 0.806441586 | 1.234856011 | 1.531240492 | 7.92E-05 |
| 10437687 | Litaf | 2.372298214 | 1.372014967 | 1.106239766 | 2.031569004 | 0.578348438 | 0.466315643 | 0.856371679 | 0.80628841 | 1.480719273 | 1.836463547 | 8.85E-05 |
| 10437080 | Ttc3 | 2.398295782 | 1.99033575 | 1.771444879 | 1.527669889 | 0.829895864 | 0.738626525 | 0.636981435 | 0.890023143 | 0.767543812 | 0.862386353 | 9.08E-05 |
| 10389151 | Slfn10-ps | 1.98530078 | 1.384460832 | 1.028309984 | 2.022460994 | 0.697355709 | 0.517961809 | 1.018717675 | 0.742751229 | 1.460829332 | 1.966781442 | 9.47E-05 |
| 10579532 | Bst2 | 1.465615892 | 0.808717502 | 0.668662221 | 1.707483962 | 0.551793622 | 0.456232922 | 1.16502828 | 0.826818042 | 2.111347854 | 2.553582223 | 9.74E-05 |
| 10531415 | Cxcl10 | 4.972590421 | 1.893921733 | 1.087841488 | 4.349561518 | 0.380872256 | 0.218767563 | 0.874707376 | 0.574385662 | 2.296589897 | 3.998341271 | 9.74E-05 |
| 10547906 | Lag3 | 1.789483556 | 0.799776958 | 0.711021389 | 1.861325163 | 0.446931717 | 0.39733329 | 1.040146559 | 0.889024599 | 2.327305312 | 2.617818804 | 9.75E-05 |
| 10419323 | Dlgap5 | 0.541792034 | 0.396008898 | 0.446128571 | 0.839191232 | 0.73092418 | 0.823431397 | 1.54891763 | 1.126561988 | 2.119122164 | 1.881052428 | 9.81E-05 |
| 10393936 | Cbr2 | 0.925491505 | 1.078262752 | 0.556695775 | 1.89806806 | 1.165070393 | 0.601513652 | 2.050875723 | 0.516289536 | 1.760301983 | 3.409524814 | 1.05E-04 |
| 10462623 | Ifit1 | 5.658767957 | 1.77527719 | 0.932173853 | 5.615678816 | 0.313721503 | 0.164730885 | 0.99238542 | 0.525086368 | 3.163268726 | 6.024282702 | 1.07E-04 |
| 10548314 | Klrb1b | 1.489110412 | 0.353893497 | 0.835053952 | 0.762615875 | 0.237654303 | 0.560773698 | 0.512128495 | 2.359619376 | 2.154930456 | 0.913253416 | 1.07E-04 |
| 10482528 | Neb | 1.608366022 | 0.902560967 | 0.777204092 | 1.760478942 | 0.561166398 | 0.483225883 | 1.094576059 | 0.861109798 | 1.950537422 | 2.265143686 | 1.17E-04 |
| 10557156 | Plk1 | 0.50340794 | 0.44192276 | 0.408352777 | 0.940877078 | 0.877862117 | 0.811176671 | 1.869015171 | 0.924036537 | 2.129053226 | 2.304079048 | 1.20E-04 |
| 10374560 | Zrsr1 | 2.334985518 | 2.280160228 | 1.823410555 | 1.632633564 | 0.976520073 | 0.780908721 | 0.699205006 | 0.799685274 | 0.716017034 | 0.89537354 | 1.20E-04 |
| 10402347 | Ifi27l2a | 1.863500797 | 0.86074027 | 1.008769658 | 1.337411034 | 0.461894232 | 0.541330414 | 0.717687396 | 1.171979158 | 1.553791637 | 1.325784359 | 1.29E-04 |
| 10572906 | Mcm5 | 0.568529471 | 0.486730602 | 0.644689088 | 0.631581961 | 0.856122026 | 1.133958961 | 1.110904524 | 1.324529596 | 1.297600682 | 0.979669073 | 1.29E-04 |
| 10585778 | Sema7a | 0.845966689 | 0.601657016 | 0.511260334 | 1.307744497 | 0.711206509 | 0.604350431 | 1.545858145 | 0.849753796 | 2.173571423 | 2.557883745 | 1.29E-04 |
| 10541307 | Usp18 | 2.193076015 | 1.119681155 | 0.571425052 | 3.654896755 | 0.510552825 | 0.260558707 | 1.66656182 | 0.510346226 | 3.264229946 | 6.396108717 | 1.34E-04 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10466224 | Ms4a3 | 0.92766958 | 0.416806334 | 0.726912695 | 0.712742231 | 0.449304734 | 0.783590096 | 0.76831476 | 1.744005876 | 1.710008158 | 0.980505961 | 1.65E-04 |
| 10521913 | Rbpj | 1.232023387 | 0.893892562 | 0.677447877 | 1.653722791 | 0.725548371 | 0.549866086 | 1.34228198 | 0.757862753 | 1.850024109 | 2.441107051 | 2.01E-04 |
| 10501020 | Chi3l3 | 1.174480246 | 0.14841066 | 0.187010278 | 2.039973611 | 0.126362841 | 0.159228117 | 1.736916068 | 1.260086556 | 13.74546552 | 10.90835027 | 2.04E-04 |
| 10346298 | Coq10b | 2.801491458 | 1.804300619 | 1.732791927 | 1.622595986 | 0.644050016 | 0.618524794 | 0.579190053 | 0.96036764 | 0.899293593 | 0.936405555 | 2.16E-04 |
| 10573172 | Clgn | 3.258370256 | 2.312643928 | 1.928107984 | 1.962804968 | 0.7097548 | 0.59173999 | 0.60238856 | 0.833724535 | 0.848727702 | 1.017995353 | 2.22E-04 |
| 10427454 | Card6 | 1.55364347 | 2.167872971 | 1.836618367 | 1.097562031 | 1.395347783 | 1.182136315 | 0.706443951 | 0.847198333 | 0.506285214 | 0.597599398 | 2.23E-04 |
| 10573823 | Chd9 | 2.029064213 | 1.946611448 | 1.594288891 | 1.543557148 | 0.959364142 | 0.785726189 | 0.760723657 | 0.819007251 | 0.792945685 | 0.968179077 | 2.23E-04 |
| 10514466 | Jun | 1.006276851 | 1.248614744 | 0.542073627 | 2.414205561 | 1.240826263 | 0.538692336 | 2.399146476 | 0.434140018 | 1.933507171 | 4.453648801 | 2.23E-04 |
| 10571984 | Ddx60 | 3.568499973 | 1.650436761 | 1.090477146 | 3.278560097 | 0.462501548 | 0.305584182 | 0.918750209 | 0.660720345 | 1.986480291 | 3.006537192 | 2.43E-04 |
| 10548535 | Klra3 | 3.63501621 | 2.36766296 | 2.100809026 | 1.969947872 | 0.651348666 | 0.577936632 | 0.541936475 | 0.887292263 | 0.832022085 | 0.937709162 | 2.44E-04 |
| 10389606 | Prr11 | 0.393845531 | 0.329715292 | 0.321579482 | 0.846788082 | 0.837169057 | 0.816511696 | 2.150051266 | 0.975324743 | 2.568240247 | 2.633215515 | 2.44E-04 |
| 10449652 | Dnahc8 | 2.333579509 | 2.208343544 | 2.038771249 | 1.257448837 | 0.946333106 | 0.873666932 | 0.538849794 | 0.923212901 | 0.569408162 | 0.616767986 | 2.45E-04 |
| 10381697 | Hexim1 | 2.081791485 | 1.425192925 | 1.76715867 | 1.019274072 | 0.684599267 | 0.848864395 | 0.489613911 | 1.239943477 | 0.715183225 | 0.576786957 | 2.49E-04 |
| 10436095 | Retnla | 1.095710787 | 1.138067216 | 0.55642843 | 2.184062755 | 1.038656578 | 0.507824178 | 1.993283976 | 0.488924047 | 1.919098208 | 3.925145874 | 2.53E-04 |
| 10441233 | Mx1 | 1.665122225 | 0.934461881 | 0.623699891 | 2.317605237 | 0.561197171 | 0.374567033 | 1.391852924 | 0.667442839 | 2.480149575 | 3.715898097 | 2.58E-04 |
| 10430113 | Arhgap39 | 1.115547516 | 0.963572368 | 0.706536528 | 1.514200036 | 0.863766316 | 0.633354041 | 1.357360412 | 0.733246979 | 1.57144402 | 2.143130577 | 2.70E-04 |
| 10383204 | Rnf213 | 2.355229636 | 0.945317974 | 0.884686511 | 1.928483151 | 0.401369769 | 0.375626435 | 0.818808969 | 0.935861303 | 2.040036478 | 2.179849162 | 2.73E-04 |
| 10504838 | Nr4a3 | 2.208215153 | 1.234169194 | 1.816958935 | 0.900658602 | 0.558898979 | 0.822817891 | 0.407867232 | 1.472212192 | 0.729769149 | 0.495695629 | 2.75E-04 |
| 10542205 | Klre1 | 3.576527528 | 6.218589437 | 2.1376224 | 3.728983615 | 1.738722654 | 0.597680958 | 1.042626846 | 0.343747151 | 0.599651039 | 1.744453845 | 2.78E-04 |
| 10561679 | Psmd8 | 0.493890672 | 0.511843827 | 0.592440851 | 0.642623209 | 1.036350463 | 1.199538448 | 1.301144657 | 1.157464093 | 1.255506417 | 1.08470442 | 2.78E-04 |
| 10512774 | Coro2a | 0.952049508 | 0.722416203 | 0.571937471 | 1.447919376 | 0.758801089 | 0.600743413 | 1.520844624 | 0.791700779 | 2.004273118 | 2.531604326 | 2.78E-04 |
| 10399360 | Rhob | 1.745469154 | 1.359789233 | 0.971434608 | 1.987844743 | 0.779039395 | 0.55654642 | 1.138859853 | 0.714400868 | 1.461877102 | 2.046298049 | 2.78E-04 |
| 10409278 | Nfil3 | 2.538648834 | 1.417048974 | 1.236874587 | 1.923892184 | 0.558190229 | 0.487217677 | 0.757841005 | 0.872852392 | 1.357675154 | 1.555446449 | 2.82E-04 |
| 10411728 | Cenph | 0.481697579 | 0.343282661 | 0.437913175 | 0.722206286 | 0.71265183 | 0.909103957 | 1.499293992 | 1.275663542 | 2.103823957 | 1.649199721 | 2.91E-04 |
| 10570434 | Ifitm1 | 0.375019897 | 0.301448444 | 0.36813905 | 0.609770882 | 0.803819867 | 0.981652047 | 1.625969413 | 1.22123387 | 2.022803216 | 1.656360232 | 2.91E-04 |
| 10522051 | Klf3 | 1.061334087 | 2.001909785 | 1.653481321 | 0.84869295 | 1.886220191 | 1.557927274 | 0.799647312 | 0.825951965 | 0.423941656 | 0.513276406 | 2.91E-04 |
| 10556113 | Rbm3 | 0.579491912 | 0.463931212 | 0.67834809 | 0.576386364 | 0.800582721 | 1.170591126 | 0.994640911 | 1.462173859 | 1.242396177 | 0.849691142 | 2.91E-04 |
| 10389143 | Slfn8 | 2.313771009 | 1.222494623 | 0.843282245 | 2.608263503 | 0.528355926 | 0.364462275 | 1.12727815 | 0.689804461 | 2.133558262 | 3.092989944 | 2.91E-04 |
| 10546853 | Srgap3 | 4.338108623 | 2.088161338 | 1.932207721 | 2.203201191 | 0.48135294 | 0.44540326 | 0.507871375 | 0.925315341 | 1.055091458 | 1.140250692 | 2.91E-04 |
| 10380174 | Mpo | 0.966829529 | 0.390825837 | 0.735305314 | 0.696001483 | 0.404234485 | 0.760532536 | 0.719880249 | 1.881414289 | 1.780848187 | 0.946547604 | 3.17E-04 |
| 10397645 | Gpr65 | 2.044284074 | 1.32682839 | 1.022452787 | 2.080102474 | 0.649043059 | 0.500152009 | 1.017521244 | 0.770599118 | 1.56772533 | 2.034423987 | 3.30E-04 |
| 10475866 | Bcl2l11 | 2.349061307 | 0.979528532 | 1.904603827 | 0.725857899 | 0.416987215 | 0.81079358 | 0.308999129 | 1.944408728 | 0.741027826 | 0.381107025 | 3.35E-04 |
| 10357043 | Bcl2 | 2.526919178 | 1.449910319 | 1.158713911 | 2.179800092 | 0.573785791 | 0.45854807 | 0.862631504 | 0.79916247 | 1.503403392 | 1.881223717 | 3.39E-04 |
| 10594774 | Ccnb2 | 0.507299165 | 0.381767197 | 0.543789376 | 0.593475333 | 0.752548442 | 1.071930359 | 1.169872481 | 1.424400475 | 1.554547741 | 1.091369855 | 3.44E-04 |
| 10417734 | Nr1d2 | 2.089565573 | 1.968231321 | 2.227075552 | 1.003229144 | 0.941933264 | 1.065807927 | 0.480113741 | 1.131511082 | 0.509710994 | 0.450469291 | 3.44E-04 |
| 10587792 | Plscr1 | 2.420001581 | 1.779205031 | 1.099622476 | 2.456882944 | 0.73520821 | 0.454389156 | 1.015240223 | 0.618041461 | 1.380888038 | 2.234296768 | 3.44E-04 |
| 10410931 | Vcan | 1.17487048 | 0.509816308 | 0.816550089 | 0.858962202 | 0.433934052 | 0.695012857 | 0.731112252 | 1.601655491 | 1.684846461 | 1.051940615 | 3.44E-04 |
| 10449284 | Dusp1 | 2.326766685 | 1.696859425 | 1.047932257 | 2.447450926 | 0.729277858 | 0.450381323 | 1.051867788 | 0.61757164 | 1.442341593 | 2.335504904 | 3.52E-04 |
| 10357488 | Cd55 | 2.396050975 | 1.526331334 | 2.260901235 | 0.870920168 | 0.637019558 | 0.943594798 | 0.363481486 | 1.481265034 | 0.570597058 | 0.385209294 | 3.53E-04 |
| 10574023 | Mt2 | 0.793830442 | 0.428878316 | 0.399699982 | 1.282911598 | 0.540264386 | 0.503508005 | 1.616102798 | 0.931965938 | 2.991318399 | 3.209686404 | 3.55E-04 |
| 10425321 | Apobec3 | 0.553610439 | 0.424343764 | 0.47095686 | 0.804508943 | 0.76650246 | 0.850700829 | 1.453204069 | 1.109847487 | 1.895889634 | 1.708243391 | 3.55E-04 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10395039 | Cmpk2 | 1.244093604 | 0.810969651 | 0.68863751 | 1.48395217 | 0.651855815 | 0.553525481 | 1.192797845 | 0.849153245 | 1.829849204 | 2.154910454 | 3.55E-04 |
| 10420302 | Gzmc | 0.799520149 | 0.40354129 | 0.38340854 | 1.31087842 | 0.504729355 | 0.479548315 | 1.639581468 | 0.950109815 | 3.24843691 | 3.419012054 | 3.55E-04 |
| 10509163 | Id3 | 1.189360432 | 1.136825066 | 0.682037857 | 1.863087505 | 0.955828894 | 0.573449258 | 1.56646165 | 0.5999497 | 1.638851535 | 2.73164823 | 3.55E-04 |
| 10356082 | Plscr1 | 2.184689925 | 1.690239526 | 1.047661033 | 2.378462929 | 0.773674793 | 0.479546787 | 1.088695884 | 0.619829922 | 1.407175074 | 2.270259992 | 3.55E-04 |
| 10433088 | Cbx5 | 0.489628845 | 0.455454799 | 0.531560769 | 0.697754214 | 0.930204181 | 1.085640224 | 1.425067621 | 1.167098844 | 1.531994427 | 1.312651825 | 3.62E-04 |
| 10344713 | Ahcy | 0.348510806 | 0.415453087 | 0.580279778 | 0.411168543 | 1.192080934 | 1.665026644 | 1.179787069 | 1.396739597 | 0.989687055 | 0.708569483 | 3.66E-04 |
| 10437040 | Chaf1b | 0.646240691 | 0.455618259 | 0.553802209 | 0.809353358 | 0.705028738 | 0.85695967 | 1.252402347 | 1.215496083 | 1.776384819 | 1.46144841 | 3.70E-04 |
| 10450367 | Hspa1a | 0.367756812 | 0.752936202 | 0.167682365 | 2.938422126 | 2.047375268 | 0.455959915 | 7.990122896 | 0.222704612 | 3.902617669 | 17.52373978 | 3.84E-04 |
| 10411739 | Ccnb1 | 0.371315502 | 0.272251913 | 0.307423494 | 0.751266538 | 0.733209122 | 0.827930676 | 2.023256593 | 1.129187636 | 2.759453655 | 2.443751213 | 3.97E-04 |
| 10521602 | Cpeb2 | 2.865642842 | 2.335709856 | 2.402020835 | 1.279202193 | 0.81507361 | 0.838213611 | 0.446392752 | 1.028390075 | 0.547671702 | 0.532552497 | 4.05E-04 |
| 10452633 | Tgif1 | 1.746075709 | 0.851784447 | 1.458263663 | 0.763435273 | 0.487827901 | 0.835166342 | 0.437229193 | 1.712010202 | 0.896277545 | 0.523523484 | 4.23E-04 |
| 10563597 | Saa3 | 2.768018304 | 1.179743011 | 0.976743592 | 2.469100242 | 0.426204917 | 0.352867461 | 0.892010085 | 0.827929119 | 2.092913641 | 2.527889881 | 4.24E-04 |
| 10562637 | Ccnb1 | 0.332163944 | 0.235774799 | 0.272054813 | 0.71576667 | 0.709814546 | 0.819037762 | 2.154859622 | 1.153875709 | 3.035806515 | 2.630964922 | 4.32E-04 |
| 10378068 | Xaf1 | 2.064464753 | 0.857994682 | 0.771285044 | 1.977258475 | 0.415601517 | 0.37360049 | 0.957758408 | 0.898939189 | 2.304511339 | 2.563589805 | 4.32E-04 |
| 10531980 | Gbp9 | 1.851042828 | 1.040215499 | 0.889988145 | 1.834888232 | 0.561961875 | 0.480803648 | 0.991272705 | 0.855580546 | 1.763950099 | 2.061699634 | 4.34E-04 |
| 10484463 | Serping1 | 1.030872586 | 1.104720929 | 0.577203959 | 1.983283025 | 1.071636732 | 0.559917846 | 1.923887638 | 0.52248848 | 1.79527967 | 3.436017712 | 4.37E-04 |
| 10543067 | Asns | 0.968492224 | 0.52068957 | 0.492752694 | 1.405961386 | 0.537629066 | 0.508783325 | 1.451701264 | 0.94634639 | 2.700191185 | 2.853279955 | 4.52E-04 |
| 10439762 | Ahcy | 0.455776897 | 0.53490157 | 0.663270752 | 0.531435944 | 1.173603958 | 1.455253121 | 1.166000179 | 1.239986549 | 0.993521001 | 0.801235306 | 4.60E-04 |
| 10366630 | Tmbim4 | 0.745262461 | 0.458051891 | 0.537497897 | 0.973720881 | 0.614618225 | 0.721219604 | 1.306547602 | 1.173443244 | 2.125787274 | 1.811580821 | 4.60E-04 |
| 10452980 | Eif2ak2 | 2.043251867 | 0.940885642 | 0.877363816 | 1.889532831 | 0.460484416 | 0.429395822 | 0.924767456 | 0.932487197 | 2.008249192 | 2.153648004 | 4.72E-04 |
| 10590494 | Kif15 | 0.583775153 | 0.369290698 | 0.512968887 | 0.699071784 | 0.63259064 | 0.878709696 | 1.197501778 | 1.389065282 | 1.893012167 | 1.362795682 | 5.15E-04 |
| 10523156 | Cxcl2 | 5.079701073 | 3.277235986 | 1.439264075 | 4.982741722 | 0.645163158 | 0.283336372 | 0.980912391 | 0.439170106 | 1.520409804 | 3.462006597 | 5.17E-04 |
| 10375443 | Havcr2 | 0.809247715 | 0.391605444 | 0.402038224 | 1.256107173 | 0.483912944 | 0.496804892 | 1.552191188 | 1.026641049 | 3.20758353 | 3.12434763 | 5.17E-04 |
| 10374197 | Ramp3 | 0.997132669 | 1.031553371 | 1.440665702 | 0.547625653 | 1.034519682 | 1.444808446 | 0.549200393 | 1.396598317 | 0.530874765 | 0.380119866 | 5.21E-04 |
| 10597279 | Ccrl2 | 2.560189297 | 1.318241712 | 0.876388362 | 2.863848361 | 0.514900095 | 0.342313892 | 1.118608051 | 0.664816136 | 2.172475908 | 3.267784564 | 5.23E-04 |
| 10587829 | Plod2 | 2.395924426 | 2.261455161 | 1.553747427 | 1.987142443 | 0.943875832 | 0.648496009 | 0.829384442 | 0.687056482 | 0.878700793 | 1.278935307 | 5.32E-04 |
| 10391461 | Brca1 | 0.711411828 | 0.452314636 | 0.599239141 | 0.770764364 | 0.635798587 | 0.842323837 | 1.083429222 | 1.324828103 | 1.704044714 | 1.28623835 | 5.45E-04 |
| 10548525 | Klra10 | 6.252471259 | 5.163918302 | 3.265207897 | 2.96598845 | 0.825900366 | 0.522226774 | 0.474370585 | 0.632312075 | 0.574367811 | 0.908361288 | 5.65E-04 |
| 10399087 | Ncapg2 | 0.525442185 | 0.334618867 | 0.525465076 | 0.581849663 | 0.636832893 | 1.000043565 | 1.107352397 | 1.570339056 | 1.738842965 | 1.107304157 | 5.96E-04 |
| 10590631 | Ccr2 | 0.366465251 | 0.425911008 | 0.482819317 | 0.592037766 | 1.1622139 | 1.317503682 | 1.615535894 | 1.133615493 | 1.390050399 | 1.226209775 | 6.24E-04 |
| 10353420 | Mcm3 | 0.549374352 | 0.47745482 | 0.553962165 | 0.720117631 | 0.869088298 | 1.008350978 | 1.31079587 | 1.160239967 | 1.508242457 | 1.299940098 | 6.24E-04 |
| 10405874 | Cbx3 | 0.541624223 | 0.480953036 | 0.597054867 | 0.687078119 | 0.887982878 | 1.102341517 | 1.268551314 | 1.241399518 | 1.428576322 | 1.15077886 | 6.26E-04 |
| 10410207 | Cbx3 | 0.541624223 | 0.480953036 | 0.597054867 | 0.687078119 | 0.887982878 | 1.102341517 | 1.268551314 | 1.241399518 | 1.428576322 | 1.15077886 | 6.26E-04 |
| 10527009 | Chst12 | 1.964328875 | 1.471389796 | 1.781663309 | 0.972193887 | 0.74905471 | 0.907008665 | 0.494924195 | 1.210871052 | 0.660731704 | 0.545666447 | 6.54E-04 |
| 10458195 | Cdc25c | 0.541250034 | 0.360491125 | 0.400983467 | 0.880256008 | 0.666034369 | 0.740847006 | 1.626338941 | 1.11232549 | 2.441824352 | 2.195242647 | 6.61E-04 |
| 10533569 | Kdm2b | 0.990867111 | 0.845646821 | 1.249576057 | 0.594236744 | 0.853441205 | 1.261093484 | 0.599713864 | 1.477657133 | 0.702700855 | 0.47555068 | 6.61E-04 |
| 10446771 | Lclat1 | 3.149171972 | 1.412205277 | 1.529328982 | 1.660593308 | 0.448437014 | 0.48562892 | 0.527311091 | 1.082936743 | 1.175886633 | 1.085831321 | 6.61E-04 |
| 10498367 | P2ry13 | 1.030619976 | 0.45099325 | 0.682576246 | 0.909372865 | 0.437594129 | 0.662296736 | 0.882355171 | 1.51349548 | 2.016377994 | 1.33226562 | 6.61E-04 |
| 10389877 | Wfikkn2 | 0.182721727 | 0.326827467 | 0.420281571 | 0.327589801 | 1.78866231 | 2.300118204 | 1.792834412 | 1.285943239 | 1.002332526 | 0.779453164 | 6.65E-04 |
| 10451287 | Isg15 | 1.606905896 | 0.945108153 | 0.694879106 | 2.000078474 | 0.588154014 | 0.43243298 | 1.24467679 | 0.735237659 | 2.116242959 | 2.87831143 | 6.72E-04 |
| 10478525 | Wfdc2 | 0.979619766 | 1.02287113 | 0.547687689 | 1.929211897 | 1.044151175 | 0.559081909 | 1.969347662 | 0.535441536 | 1.886075225 | 3.522467157 | 6.88E-04 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10490104 | Aurka | 0.576497927 | 0.644068798 | 0.515006829 | 1.055155401 | 1.117209219 | 0.893336827 | 1.830284815 | 0.799614622 | 1.638265049 | 2.048818272 | 7.19E-04 |
| 10531994 | Mpa2l | 1.968509114 | 0.887255012 | 0.773157081 | 2.024734363 | 0.450724361 | 0.392762764 | 1.028562352 | 0.871403453 | 2.282020768 | 2.618787841 | 7.37E-04 |
| 10360382 | Ifi204 | 1.507186031 | 0.621326134 | 0.578013088 | 1.862337326 | 0.412242498 | 0.383504807 | 1.235638659 | 0.930289354 | 2.99735875 | 3.221963937 | 7.70E-04 |
| 10411611 | Naip5 | 3.408869989 | 2.436101021 | 1.985041022 | 1.955340355 | 0.714635943 | 0.582316436 | 0.573603676 | 0.814843475 | 0.802651589 | 0.985037757 | 7.98E-04 |
| 10551293 | Cyp2f2 | 0.956106726 | 1.12387412 | 0.562374982 | 1.964301499 | 1.175469317 | 0.588192684 | 2.054479323 | 0.500389654 | 1.747794939 | 3.492867861 | 8.16E-04 |
| 10418193 | Plac9 | 1.006138676 | 1.122028034 | 0.693765835 | 1.63299932 | 1.115182291 | 0.689533015 | 1.623036028 | 0.618314172 | 1.45539975 | 2.353819168 | 8.16E-04 |
| 10526972 | Nudt1 | 0.458866919 | 0.364872507 | 0.39605656 | 0.805566576 | 0.795159755 | 0.863118572 | 1.755556004 | 1.085465614 | 2.20780289 | 2.03396852 | 8.71E-04 |
| 10373454 | Pa2g4 | 0.50568527 | 0.473429769 | 0.557974266 | 0.691544248 | 0.936214276 | 1.103402254 | 1.367538842 | 1.178578752 | 1.460711374 | 1.239383767 | 8.71E-04 |
| 10473022 | Plp2 | 0.554801299 | 0.396941456 | 0.534549569 | 0.652491758 | 0.715465982 | 0.963497328 | 1.176081887 | 1.346671054 | 1.643798471 | 1.220638452 | 9.00E-04 |
| 10418180 | Plac9 | 1.008061526 | 1.114519286 | 0.695485879 | 1.625312197 | 1.105606411 | 0.689924039 | 1.612314482 | 0.624023189 | 1.458307826 | 2.336944927 | 9.37E-04 |
| 10418205 | Plac9 | 1.008061526 | 1.114519286 | 0.695485879 | 1.625312197 | 1.105606411 | 0.689924039 | 1.612314482 | 0.624023189 | 1.458307826 | 2.336944927 | 9.37E-04 |
| 10392221 | Pecam1 | 0.733718603 | 0.391082138 | 0.667623559 | 0.61005925 | 0.533013797 | 0.909917722 | 0.831462154 | 1.707118515 | 1.559926137 | 0.913777294 | 9.52E-04 |
| 10452316 | C3 | 1.071682606 | 0.621371313 | 0.527415266 | 1.613263551 | 0.579809086 | 0.492137563 | 1.505355729 | 0.848792429 | 2.596295513 | 3.058810874 | 9.57E-04 |
| 10454077 | Taf4b | 2.092736017 | 1.362302034 | 2.041996474 | 0.785510424 | 0.650966975 | 0.975754447 | 0.375350936 | 1.498930798 | 0.57660519 | 0.384677659 | 9.95E-04 |
| 10368289 | Enpp1 | 2.083817434 | 0.900266393 | 1.52971609 | 0.891178414 | 0.432027479 | 0.734093143 | 0.427666263 | 1.6991816 | 0.989905234 | 0.582577656 | 9.96E-04 |
| 10548401 | Klrc2 | 2.097958988 | 1.722107864 | 1.768326052 | 1.231753985 | 0.820849156 | 0.842879228 | 0.587120145 | 1.026838149 | 0.715259485 | 0.696564971 | 1.02E-03 |
| 10462796 | Kif11 | 0.509140263 | 0.359736287 | 0.497792941 | 0.643404412 | 0.706556352 | 0.977712778 | 1.263707584 | 1.383771831 | 1.78854465 | 1.292514134 | 1.07E-03 |
| 10404439 | Serpinb9b | 0.944250829 | 0.376771227 | 0.77635009 | 0.619904191 | 0.39901604 | 0.822186294 | 0.656503729 | 2.060534444 | 1.645306613 | 0.798485372 | 1.08E-03 |
| 10582997 | Casp4 | 3.255773968 | 1.847504872 | 1.319517443 | 2.635831683 | 0.567454894 | 0.405285335 | 0.809586817 | 0.714215948 | 1.426698096 | 1.997572443 | 1.15E-03 |
| 10397346 | Fos | 1.555604645 | 1.574750285 | 0.743050786 | 2.605975438 | 1.012307523 | 0.477660432 | 1.675217059 | 0.471853089 | 1.654849955 | 3.507129642 | 1.15E-03 |
| 10346365 | Sgol2 | 0.688077934 | 0.465342844 | 0.500901362 | 1.008529624 | 0.676293805 | 0.727971843 | 1.465720051 | 1.076413591 | 2.167282976 | 2.013429591 | 1.16E-03 |
| 10546855 | Srgap3 | 2.121442121 | 1.074547844 | 1.25238243 | 1.363916457 | 0.506517634 | 0.59034485 | 0.642919476 | 1.165497132 | 1.269293373 | 1.089057483 | 1.16E-03 |
| 10482772 | Nr4a2 | 4.953035317 | 1.816833068 | 2.431762748 | 1.544635698 | 0.366812056 | 0.490964145 | 0.311856387 | 1.338462399 | 0.850180308 | 0.635191776 | 1.17E-03 |
| 10474769 | Bub1b | 0.507214515 | 0.37256157 | 0.441221771 | 0.77093853 | 0.734524663 | 0.869891848 | 1.519945719 | 1.184292225 | 2.069291605 | 1.747281254 | 1.19E-03 |
| 10575873 | Osgin1 | 1.015883979 | 1.160505915 | 0.728074321 | 1.601306691 | 1.142360681 | 0.716690425 | 1.576269262 | 0.627376657 | 1.37983501 | 2.199372571 | 1.21E-03 |
| 10541729 | Cdca3 | 0.576981543 | 0.449920079 | 0.567795873 | 0.697668991 | 0.779782445 | 0.984079785 | 1.209170378 | 1.261992741 | 1.550650935 | 1.228732056 | 1.23E-03 |
| 10524631 | Oasl1 | 1.119861166 | 1.046744378 | 0.730774146 | 1.61851604 | 0.93470906 | 0.652557807 | 1.445282764 | 0.698140025 | 1.546238102 | 2.214796527 | 1.24E-03 |
| 10349102 | Bcl2 | 2.695166895 | 1.759659984 | 1.452507451 | 2.011243045 | 0.652894627 | 0.538930429 | 0.746240631 | 0.825447793 | 1.142972542 | 1.384669692 | 1.27E-03 |
| 10590242 | Ccr8 | 0.809808445 | 0.957576448 | 0.556102975 | 1.556779913 | 1.182472786 | 0.686709281 | 1.922405134 | 0.58074003 | 1.625750002 | 2.799445396 | 1.27E-03 |
| 10542911 | Samd9l | 2.830153609 | 1.34839207 | 1.065792923 | 2.471213623 | 0.476437768 | 0.376584833 | 0.873172967 | 0.790417674 | 1.832711478 | 2.318662067 | 1.27E-03 |
| 10411359 | Plp2 | 0.598803149 | 0.444776952 | 0.563332864 | 0.715081793 | 0.742776575 | 0.940764699 | 1.194185092 | 1.266551383 | 1.607731224 | 1.269377023 | 1.28E-03 |
| 10474902 | Rad51 | 0.496168096 | 0.326815072 | 0.456875796 | 0.647724558 | 0.658678127 | 0.920808493 | 1.305453865 | 1.397964278 | 1.981929886 | 1.417725701 | 1.33E-03 |
| 10428534 | Trps1 | 4.088241682 | 1.427472736 | 1.151764949 | 3.184590961 | 0.349165447 | 0.281726238 | 0.778963478 | 0.806856005 | 2.230929447 | 2.764966032 | 1.33E-03 |
| 10525464 | Orai1 | 1.712015211 | 1.252181569 | 1.652108514 | 0.854411883 | 0.731407969 | 0.965008081 | 0.499067927 | 1.319384149 | 0.682338651 | 0.517164505 | 1.38E-03 |
| 10451763 | Satb1 | 0.416451151 | 0.348577097 | 0.570138272 | 0.444417918 | 0.837017971 | 1.369039972 | 1.067154975 | 1.635615984 | 1.274948701 | 0.779491466 | 1.38E-03 |
| 10462613 | Ifit2 | 1.124094335 | 0.692933266 | 0.538444666 | 1.754069388 | 0.616436935 | 0.479003095 | 1.56042899 | 0.777051258 | 2.531368421 | 3.257659512 | 1.38E-03 |
| 10474875 | Casc5 | 0.56410532 | 0.409445805 | 0.541428737 | 0.708148542 | 0.7258322 | 0.959800799 | 1.255348102 | 1.322345302 | 1.729529363 | 1.307925668 | 1.43E-03 |
| 10523145 | Cxcl15 | 0.998817346 | 1.100872626 | 0.519105458 | 2.198508075 | 1.102176119 | 0.519720107 | 2.201111229 | 0.471539982 | 1.997059445 | 4.235185819 | 1.46E-03 |
| 10376326 | Irgm2 | 1.122252203 | 0.715794704 | 0.640971679 | 1.472372296 | 0.637819825 | 0.571147624 | 1.311979867 | 0.895468597 | 2.056975677 | 2.297094152 | 1.47E-03 |
| 10533549 | Anapc5 | 0.561294577 | 0.458183719 | 0.662546964 | 0.570737319 | 0.81629814 | 1.180390816 | 1.016823148 | 1.44602904 | 1.245651677 | 0.861429227 | 1.47E-03 |
| 10555695 | Rrm1 | 0.43743635 | 0.353660954 | 0.437368928 | 0.655901533 | 0.808485519 | 0.999845872 | 1.49942165 | 1.236689896 | 1.854605452 | 1.499652789 | 1.48E-03 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10394978 | Rrm2 | 0.599184319 | 0.456242136 | 0.540075861 | 0.783730369 | 0.761438712 | 0.901351795 | 1.307995462 | 1.183748319 | 1.717794803 | 1.451148674 | 1.48E-03 |
| 10569102 | Irf7 | 2.032301137 | 0.942564409 | 0.831778656 | 1.856006938 | 0.463791705 | 0.409279236 | 0.913253899 | 0.882463467 | 1.969103566 | 2.2313712 | 1.48E-03 |
| 10538590 | Herc6 | 2.265780134 | 1.232336227 | 0.915246475 | 2.399728056 | 0.543890472 | 0.403943199 | 1.059117793 | 0.742692177 | 1.947299774 | 2.621947336 | 1.49E-03 |
| 10588577 | Cish | 1.555626444 | 1.344285233 | 0.809854205 | 2.030624009 | 0.864143984 | 0.520596837 | 1.305341663 | 0.602442239 | 1.510560377 | 2.507394535 | 1.49E-03 |
| 10441956 | Fam120b | 2.011958752 | 1.524535673 | 1.363176801 | 1.550052841 | 0.757737042 | 0.677537151 | 0.770419791 | 0.894158677 | 1.016737665 | 1.13708863 | 1.49E-03 |
| 10509568 | Camk2n1 | 2.356152749 | 2.220857254 | 1.825010135 | 1.58802152 | 0.942577791 | 0.77457208 | 0.673989206 | 0.821759315 | 0.715048893 | 0.870143946 | 1.50E-03 |
| 10466521 | Gcnt1 | 1.462766496 | 1.283534557 | 0.831137591 | 1.841314327 | 0.877470574 | 0.568195671 | 1.258788967 | 0.647538149 | 1.434565448 | 2.215414567 | 1.50E-03 |
| 10607870 | Tlr7 | 2.536576357 | 1.244062735 | 1.117882068 | 2.054223576 | 0.490449551 | 0.440705073 | 0.809841017 | 0.89857371 | 1.651221854 | 1.837603121 | 1.50E-03 |
| 10476989 | Gins1 | 0.552570309 | 0.343544354 | 0.455680363 | 0.737378165 | 0.621720618 | 0.824655895 | 1.334451296 | 1.326409117 | 2.146384177 | 1.618191664 | 1.53E-03 |
| 10359890 | Nuf2 | 0.46060867 | 0.328942699 | 0.423089076 | 0.692918067 | 0.714147867 | 0.918543449 | 1.504353071 | 1.286209049 | 2.106500826 | 1.637759295 | 1.61E-03 |
| 10538356 | Chn2 | 3.557088751 | 1.922236972 | 1.447029097 | 2.562880749 | 0.540396124 | 0.406801516 | 0.720499523 | 0.752783927 | 1.333280332 | 1.771132836 | 1.65E-03 |
| 10591494 | S1pr5 | 1.010612248 | 2.999090794 | 1.242337582 | 1.709564585 | 2.967597909 | 1.22929203 | 1.69161277 | 0.41423807 | 0.570027619 | 1.37608699 | 1.65E-03 |
| 10492628 | Serpini1 | 2.783043392 | 2.062845931 | 1.961277538 | 1.554756871 | 0.741219464 | 0.704724024 | 0.558653478 | 0.950762977 | 0.753695101 | 0.792726598 | 1.85E-03 |
| 10554445 | Prc1 | 0.404562673 | 0.361622795 | 0.361653499 | 0.823576594 | 0.893860998 | 0.893936893 | 2.035720666 | 1.000084907 | 2.277446571 | 2.277253217 | 1.89E-03 |
| 10435920 | Cd200r4 | 2.764663503 | 2.051167989 | 1.539440849 | 2.067737192 | 0.741923199 | 0.556827566 | 0.747916406 | 0.750519147 | 1.008077936 | 1.343174175 | 1.91E-03 |
| 10419154 | Ear1 | 1.628168094 | 1.009424042 | 0.693989465 | 2.250249841 | 0.619975324 | 0.426239445 | 1.382074645 | 0.687510338 | 2.229241376 | 3.242484152 | 1.91E-03 |
| 10397895 | Ubr7 | 0.701970359 | 0.49345856 | 0.659383887 | 0.738621316 | 0.702962103 | 0.939332949 | 1.052211546 | 1.336249769 | 1.49682542 | 1.120168889 | 1.91E-03 |
| 10444927 | Nrm | 0.418418087 | 0.463252505 | 0.653678848 | 0.446678833 | 1.107152198 | 1.562262407 | 1.067541883 | 1.411063818 | 0.964223243 | 0.683330712 | 1.95E-03 |
| 10411126 | Jmy | 2.412850846 | 1.879768124 | 2.500218806 | 0.878066594 | 0.779065199 | 1.036209433 | 0.363912504 | 1.330067669 | 0.467114312 | 0.3511959 | 1.98E-03 |
| 10586244 | Dennd4a | 2.87655449 | 1.023810648 | 1.942119658 | 0.875436312 | 0.355915611 | 0.67515483 | 0.304335035 | 1.896952001 | 0.855076389 | 0.450763324 | 1.98E-03 |
| 10352954 | Hmgb3 | 0.687771357 | 0.475743668 | 0.701856437 | 0.660696092 | 0.691717769 | 1.020479306 | 0.960633334 | 1.47528277 | 1.388764866 | 0.941355037 | 2.01E-03 |
| 10419288 | Gch1 | 5.250608635 | 2.081106774 | 2.637245753 | 1.589961333 | 0.396355341 | 0.502274295 | 0.302814672 | 1.267232314 | 0.763997961 | 0.602887058 | 2.02E-03 |
| 10408243 | Hist1h4a | 0.414586311 | 0.492843286 | 0.528887356 | 0.616264251 | 1.188759187 | 1.275699032 | 1.486455858 | 1.073134951 | 1.250426389 | 1.165208894 | 2.02E-03 |
| 10368277 | Rps12 | 2.704342637 | 2.888134447 | 1.53573019 | 2.686369099 | 1.067961732 | 0.567875597 | 0.993353824 | 0.531737777 | 0.930139905 | 1.749245484 | 2.04E-03 |
| 10436662 | Mir155 | 2.265118028 | 2.641829189 | 1.622894955 | 2.045369837 | 1.166309727 | 0.716472579 | 0.902985987 | 0.6143073 | 0.774224861 | 1.260321767 | 2.14E-03 |
| 10435907 | Cd200r1 // Cd200r1 | 2.305003271 | 2.059187287 | 1.606931854 | 1.704574957 | 0.893355473 | 0.69714949 | 0.739510863 | 0.78037188 | 0.827790152 | 1.060763687 | 2.15E-03 |
| 10543239 | Tcfec | 0.837340508 | 0.453346908 | 0.692859761 | 0.772641786 | 0.541412846 | 0.827452816 | 0.92273308 | 1.528321357 | 1.704305848 | 1.115148879 | 2.18E-03 |
| 10382998 | Birc5 | 0.492521779 | 0.357118406 | 0.427392097 | 0.749538223 | 0.725081451 | 0.867762839 | 1.521837725 | 1.196779806 | 2.098850718 | 1.75374844 | 2.20E-03 |
| 10366586 | Ifng | 1.141770226 | 0.811655091 | 0.660630419 | 1.561902807 | 0.710874283 | 0.578601897 | 1.367965963 | 0.813929989 | 1.924343019 | 2.364261109 | 2.20E-03 |
| 10362275 | Samd3 | 1.884269796 | 2.523088916 | 1.616555111 | 1.670547431 | 1.339027416 | 0.857921257 | 0.886575497 | 0.640704773 | 0.662104066 | 1.033399616 | 2.20E-03 |
| 10487577 | Ckap2l | 0.699826827 | 0.490462244 | 0.555571451 | 0.919082805 | 0.700833728 | 0.793869897 | 1.313300334 | 1.132750702 | 1.873911432 | 1.654301718 | 2.21E-03 |
| 10409190 | Cenpp | 0.67495212 | 0.42421036 | 0.624086069 | 0.668268167 | 0.628504374 | 0.924637542 | 0.990097144 | 1.471171211 | 1.575322598 | 1.070794878 | 2.26E-03 |
| 10497520 | Ect2 | 0.534305521 | 0.381607565 | 0.430792996 | 0.850679294 | 0.714212281 | 0.806267162 | 1.592121475 | 1.128890084 | 2.229199241 | 1.974682277 | 2.26E-03 |
| 10359434 | Fasl | 2.244763196 | 1.637183115 | 1.644458267 | 1.3609192 | 0.729334443 | 0.732575387 | 0.606264038 | 1.004443701 | 0.831256557 | 0.827579044 | 2.31E-03 |
| 10518145 | Prdm2 | 2.299094314 | 1.799093986 | 2.195890924 | 1.015792759 | 0.782522916 | 0.955111285 | 0.441823005 | 1.220553757 | 0.564613504 | 0.462587986 | 2.31E-03 |
| 10414315 | Cdkn3 | 0.623052713 | 0.421207137 | 0.50564917 | 0.835012447 | 0.676037723 | 0.811567239 | 1.340195508 | 1.200476263 | 1.982427107 | 1.651367186 | 2.34E-03 |
| 10508151 | Clspn | 0.601444149 | 0.452445341 | 0.640935729 | 0.634593629 | 0.75226493 | 1.06566126 | 1.055116473 | 1.416603669 | 1.402586283 | 0.990104935 | 2.34E-03 |
| 10424400 | Myc | 1.425774096 | 0.886586428 | 0.658688746 | 1.8828227 | 0.621828121 | 0.461986754 | 1.320561725 | 0.742949278 | 2.123676431 | 2.85844067 | 2.34E-03 |
| 10361091 | Atf3 | 1.580818986 | 1.464554498 | 0.822397733 | 2.270518994 | 0.926453004 | 0.520235233 | 1.436292842 | 0.561534401 | 1.550313762 | 2.760852691 | 2.35E-03 |
| 10408074 | Hist1h4k | 0.424490794 | 0.497702034 | 0.540409371 | 0.627974103 | 1.17246838 | 1.273076775 | 1.479358591 | 1.085809047 | 1.261747111 | 1.162034074 | 2.35E-03 |
| 10492815 | Tmem154 | 0.479052096 | 0.566913766 | 0.758598642 | 0.492470886 | 1.183407338 | 1.583541014 | 1.028011129 | 1.338119989 | 0.868687472 | 0.649185035 | 2.40E-03 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10563085 | Fcgrt | 0.490505165 | 0.799869952 | 0.859835989 | 0.565514816 | 1.630706482 | 1.752960113 | 1.152923265 | 1.074969734 | 0.707008452 | 0.657700798 | 2.46E-03 |
| 10570000 | Gpi1 | 0.433710542 | 0.468691752 | 0.608494488 | 0.515330088 | 1.080655659 | 1.402996767 | 1.188188982 | 1.298282904 | 1.099507482 | 0.8468936 | 2.47E-03 |
| 10443463 | Cdkn1a | 1.040171819 | 0.684093709 | 0.625397128 | 1.278237035 | 0.657673758 | 0.60124406 | 1.22887105 | 0.91419804 | 1.868511607 | 2.043880566 | 2.48E-03 |
| 10365344 | Tcp11l2 | 1.31406386 | 1.618135853 | 1.70156935 | 0.825767432 | 1.231398185 | 1.294890912 | 0.628407383 | 1.051561491 | 0.510320212 | 0.485297547 | 2.56E-03 |
| 10438378 | Cdc45 | 0.616162182 | 0.493152963 | 0.576765801 | 0.784835994 | 0.800362269 | 0.936061669 | 1.273749049 | 1.169547471 | 1.591465637 | 1.360753348 | 2.56E-03 |
| 10422227 | Spry2 | 2.668387558 | 2.086961398 | 2.024584427 | 1.433453257 | 0.782105805 | 0.758729526 | 0.537198299 | 0.970111105 | 0.686861414 | 0.708023453 | 2.65E-03 |
| 10558134 | Plekha1 | 2.717216684 | 2.081460114 | 1.520258483 | 2.069749267 | 0.766026547 | 0.559491075 | 0.761716678 | 0.73038079 | 0.994373735 | 1.36144563 | 2.79E-03 |
| 10364950 | Gadd45b | 1.293231807 | 0.67367114 | 0.555583413 | 1.671003754 | 0.52092064 | 0.429608528 | 1.292114643 | 0.824710129 | 2.480444322 | 3.007655943 | 2.81E-03 |
| 10594911 | Tex9 | 0.903768904 | 0.671442336 | 0.594623487 | 1.340285409 | 0.742935869 | 0.657937537 | 1.482995712 | 0.885591293 | 1.996128837 | 2.254006845 | 2.81E-03 |
| 10530100 | Arap2 | 1.69645348 | 1.059171254 | 1.572068707 | 0.84525137 | 0.624344414 | 0.926679526 | 0.498246123 | 1.484244122 | 0.798030882 | 0.537668211 | 2.85E-03 |
| 10404132 | Cmah | 0.489004448 | 0.534607287 | 0.872554186 | 0.397255748 | 1.09325649 | 1.784348158 | 0.812376554 | 1.632140466 | 0.743079562 | 0.455279173 | 2.85E-03 |
| 10345074 | Cetn4 | 0.949854876 | 0.36855479 | 0.584855666 | 0.885970877 | 0.388011684 | 0.615731604 | 0.932743412 | 1.586889336 | 2.403905475 | 1.514853884 | 2.85E-03 |
| 10550326 | Ap2s1 | 0.425108568 | 0.428529572 | 0.533075635 | 0.554949431 | 1.008047364 | 1.253975278 | 1.305429888 | 1.243964642 | 1.295008483 | 1.041033193 | 2.88E-03 |
| 10367224 | Stat2 | 1.396967142 | 0.973477986 | 0.752072563 | 1.666760043 | 0.696851026 | 0.538360954 | 1.193127593 | 0.772562476 | 1.712170247 | 2.216222377 | 2.88E-03 |
| 10548532 | Klra9 | 5.549867082 | 5.693545585 | 2.819820075 | 3.467864547 | 1.025888639 | 0.508087857 | 0.624855424 | 0.495266093 | 0.609086991 | 1.229817667 | 2.94E-03 |
| 10350392 | Aspm | 0.6953865 | 0.487499118 | 0.610637009 | 0.812012362 | 0.701047717 | 0.878126062 | 1.167713728 | 1.252591002 | 1.665669398 | 1.32977915 | 2.97E-03 |
| 10360985 | Cenpf | 0.605036839 | 0.396109507 | 0.459705946 | 0.896458034 | 0.654686594 | 0.759798275 | 1.481658598 | 1.160552672 | 2.263157078 | 1.950068388 | 3.00E-03 |
| 10521731 | Ncapg | 0.606327606 | 0.408327191 | 0.533919223 | 0.766032321 | 0.673443179 | 0.880578779 | 1.26339674 | 1.30757695 | 1.876025742 | 1.434734485 | 3.00E-03 |
| 10392207 | Tex2 | 0.809479804 | 0.464085073 | 0.962866825 | 0.459304675 | 0.573312726 | 1.189488385 | 0.567407207 | 2.074763615 | 0.989699306 | 0.477017863 | 3.15E-03 |
| 10502791 | Ifi44 | 1.790134338 | 0.867884417 | 0.845786595 | 1.735054 | 0.484815245 | 0.472471019 | 0.96923117 | 0.974538289 | 1.999176348 | 2.051408725 | 3.16E-03 |
| 10496822 | Gng5 | 2.158334206 | 1.485422982 | 1.391882984 | 1.5777302 | 0.688226586 | 0.644887608 | 0.730994391 | 0.937028039 | 1.062142042 | 1.133522155 | 3.18E-03 |
| 10356299 | Gpr55 | 0.623487129 | 0.479848349 | 0.741501037 | 0.545947425 | 0.769620297 | 1.189280424 | 0.875635437 | 1.545282042 | 1.137749928 | 0.736273313 | 3.18E-03 |
| 10363475 | Prf1 | 1.135839865 | 0.854782867 | 0.682723624 | 1.475358978 | 0.752555791 | 0.601073835 | 1.298914595 | 0.798709999 | 1.726004386 | 2.16099008 | 3.18E-03 |
| 10403980 | Hist1h2bj | 0.231369764 | 0.206965313 | 0.292244187 | 0.411880526 | 0.894521865 | 1.263104489 | 1.780183025 | 1.412044286 | 1.990094479 | 1.40937115 | 3.18E-03 |
| 10365933 | Eea1 | 2.331841364 | 1.127109866 | 1.522918582 | 1.160143645 | 0.483356151 | 0.653096993 | 0.497522543 | 1.35117137 | 1.029308393 | 0.761789671 | 3.21E-03 |
| 10439651 | Cd200 | 1.220376392 | 1.105728013 | 0.785250821 | 1.637965891 | 0.906054903 | 0.643449699 | 1.342180906 | 0.710166345 | 1.48134611 | 2.085914266 | 3.24E-03 |
| 10487392 | Kcnip3 | 1.714412449 | 2.040212314 | 1.562405118 | 1.438390526 | 1.190035872 | 0.911335612 | 0.838999114 | 0.76580516 | 0.70502002 | 0.920625842 | 3.24E-03 |
| 10412345 | Parp8 | 2.538643314 | 1.793225168 | 2.162597515 | 1.107520399 | 0.706371453 | 0.851871353 | 0.436264674 | 1.205982134 | 0.617613682 | 0.512125068 | 3.31E-03 |
| 10531407 | Cxcl9 | 0.742153015 | 0.490448583 | 0.365970567 | 1.58289821 | 0.660845638 | 0.493120098 | 2.132846164 | 0.746195585 | 3.227449861 | 4.325206322 | 3.36E-03 |
| 10394735 | Pdia6 | 0.52302611 | 0.437943426 | 0.434119422 | 0.890953373 | 0.837326126 | 0.830014819 | 1.703458691 | 0.991268269 | 2.034402891 | 2.052323224 | 3.37E-03 |
| 10469278 | Il2ra | 0.593280988 | 0.33919575 | 0.355905992 | 0.988472934 | 0.571728669 | 0.599894484 | 1.666112607 | 1.049264304 | 2.914166628 | 2.777342769 | 3.43E-03 |
| 10606770 | Zmat1 | 2.18471468 | 2.123507232 | 1.662741055 | 1.602304148 | 0.971983779 | 0.76107927 | 0.733415747 | 0.783016431 | 0.754555541 | 0.963652244 | 3.43E-03 |
| 10446074 | Uhrf1 | 0.525895957 | 0.489513044 | 0.562841011 | 0.698394498 | 0.930817279 | 1.070251642 | 1.328008875 | 1.14979778 | 1.426712744 | 1.24083797 | 3.45E-03 |
| 10455961 | Iigp1 | 1.4628641 | 0.585367673 | 0.502440268 | 2.067149087 | 0.40015178 | 0.343463394 | 1.413083476 | 0.85833279 | 3.531368715 | 4.114218581 | 3.54E-03 |
| 10468885 | Zfp826 | 2.176030959 | 1.662777889 | 1.673758846 | 1.381211764 | 0.764133379 | 0.769179703 | 0.634739023 | 1.006603983 | 0.830665222 | 0.825215513 | 3.55E-03 |
| 10408210 | Hist1h2bf | 0.233988127 | 0.21683686 | 0.298974477 | 0.420924029 | 0.926700271 | 1.277733538 | 1.798911914 | 1.378799142 | 1.941201455 | 1.407892851 | 3.55E-03 |
| 10408070 | Hist1h2bl | 0.226936632 | 0.200049359 | 0.290328789 | 0.395653323 | 0.88152079 | 1.279338583 | 1.74345287 | 1.451285775 | 1.977778505 | 1.362776745 | 3.55E-03 |
| 10403948 | Hist1h2bn | 0.238139155 | 0.212187713 | 0.298176879 | 0.423553353 | 0.891024042 | 1.252111939 | 1.778596018 | 1.405250453 | 1.996125731 | 1.420476846 | 3.55E-03 |
| 10544133 | Parp12 | 1.649845804 | 1.083822026 | 0.849202833 | 1.815678543 | 0.656923225 | 0.514716485 | 1.100514083 | 0.783526089 | 1.675255254 | 2.138097605 | 3.55E-03 |
| 10368612 | Gapdh | 0.500359333 | 0.453494772 | 0.575435465 | 0.612649034 | 0.90633819 | 1.150044434 | 1.224418122 | 1.268891068 | 1.3509506 | 1.064670274 | 3.57E-03 |
| 10483110 | Ifih1 | 2.80657878 | 1.394967423 | 1.110357724 | 2.383444787 | 0.497034836 | 0.39562678 | 0.849234949 | 0.795973946 | 1.708602472 | 2.146555776 | 3.63E-03 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10403978 | Hist1h2bk | 0.221890907 | 0.198123223 | 0.283568292 | 0.398337755 | 0.892885722 | 1.277962655 | 1.795196391 | 1.43127236 | 2.010555601 | 1.40473306 | 3.71E-03 |
| 10547590 | Klrg1 | 0.257059266 | 0.418556756 | 0.466950936 | 0.472356085 | 1.628250021 | 1.81651081 | 1.837537667 | 1.115621549 | 1.128535325 | 1.01157541 | 3.71E-03 |
| 10406423 | Mblac2 | 1.565092667 | 2.154249241 | 1.228749629 | 1.961254168 | 1.376435586 | 0.785097046 | 1.253123352 | 0.570384153 | 0.910411911 | 1.596138157 | 3.76E-03 |
| 10380067 | 4-Sep | 2.405945385 | 2.69193643 | 1.534666035 | 2.327364274 | 1.118868469 | 0.637864036 | 0.96733878 | 0.570097428 | 0.864568809 | 1.516528171 | 3.84E-03 |
| 10491091 | Tnfsf10 | 1.619872135 | 1.360970413 | 0.743495164 | 2.436182353 | 0.840171507 | 0.458983859 | 1.503934971 | 0.546297816 | 1.790033296 | 3.276662003 | 3.91E-03 |
| 10356866 | Pdcd1 | 3.407189136 | 1.154541263 | 1.407135123 | 1.622094917 | 0.338854468 | 0.412990024 | 0.476080092 | 1.218782878 | 1.404969202 | 1.152764145 | 3.94E-03 |
| 10503281 | Gxylt1 | 2.064318761 | 1.485018886 | 1.508168498 | 1.368726583 | 0.719374795 | 0.730588961 | 0.663040325 | 1.015588766 | 0.921689681 | 0.907542218 | 3.97E-03 |
| 10429568 | Ly6c1 | 0.565081601 | 0.488949979 | 0.557189358 | 0.766947577 | 0.865273226 | 0.986033446 | 1.35723332 | 1.139563108 | 1.568560404 | 1.376457691 | 3.97E-03 |
| 10406581 | Dhfr | 0.67444148 | 0.443981307 | 0.48530029 | 0.945185463 | 0.658294782 | 0.719558782 | 1.40143436 | 1.09306469 | 2.128885718 | 1.947630124 | 4.08E-03 |
| 10511363 | Penk | 5.737633755 | 3.501975627 | 1.979746418 | 3.860715178 | 0.610351894 | 0.345045798 | 0.672875848 | 0.565322729 | 1.102439191 | 1.950105903 | 4.13E-03 |
| 10403957 | Hist1h4m | 0.394677811 | 0.502112673 | 0.514251677 | 0.624632804 | 1.272209025 | 1.302965767 | 1.58263978 | 1.024175856 | 1.244009238 | 1.214644175 | 4.14E-03 |
| 10408092 | Hist1h4m | 0.394677811 | 0.502112673 | 0.514251677 | 0.624632804 | 1.272209025 | 1.302965767 | 1.58263978 | 1.024175856 | 1.244009238 | 1.214644175 | 4.14E-03 |
| 10346790 | Ctla4 | 2.252162249 | 0.756470068 | 0.993325723 | 1.37693321 | 0.335886133 | 0.441054246 | 0.611382777 | 1.313106447 | 1.820208451 | 1.386184993 | 4.17E-03 |
| 10549102 | Kcnj8 | 2.462396806 | 4.333034102 | 2.485890484 | 1.840851431 | 1.759681499 | 1.00954098 | 0.747585209 | 0.573706651 | 0.424841205 | 0.740519923 | 4.17E-03 |
| 10404036 | Hist1h2bg | 0.322779742 | 0.50291873 | 0.359416851 | 0.893723956 | 1.558086411 | 1.11350498 | 2.768835335 | 0.714661891 | 1.777074311 | 2.486594477 | 4.23E-03 |
| 10603346 | Plp2 | 0.665246776 | 0.484684877 | 0.60401928 | 0.761900327 | 0.72857907 | 0.907962731 | 1.14528977 | 1.246210286 | 1.571949863 | 1.261384119 | 4.23E-03 |
| 10591556 | Spc24 | 0.589511532 | 0.37553398 | 0.434736162 | 0.880913144 | 0.637025673 | 0.737451497 | 1.494310281 | 1.157648001 | 2.345761475 | 2.026316697 | 4.23E-03 |
| 10473240 | Eno1 | 0.457862464 | 0.4384976 | 0.475167831 | 0.706782527 | 0.957705936 | 1.037795994 | 1.543656846 | 1.083626982 | 1.611827585 | 1.487437662 | 4.29E-03 |
| 10346668 | Fam117b | 1.756050775 | 1.273650631 | 1.713280466 | 0.858370731 | 0.725292599 | 0.975644037 | 0.488807467 | 1.345173021 | 0.673945201 | 0.501010049 | 4.31E-03 |
| 10404067 | Hist1h4b | 0.422800884 | 0.502650505 | 0.532516673 | 0.636912906 | 1.188858691 | 1.259497539 | 1.506413375 | 1.059417363 | 1.267108856 | 1.196043127 | 4.31E-03 |
| 10490150 | Zbp1 | 0.943191335 | 0.616490534 | 0.591899239 | 1.21866109 | 0.653621923 | 0.627549488 | 1.292061371 | 0.960110831 | 1.976771778 | 2.058899572 | 4.36E-03 |
| 10455389 | Scgb3a2 | 0.96518972 | 1.009831814 | 0.515885781 | 2.00734343 | 1.046252144 | 0.534491582 | 2.079739752 | 0.51086307 | 1.987799753 | 3.891061752 | 4.42E-03 |
| 10412298 | Itga1 | 0.499099883 | 0.412560095 | 0.44327805 | 0.803926136 | 0.826608277 | 0.888154987 | 1.610752003 | 1.074456924 | 1.948627962 | 1.813593377 | 4.47E-03 |
| 10593492 | Zc3h12c | 1.540725576 | 0.729345438 | 1.085277443 | 0.980500377 | 0.4733779 | 0.704393735 | 0.63638872 | 1.488015672 | 1.344356632 | 0.903455963 | 4.49E-03 |
| 10558295 | Zranb1 | 2.734264293 | 1.918179483 | 2.300127233 | 1.107019159 | 0.701534043 | 0.841223447 | 0.404869113 | 1.199119923 | 0.577119696 | 0.481286054 | 4.49E-03 |
| 10440393 | Samsn1 | 2.144415748 | 1.458565352 | 1.215270906 | 1.775014961 | 0.68016911 | 0.566714224 | 0.827738261 | 0.833196061 | 1.2169595 | 1.460591999 | 4.56E-03 |
| 10380571 | Gngt2 | 1.458509075 | 1.514899156 | 0.951309396 | 1.963786337 | 1.038662825 | 0.652247842 | 1.346434089 | 0.627968794 | 1.296314893 | 2.064298267 | 4.57E-03 |
| 10548307 | Klrb1c | 1.379559509 | 0.489508781 | 0.95251248 | 0.802423501 | 0.354829769 | 0.690446823 | 0.581651966 | 1.945853715 | 1.639242301 | 0.842428333 | 4.63E-03 |
| 10581813 | Mlkl | 1.240190943 | 0.64136264 | 0.648658748 | 1.431556082 | 0.517148301 | 0.523031354 | 1.154302964 | 1.011375949 | 2.232054057 | 2.20694793 | 4.66E-03 |
| 10380551 | Phb | 0.53363487 | 0.440169654 | 0.533579303 | 0.703429348 | 0.824851745 | 0.999895871 | 1.31818475 | 1.212212833 | 1.598086878 | 1.318322026 | 4.71E-03 |
| 10499431 | Syt11 | 2.666002509 | 1.380279403 | 1.317803932 | 1.795206348 | 0.517733723 | 0.494299584 | 0.673370089 | 0.954737083 | 1.300610835 | 1.362271203 | 4.73E-03 |
| 10411622 | Naip6 | 2.045960304 | 2.051107368 | 1.557273962 | 1.633645831 | 1.00251572 | 0.761145736 | 0.798473865 | 0.759235711 | 0.796470168 | 1.049042025 | 4.87E-03 |
| 10385518 | Tgtp1 | 1.102776812 | 0.813916319 | 0.670033575 | 1.495850571 | 0.738060785 | 0.607587653 | 1.356439993 | 0.823221699 | 1.837843198 | 2.232500918 | 4.87E-03 |
| 10439321 | Slc15a2 | 2.194486768 | 1.554028199 | 1.658743446 | 1.278387214 | 0.708151091 | 0.755868511 | 0.582544964 | 1.067383106 | 0.822628068 | 0.770696166 | 4.88E-03 |
| 10406968 | Cenpk | 0.906214938 | 0.531368206 | 0.624114298 | 1.083375473 | 0.586360016 | 0.688704491 | 1.19549505 | 1.174542043 | 2.038841354 | 1.735860684 | 4.92E-03 |
| 10469151 | Itih5 | 1.431858428 | 0.554597453 | 0.793853005 | 1.099848971 | 0.387327016 | 0.554421435 | 0.768126897 | 1.431403986 | 1.983148256 | 1.385456709 | 4.92E-03 |
| 10545135 | Il12rb2 | 0.619813053 | 0.343712991 | 0.880003908 | 0.328790166 | 0.554543002 | 1.419789247 | 0.53046667 | 2.560287017 | 0.956583471 | 0.373623529 | 5.04E-03 |
| 10372648 | Lyz2 | 1.027486185 | 0.457136251 | 0.291254503 | 2.491657235 | 0.444907443 | 0.283463181 | 2.42500315 | 0.637128432 | 5.450578968 | 8.554914043 | 5.04E-03 |
| 10606554 | Nap1l3 | 2.068403063 | 2.052594038 | 1.594670059 | 1.632562161 | 0.992356894 | 0.770966785 | 0.789286281 | 0.776904751 | 0.795365343 | 1.023761719 | 5.09E-03 |
| 10533729 | Vps37b | 1.8155033 | 1.191032046 | 1.60875029 | 0.851141162 | 0.656034085 | 0.886118075 | 0.468818295 | 1.350719568 | 0.714624904 | 0.52906978 | 5.27E-03 |
| 10414202 | Sftpa1 | 0.91934384 | 1.036288902 | 0.619644903 | 1.694754896 | 1.127204922 | 0.674007783 | 1.843439661 | 0.597946096 | 1.635407746 | 2.735042099 | 5.28E-03 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10467637 | Arhgap19 | 0.643534407 | 0.456354773 | 0.629282849 | 0.685371911 | 0.70913811 | 0.97785424 | 1.06501207 | 1.378933421 | 1.501840127 | 1.089131719 | 5.29E-03 |
| 10385533 | Tgtp1 | 0.908172138 | 0.665108577 | 0.56682144 | 1.347738123 | 0.732359592 | 0.624134364 | 1.484011749 | 0.852223921 | 2.026343021 | 2.377711972 | 5.41E-03 |
| 10449581 | Mtch1 | 0.577912282 | 0.486381619 | 0.72741015 | 0.538595611 | 0.841618416 | 1.25868609 | 0.931967754 | 1.495554358 | 1.107351903 | 0.740429057 | 5.64E-03 |
| 10355312 | Ikzf2 | 2.718834426 | 1.526780063 | 2.007634268 | 1.162453289 | 0.561556838 | 0.73841726 | 0.427555749 | 1.31494661 | 0.761375732 | 0.579016461 | 5.71E-03 |
| 10452516 | Ankrd12 | 2.571997499 | 1.903589005 | 2.146827785 | 1.188989233 | 0.740120862 | 0.834692797 | 0.462282422 | 1.127779042 | 0.624603961 | 0.553835404 | 5.75E-03 |
| 10445338 | Enpp5 | 2.095237728 | 1.778680268 | 1.454447721 | 1.708369496 | 0.848915731 | 0.694168352 | 0.815358311 | 0.817711731 | 0.960470258 | 1.174582951 | 5.79E-03 |
| 10601011 | Kif4 | 0.536031217 | 0.334995371 | 0.479472863 | 0.655625471 | 0.624954966 | 0.894486827 | 1.223110614 | 1.431282053 | 1.957118 | 1.367388067 | 5.81E-03 |
| 10511282 | Tnfrsf4 | 1.60195151 | 0.828581523 | 0.771311848 | 1.61533877 | 0.517232586 | 0.481482644 | 1.008356845 | 0.93088227 | 1.949523042 | 2.094274545 | 5.81E-03 |
| 10508651 | Sdc3 | 0.959782414 | 1.025081617 | 0.70122784 | 1.466968457 | 1.068035423 | 0.730611261 | 1.528438566 | 0.684070252 | 1.431074787 | 2.091999738 | 5.83E-03 |
| 10548333 | Cd69 | 1.873987531 | 1.247683726 | 0.899036232 | 2.157788994 | 0.665790836 | 0.479745045 | 1.151442557 | 0.720564205 | 1.729435873 | 2.400113496 | 5.83E-03 |
| 10447317 | Epas1 | 0.705064055 | 0.456089967 | 0.458655598 | 1.064351383 | 0.64687735 | 0.650516212 | 1.509581116 | 1.005625274 | 2.333643491 | 2.320589539 | 5.84E-03 |
| 10408200 | Hist1h4f | 0.268491362 | 0.368982045 | 0.361525922 | 0.561257775 | 1.374279017 | 1.346508579 | 2.090412782 | 0.979792722 | 1.521097795 | 1.552468967 | 5.87E-03 |
| 10594540 | Plekho2 | 0.528672908 | 0.592449826 | 0.488895663 | 0.967167756 | 1.120635873 | 0.924760198 | 1.829425607 | 0.82521024 | 1.632488885 | 1.97827027 | 5.92E-03 |
| 10487340 | Ncaph | 0.575780381 | 0.419970443 | 0.617332325 | 0.594144341 | 0.729393459 | 1.072166307 | 1.031894036 | 1.469942313 | 1.414728942 | 0.96243841 | 5.92E-03 |
| 10399391 | Gen1 | 0.507232721 | 0.306716727 | 0.424385926 | 0.697487963 | 0.604686397 | 0.836669065 | 1.375084718 | 1.383641287 | 2.274046059 | 1.643522841 | 6.06E-03 |
| 10573261 | Asf1b | 0.59760083 | 0.474744516 | 0.516451308 | 0.830378362 | 0.79441743 | 0.864207815 | 1.389520094 | 1.087851025 | 1.74910575 | 1.607854118 | 6.10E-03 |
| 10491300 | Skil | 2.253125785 | 1.476346478 | 1.487991924 | 1.401979549 | 0.655243701 | 0.660412275 | 0.622237586 | 1.007888017 | 0.949627726 | 0.94219567 | 6.15E-03 |
| 10592201 | Chek1 | 0.660895256 | 0.475638386 | 0.588803361 | 0.791922968 | 0.719688002 | 0.890917821 | 1.198257909 | 1.237922292 | 1.664968578 | 1.344970188 | 6.18E-03 |
| 10385500 | Irgm1 | 0.959451344 | 0.523481641 | 0.533970656 | 1.23409131 | 0.545605199 | 0.556537504 | 1.286246893 | 1.020037024 | 2.357468175 | 2.311159419 | 6.18E-03 |
| 10377429 | Snord118 | 2.611846733 | 3.192130324 | 0.859372939 | 5.415624738 | 1.222173676 | 0.329028855 | 2.073484891 | 0.26921612 | 1.696555024 | 6.30183299 | 6.18E-03 |
| 10380059 | Rnu3b1 | 0.777521892 | 1.947021407 | 0.61641038 | 2.426607208 | 2.504137088 | 0.792788455 | 3.120950332 | 0.316591475 | 1.246317683 | 3.936674798 | 6.18E-03 |
| 10588007 | Tfdp2 | 2.020212493 | 1.101077221 | 1.505073438 | 1.0870799 | 0.545030399 | 0.74500749 | 0.538101761 | 1.366909977 | 0.987287612 | 0.722276981 | 6.18E-03 |
| 10494407 | Hist2h2bb | 0.347910407 | 0.516193318 | 0.627547763 | 0.442343187 | 1.483696112 | 1.80376255 | 1.271428442 | 1.215722367 | 0.85693319 | 0.704875729 | 6.18E-03 |
| 10573082 | Inpp4b | 2.093014762 | 1.293901525 | 1.01363954 | 1.984292879 | 0.618199904 | 0.484296412 | 0.94805489 | 0.783397747 | 1.533573337 | 1.957592223 | 6.27E-03 |
| 10438445 | Klhl6 | 0.468673054 | 0.520429351 | 0.758522384 | 0.466246159 | 1.110431562 | 1.618446755 | 0.994821773 | 1.457493475 | 0.895887515 | 0.614676862 | 6.32E-03 |
| 10533246 | Oas1g | 1.380725587 | 0.890021824 | 0.749136518 | 1.610170986 | 0.644604426 | 0.542567274 | 1.166177408 | 0.841705785 | 1.809136519 | 2.149369235 | 6.42E-03 |
| 10435501 | Stfa1 | 1.19455885 | 0.546401913 | 0.873485613 | 0.868171603 | 0.457408953 | 0.731220244 | 0.726771731 | 1.598613755 | 1.588888295 | 0.993916317 | 6.42E-03 |
| 10510580 | Tnfrsf9 | 1.578787524 | 0.700395968 | 0.725107889 | 1.501793504 | 0.443629024 | 0.459281492 | 0.951232184 | 1.035282786 | 2.144206383 | 2.071131106 | 6.45E-03 |
| 10379615 | Slfn5 | 1.504107616 | 0.812965265 | 0.695152161 | 1.747858492 | 0.540496742 | 0.462169165 | 1.162056806 | 0.855082241 | 2.1499793 | 2.514353821 | 6.48E-03 |
| 10463704 | As3mt | 0.649496518 | 1.91571565 | 1.268128047 | 0.841331184 | 2.949539524 | 1.952478593 | 1.295359037 | 0.661960478 | 0.439173311 | 0.663443401 | 6.60E-03 |
| 10443690 | Glp1r | 2.183546701 | 2.134998378 | 1.422295277 | 1.987214093 | 0.9777663 | 0.651369296 | 0.910085455 | 0.666180964 | 0.930780142 | 1.397188141 | 6.64E-03 |
| 10494411 | Rnu1b1 | 0.473645303 | 1.173073894 | 0.527008408 | 1.418150252 | 2.476692759 | 1.112664696 | 2.994118683 | 0.449254229 | 1.208918091 | 2.690944264 | 6.70E-03 |
| 10450796 | Armcx5 | 2.262570434 | 1.658419192 | 1.737809986 | 1.283968501 | 0.732980139 | 0.7680689 | 0.567482223 | 1.047871367 | 0.774212278 | 0.73884286 | 6.77E-03 |
| 10590267 | Snora62 | 0.600247075 | 1.213967165 | 0.799581778 | 1.03906329 | 2.02244578 | 1.332087753 | 1.731059314 | 0.658651899 | 0.855923719 | 1.299508467 | 6.78E-03 |
| 10372781 | Irak3 | 0.631656344 | 0.346624616 | 0.598527087 | 0.610923278 | 0.548755062 | 0.947551769 | 0.967176668 | 1.726729894 | 1.762492477 | 1.020711162 | 6.82E-03 |
| 10504470 | Melk | 0.669567623 | 0.476657515 | 0.610034037 | 0.767454024 | 0.711888536 | 0.911086522 | 1.146193451 | 1.279816258 | 1.610074321 | 1.258051155 | 6.85E-03 |
| 10508723 | Snora61 | 1.759065035 | 2.010441195 | 1.153415737 | 2.138122036 | 1.142903278 | 0.655698177 | 1.215487769 | 0.573712745 | 1.063508866 | 1.853730591 | 6.85E-03 |
| 10507112 | Stil | 0.716960627 | 0.394211809 | 0.63121938 | 0.643052501 | 0.549837458 | 0.880410103 | 0.896914666 | 1.601218851 | 1.631236018 | 1.018746448 | 6.85E-03 |
| 10362674 | Rnu3a | 0.367331888 | 1.337906933 | 0.373804968 | 1.905318046 | 3.642229213 | 1.017621884 | 5.186911644 | 0.279395344 | 1.424103575 | 5.097091292 | 6.99E-03 |
| 10555510 | Pde2a | 1.285094647 | 1.241482837 | 1.637302967 | 0.666564879 | 0.966063348 | 1.274071891 | 0.518689328 | 1.318828516 | 0.536910265 | 0.407111507 | 7.00E-03 |
| 10497646 | Phc3 | 2.008943005 | 1.903155058 | 1.815758423 | 1.320317922 | 0.947341489 | 0.903837699 | 0.657220199 | 0.954078027 | 0.693752155 | 0.727144044 | 7.25E-03 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10518561 | Apitd1 | 0.541521039 | 0.453079928 | 0.483561121 | 0.832239081 | 0.836680194 | 0.892968298 | 1.536854564 | 1.06727553 | 1.836848267 | 1.721062851 | 7.46E-03 |
| 10515431 | Kif2c | 0.498210906 | 0.412198141 | 0.481107298 | 0.727510243 | 0.827356721 | 0.965669946 | 1.46024552 | 1.167174837 | 1.76495275 | 1.512157985 | 7.46E-03 |
| 10430372 | Rac2 | 0.457377157 | 0.54202843 | 0.621240732 | 0.587300389 | 1.185079801 | 1.358267947 | 1.28406148 | 1.146140493 | 1.083523219 | 0.945366842 | 7.52E-03 |
| 10450363 | Snord52 | 0.396230362 | 0.800413719 | 0.355490664 | 1.427841713 | 2.020071645 | 0.897181787 | 3.603564618 | 0.444133647 | 1.78387961 | 4.016537866 | 7.53E-03 |
| 10497971 | Sclt1 | 2.320792072 | 1.281467095 | 1.307810405 | 1.59106291 | 0.55216799 | 0.56351899 | 0.685568918 | 1.020557149 | 1.241594823 | 1.216585297 | 8.09E-03 |
| 10584841 | Amica1 | 1.020807521 | 0.678052246 | 0.533516697 | 1.543330147 | 0.664231241 | 0.522641817 | 1.511871842 | 0.78683715 | 2.276122756 | 2.892749478 | 8.34E-03 |
| 10353674 | Lsm5 | 0.719568398 | 0.500892965 | 0.51051422 | 1.040176329 | 0.69610195 | 0.70947282 | 1.445555881 | 1.019208206 | 2.076643919 | 2.037507062 | 8.34E-03 |
| 10375880 | Nhp2 | 0.486546083 | 0.440514683 | 0.502730491 | 0.701071114 | 0.90539149 | 1.033263875 | 1.440914107 | 1.141234356 | 1.591481831 | 1.394526744 | 8.34E-03 |
| 10563260 | Snrnp70 | 0.482598636 | 0.582731458 | 0.688966143 | 0.580076687 | 1.207486749 | 1.427617263 | 1.201985758 | 1.182304704 | 0.995444265 | 0.841952384 | 8.37E-03 |
| 10389395 | Brip1 | 0.63686796 | 0.405602665 | 0.517872519 | 0.806751579 | 0.63687089 | 0.81315524 | 1.266748572 | 1.276797625 | 1.989019426 | 1.557818865 | 8.39E-03 |
| 10531987 | Gbp4 | 1.377217202 | 0.884487436 | 0.75412489 | 1.631057091 | 0.64222799 | 0.5475715 | 1.184313621 | 0.852612326 | 1.84407039 | 2.162847445 | 8.39E-03 |
| 10581306 | Rps2 | 0.556569804 | 0.462639899 | 0.596358669 | 0.658690977 | 0.831234278 | 1.071489442 | 1.183483136 | 1.289034235 | 1.423766039 | 1.104521509 | 8.71E-03 |
| 10496204 | Cenpe | 0.747861925 | 0.470943716 | 0.561142951 | 0.944739729 | 0.62972014 | 0.750329616 | 1.263254215 | 1.191528694 | 2.006056555 | 1.683599032 | 8.78E-03 |
| 10346722 | Nbeal1 | 2.385857552 | 1.618743781 | 1.734425898 | 1.343342845 | 0.678474614 | 0.726961212 | 0.563044027 | 1.07146413 | 0.829867494 | 0.77451729 | 8.88E-03 |
| 10487480 | Bub1 | 0.600330116 | 0.342599791 | 0.469304102 | 0.768471473 | 0.570685665 | 0.781743394 | 1.280081497 | 1.369831839 | 2.243058788 | 1.63747018 | 8.90E-03 |
| 10531972 | Gbp8 | 1.80128493 | 1.35466139 | 0.970447843 | 2.021040662 | 0.752052808 | 0.538753102 | 1.121999429 | 0.716376691 | 1.491915749 | 2.082585557 | 8.95E-03 |
| 10472235 | Dapl1 | 1.559136868 | 1.906182764 | 1.931864009 | 0.827673679 | 1.222588473 | 1.239059923 | 0.530853767 | 1.013472604 | 0.434204786 | 0.428432682 | 9.14E-03 |
| 10345752 | Il1r2 | 2.451746705 | 0.751026816 | 1.017693297 | 1.505840166 | 0.306323167 | 0.415089085 | 0.614190757 | 1.355069187 | 2.00504181 | 1.479660101 | 9.19E-03 |
| 10606532 | Acp1 | 0.505347426 | 0.402822695 | 0.509966285 | 0.68133997 | 0.797120305 | 1.009139967 | 1.348260491 | 1.265982011 | 1.69141406 | 1.336049047 | 9.37E-03 |
| 10499639 | Cks1b | 0.575227526 | 0.43833598 | 0.504240356 | 0.832965216 | 0.762021913 | 0.876592883 | 1.448062163 | 1.15035128 | 1.900289399 | 1.651920967 | 9.43E-03 |
| 10535904 | Hsph1 | 0.752425263 | 0.93542034 | 0.584068517 | 1.428050251 | 1.243206981 | 0.776247882 | 1.897929695 | 0.624391508 | 1.526640152 | 2.445004669 | 9.47E-03 |
| 10358408 | Rgs1 | 2.405053378 | 1.8778976 | 1.420120378 | 1.903007089 | 0.780813273 | 0.590473538 | 0.791253577 | 0.756228869 | 1.013371064 | 1.340032238 | 9.47E-03 |
| 10351095 | Tnfsf4 | 2.209448011 | 1.499913791 | 1.384198658 | 1.618911026 | 0.678863582 | 0.626490712 | 0.732721937 | 0.922852144 | 1.07933605 | 1.169565522 | 9.53E-03 |
| 10382701 | Sap30bp | 0.498578566 | 0.456663252 | 0.592054311 | 0.61465079 | 0.915930374 | 1.187484485 | 1.232806285 | 1.296478988 | 1.345960698 | 1.038166226 | 9.54E-03 |
| 10359982 | Atf6 | 0.64363763 | 0.491113619 | 0.62327185 | 0.742682902 | 0.763028133 | 0.968358314 | 1.153883594 | 1.269099096 | 1.512242529 | 1.191587429 | 9.71E-03 |
| 10563780 | E2f8 | 0.597866866 | 0.404272572 | 0.568497874 | 0.656528364 | 0.676191633 | 0.950877038 | 1.098117995 | 1.4062242 | 1.623974538 | 1.154847526 | 9.96E-03 |
| 10416945 | Mir17hg | 2.445077568 | 1.729389139 | 1.987181739 | 1.221170105 | 0.707294182 | 0.812727484 | 0.499440231 | 1.149065699 | 0.706128006 | 0.614523614 | 9.99E-03 |
| 10395538 | Pnpla8 | 2.457856189 | 1.350336372 | 2.116637638 | 0.898513482 | 0.549396005 | 0.861172288 | 0.365567964 | 1.567489169 | 0.665399748 | 0.42450038 | 9.99E-03 |
| 10372383 | Zdhhc17 | 2.669028479 | 2.050414321 | 1.541135182 | 2.085671527 | 0.768224969 | 0.577414289 | 0.781434722 | 0.751621351 | 1.017195162 | 1.353334575 | 9.99E-03 |
| 10391207 | Dhx58 | 1.083786246 | 0.715616545 | 0.597865784 | 1.450390258 | 0.660293068 | 0.55164548 | 1.338262285 | 0.835455508 | 2.026770157 | 2.425946252 | 1.02E-02 |
| 10450325 | Cfb | 0.937825218 | 0.527044908 | 0.575513551 | 1.149971725 | 0.561986282 | 0.613668239 | 1.226211135 | 1.091963023 | 2.181923606 | 1.998166201 | 1.05E-02 |
| 10444658 | Clic1 | 0.544499125 | 0.479050538 | 0.56544441 | 0.696302507 | 0.879800382 | 1.038467068 | 1.278794537 | 1.180343962 | 1.453505321 | 1.231425219 | 1.05E-02 |
| 10587508 | Ttk | 0.669456052 | 0.43878654 | 0.595380707 | 0.735350852 | 0.655437409 | 0.889349952 | 1.098430361 | 1.356880062 | 1.67587377 | 1.235093518 | 1.06E-02 |
| 10390535 | Arl5c | 0.779220577 | 0.939954753 | 1.205023688 | 0.558468185 | 1.206275579 | 1.546447467 | 0.716701023 | 1.282001803 | 0.594143689 | 0.463449964 | 1.08E-02 |
| 10384373 | Fignl1 | 0.536292792 | 0.426526639 | 0.492730756 | 0.793355393 | 0.795324205 | 0.918771915 | 1.479332566 | 1.15521684 | 1.860037149 | 1.610119489 | 1.08E-02 |
| 10604076 | Snora69 | 3.254288523 | 2.870975453 | 2.012168046 | 2.147372093 | 0.882212942 | 0.618312738 | 0.65985916 | 0.700865639 | 0.747959057 | 1.067193218 | 1.08E-02 |
| 10375980 | Aff4 | 1.989238157 | 1.301798311 | 1.730925082 | 0.954211631 | 0.654420541 | 0.870144721 | 0.479686973 | 1.329641518 | 0.732994983 | 0.551272635 | 1.08E-02 |
| 10369815 | Cdk1 | 0.636598878 | 0.456519989 | 0.469641267 | 0.987431778 | 0.717123458 | 0.73773499 | 1.551105119 | 1.028741957 | 2.162954093 | 2.102523454 | 1.08E-02 |
| 10408094 | Hist1h2ao | 0.429246327 | 0.49911291 | 0.523136282 | 0.649814689 | 1.162765709 | 1.218732111 | 1.513850318 | 1.04813214 | 1.301939252 | 1.242151827 | 1.09E-02 |
| 10416037 | Pbk | 0.780098239 | 0.454633215 | 0.622101178 | 0.822832684 | 0.582789696 | 0.797465175 | 1.054780851 | 1.368358398 | 1.809882465 | 1.322666976 | 1.10E-02 |
| 10386058 | Sparc | 0.989431528 | 1.129338306 | 0.616194591 | 1.866972245 | 1.141401171 | 0.622776386 | 1.886914042 | 0.545624449 | 1.653155866 | 3.029841987 | 1.10E-02 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10404045 | Hist1h2ad | 0.429810032 | 0.503079729 | 0.525813408 | 0.648485927 | 1.170469954 | 1.223362344 | 1.508773361 | 1.04518902 | 1.289032116 | 1.233300476 | 1.11E-02 |
| 10595753 | Trpc1 | 2.159091256 | 1.497905358 | 1.795834089 | 1.128177453 | 0.69376658 | 0.831754602 | 0.52252421 | 1.198896899 | 0.75317005 | 0.628219199 | 1.13E-02 |
| 10461152 | Snhg1 | 0.899734267 | 1.671689553 | 0.799993908 | 1.822913072 | 1.857981421 | 0.889144647 | 2.02605718 | 0.478554111 | 1.090461485 | 2.278658693 | 1.14E-02 |
| 10422776 | Phb | 0.537546847 | 0.415289352 | 0.524431165 | 0.687875446 | 0.772564018 | 0.975600857 | 1.27965674 | 1.26280908 | 1.656376313 | 1.311660122 | 1.15E-02 |
| 10410560 | Trip13 | 0.662482067 | 0.447151871 | 0.569790835 | 0.78390942 | 0.674964492 | 0.86008492 | 1.183291532 | 1.274266914 | 1.753116715 | 1.375784536 | 1.15E-02 |
| 10597871 | Higd1a | 2.101519537 | 1.923679032 | 1.211148601 | 2.281322192 | 0.915375279 | 0.57632041 | 1.085558403 | 0.629600147 | 1.185916234 | 1.883602219 | 1.17E-02 |
| 10514221 | Plin2 | 0.920832079 | 0.499346007 | 0.598415278 | 1.056370536 | 0.542276945 | 0.649863631 | 1.147191285 | 1.198398045 | 2.115508128 | 1.765280023 | 1.19E-02 |
| 10373569 | Rpsa | 0.421775826 | 0.379288478 | 0.554130101 | 0.476529395 | 0.89926557 | 1.313802422 | 1.129816756 | 1.460972672 | 1.256377196 | 0.85995941 | 1.19E-02 |
| 10379636 | Slfn4 | 1.519683009 | 0.696268567 | 0.781747645 | 1.392941398 | 0.458166975 | 0.514414941 | 0.916599969 | 1.122767394 | 2.000580615 | 1.781829991 | 1.19E-02 |
| 10347193 | Atic | 0.445622979 | 0.534225337 | 0.571252819 | 0.646797569 | 1.198828074 | 1.281919573 | 1.451445729 | 1.069310606 | 1.210720504 | 1.132243987 | 1.20E-02 |
| 10501629 | Cdc14a | 1.619132082 | 0.681789634 | 0.721395507 | 1.572724766 | 0.421083395 | 0.445544569 | 0.971338153 | 1.058091045 | 2.306759575 | 2.180114448 | 1.23E-02 |
| 10528090 | Rundc3b | 2.162245751 | 1.981286292 | 2.010205079 | 1.145727396 | 0.916309485 | 0.929683907 | 0.529878436 | 1.014595966 | 0.578274528 | 0.569955478 | 1.26E-02 |
| 10368970 | Prdm1 | 1.255917451 | 1.057412391 | 0.752597326 | 1.730517681 | 0.841944182 | 0.599241077 | 1.377891262 | 0.711734922 | 1.63655892 | 2.299393875 | 1.27E-02 |
| 10516051 | Cap1 | 0.43817415 | 0.436003263 | 0.447115669 | 0.745935427 | 0.995045608 | 1.020406314 | 1.702372054 | 1.025486979 | 1.710848268 | 1.668327636 | 1.27E-02 |
| 10492469 | Mlf1 | 2.101886774 | 1.494231573 | 1.43041712 | 1.45384625 | 0.710900126 | 0.680539569 | 0.691686283 | 0.957292796 | 0.972972514 | 1.016379229 | 1.27E-02 |
| 10560260 | Sae1 | 0.504446832 | 0.431879194 | 0.538694227 | 0.664405935 | 0.856144129 | 1.06789099 | 1.317098041 | 1.247326185 | 1.538406906 | 1.233363754 | 1.27E-02 |
| 10460359 | Coro1b | 0.489280039 | 0.578625012 | 0.569672199 | 0.722334979 | 1.182604982 | 1.164307051 | 1.476322192 | 0.984527436 | 1.248364597 | 1.267983554 | 1.30E-02 |
| 10350377 | Zbtb41 | 2.106345913 | 1.209509743 | 1.360246444 | 1.333121627 | 0.574221801 | 0.645784928 | 0.632907263 | 1.124626281 | 1.102199991 | 0.980058895 | 1.32E-02 |
| 10582985 | Casp1 | 2.443317421 | 2.084625193 | 1.397930331 | 2.224623345 | 0.853194585 | 0.57214438 | 0.910492974 | 0.670590731 | 1.067157469 | 1.591369252 | 1.32E-02 |
| 10352918 | Mir29c | 5.610280592 | 2.561354308 | 2.348585094 | 2.443045623 | 0.45654656 | 0.418621681 | 0.435458723 | 0.916930972 | 0.953810106 | 1.040220186 | 1.32E-02 |
| 10408118 | Hist1h2ag | 0.431434083 | 0.498216714 | 0.523820727 | 0.647072121 | 1.1547922 | 1.214138491 | 1.499816881 | 1.051391316 | 1.298776421 | 1.235293084 | 1.34E-02 |
| 10460376 | Ppp1ca | 0.431416816 | 0.456338933 | 0.486477875 | 0.687310575 | 1.057768071 | 1.127628449 | 1.593147392 | 1.066045081 | 1.506140557 | 1.41283008 | 1.34E-02 |
| 10364990 | Eef2 | 0.487966142 | 0.550474628 | 0.691322723 | 0.546069971 | 1.128100047 | 1.416743219 | 1.119073484 | 1.255866644 | 0.991998438 | 0.789891541 | 1.34E-02 |
| 10442262 | Zfp758 | 2.292147279 | 1.412952097 | 1.451551522 | 1.516754366 | 0.616431636 | 0.63327149 | 0.661717674 | 1.027318283 | 1.073464818 | 1.044919414 | 1.34E-02 |
| 10450605 | Tubb5 | 0.448284226 | 0.384830662 | 0.449469523 | 0.671302092 | 0.858452382 | 1.002644074 | 1.497492112 | 1.167967025 | 1.744409059 | 1.493543073 | 1.35E-02 |
| 10385375 | Thg1l | 0.449430018 | 0.367812613 | 0.467019835 | 0.633194206 | 0.818397968 | 1.039138055 | 1.408882765 | 1.269722184 | 1.72151303 | 1.35581866 | 1.36E-02 |
| 10457205 | Crem | 2.668883537 | 1.495907782 | 1.796495469 | 1.272900081 | 0.56049946 | 0.673126213 | 0.476941037 | 1.200939985 | 0.850921492 | 0.708546224 | 1.36E-02 |
| 10419151 | Ear1 | 1.032118398 | 1.056558153 | 0.61946086 | 1.799575609 | 1.023679217 | 0.600183914 | 1.743574781 | 0.586300771 | 1.703243313 | 2.905067496 | 1.38E-02 |
| 10591472 | Cdc37 | 0.455953283 | 0.534508993 | 0.594332847 | 0.625058663 | 1.172288944 | 1.303495049 | 1.370883127 | 1.111923008 | 1.169407197 | 1.051697993 | 1.39E-02 |
| 10353034 | Snord87 | 2.249551867 | 2.176058303 | 1.561340224 | 1.889618699 | 0.967329687 | 0.694067226 | 0.839997835 | 0.717508452 | 0.868367679 | 1.210254286 | 1.40E-02 |
| 10445894 | Erh | 0.541373238 | 0.439692845 | 0.5037118 | 0.76893589 | 0.812180608 | 0.930433507 | 1.42034337 | 1.145599265 | 1.748802369 | 1.52653936 | 1.41E-02 |
| 10408072 | Hist1h2ai | 0.419903566 | 0.493969726 | 0.519920266 | 0.635372833 | 1.176388501 | 1.23818969 | 1.513139885 | 1.052534677 | 1.286258651 | 1.222058217 | 1.45E-02 |
| 10496539 | Gbp5 | 1.027085313 | 0.682694178 | 0.629913883 | 1.327510593 | 0.664690819 | 0.613302395 | 1.29250275 | 0.92268823 | 1.944517231 | 2.107447747 | 1.52E-02 |
| 10569014 | Ifitm2 | 1.321134083 | 0.798959689 | 0.638505815 | 1.697297526 | 0.604752916 | 0.483301296 | 1.28472768 | 0.799171502 | 2.124384433 | 2.658233468 | 1.53E-02 |
| 10394674 | Socs2 | 0.800461403 | 0.892780446 | 0.610173184 | 1.337955287 | 1.115332286 | 0.762276834 | 1.671480076 | 0.683452675 | 1.498638654 | 2.192746783 | 1.55E-02 |
| 10420668 | Mir15a | 2.964653132 | 0.824901022 | 1.414598872 | 1.195809075 | 0.278245375 | 0.477154935 | 0.403355476 | 1.714871037 | 1.449639463 | 0.845334391 | 1.57E-02 |
| 10408111 | Hist1h2ah | 0.422571912 | 0.497909882 | 0.521802645 | 0.639619451 | 1.178284377 | 1.234825673 | 1.513634563 | 1.04798612 | 1.284608871 | 1.225788057 | 1.57E-02 |
| 10403955 | Hist1h2ao | 0.422103133 | 0.495903053 | 0.521102351 | 0.637996657 | 1.174838597 | 1.234537984 | 1.511471029 | 1.050814969 | 1.286535046 | 1.224321203 | 1.57E-02 |
| 10368486 | Rnf146 | 2.576151841 | 2.088941918 | 2.392570706 | 1.085257848 | 0.810876861 | 0.928738232 | 0.421270917 | 1.145350517 | 0.519525143 | 0.453594891 | 1.57E-02 |
| 10552418 | Etfb | 0.596435764 | 0.471696704 | 0.526781742 | 0.830698268 | 0.790859188 | 0.883216222 | 1.392770719 | 1.11678063 | 1.761085589 | 1.576930636 | 1.59E-02 |
| 10548565 | Magohb | 1.365716193 | 1.176375638 | 0.79035393 | 1.91205721 | 0.861361712 | 0.578710229 | 1.400039935 | 0.671855065 | 1.625379809 | 2.419241731 | 1.60E-02 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10586744 | Anxa2 | 0.719983409 | 0.477237014 | 0.591078675 | 0.827513 | 0.662844461 | 0.820961522 | 1.149350096 | 1.238543234 | 1.733966509 | 1.400004829 | 1.61E-02 |
| 10496592 | Gbp2 | 0.818753223 | 0.638263675 | 0.567568047 | 1.194217564 | 0.779555619 | 0.693210153 | 1.458580597 | 0.889237581 | 1.871041092 | 2.104095836 | 1.64E-02 |
| 10403938 | Hist1h2ai | 0.444774041 | 0.514791517 | 0.535421041 | 0.660441622 | 1.157422577 | 1.20380461 | 1.484892466 | 1.040073551 | 1.282930276 | 1.233499568 | 1.65E-02 |
| 10389214 | Ccl9 | 1.803002884 | 2.058801588 | 1.377255219 | 1.806140042 | 1.141873708 | 0.763867452 | 1.001739963 | 0.668959664 | 0.87727737 | 1.31140548 | 1.66E-02 |
| 10358389 | Rgs2 | 2.090360171 | 1.433515564 | 1.199991514 | 1.764148528 | 0.685774435 | 0.574059691 | 0.843944767 | 0.837096955 | 1.230644837 | 1.47013417 | 1.67E-02 |
| 10493259 | Ssr2 | 0.391260533 | 0.332723689 | 0.494407731 | 0.483144379 | 0.85038909 | 1.263627912 | 1.234840568 | 1.485940879 | 1.452088912 | 0.977218496 | 1.67E-02 |
| 10540650 | Arpc4 | 0.482220369 | 0.58619755 | 0.615404236 | 0.649601082 | 1.215621711 | 1.276188805 | 1.347104195 | 1.049823965 | 1.10816069 | 1.055568102 | 1.67E-02 |
| 10542470 | Mgst1 | 1.560528043 | 0.592968531 | 0.606819451 | 1.733289142 | 0.379979414 | 0.388855204 | 1.110706821 | 1.023358608 | 2.92307104 | 2.856350664 | 1.76E-02 |
| 10515425 | Snord38a | 1.492087919 | 2.6952925 | 1.267614992 | 2.052120162 | 1.806389869 | 0.849557842 | 1.375334615 | 0.470307023 | 0.761371971 | 1.618882843 | 1.76E-02 |
| 10420877 | Esco2 | 0.638492372 | 0.445642581 | 0.546389343 | 0.796873078 | 0.697960698 | 0.855749211 | 1.248054187 | 1.226070771 | 1.788143933 | 1.458434517 | 1.78E-02 |
| 10439312 | Cd86 | 2.258242932 | 0.882290154 | 0.970944514 | 1.664143508 | 0.390697627 | 0.429955741 | 0.736919613 | 1.100482091 | 1.886163525 | 1.713942953 | 1.79E-02 |
| 10376778 | Mfap4 | 1.042573861 | 1.265821535 | 0.714719511 | 1.736011995 | 1.214131278 | 0.685533695 | 1.66512135 | 0.564628972 | 1.371450831 | 2.428941659 | 1.80E-02 |
| 10374464 | Spred2 | 2.503363468 | 1.412253003 | 1.642341454 | 1.332651082 | 0.564142211 | 0.656053935 | 0.532344223 | 1.162922968 | 0.943634801 | 0.811433626 | 1.81E-02 |
| 10392183 | Ern1 | 0.708825687 | 0.478811291 | 0.825768612 | 0.545991986 | 0.675499351 | 1.164981219 | 0.770276806 | 1.724622263 | 1.140307248 | 0.661192467 | 1.81E-02 |
| 10394558 | Rpl29 | 0.536319403 | 0.440542002 | 0.612571185 | 0.575651354 | 0.821417236 | 1.142176064 | 1.073336804 | 1.390494396 | 1.306688923 | 0.93972973 | 1.81E-02 |
| 10396068 | Ppil5 | 0.571779336 | 0.46293912 | 0.538609925 | 0.786036283 | 0.809646468 | 0.94198914 | 1.37471964 | 1.163457357 | 1.697925816 | 1.4593795 | 1.82E-02 |
| 10565994 | Art2b | 2.265364895 | 1.629261566 | 1.262403071 | 2.066200005 | 0.719204915 | 0.557262573 | 0.912082645 | 0.774831431 | 1.268181886 | 1.636719723 | 1.84E-02 |
| 10463505 | Dpcd | 0.495834717 | 0.533753063 | 0.493927364 | 0.878094133 | 1.076473763 | 0.99615325 | 1.770941209 | 0.925385536 | 1.645131791 | 1.777779884 | 1.85E-02 |
| 10408085 | Hist1h2an | 0.400799485 | 0.480528345 | 0.500446516 | 0.62615545 | 1.198924558 | 1.248620657 | 1.562266103 | 1.041450564 | 1.30305622 | 1.251193542 | 1.89E-02 |
| 10493189 | Mef2d | 2.127224202 | 2.147875623 | 2.080821552 | 1.138796458 | 1.009708155 | 0.978186291 | 0.53534388 | 0.968781213 | 0.530196649 | 0.547282134 | 1.92E-02 |
| 10351509 | Fcgr4 | 1.264946595 | 0.536830004 | 0.747810357 | 1.091808751 | 0.424389461 | 0.59117939 | 0.863126361 | 1.393011479 | 2.033807246 | 1.460007529 | 1.99E-02 |
| 10577190 | Rasa3 | 0.556170336 | 0.569028362 | 0.913693931 | 0.42230883 | 1.023118865 | 1.642831113 | 0.759315632 | 1.605708945 | 0.742157787 | 0.462199447 | 2.00E-02 |
| 10580300 | Asna1 | 0.460848448 | 0.544830047 | 0.472162058 | 0.831725898 | 1.182232574 | 1.024549525 | 1.804770964 | 0.866622648 | 1.526578613 | 1.76152633 | 2.00E-02 |
| 10568217 | Dctpp1 | 0.570047161 | 0.504009435 | 0.487138638 | 0.918562794 | 0.884153926 | 0.854558486 | 1.611380352 | 0.966526823 | 1.822511108 | 1.885629104 | 2.00E-02 |
| 10363735 | Egr2 | 1.541129494 | 1.27200788 | 0.817612244 | 2.023450071 | 0.825373783 | 0.530527933 | 1.31296564 | 0.64277294 | 1.59075278 | 2.474828484 | 2.00E-02 |
| 10404051 | Hist1h4d | 0.355849872 | 0.367291656 | 0.437023666 | 0.546704607 | 1.032153401 | 1.228112473 | 1.536334983 | 1.1898546 | 1.488475435 | 1.250972543 | 2.00E-02 |
| 10573198 | Dnajb1 | 1.115539845 | 1.055612355 | 0.752298805 | 1.52236675 | 0.946279382 | 0.674380936 | 1.364690608 | 0.712665783 | 1.442164581 | 2.023619789 | 2.03E-02 |
| 10528207 | Cd36 | 1.584590255 | 1.356469935 | 0.754062783 | 2.392326593 | 0.856038292 | 0.47587241 | 1.509744608 | 0.555900845 | 1.763641443 | 3.17258277 | 2.05E-02 |
| 10526838 | Got2 | 0.57923357 | 0.486663678 | 0.725083162 | 0.538927442 | 0.840185554 | 1.251797546 | 0.930414724 | 1.489906057 | 1.107391956 | 0.74326294 | 2.06E-02 |
| 10404389 | Irf4 | 1.260720887 | 0.654836685 | 0.667794303 | 1.311357853 | 0.519414481 | 0.529692424 | 1.040165089 | 1.019787557 | 2.002572372 | 1.963715245 | 2.08E-02 |
| 10591781 | Anln | 0.632513257 | 0.484624997 | 0.510462707 | 0.9301683 | 0.766189469 | 0.807038749 | 1.470590995 | 1.053314854 | 1.919356836 | 1.82220618 | 2.11E-02 |
| 10547943 | Ncapd2 | 0.541302889 | 0.476204397 | 0.593862173 | 0.638747631 | 0.8797374 | 1.097097733 | 1.180018883 | 1.247074107 | 1.341330813 | 1.075582281 | 2.15E-02 |
| 10410295 | Zfp595 | 2.251670722 | 1.649448044 | 1.420223829 | 1.682260457 | 0.732544074 | 0.630742237 | 0.747116548 | 0.861029745 | 1.019892965 | 1.184503753 | 2.15E-02 |
| 10546685 | Eif4e3 | 1.240354984 | 0.810392861 | 0.740644301 | 1.496620585 | 0.653355589 | 0.597122848 | 1.206606661 | 0.91393241 | 1.846784019 | 2.020700873 | 2.15E-02 |
| 10497831 | Ccna2 | 0.640936456 | 0.486342646 | 0.63283889 | 0.704674563 | 0.758800099 | 0.987366039 | 1.099445284 | 1.301220231 | 1.448926121 | 1.113513368 | 2.15E-02 |
| 10395259 | Nampt | 1.559336401 | 0.734486927 | 0.820943196 | 1.381302573 | 0.47102532 | 0.52646959 | 0.885827184 | 1.117709745 | 1.880636024 | 1.682579965 | 2.15E-02 |
| 10503315 | Rad54b | 0.734049442 | 0.485131462 | 0.595650927 | 0.862303138 | 0.660897529 | 0.811458865 | 1.174720788 | 1.227813435 | 1.777462823 | 1.447665233 | 2.18E-02 |
| 10445268 | Gpr116 | 0.924671952 | 1.016467189 | 0.685057575 | 1.466607243 | 1.099273301 | 0.740865529 | 1.586083842 | 0.673959359 | 1.442847599 | 2.14085253 | 2.18E-02 |
| 10389719 | Scpep1 | 0.68545093 | 0.470490113 | 0.817502324 | 0.500993354 | 0.686395033 | 1.192648939 | 0.730896016 | 1.737554735 | 1.064832905 | 0.612834165 | 2.19E-02 |
| 10414262 | Ear2 | 2.089357396 | 0.917225466 | 0.744382111 | 2.248263653 | 0.438998837 | 0.356273232 | 1.076055087 | 0.811558487 | 2.451157035 | 3.020308547 | 2.19E-02 |
| 10360070 | Fcer1g | 1.569256563 | 0.765627925 | 0.689297846 | 1.801665533 | 0.487892129 | 0.439251211 | 1.148101321 | 0.900303951 | 2.353186809 | 2.613769277 | 2.22E-02 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10445067 | Znrd1as | 2.118860749 | 2.041485759 | 1.553155212 | 1.739401677 | 0.96348274 | 0.733014292 | 0.820913634 | 0.760796496 | 0.852027338 | 1.119914909 | 2.24E-02 |
| 10424676 | Ly6e | 0.625372928 | 0.431784479 | 0.566453746 | 0.697062993 | 0.690443189 | 0.905785525 | 1.114635704 | 1.311890014 | 1.614377143 | 1.230573544 | 2.25E-02 |
| 10499035 | Mnd1 | 0.75822153 | 0.386151288 | 0.535606829 | 0.845618893 | 0.509285574 | 0.706398866 | 1.115266264 | 1.387038828 | 2.189864233 | 1.578805286 | 2.26E-02 |
| 10408081 | Hist1h1b | 0.293391907 | 0.421689863 | 0.449693048 | 0.502035085 | 1.437292078 | 1.532738422 | 1.711141561 | 1.066407062 | 1.190531547 | 1.116395033 | 2.26E-02 |
| 10578690 | Neil3 | 0.736653247 | 0.462085597 | 0.659053173 | 0.732336758 | 0.627276944 | 0.894658614 | 0.994140406 | 1.426257768 | 1.584850864 | 1.111195255 | 2.26E-02 |
| 10425226 | Eif3l | 0.505898902 | 0.448036748 | 0.57737239 | 0.605082843 | 0.885625064 | 1.141280179 | 1.196054865 | 1.288671951 | 1.350520568 | 1.047994074 | 2.31E-02 |
| 10578515 | Ankrd37 | 1.137030477 | 0.977915625 | 0.72561094 | 1.629184654 | 0.860061049 | 0.63816314 | 1.432841676 | 0.74199749 | 1.665976708 | 2.245259222 | 2.36E-02 |
| 10563099 | Snord35b | 0.429586 | 0.612094081 | 0.920766321 | 0.355583841 | 1.424846435 | 2.143380651 | 0.827736101 | 1.504288883 | 0.580930043 | 0.386182501 | 2.40E-02 |
| 10584580 | Snord14e | 0.732160154 | 1.227874627 | 0.46169197 | 2.327212449 | 1.677057432 | 0.630588769 | 3.178556546 | 0.376009048 | 1.895317647 | 5.040617121 | 2.40E-02 |
| 10408693 | F13a1 | 1.180234916 | 0.588280942 | 0.826750602 | 0.97499683 | 0.49844394 | 0.700496647 | 0.826104038 | 1.405366965 | 1.657365997 | 1.179311908 | 2.41E-02 |
| 10368886 | Foxo3 | 2.220157757 | 2.093988817 | 1.57468426 | 1.765617643 | 0.943171182 | 0.709266832 | 0.79526675 | 0.75200223 | 0.843183893 | 1.121251852 | 2.41E-02 |
| 10351825 | Tagln2 | 0.483202463 | 0.589508363 | 0.505366876 | 0.824255542 | 1.220002812 | 1.045869828 | 1.705818174 | 0.857268375 | 1.398208396 | 1.631004288 | 2.42E-02 |
| 10376060 | Irf1 | 0.830182927 | 0.688360803 | 0.585168678 | 1.206549625 | 0.829167621 | 0.704867155 | 1.453353935 | 0.850090064 | 1.752786649 | 2.061883469 | 2.45E-02 |
| 10583100 | Mmp8 | 0.880775388 | 0.493900207 | 0.733085068 | 0.790009018 | 0.56075614 | 0.832317839 | 0.8969472 | 1.484277709 | 1.599531661 | 1.077649856 | 2.45E-02 |
| 10450145 | Psmb9 | 0.67042954 | 0.473767209 | 0.49968117 | 0.954735575 | 0.706662192 | 0.745314967 | 1.424065495 | 1.054697669 | 2.01519978 | 1.910689518 | 2.48E-02 |
| 10501586 | S1pr1 | 0.63738993 | 0.644683889 | 1.016592637 | 0.451127032 | 1.011443481 | 1.594930496 | 0.707772449 | 1.576885437 | 0.699764705 | 0.44376382 | 2.52E-02 |
| 10575733 | Cenpn | 0.634887524 | 0.481416194 | 0.684440692 | 0.622783015 | 0.758270048 | 1.078050309 | 0.980934404 | 1.42172345 | 1.293647832 | 0.909915239 | 2.55E-02 |
| 10404026 | Hist1h2af | 0.423196619 | 0.498137219 | 0.519167909 | 0.640406915 | 1.177082228 | 1.226777071 | 1.513260943 | 1.042218668 | 1.285603425 | 1.233525617 | 2.55E-02 |
| 10412207 | Gpx8 | 1.086954022 | 3.671116832 | 1.479658712 | 1.63995192 | 3.377435254 | 1.361289146 | 1.508759236 | 0.403054106 | 0.446717442 | 1.108331203 | 2.55E-02 |
| 10583310 | Taf1d | 3.035151645 | 1.590260717 | 1.366862512 | 2.05249406 | 0.523947698 | 0.450344059 | 0.676241025 | 0.859521019 | 1.290665133 | 1.501609739 | 2.57E-02 |
| 10439299 | Stfa3 | 0.92233709 | 0.323991043 | 0.651738696 | 0.645084702 | 0.351271836 | 0.706616598 | 0.699402322 | 2.011594796 | 1.991057208 | 0.989790395 | 2.60E-02 |
| 10480432 | Mastl | 0.649135648 | 0.362344531 | 0.65524445 | 0.537582122 | 0.558195398 | 1.009410671 | 0.828150669 | 1.808346459 | 1.483621457 | 0.820429874 | 2.61E-02 |
| 10473356 | Ube2l6 | 1.242446281 | 1.103148419 | 0.793056016 | 1.601961385 | 0.887884197 | 0.638302056 | 1.289360683 | 0.718902372 | 1.452172126 | 2.019985163 | 2.63E-02 |
| 10421517 | Cysltr2 | 2.035476021 | 1.033522447 | 0.863519366 | 2.073691539 | 0.507754666 | 0.424234605 | 1.018774732 | 0.835510993 | 2.00643106 | 2.401441844 | 2.72E-02 |
| 10536499 | Cav1 | 0.92063375 | 1.27192837 | 0.67909477 | 1.689547298 | 1.381579123 | 0.737638361 | 1.83520026 | 0.533909603 | 1.328335257 | 2.487940376 | 2.78E-02 |
| 10403943 | Hist1h2bm | 0.310144356 | 0.355230464 | 0.367675436 | 0.578025313 | 1.145371363 | 1.185497748 | 1.863729911 | 1.035033515 | 1.627183961 | 1.572107509 | 2.78E-02 |
| 10456400 | Tubb6 | 1.107573881 | 1.062156532 | 0.733841132 | 1.621058778 | 0.958993842 | 0.662566303 | 1.46361232 | 0.690897349 | 1.526195743 | 2.209005065 | 2.83E-02 |
| 10533256 | Oas1a | 1.744650774 | 1.226814187 | 0.792050186 | 2.245223743 | 0.703186108 | 0.453987811 | 1.286918721 | 0.645615444 | 1.830125349 | 2.834698841 | 2.89E-02 |
| 10505276 | Slc31a1 | 0.737624898 | 0.428061858 | 0.683566649 | 0.628416771 | 0.580324578 | 0.926713091 | 0.851946257 | 1.596887547 | 1.468051311 | 0.919320408 | 2.89E-02 |
| 10500324 | Hist2h2ac | 0.4523965 | 0.516771556 | 0.558925922 | 0.632718505 | 1.142297866 | 1.235477998 | 1.398592839 | 1.081572535 | 1.2243679 | 1.132025694 | 3.01E-02 |
| 10445875 | Btg3 | 2.094770029 | 1.454861552 | 1.229623803 | 1.778884444 | 0.694520894 | 0.586997039 | 0.849202738 | 0.845182692 | 1.222717338 | 1.446689987 | 3.02E-02 |
| 10419156 | Ear10 | 1.595468511 | 0.997729294 | 0.815924654 | 1.821869621 | 0.625351919 | 0.51140129 | 1.141902587 | 0.817781595 | 1.826015965 | 2.232889534 | 3.03E-02 |
| 10346876 | Snora41 | 3.972020787 | 2.039796641 | 1.458954035 | 2.894382153 | 0.51354128 | 0.367307754 | 0.7286926 | 0.715244846 | 1.418956231 | 1.983874807 | 3.09E-02 |
| 10362097 | H60b | 2.309484767 | 1.108957618 | 2.082481288 | 0.746086925 | 0.480175333 | 0.901708172 | 0.323053408 | 1.877872746 | 0.672782181 | 0.358268249 | 3.10E-02 |
| 10404069 | Hist1h1a | 0.416310348 | 0.693751219 | 0.486207173 | 0.896916395 | 1.666427996 | 1.16789596 | 2.15444175 | 0.700837937 | 1.292850189 | 1.844720613 | 3.10E-02 |
| 10458382 | Cd14 | 2.307436105 | 1.455973588 | 1.058325261 | 2.27332984 | 0.630991942 | 0.458658534 | 0.985218977 | 0.726884931 | 1.561381236 | 2.148044579 | 3.11E-02 |
| 10467124 | Acta2 | 0.920684016 | 0.80618482 | 0.61746771 | 1.374321508 | 0.875636816 | 0.670661921 | 1.492717897 | 0.765913343 | 1.704722632 | 2.225738262 | 3.12E-02 |
| 10365482 | Timp3 | 1.015275246 | 1.072960955 | 0.73551289 | 1.500830659 | 1.056817803 | 0.724446787 | 1.478250026 | 0.685498281 | 1.39877472 | 2.040522579 | 3.15E-02 |
| 10407792 | Gpr137b-ps | 2.304680533 | 1.532382137 | 1.941678261 | 1.074133153 | 0.664900022 | 0.842493453 | 0.466065963 | 1.267097948 | 0.700956457 | 0.553198321 | 3.16E-02 |
| 10440419 | Btg3 | 2.040754655 | 1.42308962 | 1.209045662 | 1.753163853 | 0.697334987 | 0.592450278 | 0.859076249 | 0.849592074 | 1.231941986 | 1.450039405 | 3.25E-02 |
| 10405587 | Tgfbi | 0.984632432 | 0.60728056 | 0.576357985 | 1.334662592 | 0.616758641 | 0.585353444 | 1.355493227 | 0.949080248 | 2.197769334 | 2.315683355 | 3.26E-02 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10466210 | Ms4a6d | 1.25111049 | 0.687940512 | 0.67833541 | 1.472069199 | 0.549863915 | 0.542186654 | 1.176610068 | 0.986037889 | 2.139820483 | 2.170119939 | 3.28E-02 |
| 10351873 | Pyhin1 | 1.490720049 | 1.004651347 | 0.813849511 | 1.738467775 | 0.673936966 | 0.545943896 | 1.166193329 | 0.81008154 | 1.730418996 | 2.136104713 | 3.28E-02 |
| 10466606 | Anxa1 | 0.558562519 | 0.467278666 | 0.474817944 | 0.90143257 | 0.836573617 | 0.85007126 | 1.613843643 | 1.016134435 | 1.929111331 | 1.898480421 | 3.28E-02 |
| 10503833 | Rplp1 // Rplp1 // Rplp1 | 0.468962535 | 0.485591807 | 0.527225074 | 0.690576725 | 1.035459703 | 1.124237086 | 1.472562676 | 1.085737168 | 1.422134218 | 1.309832858 | 3.31E-02 |
| 10409220 | Hist2h2aa1 | 0.453715976 | 0.526358336 | 0.565862593 | 0.634330592 | 1.160105363 | 1.247173615 | 1.398078591 | 1.075052021 | 1.205130702 | 1.120997569 | 3.32E-02 |
| 10494662 | Ywhah | 0.589519829 | 0.490629786 | 0.558310094 | 0.796662619 | 0.832253236 | 0.947059058 | 1.351375442 | 1.13794578 | 1.623755106 | 1.426917815 | 3.36E-02 |
| 10531931 | Sparcl1 | 1.016498417 | 0.953929082 | 0.679606423 | 1.496063064 | 0.938446205 | 0.668575977 | 1.471781007 | 0.712428665 | 1.568316862 | 2.201366872 | 3.46E-02 |
| 10425049 | Apol9b | 1.269326699 | 1.295900153 | 0.831682243 | 1.771904574 | 1.020935078 | 0.655215276 | 1.395940521 | 0.64177957 | 1.367315661 | 2.130506679 | 3.48E-02 |
| 10603567 | Dynlt3 | 2.440359488 | 1.312702907 | 1.446009623 | 1.488326516 | 0.537913743 | 0.592539595 | 0.60988003 | 1.101551323 | 1.133787781 | 1.0292646 | 3.51E-02 |
| 10567171 | Snord14a | 2.307898501 | 2.634362559 | 1.243484186 | 2.840012168 | 1.141455119 | 0.538795006 | 1.230561988 | 0.472024696 | 1.078064277 | 2.283914987 | 3.56E-02 |
| 10461162 | Snord22 | 2.232664598 | 2.035655361 | 1.197681115 | 2.435376616 | 0.911760487 | 0.536435753 | 1.090793762 | 0.588351613 | 1.196359985 | 2.033409883 | 3.59E-02 |
| 10344819 | Cspp1 | 2.030693543 | 2.061434873 | 1.799118694 | 1.320452767 | 1.01513834 | 0.88596268 | 0.650247189 | 0.872750684 | 0.64055032 | 0.73394422 | 3.63E-02 |
| 10544932 | Inmt | 0.983310328 | 1.093986929 | 0.680329333 | 1.561103195 | 1.112555108 | 0.691876525 | 1.587599713 | 0.621880678 | 1.426985235 | 2.294628674 | 3.76E-02 |
| 10440513 | Cyyr1 | 1.091591323 | 1.137366085 | 0.73791233 | 1.672413369 | 1.041933974 | 0.675996881 | 1.532087452 | 0.648790516 | 1.470426621 | 2.266412013 | 3.90E-02 |
| 10364293 | Ube2g2 | 0.486203899 | 0.663101351 | 0.542410904 | 0.879998796 | 1.36383388 | 1.115603772 | 1.809937759 | 0.81799095 | 1.327095466 | 1.622384045 | 3.97E-02 |
| 10546706 | Rybp | 2.325205308 | 1.532474925 | 1.817366515 | 1.106370489 | 0.659070801 | 0.781593999 | 0.475816258 | 1.185902937 | 0.721950142 | 0.608776755 | 4.05E-02 |
| 10433145 | Gtsf1 | 0.906228263 | 0.463127805 | 0.66741619 | 0.853751285 | 0.511049836 | 0.736476908 | 0.94209298 | 1.441105851 | 1.843446401 | 1.279188756 | 4.08E-02 |
| 10451225 | Polh | 0.563214015 | 0.456480195 | 0.610457504 | 0.644321501 | 0.810491541 | 1.083881947 | 1.144008286 | 1.337314324 | 1.411499353 | 1.055473144 | 4.13E-02 |
| 10376455 | Hist3h2a | 0.459765371 | 0.471699629 | 0.445430253 | 0.840334132 | 1.025957279 | 0.968820797 | 1.827745597 | 0.944309102 | 1.781502635 | 1.88656726 | 4.13E-02 |
| 10375402 | Adam19 | 1.115723141 | 0.780540534 | 0.665163476 | 1.402073349 | 0.699582634 | 0.596172519 | 1.256649879 | 0.852183131 | 1.796285124 | 2.107862805 | 4.18E-02 |
| 10373407 | Esyt1 | 0.46405611 | 0.423710056 | 0.538273378 | 0.587297016 | 0.913057811 | 1.159931669 | 1.265573285 | 1.270381409 | 1.386082316 | 1.091075724 | 4.22E-02 |
| 10363070 | Gp49a | 2.706321601 | 1.300111801 | 1.097059312 | 2.190868192 | 0.480398117 | 0.405369159 | 0.809537267 | 0.843819209 | 1.685138301 | 1.997037141 | 4.39E-02 |
| 10500333 | Hist2h4 | 0.466546873 | 0.543787984 | 0.551473936 | 0.678625144 | 1.165559165 | 1.182033292 | 1.454570127 | 1.014134098 | 1.247959066 | 1.230566124 | 4.39E-02 |
| 10402800 | Gpr132 | 0.857574525 | 0.606249055 | 1.043025418 | 0.502390016 | 0.706934543 | 1.216250469 | 0.585826656 | 1.72045698 | 0.828685854 | 0.481666129 | 4.44E-02 |
| 10404061 | Hist1h2bb | 0.300696379 | 0.355776248 | 0.316023689 | 0.697795009 | 1.183174367 | 1.050972713 | 2.32059665 | 0.888265282 | 1.961331072 | 2.208046529 | 4.48E-02 |
| 10572932 | Naa20 | 1.717612962 | 0.88260393 | 0.798400578 | 1.709844777 | 0.513854954 | 0.464831481 | 0.995477337 | 0.904596672 | 1.937273016 | 2.1415876 | 4.52E-02 |
| 10591816 | Dpy19l1 | 0.496994314 | 0.432741387 | 0.49390457 | 0.732364819 | 0.870716977 | 0.99378314 | 1.473587924 | 1.141338882 | 1.692384509 | 1.482806322 | 4.58E-02 |
| 10427918 | Fam105a | 0.481210337 | 0.608875987 | 0.566145842 | 0.787821306 | 1.265301137 | 1.176503906 | 1.637166213 | 0.929821267 | 1.293894524 | 1.391551871 | 4.61E-02 |
| 10368144 | Tnfaip3 | 2.098070555 | 1.302858309 | 1.649823014 | 1.041273687 | 0.620979264 | 0.786352494 | 0.496300606 | 1.266310391 | 0.79922251 | 0.631142661 | 4.67E-02 |
| 10582303 | Cyba | 0.406180004 | 0.424600001 | 0.45033558 | 0.647013099 | 1.045349345 | 1.10870938 | 1.592922088 | 1.06061135 | 1.523817942 | 1.436735466 | 4.68E-02 |
| 10420483 | Phf11 | 1.20619063 | 0.848044875 | 0.726396541 | 1.479259887 | 0.703076988 | 0.602223664 | 1.226389802 | 0.856554367 | 1.744317938 | 2.036435755 | 4.70E-02 |
| 10497122 | Depdc1a | 0.809778262 | 0.480054019 | 0.631142932 | 0.82900718 | 0.592821568 | 0.779402166 | 1.023745905 | 1.314733147 | 1.726903946 | 1.313501488 | 4.78E-02 |
| 10559261 | Cd81 | 0.706021317 | 0.619560928 | 0.521757065 | 1.179148234 | 0.877538558 | 0.739010356 | 1.670131207 | 0.84214004 | 1.903199798 | 2.259956431 | 4.80E-02 |
| 10453632 | Rpl7a | 0.573719595 | 0.480439458 | 0.571159537 | 0.734359403 | 0.837411623 | 0.995537789 | 1.279997073 | 1.188827288 | 1.528516009 | 1.285734291 | 4.88E-02 |
| 10523058 | Eif5a | 0.349257912 | 0.452667214 | 0.38229705 | 0.758437897 | 1.29608292 | 1.09459811 | 2.171569696 | 0.844543272 | 1.675486701 | 1.983896808 | 4.90E-02 |
| 10427628 | Il7r | 1.123441728 | 1.319915072 | 1.579298595 | 0.66544491 | 1.174885211 | 1.405768146 | 0.592327036 | 1.196515313 | 0.504157369 | 0.421354715 | 4.93E-02 |
| 10581605 | Hp | 1.157815048 | 0.66428872 | 0.614683418 | 1.484682487 | 0.573743381 | 0.530899489 | 1.282314035 | 0.92532569 | 2.234995781 | 2.415361214 | 4.93E-02 |
| 10576883 | Shcbp1 | 0.753810431 | 0.395042559 | 0.511222473 | 0.92642272 | 0.524060881 | 0.678184398 | 1.228986337 | 1.294094679 | 2.345121303 | 1.812171351 | 4.93E-02 |
| 10404063 | Hist1h2ab | 0.20605657 | 0.258657365 | 0.247212246 | 0.539871253 | 1.255273562 | 1.199729987 | 2.620014747 | 0.955751816 | 2.087206188 | 2.18383701 | 4.94E-02 |
| 10593050 | Il10ra | 1.3249659 | 1.124933296 | 0.814250672 | 1.63745798 | 0.849028111 | 0.614544625 | 1.23584915 | 0.723821293 | 1.455604512 | 2.01099985 | 4.95E-02 |
| 10477167 | Mcts2 | 2.162674355 | 1.366144948 | 1.760504072 | 1.045043055 | 0.631692397 | 0.814040296 | 0.483217944 | 1.288665653 | 0.764957669 | 0.593604452 | 4.95E-02 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10344658 | Rb1cc1 | 1.970923108 | 1.478607233 | 1.881256578 | 0.959091702 | 0.750210511 | 0.954505313 | 0.486620558 | 1.272316634 | 0.648645348 | 0.509814405 | 4.98E-02 |
| 10455015 | Vaultrc5 | 0.861026113 | 0.944064099 | 0.596107338 | 1.437994272 | 1.096440728 | 0.692322021 | 1.670093682 | 0.631426763 | 1.52319559 | 2.412307615 | 5.11E-02 |
| 10480804 | Phpt1 | 0.542308916 | 0.366897836 | 0.490488205 | 0.697522535 | 0.676547675 | 0.904444295 | 1.286208864 | 1.33685227 | 1.901135591 | 1.422098488 | 5.20E-02 |
| 10368616 | Zufsp | 2.820588673 | 1.557747019 | 1.428808092 | 1.846695037 | 0.552277272 | 0.506563791 | 0.654719724 | 0.9172273 | 1.185490978 | 1.292472409 | 5.26E-02 |
| 10577508 | Ckap2 | 0.603779887 | 0.385019072 | 0.53495498 | 0.704097061 | 0.637681182 | 0.886009938 | 1.166148585 | 1.389424626 | 1.828732943 | 1.316180028 | 5.30E-02 |
| 10512487 | Rmrp | 0.335621862 | 0.733120094 | 0.431363698 | 0.86009438 | 2.184363344 | 1.285266982 | 2.562688776 | 0.588394319 | 1.173197116 | 1.993896063 | 5.40E-02 |
| 10363082 | Lilrb4 | 2.715765289 | 1.259554287 | 1.066142089 | 2.19740126 | 0.4637935 | 0.392575196 | 0.809127825 | 0.846443937 | 1.744586384 | 2.061077301 | 5.43E-02 |
| 10382844 | Snord1c | 0.383946587 | 0.870013516 | 0.573969412 | 0.913944048 | 2.265975385 | 1.494919948 | 2.380393728 | 0.659724708 | 1.05049408 | 1.59232187 | 5.49E-02 |
| 10600169 | Bgn | 1.064872546 | 1.1068292 | 0.751656093 | 1.517753036 | 1.039400635 | 0.705864843 | 1.425290793 | 0.679107574 | 1.371262192 | 2.019212044 | 5.54E-02 |
| 10592058 | Tuba1b | 0.573092906 | 0.44619198 | 0.493958072 | 0.797405493 | 0.778568317 | 0.86191622 | 1.39140702 | 1.10705278 | 1.787135424 | 1.614318175 | 5.62E-02 |
| 10584578 | Snord14c | 0.425360189 | 1.048068472 | 0.362718665 | 1.790506463 | 2.463955253 | 0.852732989 | 4.209388911 | 0.346082985 | 1.708386914 | 4.936350491 | 5.62E-02 |
| 10476297 | Mir103-2 | 2.96952519 | 1.02671168 | 1.524026322 | 1.322548593 | 0.345749443 | 0.513222224 | 0.445373758 | 1.484376142 | 1.288140204 | 0.867799049 | 5.67E-02 |
| 10406254 | Ell2 | 1.677918601 | 0.881412963 | 1.535295495 | 0.719154202 | 0.525301384 | 0.914999985 | 0.428598981 | 1.741857176 | 0.815910626 | 0.468414194 | 5.72E-02 |
| 10425834 | Samm50 | 0.622665582 | 0.497747792 | 0.626511719 | 0.711015339 | 0.799382214 | 1.00617689 | 1.141889578 | 1.258693116 | 1.428465079 | 1.134879552 | 5.80E-02 |
| 10461156 | Snhg1 | 1.426941195 | 1.527439722 | 0.907234443 | 2.004208835 | 1.07042934 | 0.63578965 | 1.404549004 | 0.593957608 | 1.312136123 | 2.209141032 | 5.83E-02 |
| 10476106 | Snord57 | 1.538601337 | 2.612774695 | 1.376847318 | 1.900358547 | 1.698149242 | 0.89486944 | 1.235120821 | 0.526967488 | 0.727333494 | 1.380224607 | 5.87E-02 |
| 10351039 | Gas5 | 1.811536195 | 2.001428656 | 1.171498478 | 2.139490059 | 1.104823995 | 0.646687867 | 1.18103633 | 0.58533112 | 1.068981426 | 1.826284967 | 5.95E-02 |
| 10449303 | Bak1 | 0.443922201 | 0.50455085 | 0.490498598 | 0.705885266 | 1.136574945 | 1.10492018 | 1.590110307 | 0.972148986 | 1.399036917 | 1.439117808 | 6.06E-02 |
| 10535025 | Got2 | 0.573567177 | 0.465816789 | 0.635924794 | 0.598640228 | 0.812139899 | 1.108718942 | 1.043714236 | 1.36518221 | 1.285140943 | 0.941369535 | 6.14E-02 |
| 10371662 | Spic | 0.535717962 | 0.34702455 | 0.676050049 | 0.455300632 | 0.647774715 | 1.261951432 | 0.849888681 | 1.948133205 | 1.312012744 | 0.673471783 | 6.16E-02 |
| 10497337 | Car1 | 0.570654636 | 0.274473003 | 0.496976574 | 0.597330887 | 0.480979187 | 0.870888525 | 1.046746753 | 1.810657403 | 2.176282846 | 1.201929665 | 6.20E-02 |
| 10492499 | Mfsd1 | 0.517218611 | 0.430875669 | 0.506591051 | 0.736652629 | 0.833062963 | 0.97945248 | 1.424257778 | 1.175724433 | 1.709664024 | 1.45413668 | 6.25E-02 |
| 10406407 | Arrdc3 | 2.318693374 | 1.709725605 | 1.479621125 | 1.648230969 | 0.737365977 | 0.63812712 | 0.710844732 | 0.865414381 | 0.964032453 | 1.113954742 | 6.31E-02 |
| 10446229 | Tnfsf9 | 1.20102138 | 0.746836342 | 0.574712031 | 1.716045587 | 0.621834344 | 0.478519401 | 1.428821848 | 0.769528742 | 2.29775319 | 2.985922504 | 6.44E-02 |
| 10408225 | Hist1h4c // Hist1h4c | 0.288783703 | 0.401075564 | 0.366724742 | 0.613892151 | 1.388844175 | 1.269894176 | 2.125785301 | 0.914353243 | 1.530614693 | 1.673986181 | 6.75E-02 |
| 10457357 | Mpp7 | 2.301794465 | 1.470536064 | 1.224947973 | 1.978470344 | 0.638865062 | 0.532170874 | 0.859533887 | 0.832994173 | 1.345407564 | 1.615146429 | 6.96E-02 |
| 10511290 | Tnfrsf18 | 1.251491115 | 0.587366577 | 0.748740631 | 1.071529168 | 0.469333398 | 0.598278823 | 0.856201978 | 1.274741635 | 1.824293737 | 1.431108616 | 7.13E-02 |
| 10543118 | Glcci1 | 2.026438071 | 1.323015375 | 1.492430614 | 1.218014162 | 0.652877279 | 0.736479755 | 0.601061626 | 1.128052359 | 0.920634926 | 0.816127832 | 7.29E-02 |
| 10395273 | Gdap10 | 2.068254275 | 0.848376285 | 0.785001052 | 2.0277123 | 0.410189547 | 0.379547651 | 0.980397974 | 0.925298204 | 2.390109597 | 2.58306953 | 7.41E-02 |
| 10569020 | Ifitm6 | 2.598738496 | 1.429102649 | 1.368790148 | 1.808534835 | 0.549921683 | 0.526713307 | 0.695927981 | 0.957796943 | 1.265503802 | 1.321265233 | 7.52E-02 |
| 10437673 | Tnp2 | 0.965390014 | 0.893936944 | 0.67658624 | 1.387283914 | 0.925985282 | 0.700842385 | 1.437019126 | 0.756861258 | 1.551881173 | 2.050416978 | 7.57E-02 |
| 10407985 | Gpr141 | 0.964355119 | 0.457763267 | 0.710870359 | 0.850366169 | 0.474683296 | 0.737145834 | 0.881797744 | 1.552921369 | 1.857654886 | 1.19623242 | 7.81E-02 |
| 10360406 | Ifi205 | 1.733017795 | 0.575431223 | 0.704121383 | 1.539812924 | 0.332039997 | 0.406297838 | 0.888515356 | 1.223641254 | 2.675928698 | 2.18685721 | 7.84E-02 |
| 10456974 | Arf1 | 0.462708923 | 0.42044227 | 0.543566042 | 0.56256991 | 0.908653904 | 1.174747265 | 1.215818155 | 1.292843468 | 1.338043175 | 1.034961469 | 8.01E-02 |
| 10547793 | Rnu7 | 1.6162143 | 2.786201955 | 0.980334218 | 3.134480216 | 1.723906264 | 0.606562025 | 1.939396413 | 0.351853252 | 1.125001083 | 3.197358776 | 8.01E-02 |
| 10461154 | Snhg1 | 1.134898655 | 1.597996593 | 0.858306865 | 1.857639694 | 1.40805224 | 0.756285032 | 1.63683311 | 0.537114328 | 1.162480385 | 2.164307161 | 8.01E-02 |
| 10408202 | Hist1h3e | 0.346940575 | 0.403334628 | 0.41749565 | 0.577206856 | 1.16254672 | 1.203363573 | 1.663705249 | 1.035109861 | 1.431086786 | 1.382545796 | 8.11E-02 |
| 10413596 | Sfmbt1 | 2.164866276 | 1.436473199 | 1.447215848 | 1.43676162 | 0.663538998 | 0.668501267 | 0.663672226 | 1.007478489 | 1.000200784 | 0.992776318 | 8.12E-02 |
| 10571840 | Hpgd | 1.171505586 | 1.598030875 | 0.824369243 | 1.983888803 | 1.364083018 | 0.703683578 | 1.693452277 | 0.515865654 | 1.241458368 | 2.406553641 | 8.21E-02 |
| 10372652 | Lyz1 | 1.113452807 | 0.921815699 | 0.697229591 | 1.634940714 | 0.827889331 | 0.626186926 | 1.468352052 | 0.756365498 | 1.773609102 | 2.344910107 | 8.23E-02 |
| 10486057 | Rab5b | 0.464082318 | 0.650841314 | 0.477050786 | 0.956153821 | 1.402426444 | 1.027944328 | 2.060310821 | 0.732975574 | 1.469104373 | 2.004301951 | 8.37E-02 |

| ID | Gene.Symbol | D30cl13vs D8Arm.FC | D30cl13vs D8cl13.FC | D30cl13vs HMPVLung.FC | D30cl13vs HMPVSpleen.FC | D8Armvs D8cl13.FC | D8Armvs HMPVLung.FC | D8Armvs HMPVSpleen.FC | D8cl13vs HMPVLung.FC | D8cl13vs HMPVSpleen.FC | HMPVLungvs HMPVSpleen.FC | adj.P.Val |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10482177 | Strbp | 2.060971057 | 1.616175924 | 1.678334635 | 1.295406647 | 0.784181766 | 0.814341681 | 0.628541892 | 1.038460362 | 0.801525767 | 0.771840502 | 8.40E-02 |
| 10447566 | Atp5g2 | 0.479480427 | 0.411442588 | 0.450813267 | 0.74736208 | 0.858100904 | 0.940212032 | 1.558691528 | 1.095689361 | 1.816443172 | 1.657808532 | 8.45E-02 |
| 10402512 | Scarna13 | 1.082821125 | 1.303624057 | 1.499703237 | 0.666906475 | 1.203914503 | 1.384996287 | 0.615897178 | 1.150410833 | 0.511578834 | 0.444692296 | 8.51E-02 |
| 10548552 | Klra2 | 1.173424693 | 0.549293201 | 0.739225355 | 1.074806292 | 0.468111166 | 0.629972558 | 0.91595677 | 1.345775542 | 1.956707803 | 1.453962969 | 8.73E-02 |
| 10406928 | Cd180 | 1.261043 | 0.620533577 | 0.817467298 | 1.086226489 | 0.492079633 | 0.648246965 | 0.861371491 | 1.317361909 | 1.750471737 | 1.328770572 | 8.81E-02 |
| 10496569 | Gbp6 | 0.840064527 | 0.612831368 | 0.57509939 | 1.172593338 | 0.729505113 | 0.684589543 | 1.395837224 | 0.938430081 | 1.913402933 | 2.038940324 | 9.00E-02 |
| 10454512 | Sft2d3 | 2.167380264 | 1.621769658 | 1.839244576 | 1.139599378 | 0.748262631 | 0.848602623 | 0.525795772 | 1.134097291 | 0.702688802 | 0.61960187 | 9.14E-02 |
| 10425799 | Rnu12 | 0.752779477 | 1.245354293 | 0.660747281 | 1.527662269 | 1.654341451 | 0.877743484 | 2.029362269 | 0.530569722 | 1.226688885 | 2.312022028 | 9.20E-02 |
| 10408077 | Hist1h2ak | 0.39360033 | 0.505165335 | 0.435324013 | 0.745517908 | 1.283447436 | 1.106005202 | 1.894098788 | 0.861745616 | 1.475789919 | 1.712558661 | 9.36E-02 |
| 10404049 | Hist1h3d | 0.331260744 | 0.368400711 | 0.402725811 | 0.540865505 | 1.11211702 | 1.215736602 | 1.632748571 | 1.093173272 | 1.468144575 | 1.343011774 | 9.43E-02 |
| 10539091 | Sftpb | 0.922323002 | 1.09680198 | 0.702877 | 1.525524043 | 1.1891734 | 0.762072504 | 1.65400195 | 0.640842205 | 1.390883743 | 2.17039972 | 9.44E-02 |
| 10405927 | Zfp455 | 2.251600085 | 1.943185507 | 1.443000101 | 1.879669808 | 0.863024264 | 0.640877619 | 0.834815126 | 0.742595134 | 0.967313621 | 1.302612389 | 9.48E-02 |
| 10565990 | Art2a-ps | 2.196570194 | 1.723410385 | 1.419293174 | 1.778376649 | 0.784591537 | 0.646140596 | 0.809615215 | 0.823537555 | 1.031893891 | 1.253001621 | 9.51E-02 |
| 10502655 | Cyr61 | 0.963030519 | 1.145363265 | 0.734640528 | 1.536782798 | 1.189332261 | 0.762842417 | 1.595777879 | 0.641403955 | 1.341742699 | 2.091884043 | 9.57E-02 |
| 10548497 | Klra6 | 2.133247055 | 1.720139542 | 1.387085397 | 1.810517273 | 0.806348021 | 0.650222577 | 0.848714296 | 0.806379577 | 1.05254093 | 1.305267345 | 9.65E-02 |
| 10526508 | Fis1 | 0.584733102 | 0.489133703 | 0.579280986 | 0.724388084 | 0.836507633 | 0.990675889 | 1.23883543 | 1.184299879 | 1.480961297 | 1.250495186 | 9.78E-02 |