

Decoding equine IBH: Single-cell insights into allergen-specific immune dysregulation

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Equine insect bite hypersensitivity (IBH)

Seasonal allergic **IgE mediated** dermatitis with
Th2 dominance

Cause:

- Bites from *Culicoides spp.*

Clinical signs:

- Pruritic papules → self-trauma

Diagnosis:

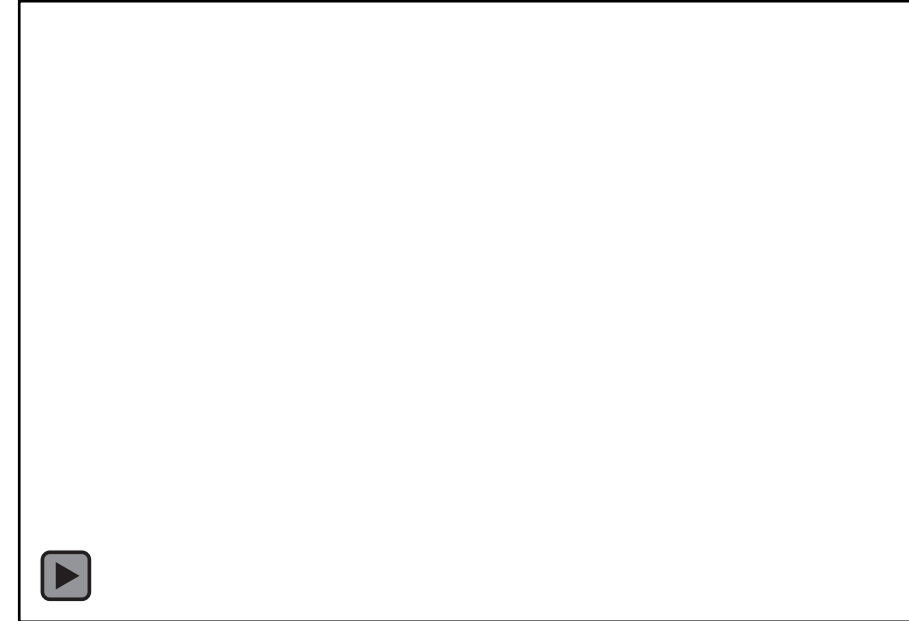
- Clinical signs, exclusion of other diseases
- IgE testing (intradermal or serological)

Treatment

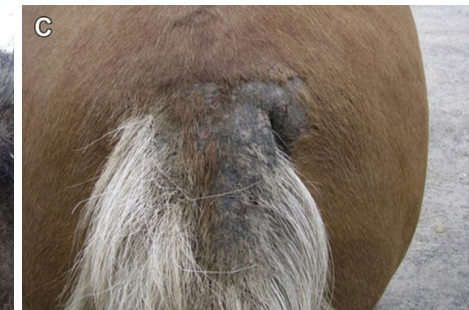
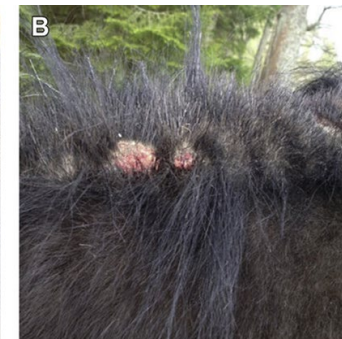
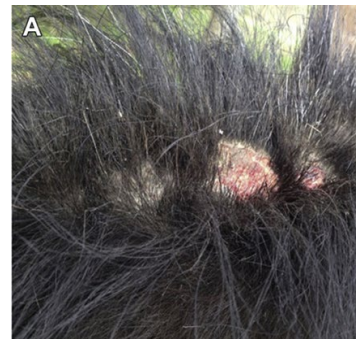
- Strict insect control



<https://infravec2.eu/wp-content/uploads/2017/08/Culicoides-nubeculosus.jpg>



Video taken by Fenja Johanna Von der Hören

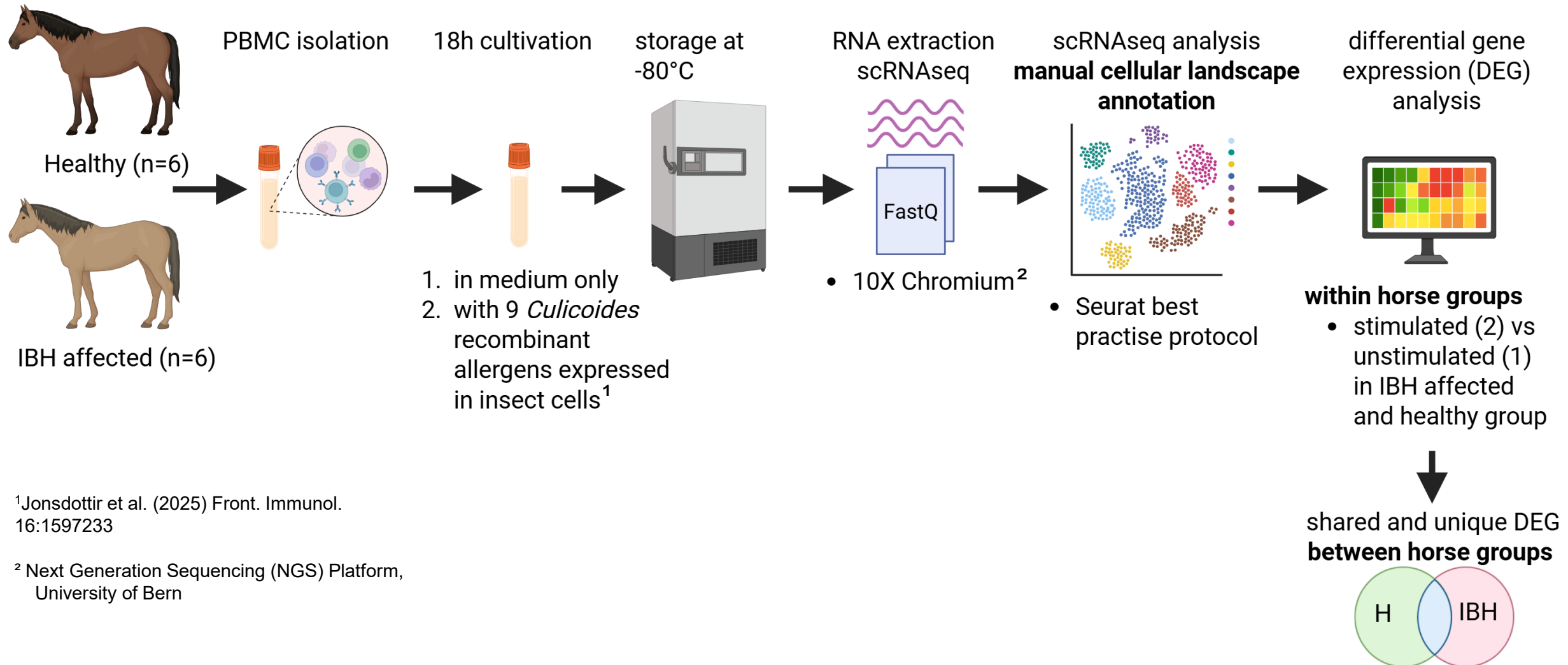


Genetics of Skin Disease in Horses - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Clinical-signs-of-IBH-A-B-Alopecia-broken-hairs-and-focal-ulcerations-in-the-mane_fig1_342092138 [accessed 12 Jun, 2023]

Research aim

How do PBMC from healthy and IBH horses differ in their allergen response on a transcriptional level?

Methods



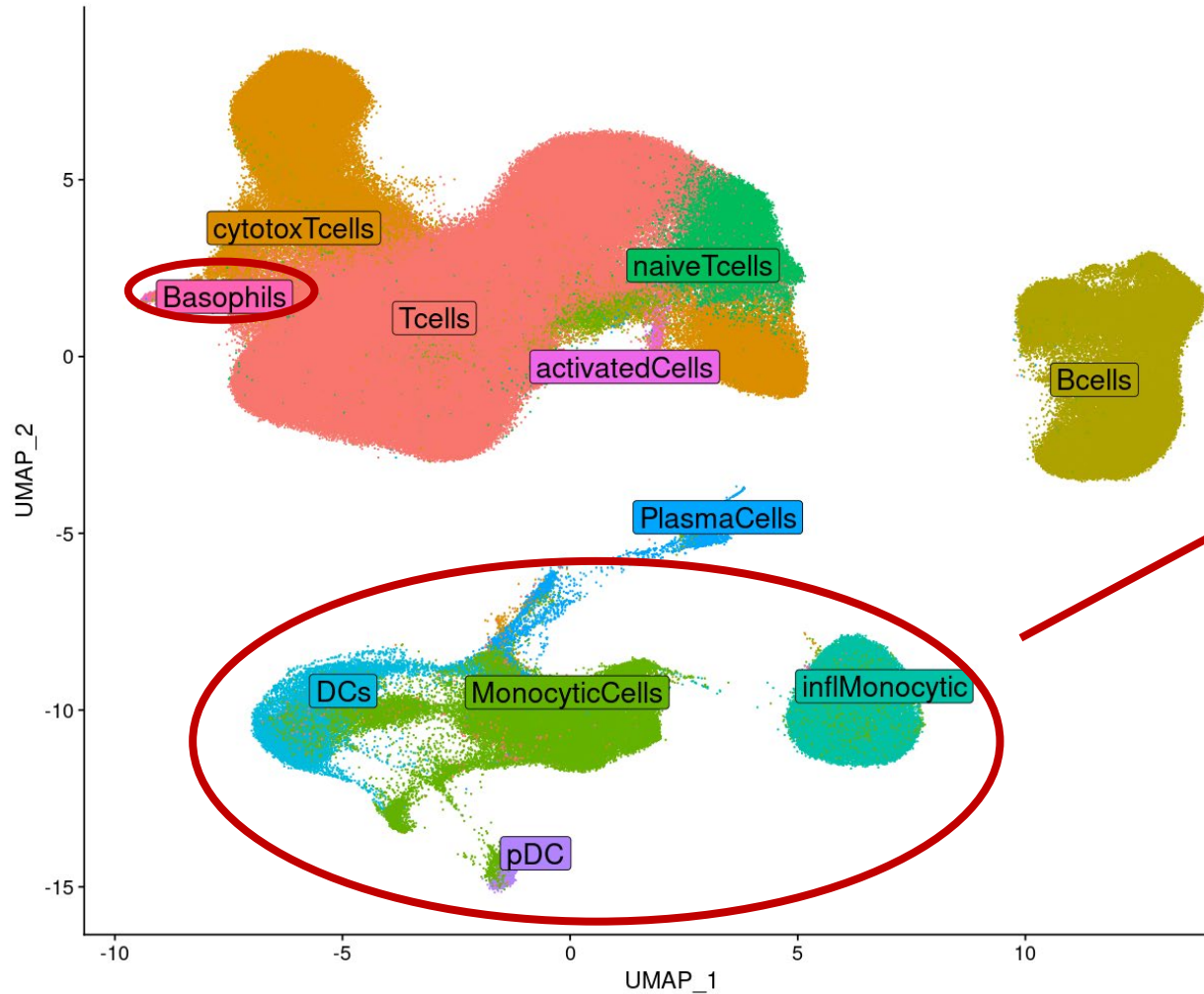
¹Jonsdottir et al. (2025) Front. Immunol. 16:1597233

² Next Generation Sequencing (NGS) Platform, University of Bern

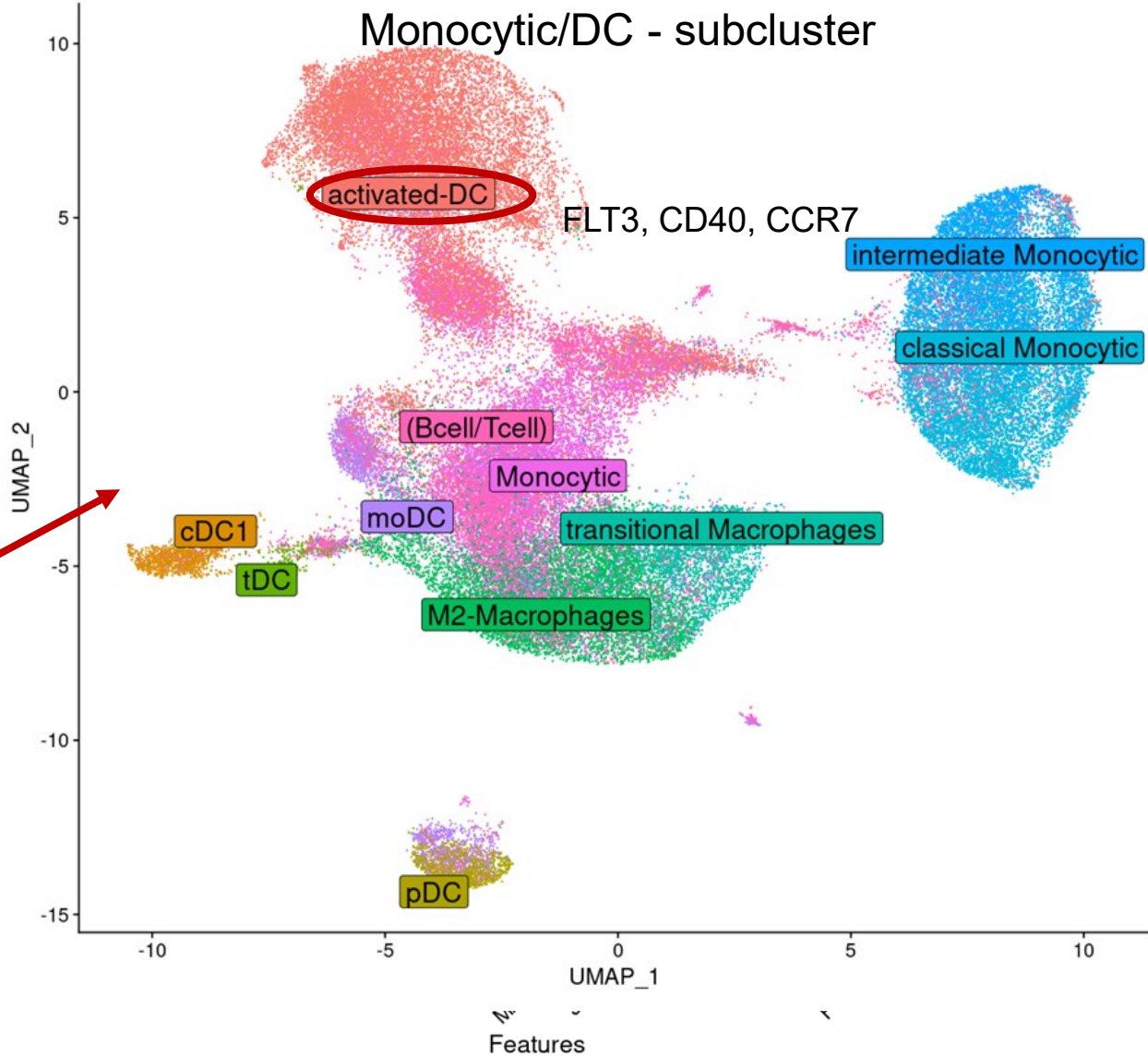
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Annotation of equine PBMC

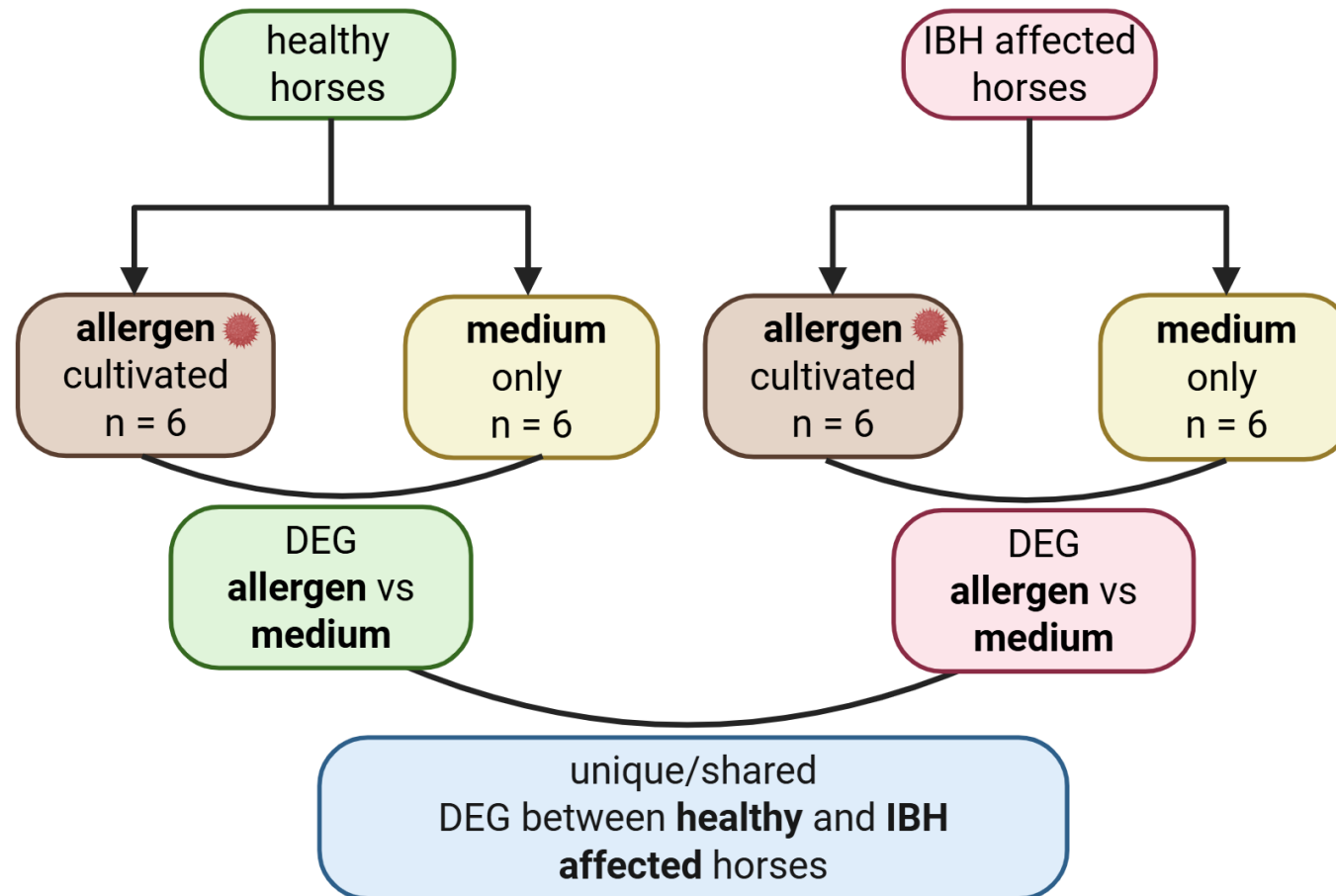
major cell types



Monocytic/DC - subcluster



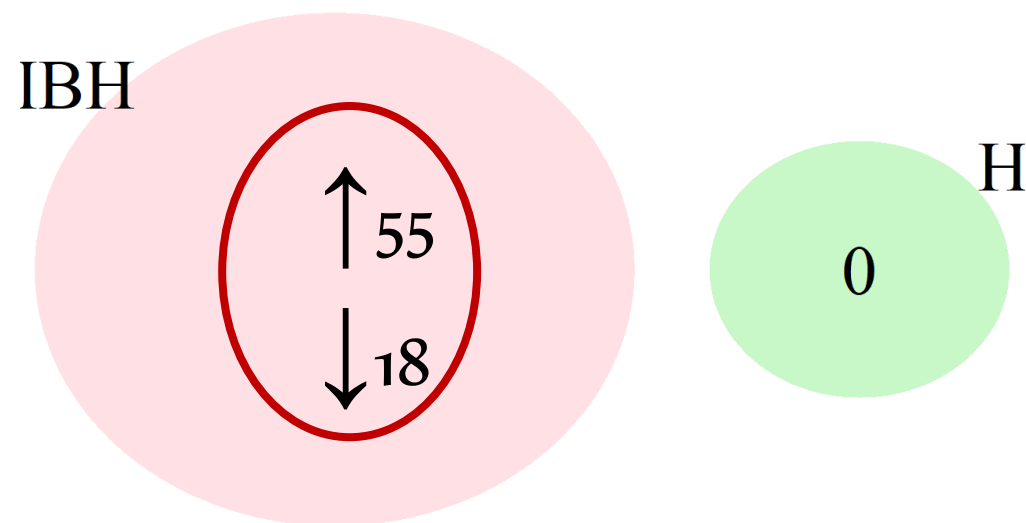
Shared and unique DEG within horse groups stimulated vs unstimulated



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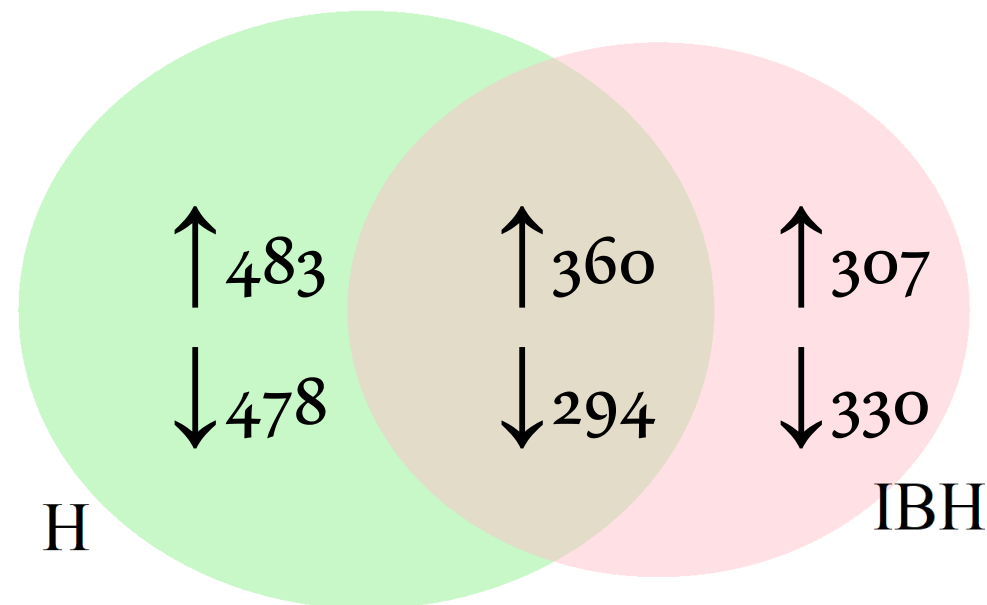
Shared and unique DEG within horse groups stimulated vs unstimulated

Basophils



→ DEG **only** in IBH affected horses in response to *Culicoides* allergen cultivation

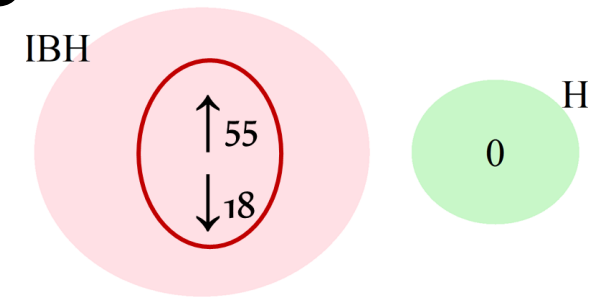
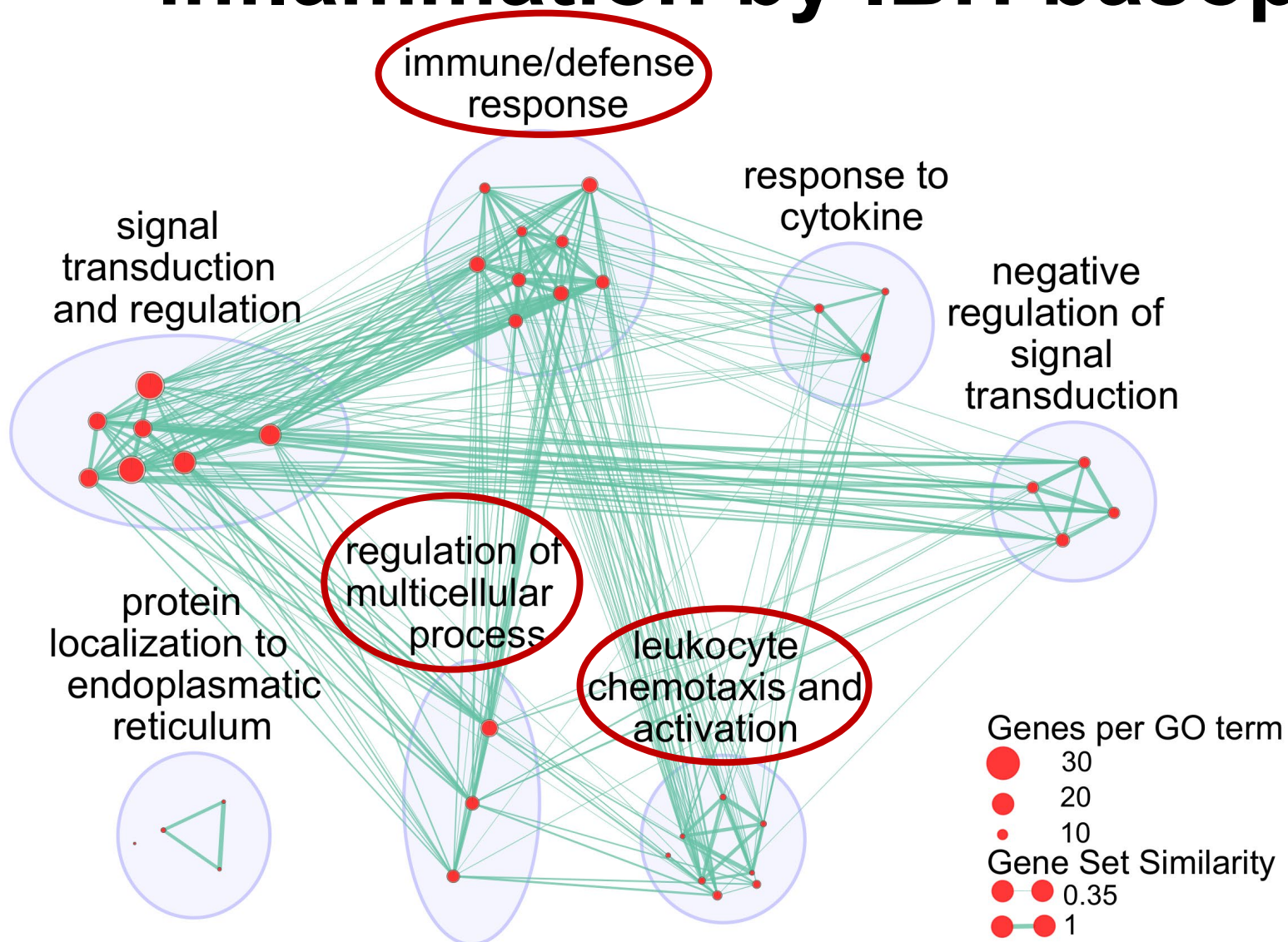
Activated DCs



→ **enrichment analysis (EA)** with g:profiler¹

→ visualization with **EnrichmentMap** and **AutoAnnotate** in **cytoscape**²

Immune priming and initiation of inflammation by IBH basophils



→ No biological process associations with downregulated genes

Cytokines:

- CSF2, IL6, IL31

Chemokines:

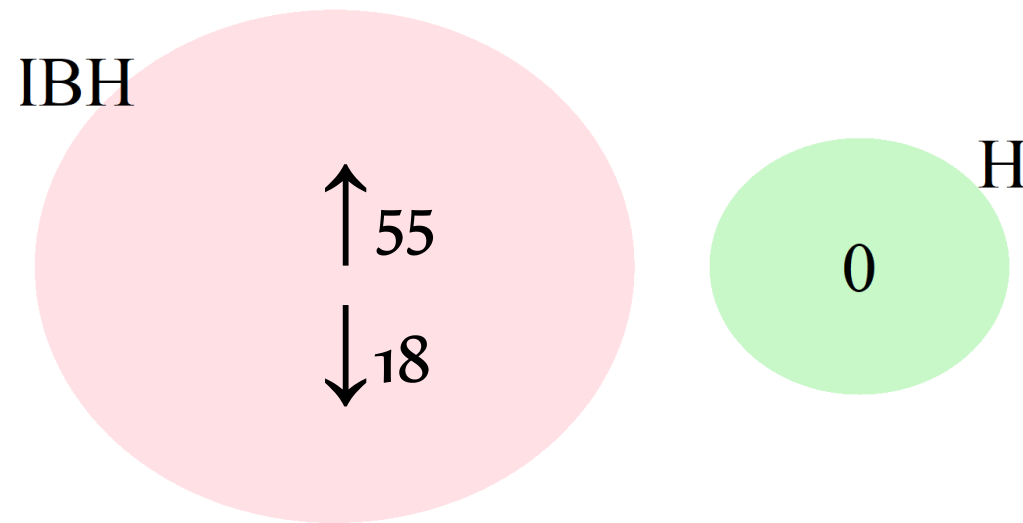
- CXCL8, CCL4, CCL1

→ Promotion of Th17 and Th2 immune response, pruritus and inflammation

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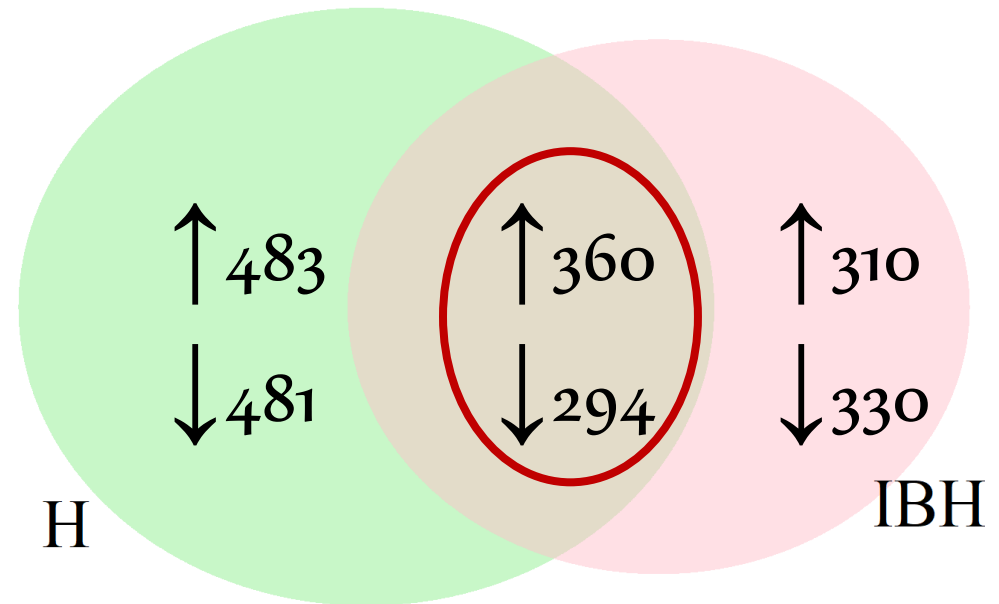
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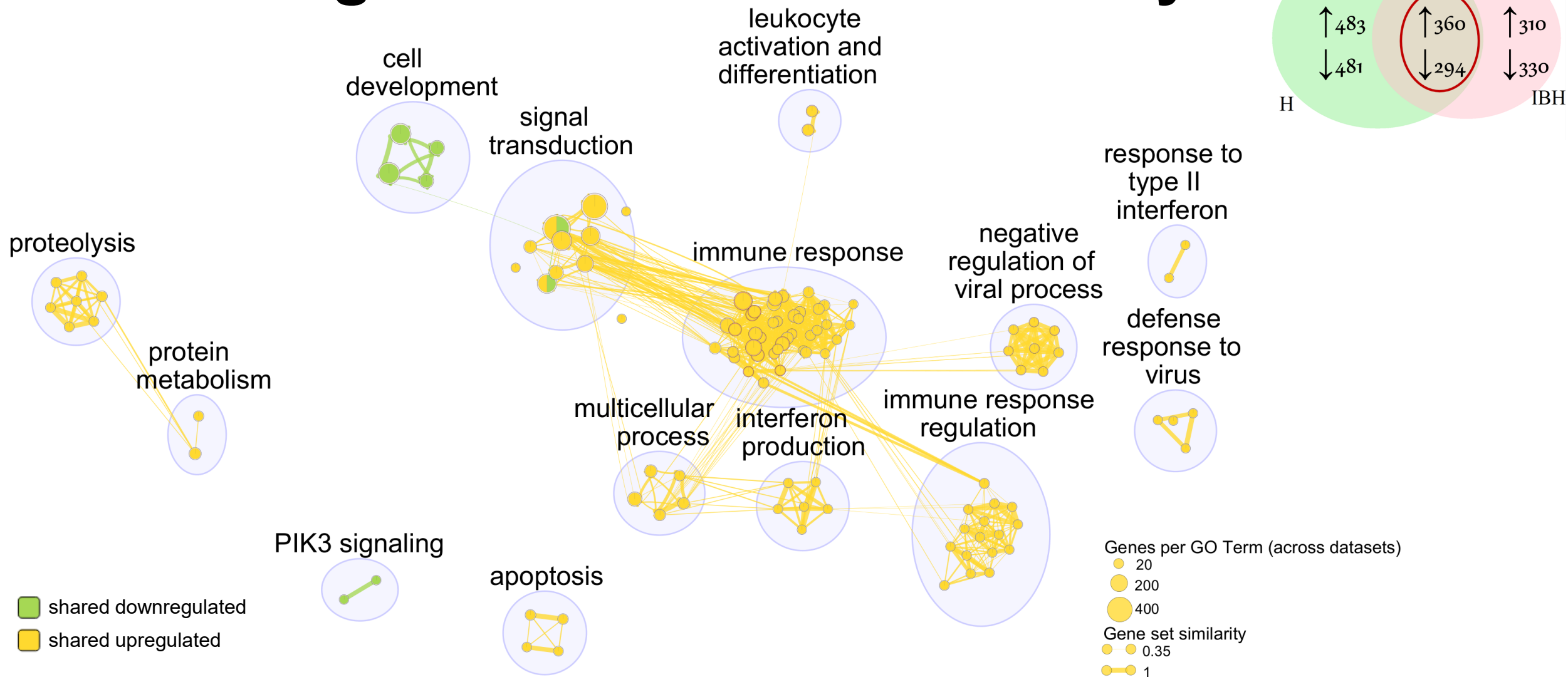


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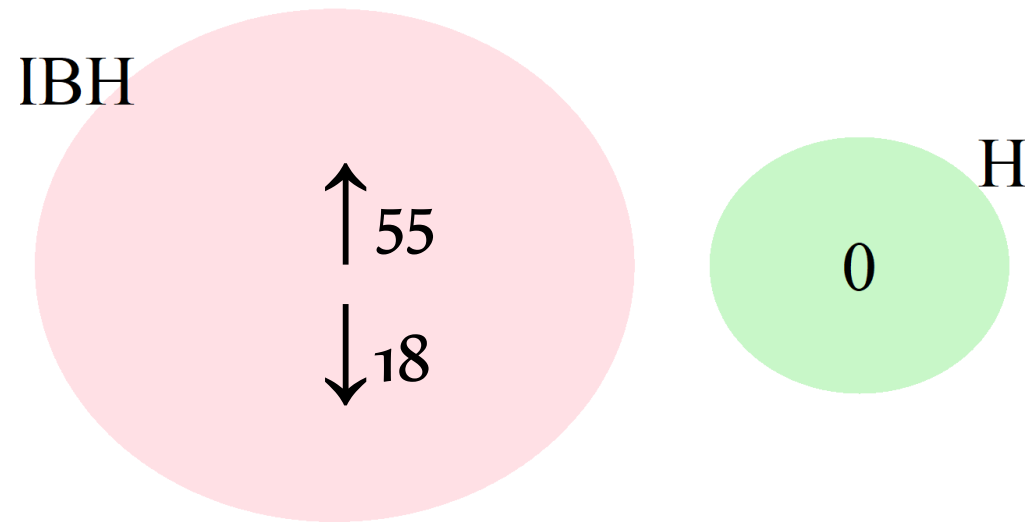
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activated DC - broad immune activation and regulation in IBH and healthy



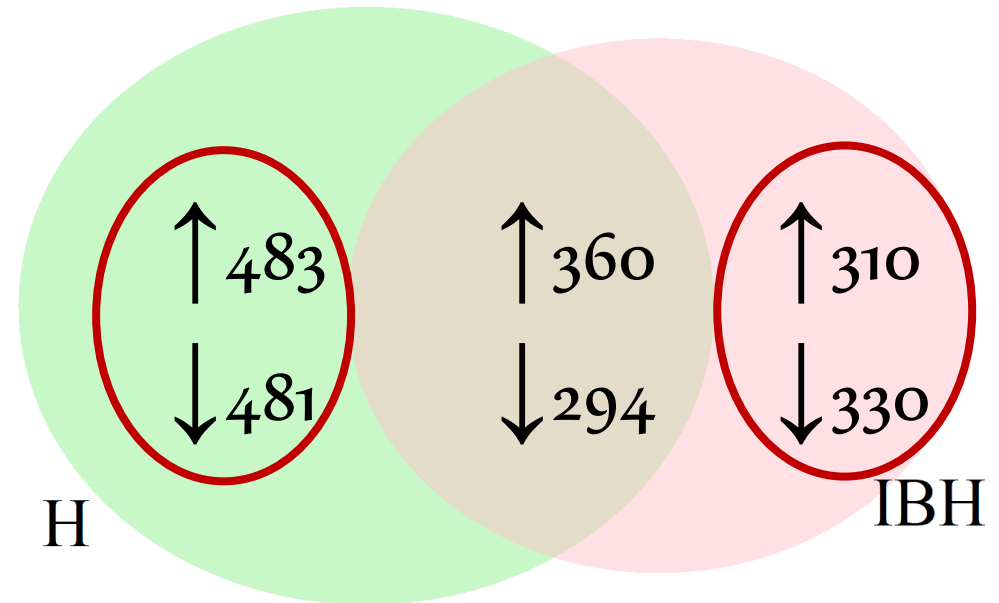
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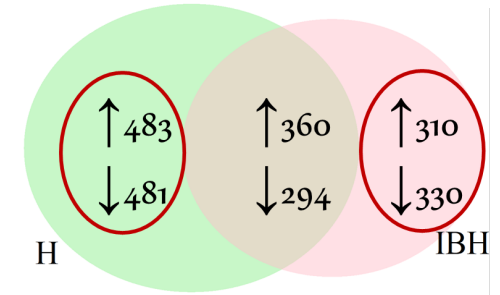
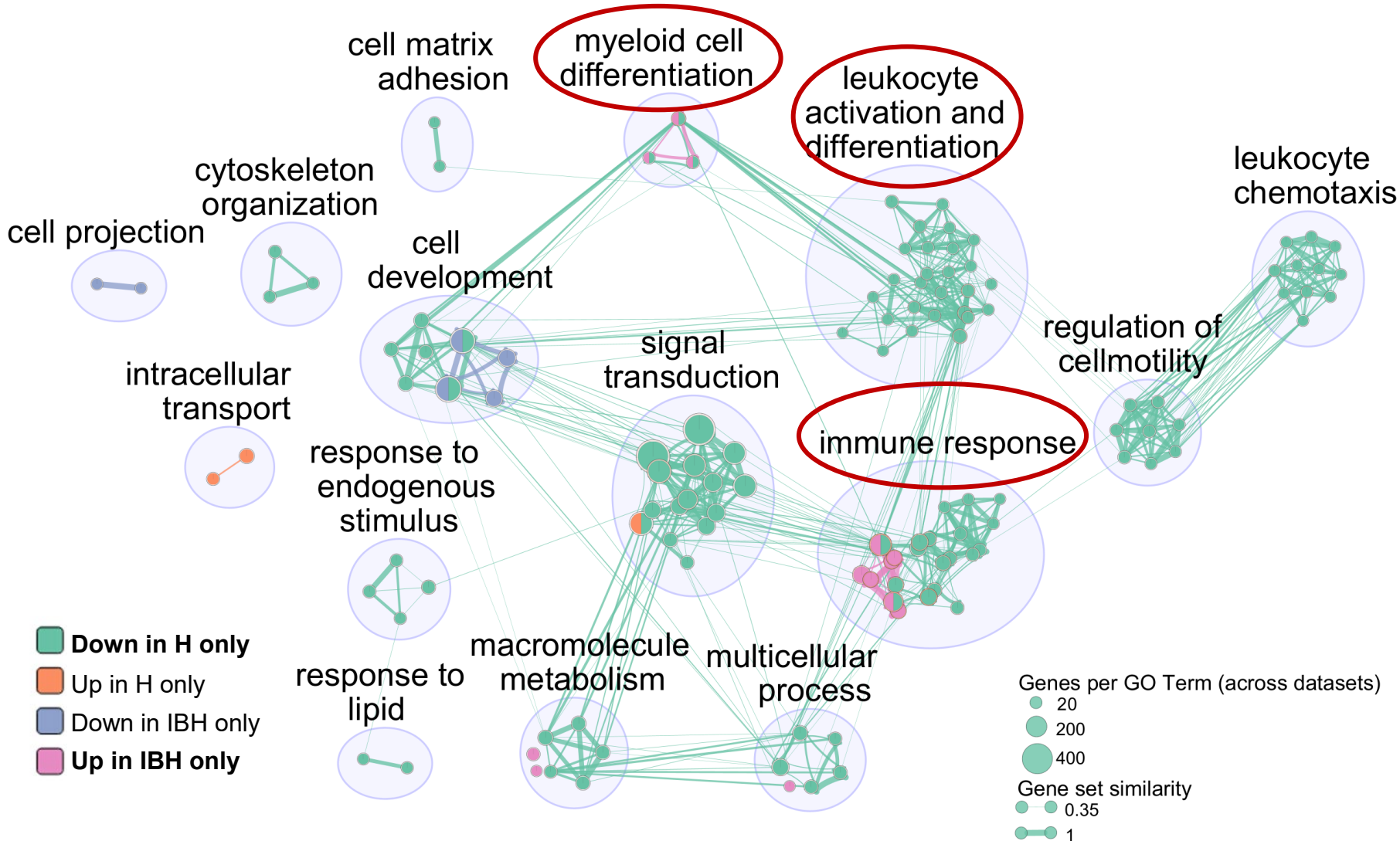


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Distinct transcriptional programs in IBH affected and H activated DC

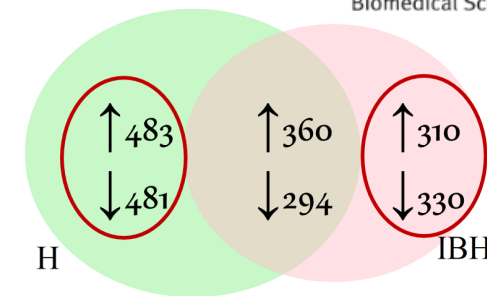
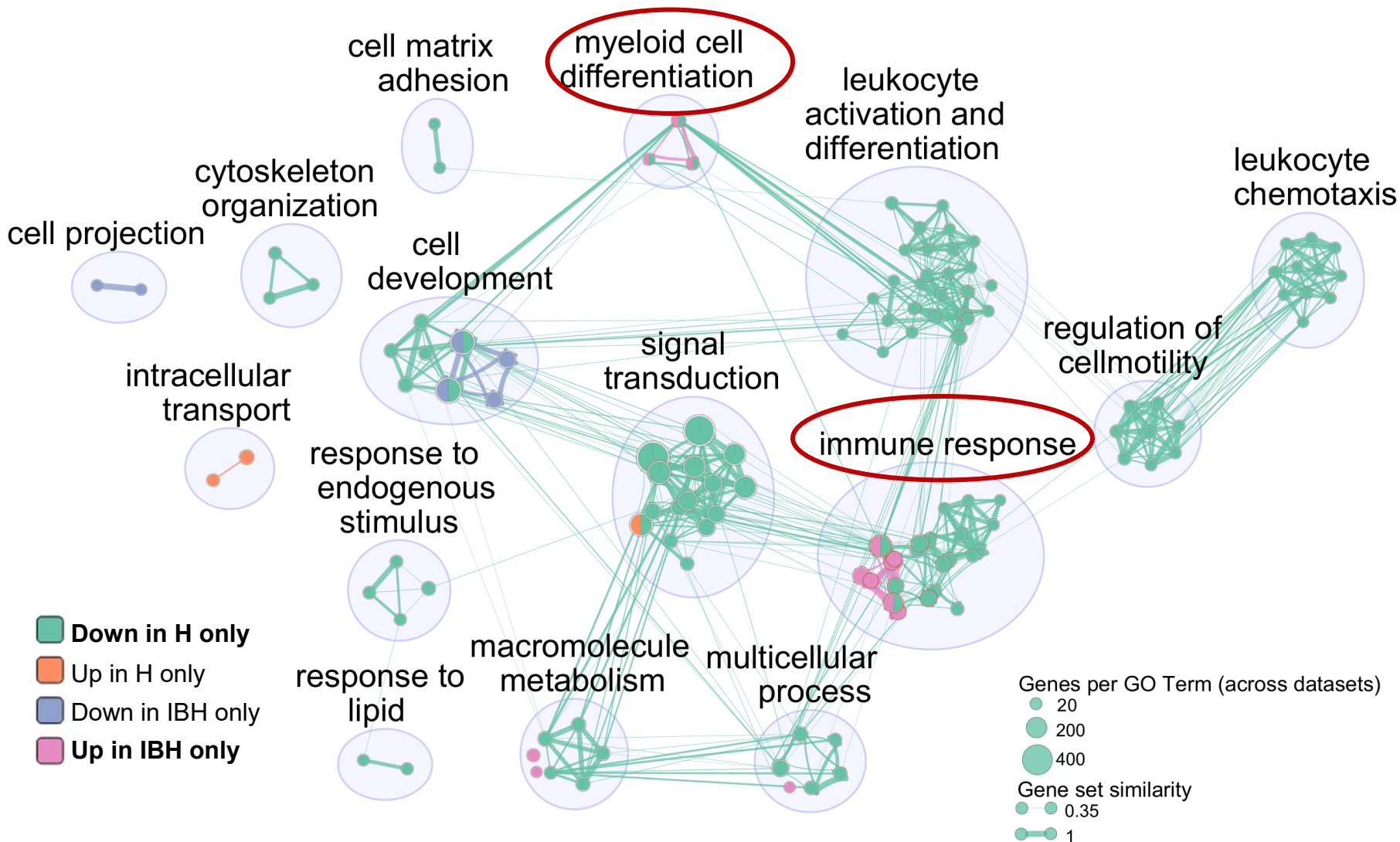


Down in H only:

- CSFR1, SPI1
→ DC development and maturation
- IL16, IL2
→ monocyte, eosinophil and CD4+ recruitment
- CD63, CTSS
→ Ag processing and presentation
- TYROBP
→ Signal transduction for DC activation

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Distinct transcriptional programs in IBH affected and H activated DC



Up in IBH only:

- MYD88, CASP8, UBD, MAFB, CEBPB
→ maturation and differentiation
- PTAFR, ITGB8
→ regulatory properties
- CLEC5A, TRIM21
→ pattern recognition and Ag presentation

u^b Summary and conclusion

Stimulation of PBMC with *Culicoides* allergen:

Basophils

→ activation only in **IBH affected horses**

Activated DC

→ broad immune activation in **both horse groups**

→ **Healthy horse specific reduced** maturation, T cell recruitment and MHC II antigen presentation

→ **IBH specific enhanced** antigen presentation, maturation, pattern recognition, and regulatory properties

Activated dendritic cells in IBH affected horses bear a transcriptional program associated with enhanced specialization and functionality possibly shaped by antigen specific IgE mediated basophil activation

Thank you for your attention! – Questions?



Image generated by ChatGPT (OpenAI)

Acknowledgements

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