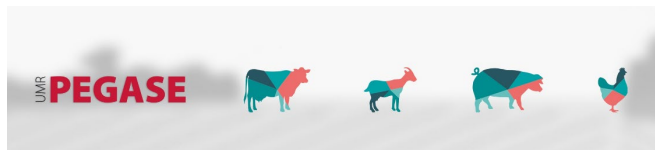


Impact of social behavior on immune cell transcriptome in pregnant sows

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Social behavior in pigs

- ❑ Pigs are highly gregarious species, which live in stable social groups;
 - ❑ Dominant-subordinate relationships and agonistic behaviors have received extensive research attention;
 - ❑ Other social behaviors (non-agonistic) are less studied:
 - Social exploration (ex: nose-nose contact)
 - Socio-positive (ex: grooming)
- } Contribute to social recognition, maintenance of social relationships, group cohesion and animal welfare



Affiliative behaviors
(social grooming and nosing)

Social behaviors: implications for mental and physical health

- In humans and other primates, the **quality** and **quantity** of social relationships:

↗ life expectancy



↘ inflammatory markers



+ mental health



- Gene expression profiles in the peripheral mononuclear cells (PBMC) appear to correlate with these effects:



Negative mental states:

- ↘ Antiviral and antibody synthesis genes
- ↗ Inflammatory genes



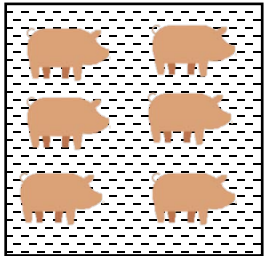
Positive mental states:

- ↗ Antiviral and antibody synthesis genes
- ↘ Inflammatory genes

What are the transcriptomic variations observed in the PBMC of pigs showing different levels of affiliative behaviors?

Multiparous pregnant sows during gestation (G0 – G105 days)

□ In two repetitions (Rep):

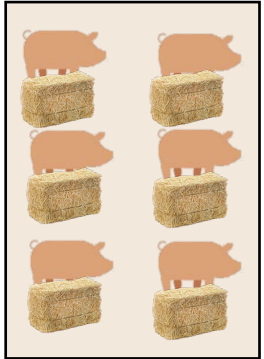


Conventional

Concrete floor

Minimum space/sow

Minimal enrichment material



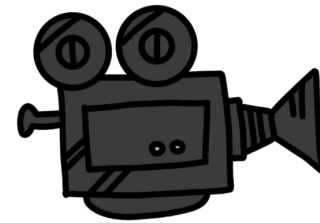
Enriched

Accumulated straw floor

Increased space/sow

Video recordings

G99 – G104



Social grooming

Nosing

Classification of sows

High social expression
(**HSE**, n = 10)

Low social expression
(**LSE**, n = 11)

Differential analysis and pathway analysis

DESeq2

Model = rep + housing + social behavior

Contrast = HSE vs. LSE

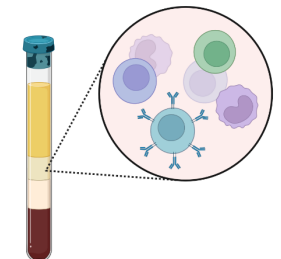
DAVID software

RNAseq



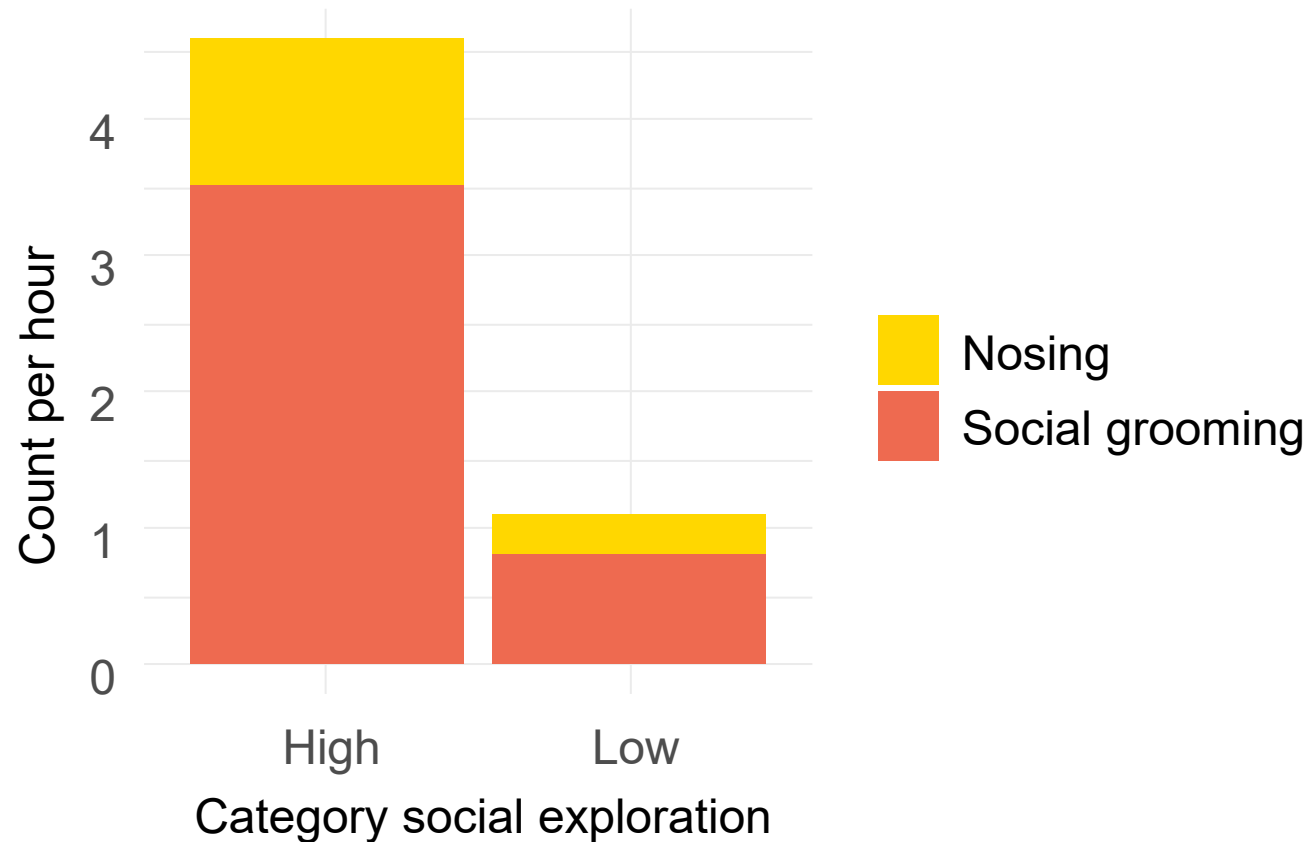
Blood collection and PBMC isolation

G98



The different social behaviors in each category

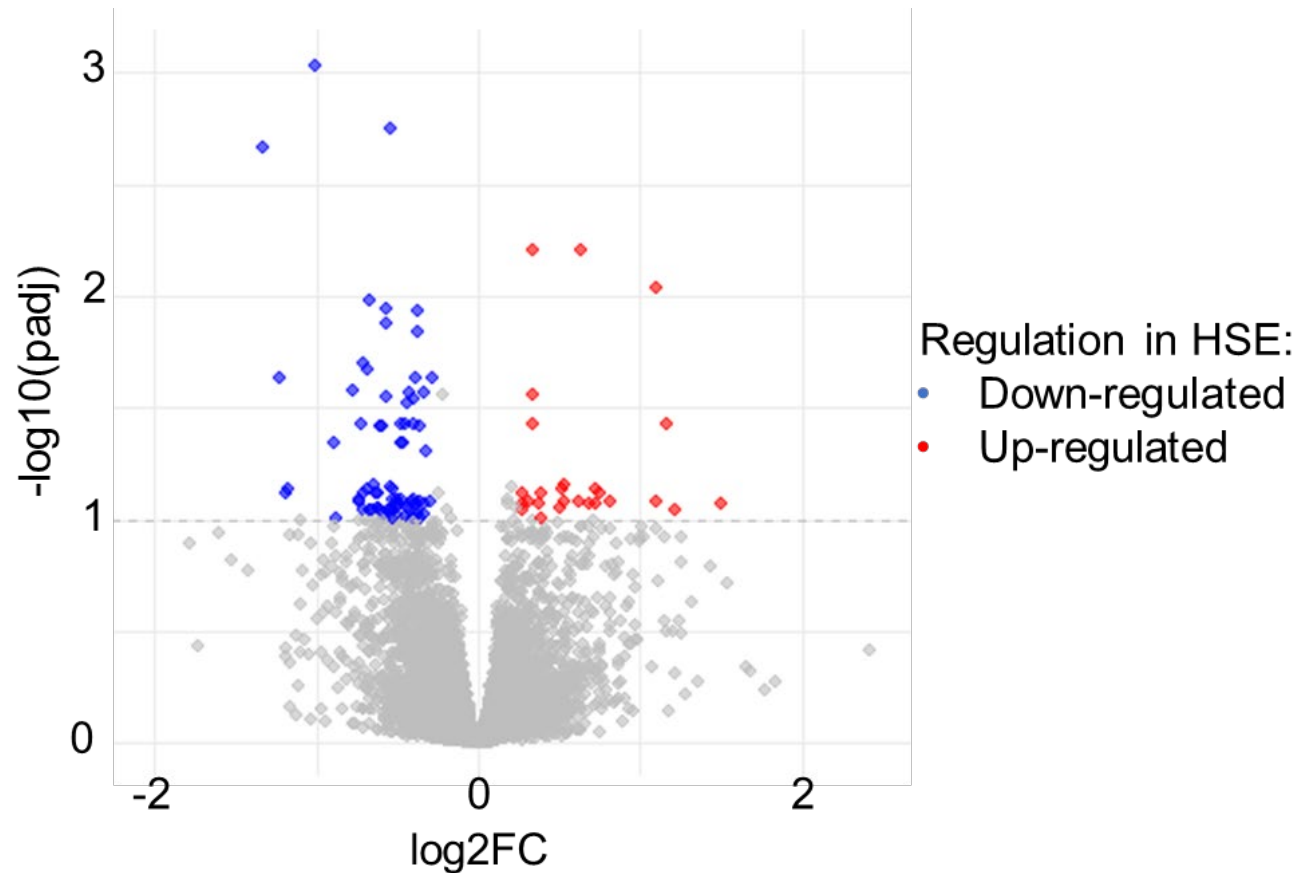
- The different social behaviors in each category
- “Low” and “High” categories defined based on median values



Social grooming = nosing head, nosing body, and grooming
Nosing = nosing-snout

Social behaviors had a modest impact on the PBMC transcriptome

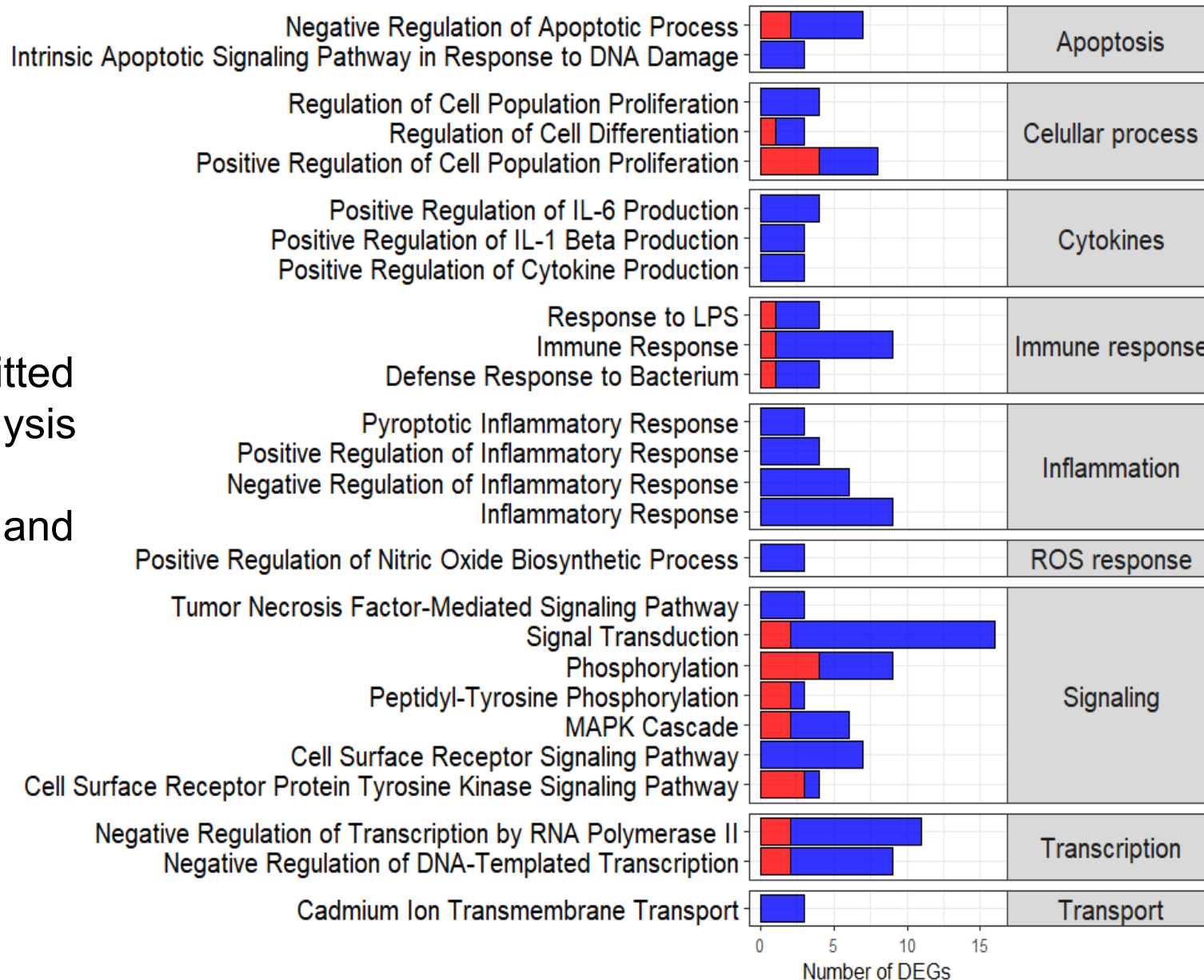
- 12,165 genes submitted to differential analysis
- p-adjusted < 0.1 and FC > 1.2 or < 0.83



102 differentially expressed genes (DEGs)
75 down- and 27 up-regulated in HSE

DEG pathway analysis revealed that social behaviors impacted immune-related functions

- All DEGs submitted to pathway analysis
- Minimum of 3 genes/pathway and p-value < 0.05



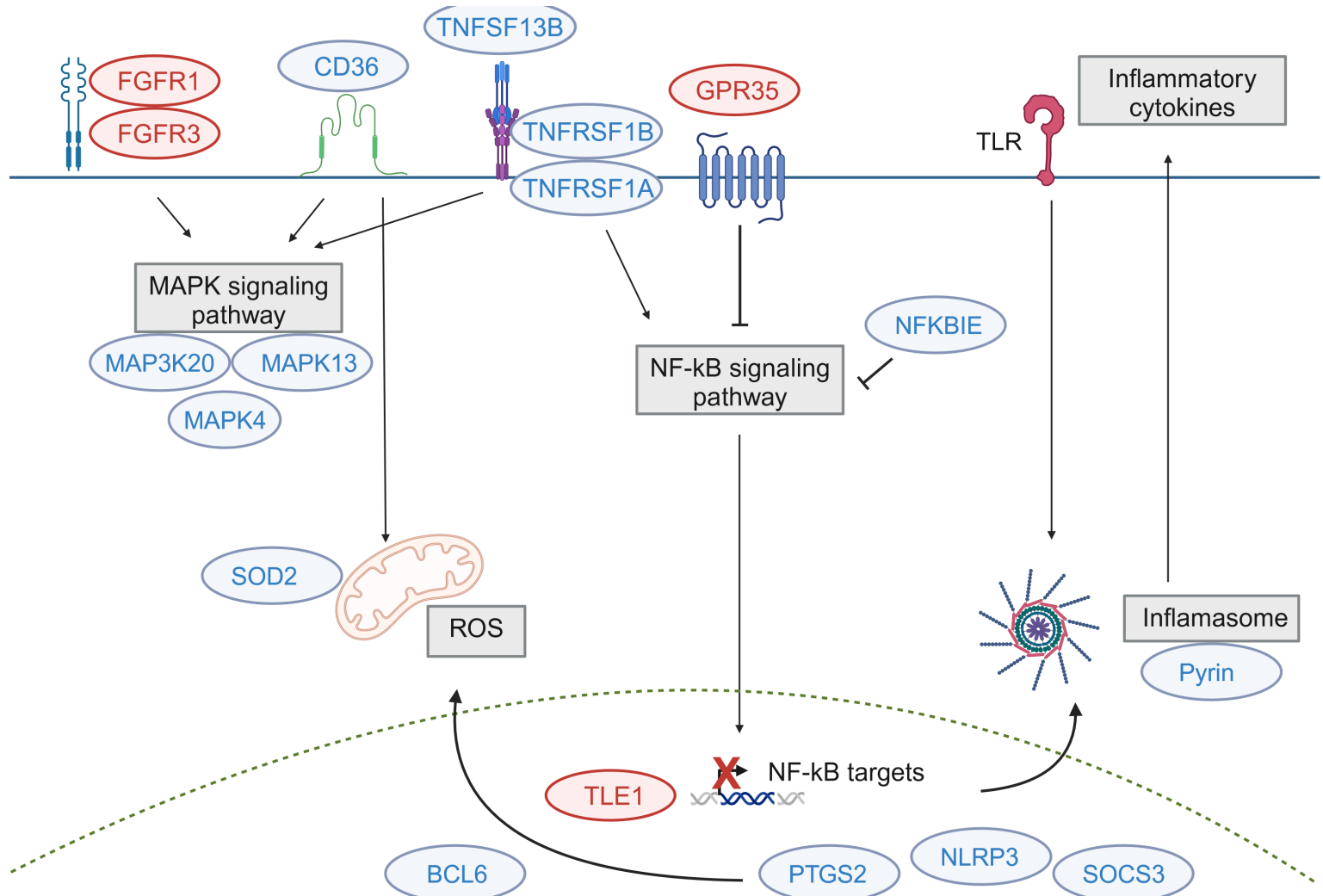
Regulation in high social expression (HSE) sows:

- Down-regulated
- Up-regulated

DEGs and inflammatory pathways

- **TNF signaling:** inflammatory cytokine
- **MAPK signaling:** stimulated by stress, growth factors, pathogen-associated molecular patterns, and inflammatory cytokines
- **NF-κB signaling:** mediator of inflammation
- **Pro-inflammatory cytokines production:** IL-1 and IL-6
- **Response to LPS:** inflammasome activation
- **ROS production:** mediator of inflammation

...



Graphic overview of the signaling pathways in which some down-
(in blue) and up-regulated DEGs (in red) were implicated.

The figure was made using BioRender.

Take home message

1. Social behaviors affected a modest number but important genes, highlighting the importance of this variable on immune response;
2. Distinct genes implicated in pathways associated with the inflammatory response were affected by social behaviors;
3. Mainly down-regulated DEGs in sows displaying high social behaviors were associated with these pathways, suggesting a lower inflammatory response in this group

Research perspectives?

- Conduct further evaluations to confirm the reduced inflammatory response in animals displaying high social behaviors;
- Investigate other molecular mechanisms underlying these responses;
- Explore the interactions with other environmental factors;
- Investigate the effects on other groups

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Thank you for your attention!

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