Faculty of Agrobiology, Food and Natural Resources

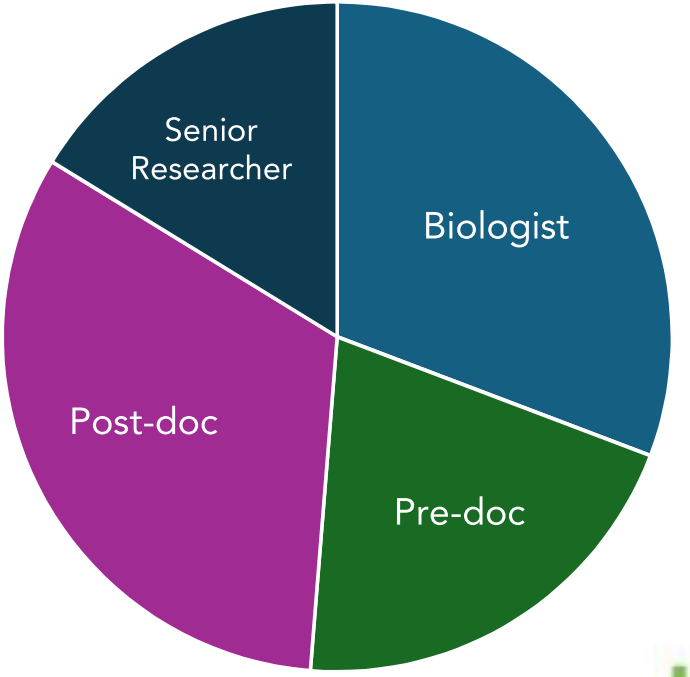
The 3rd CZU Prague hybrid seminar
"Biotechnology in small ruminant reproduction: an international experience"
3rd May 2024 10.30-11.30 h

Current advances in the female **immune response** to the presence of **spermatozoa** in the swine model: scientific inspiration *for small ruminant researchers*

INIA Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria
CSIC Consejo Superior de Investigaciones Científicas

Manuel Álvarez Rodríguez
Científico Titular (Tenured Scienitst)
Department of Animal Reproduction
INIA-CSIC. Madrid, Spain

SAProC
Spermatology in Animal Production and Conservation



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University of Yamanashi

Universidad de Murcia

Universidad de León

ZSL London Zoo

Linköping University

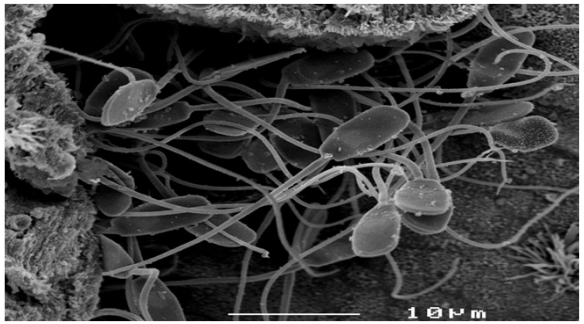
The University Of Sheffield.

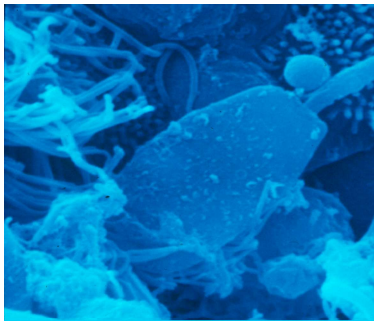
01.Background

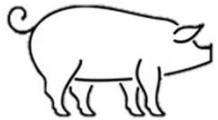
02. Male-female interaction

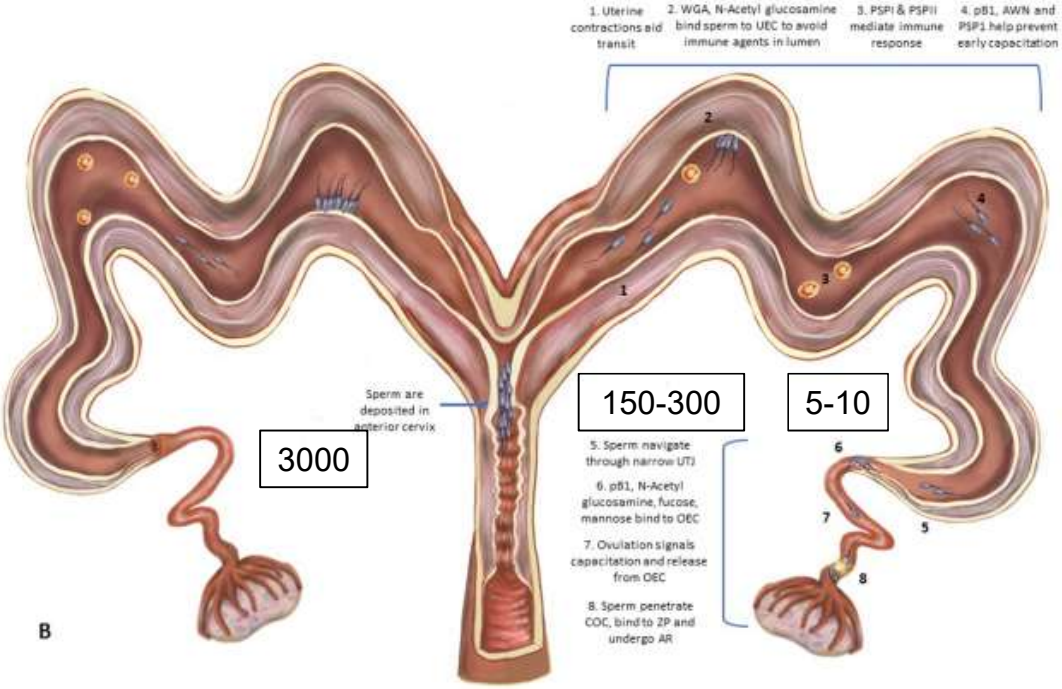
03. Species-specific

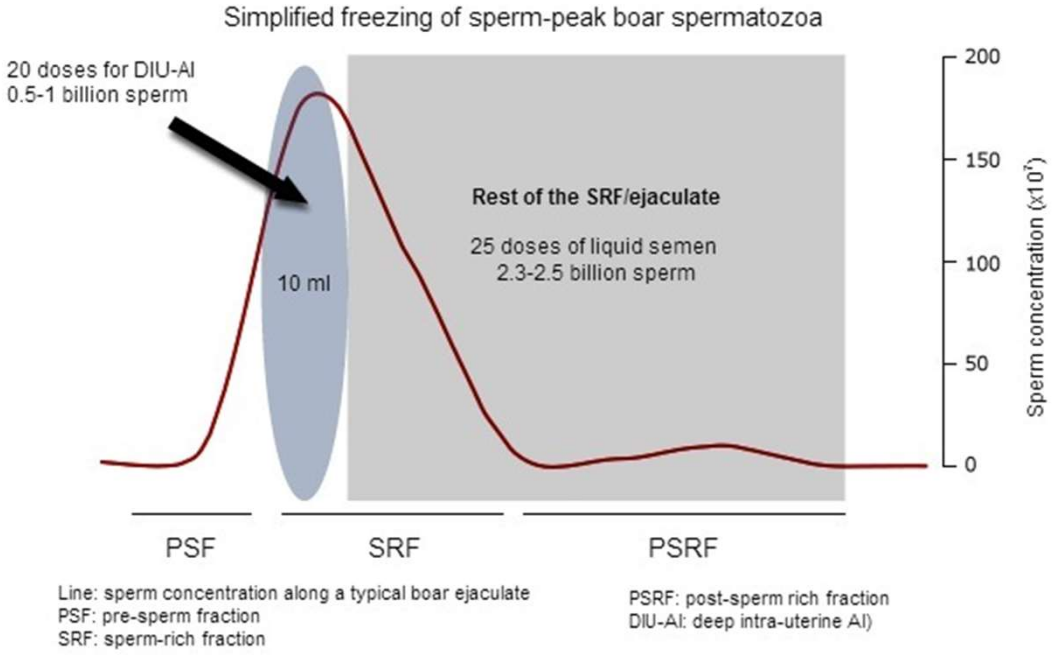
01.Background







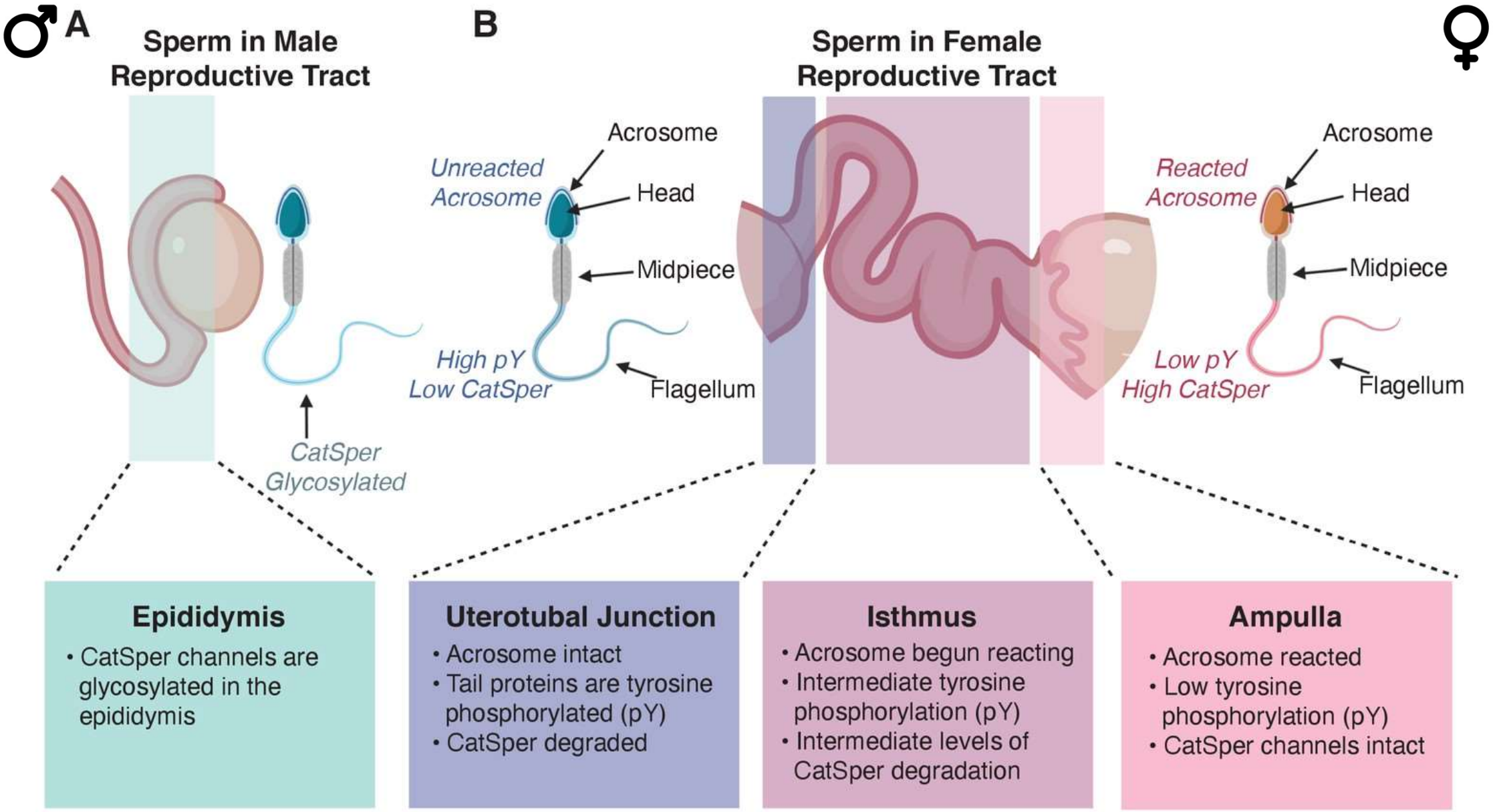




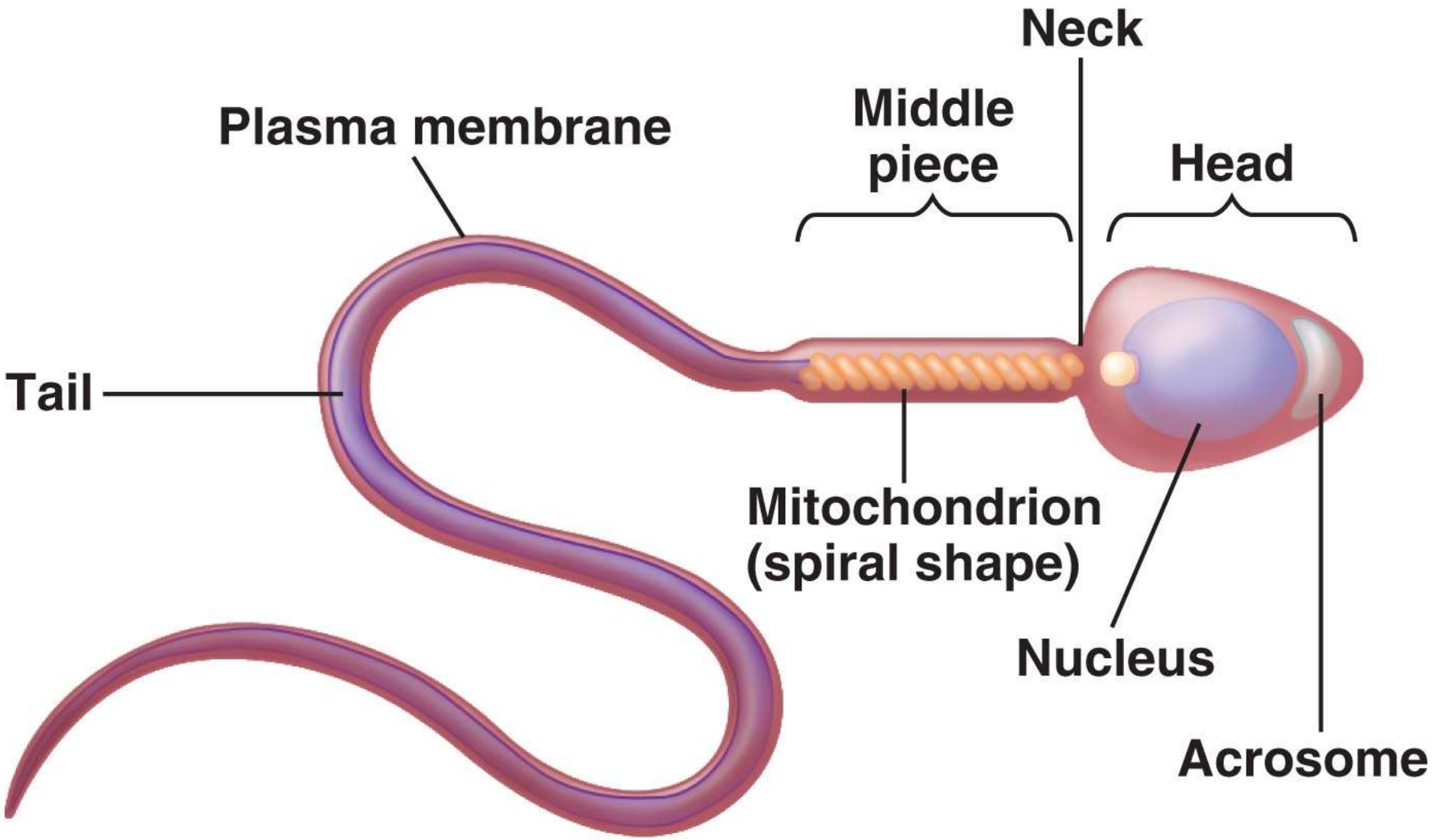
Line: sperm concentration along a typical boar ejaculate
PSF: pre-sperm fraction
SRF: sperm-rich fraction

PSRF: post-sperm rich fraction
DIU-AI: deep intra-uterine AI)

SEM images coustesy of Rodriguez-Martinez H



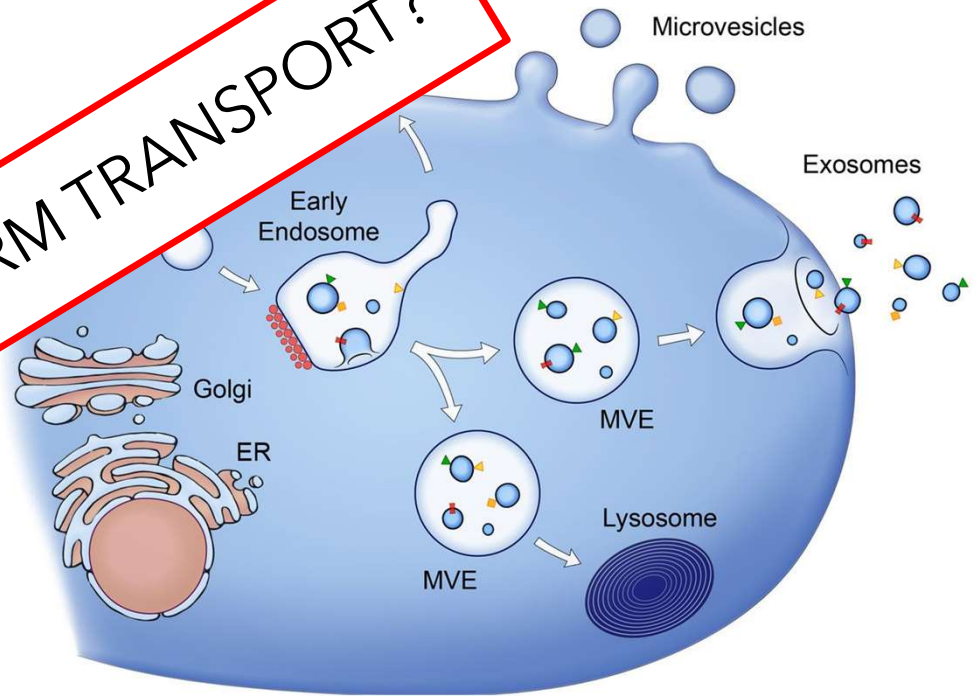
Source: *Sperm: The secrets of success (2020). doi.org/10.7554/eLife*



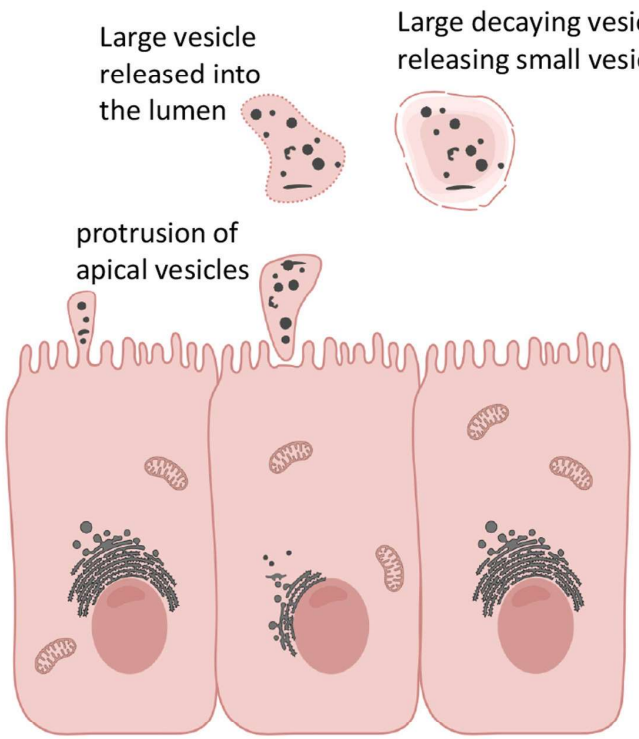
Seminal plasma **components**

Sugars
Oligosaccharides
Glycans
Lipids
Inorganic ions
Small molecule metab
Cell-free DNA
RNA
microRNA
Peptides
Proteins…

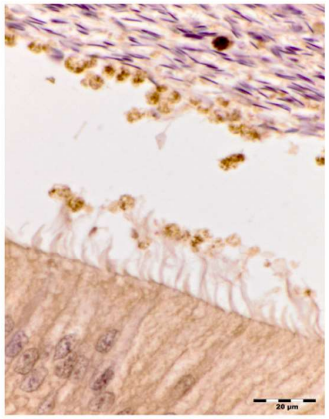
ONLY RELEVANT FOR SPERM TRANSPORT?



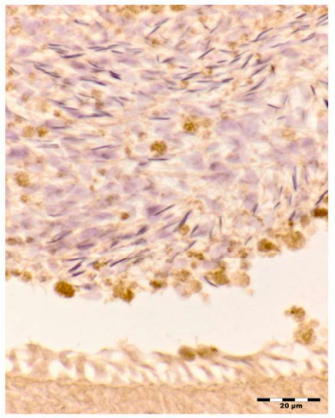
Apocrine secretion



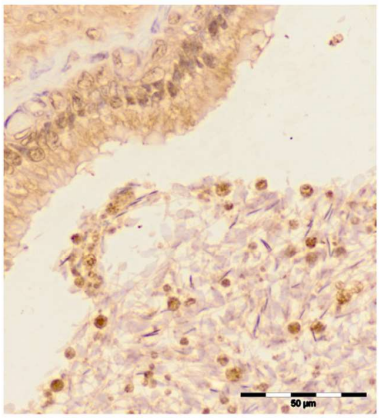
Epididymis



Caput

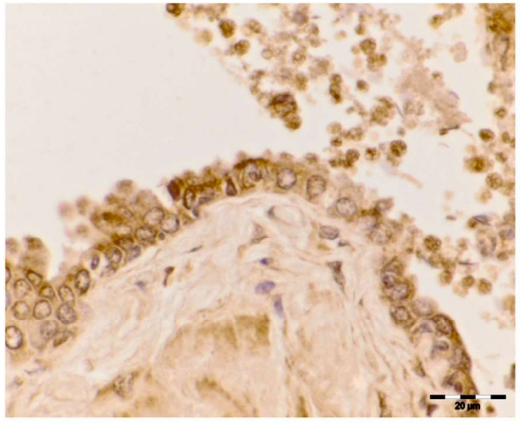


Corpus

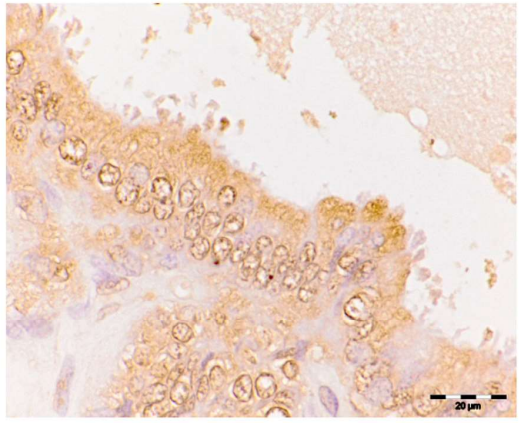


Cauda

Accessory sex glands

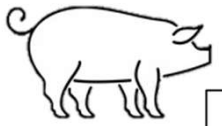


Prostate

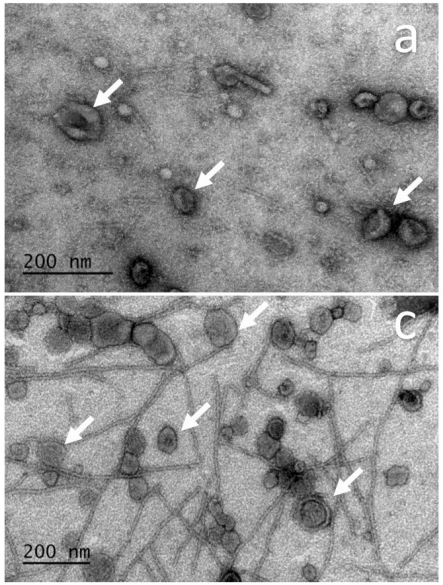


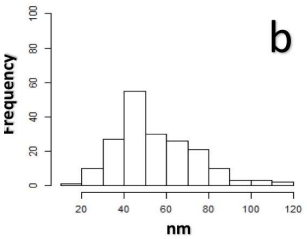
Vesicular glands

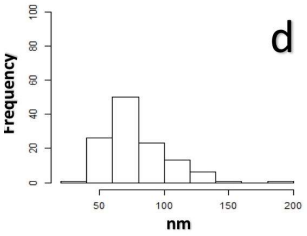
Roca J et al. Animal Reproduction Science, 2021



	Control (not ultracentifuged)	**Ultracentrifugated fractions** F1	F2	F3
P1	Positive: 99.93 %	Positive: 1.21 %	Positive: 99.91 %	Positive: 99.96 %
SRF-P1	Positive: 59.57 %	Positive: 0.39 %	Positive: 99.84 %	Positive: 99.99 %
Post-SRF	Positive: 88.37 %	Positive: 0.46 %	Positive: 99.72 %	Positive: 99.97 %

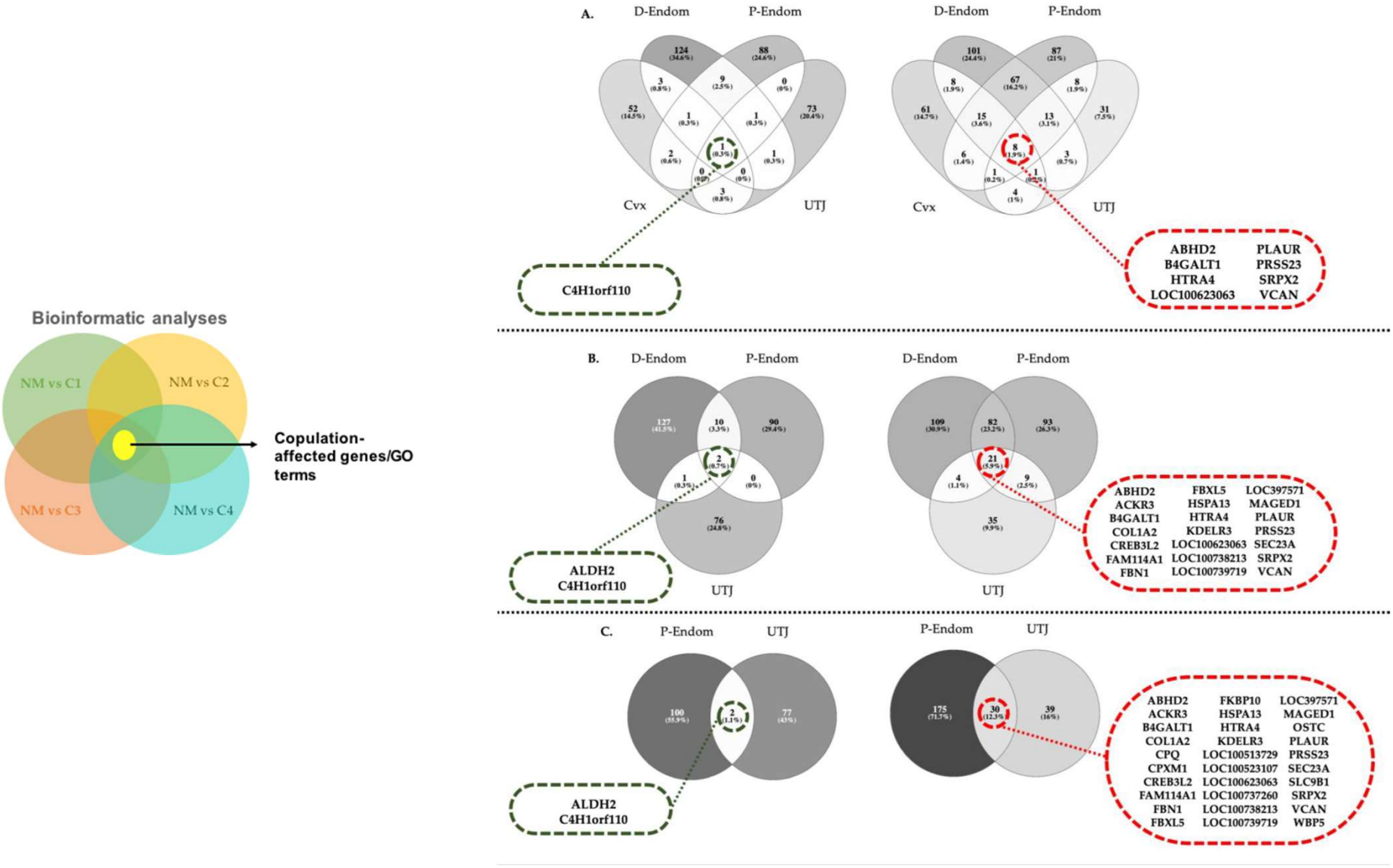




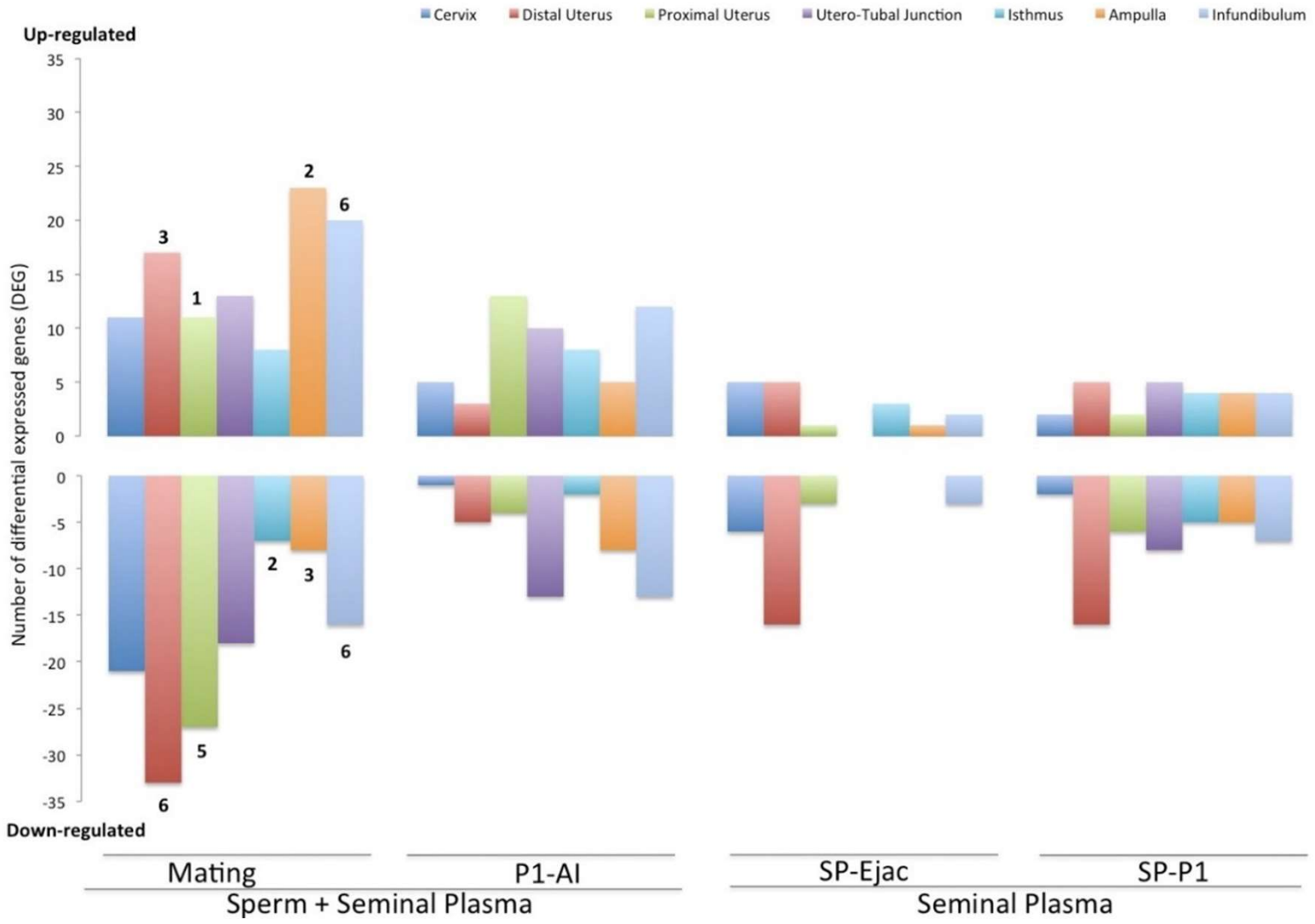


Álvarez-Rodriguez M, et al. Theriogenology, 2019, 140:143-152.

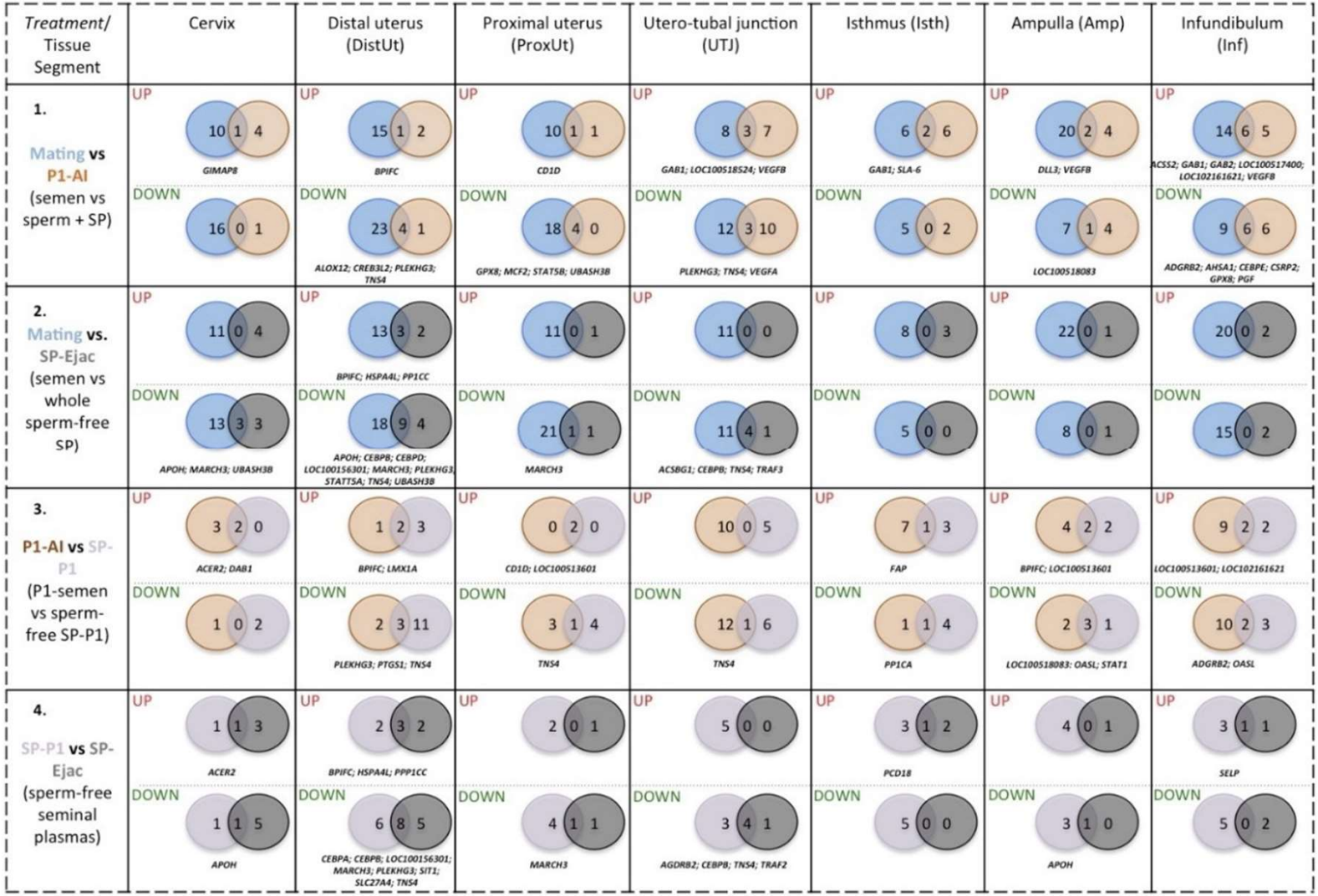
02. Male-female interaction



Alvarez-Rodriguez M, Martinez CA, Wright D, Rodriguez-Martinez H. Does the act of copulation per se, without considering seminal deposition, change the expression of genes in the porcine female genital tract?. Int J Mol Sci. 2020 Jul 31;21(15):E5477. https://doi.org/10.3390/ijms21155477.



Álvarez-Rodriguez M, Atikuzzaman M, Venhoranta H, Wright D, Rodriguez-Martinez H. Expression of Immune Regulatory Genes in the Porcine Internal Genital Tract Is Differentially Triggered by Spermatozoa and Seminal Plasma. Int. J. Mol. Sci. 2019, 20(3), 513; https://doi.org/10.3390/ijms20030513



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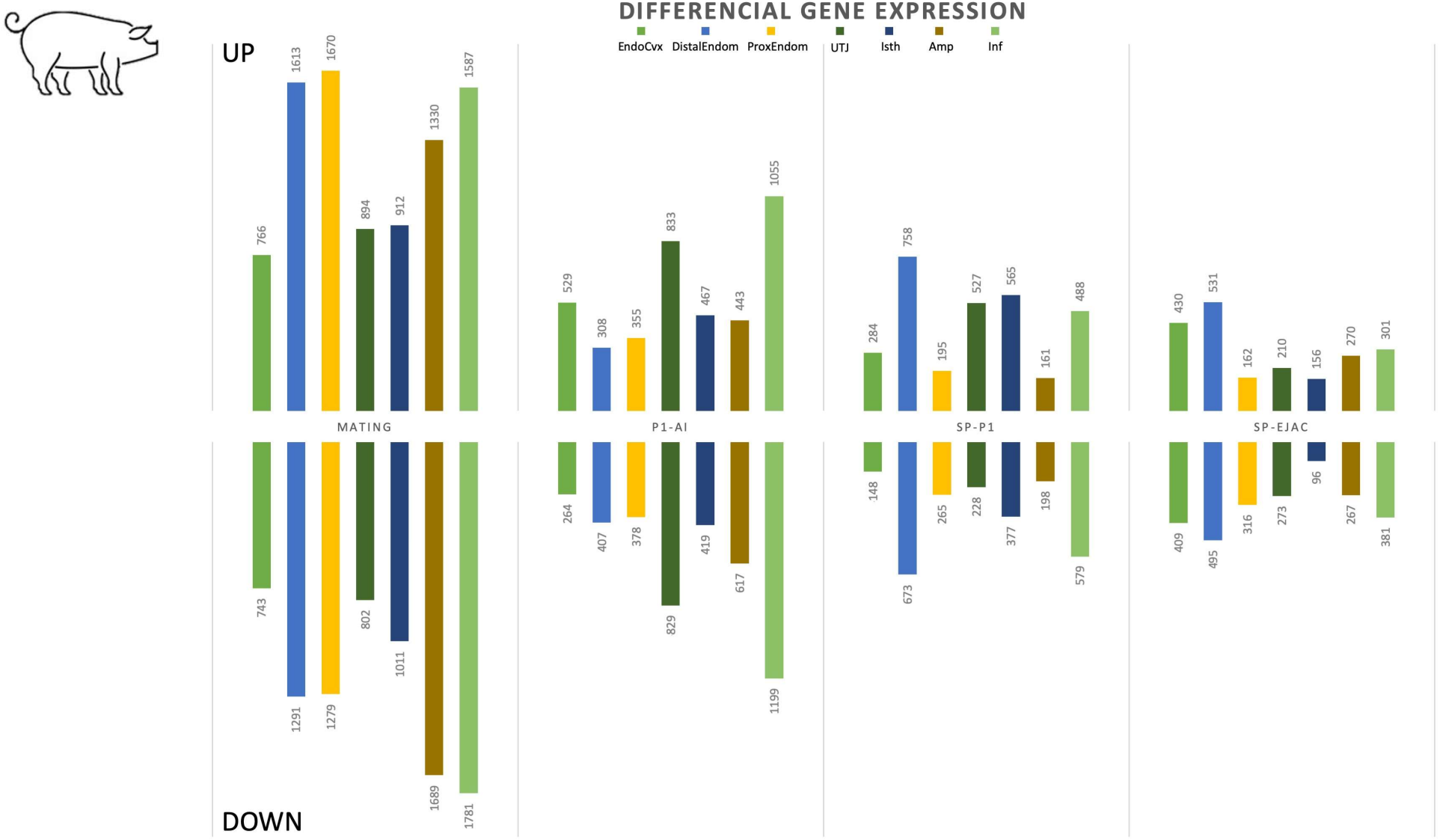
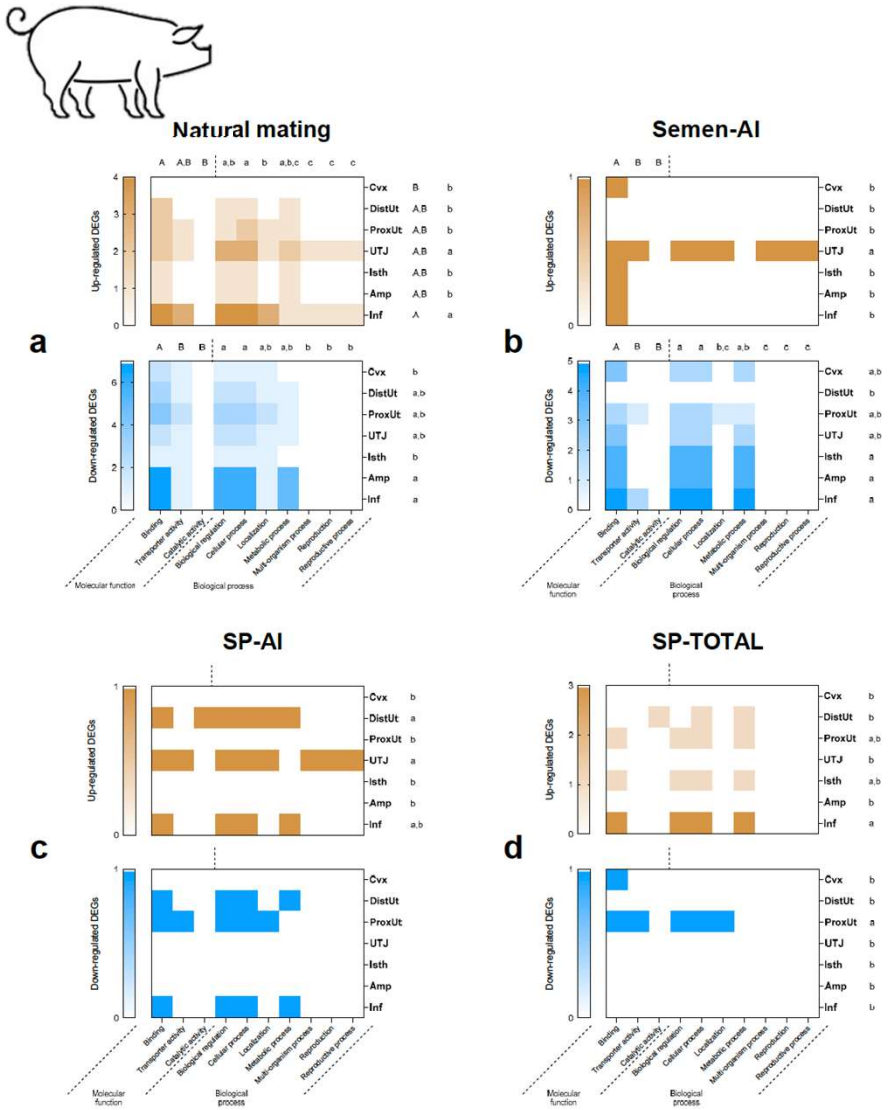
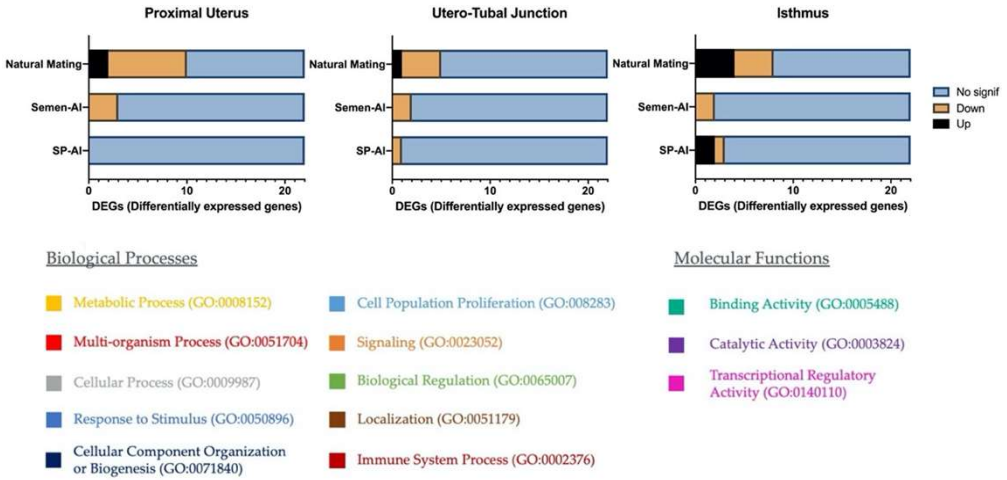
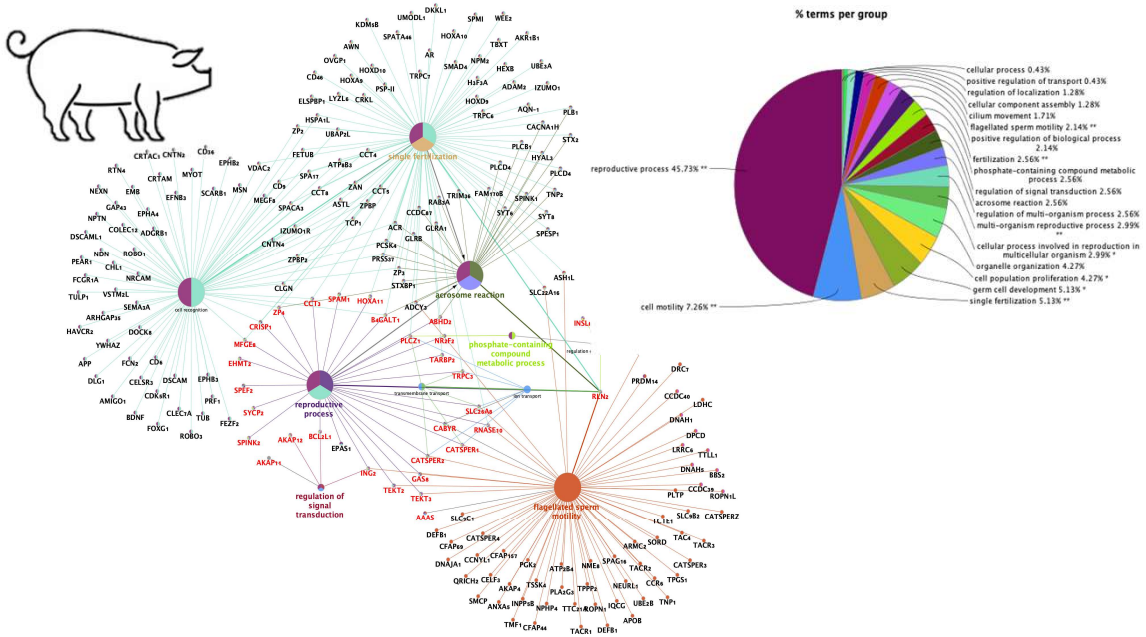


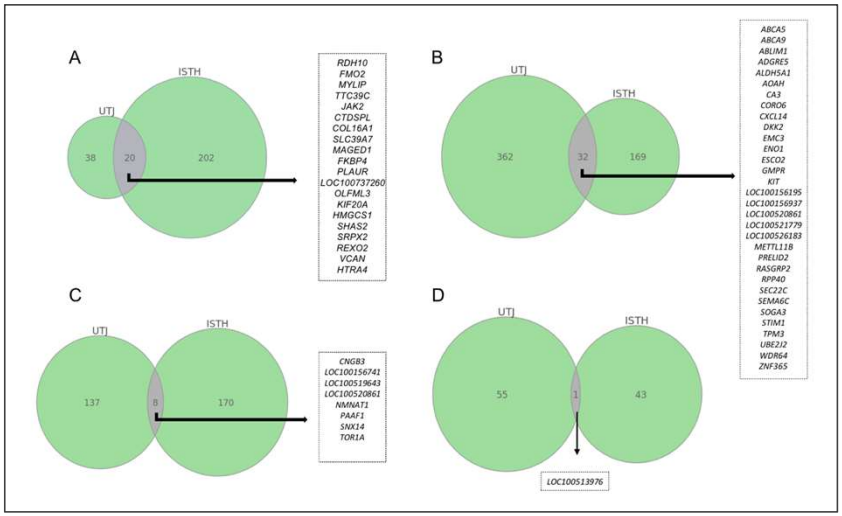
Alvarez-Rodriguez M,et al. Scientific Reports. 2020.

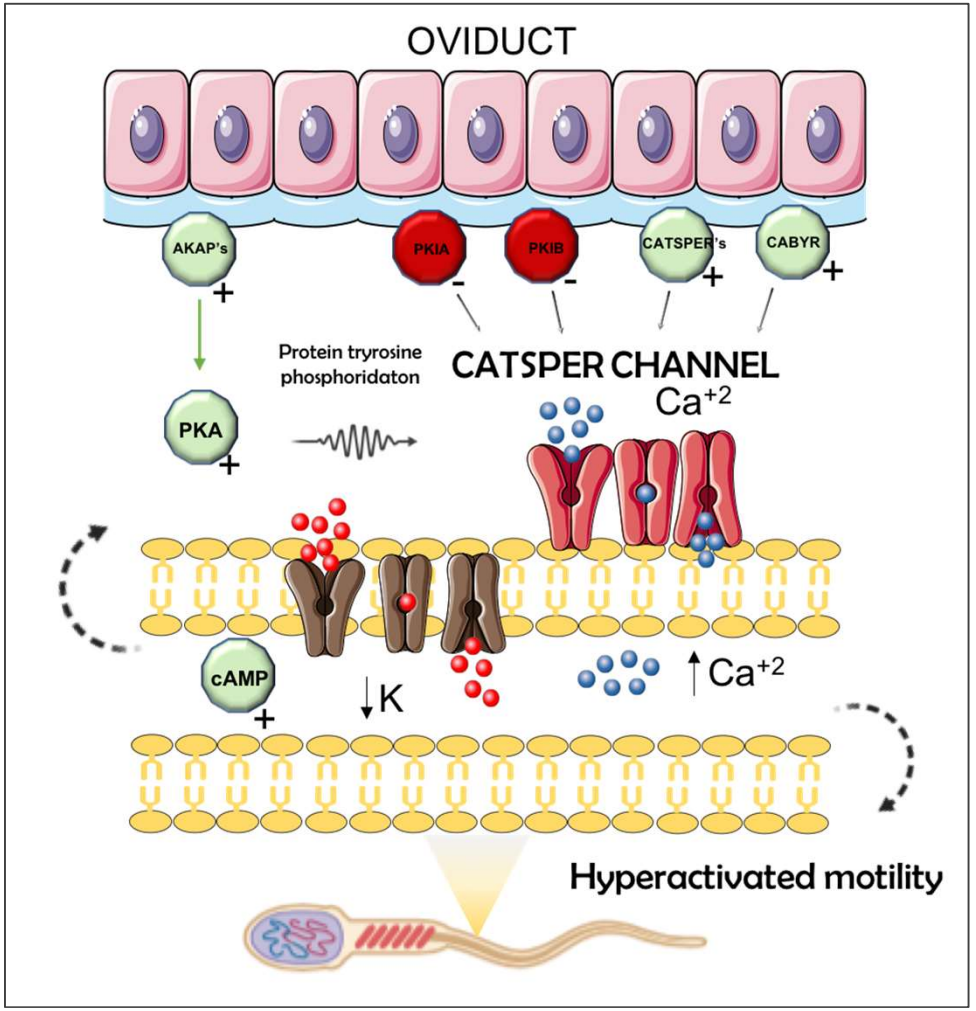




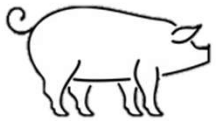
Gardela et al. Int J Mol Sci, 2020 & Ruiz-Conca et al. Int J Mol Sci, 2020

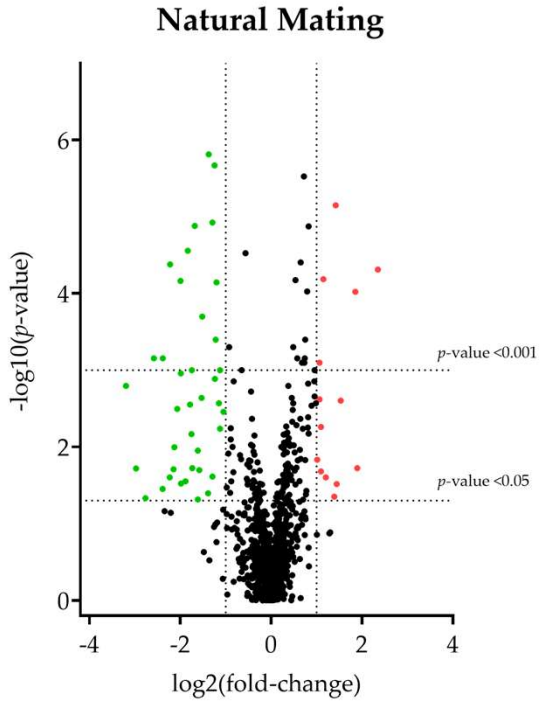


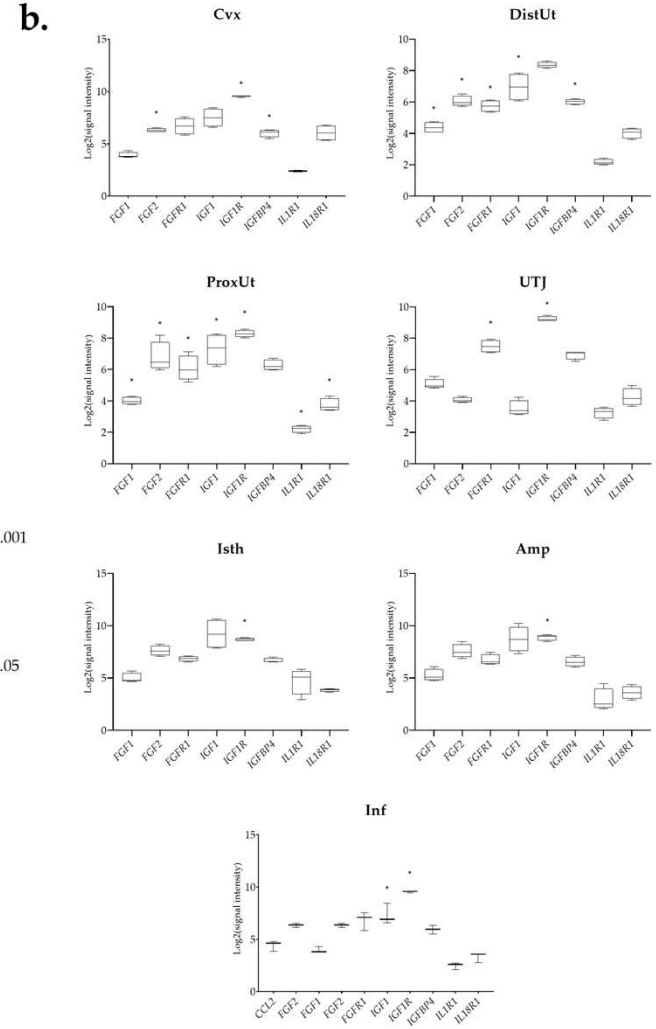


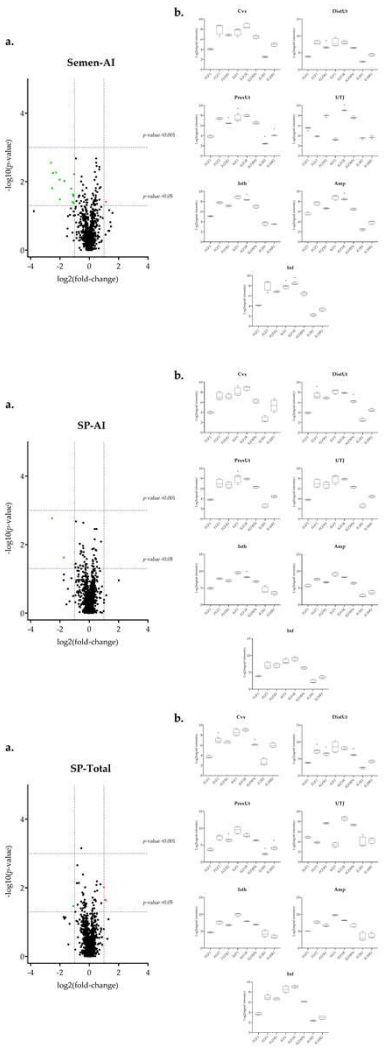


Martinez CA et al. Int. J. Mol. Sci. 2020, 21(5), 1840.



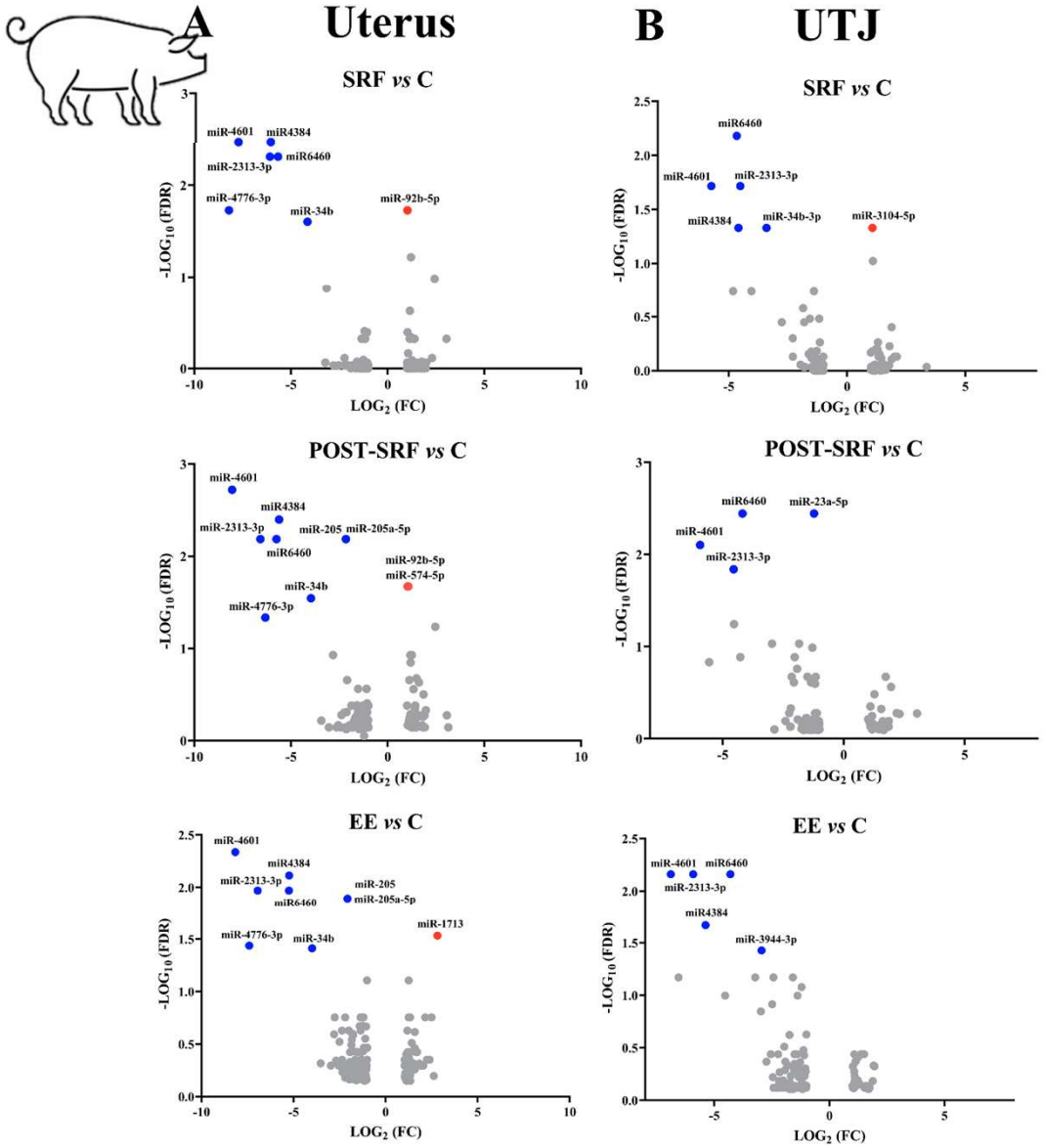


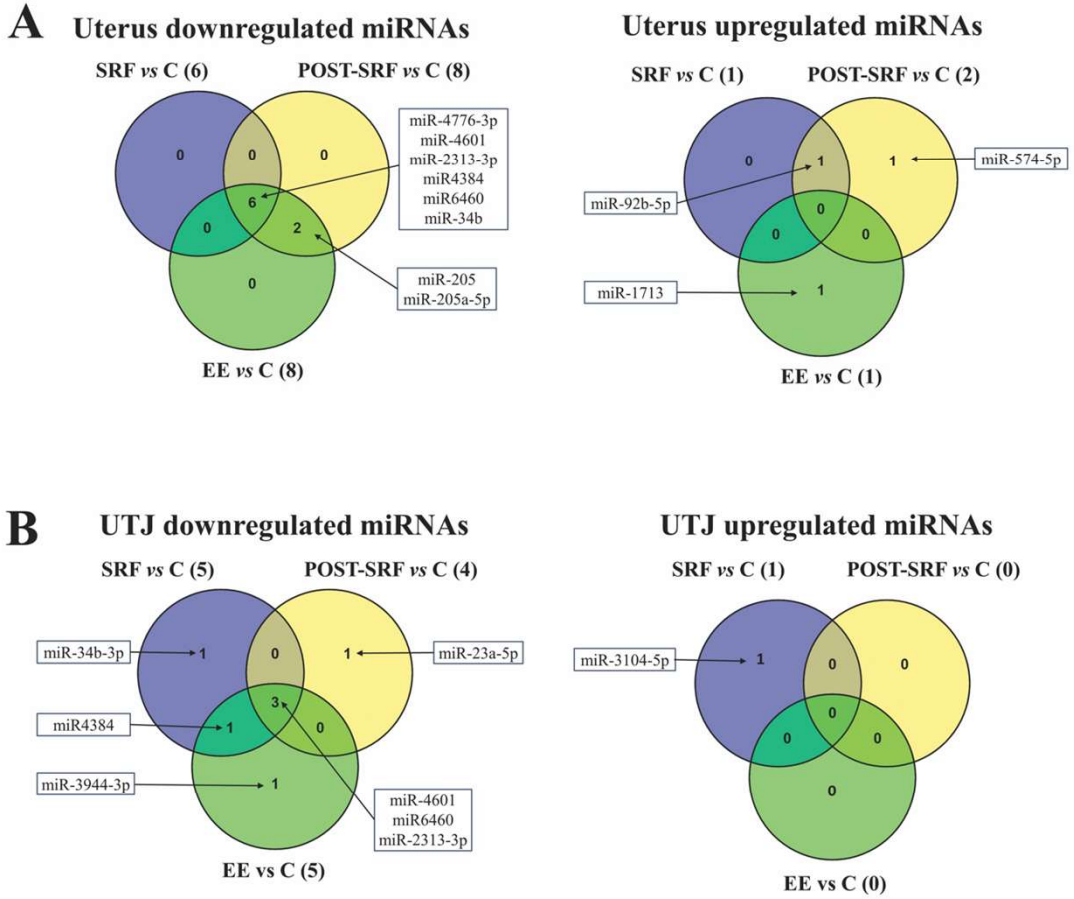




Gardela J, Ruiz-Conca M, Wright D, López-Béjar M, Martinez CA, Rodriguez-Martinez H, , Álvarez-Rodríguez M. Semen modulates cell proliferation and differentiation-related transcripts in the pig periovulatory endometrium. Biology 2022, 11(4), 616; https://doi.org/10.3390/biology11040616

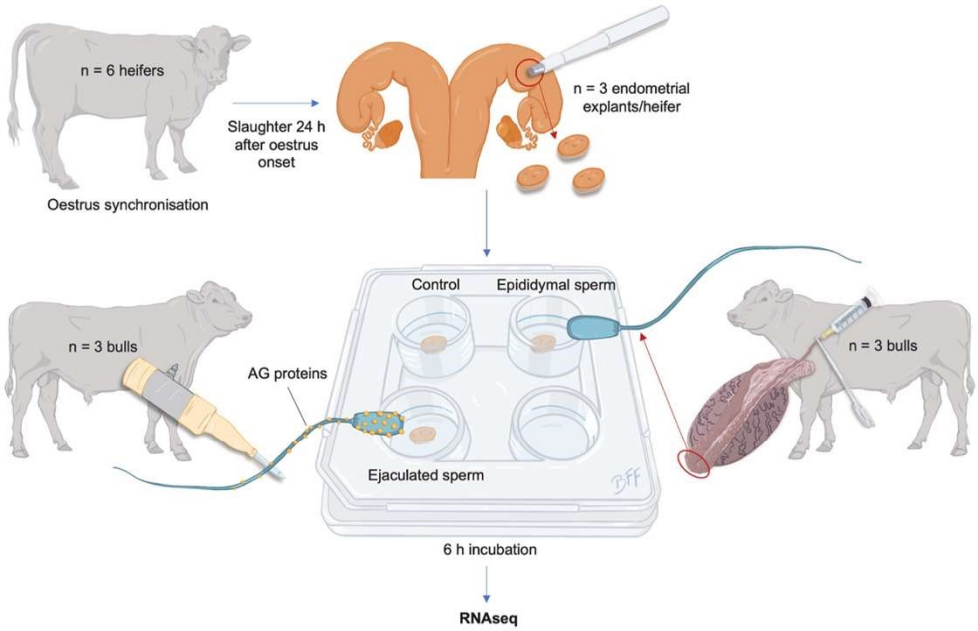
03. Species-specific

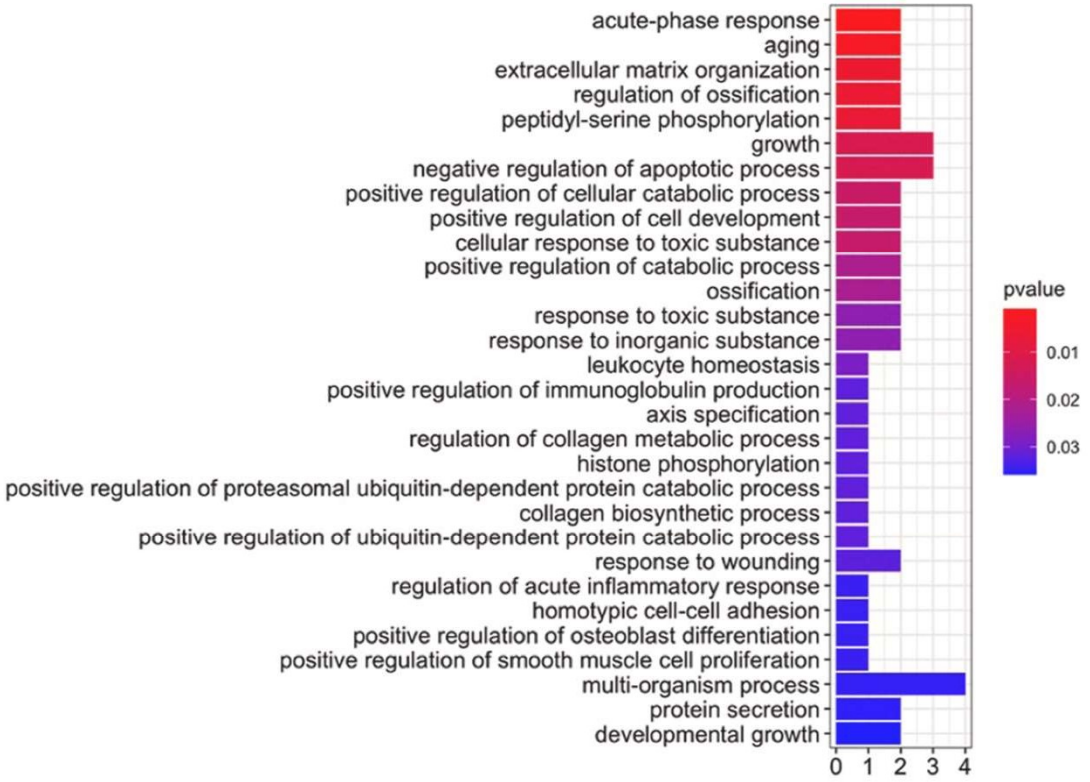




Barranco et al. Biomolecules. 2021

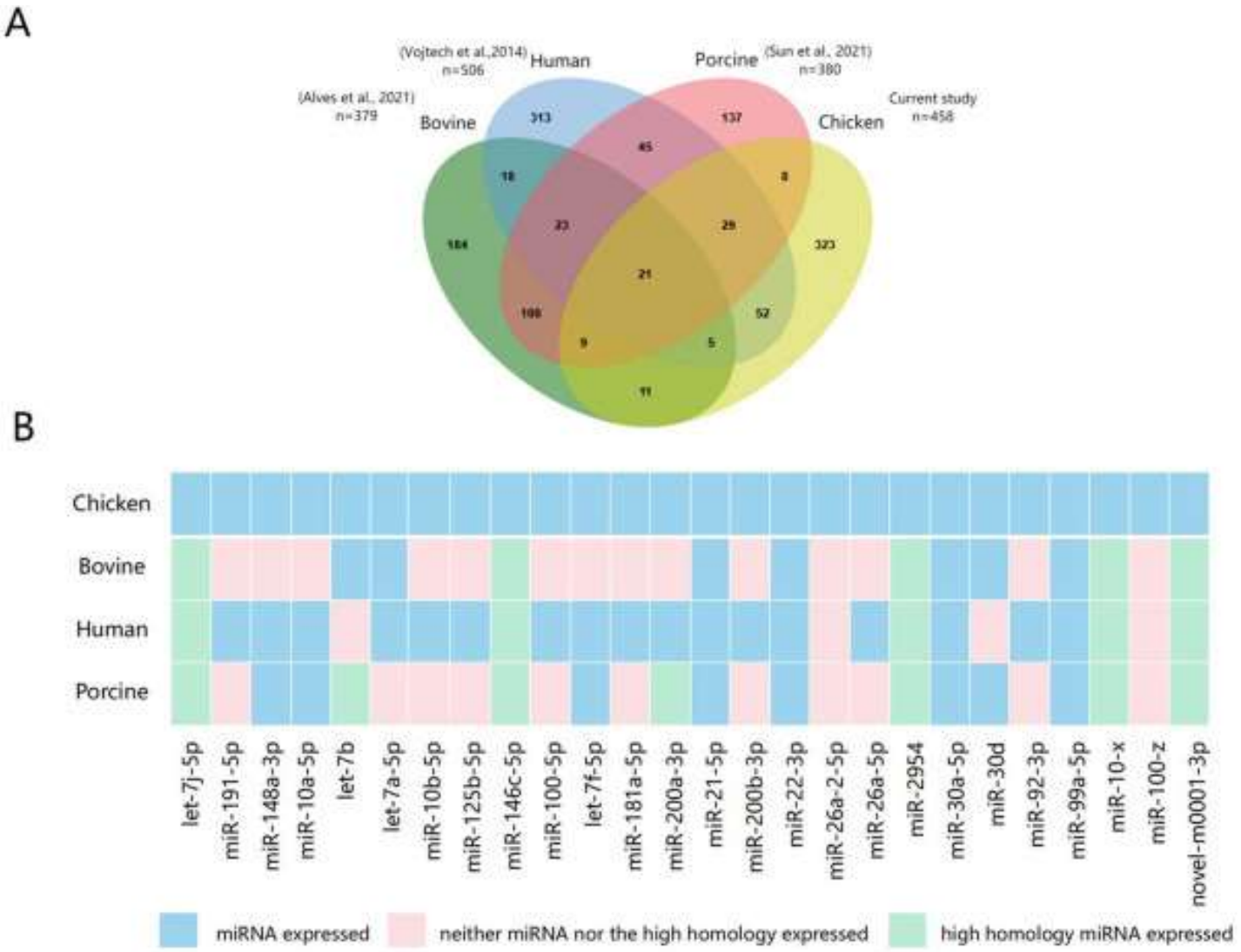
BOVINE





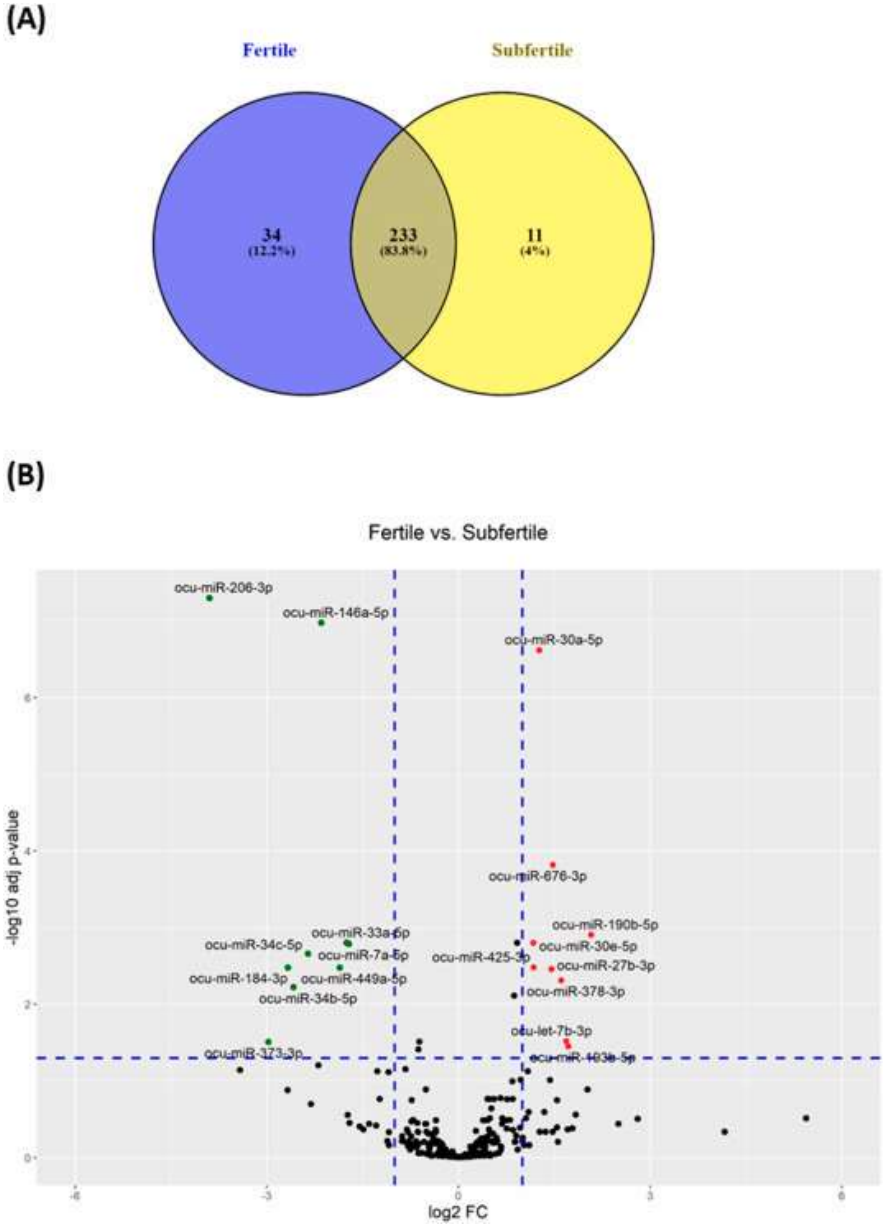
Sanchez et al. 2024. Theriogenology.

ROOSTER



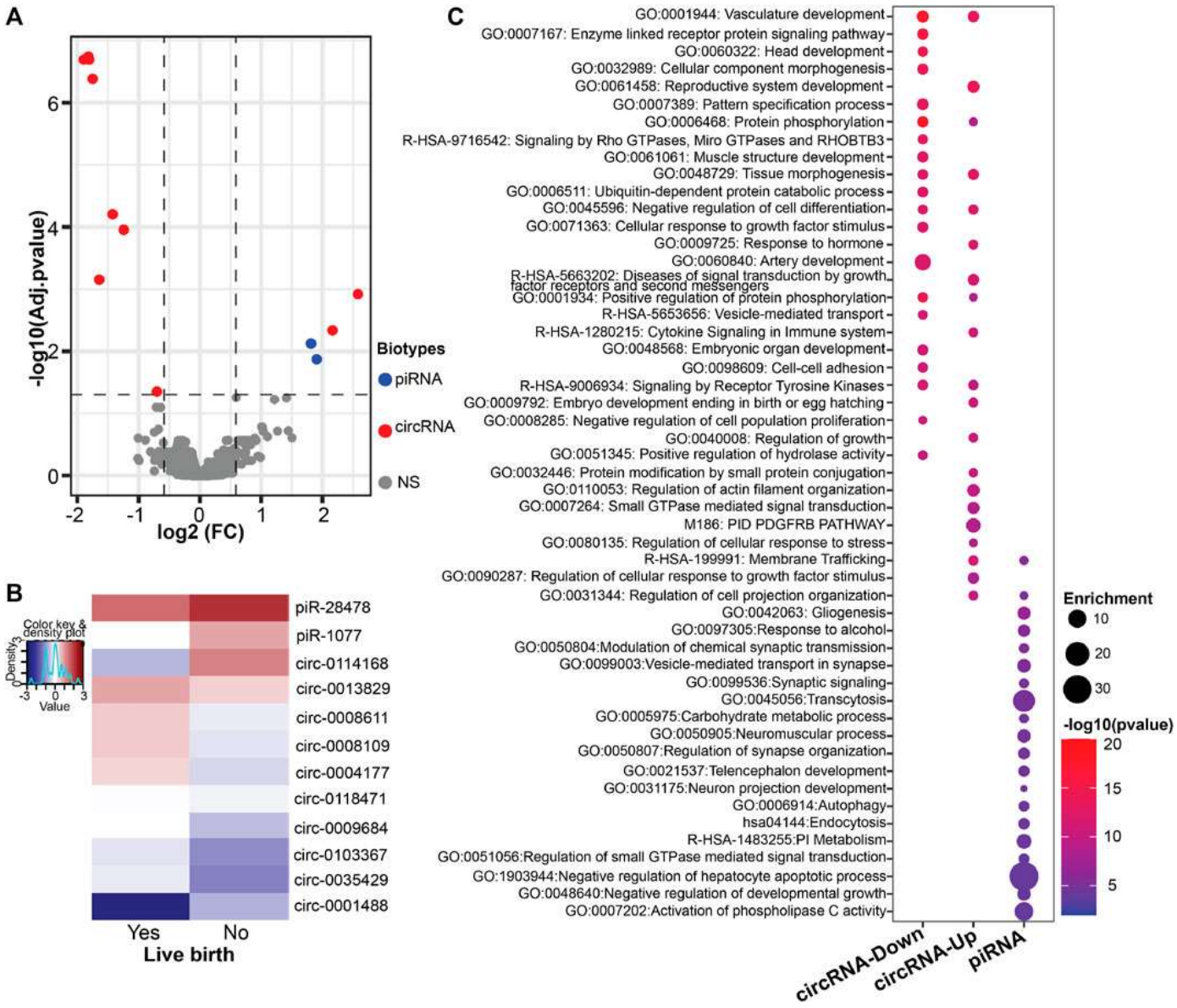
Han X et al. Poultry Science 2022

RABBIT

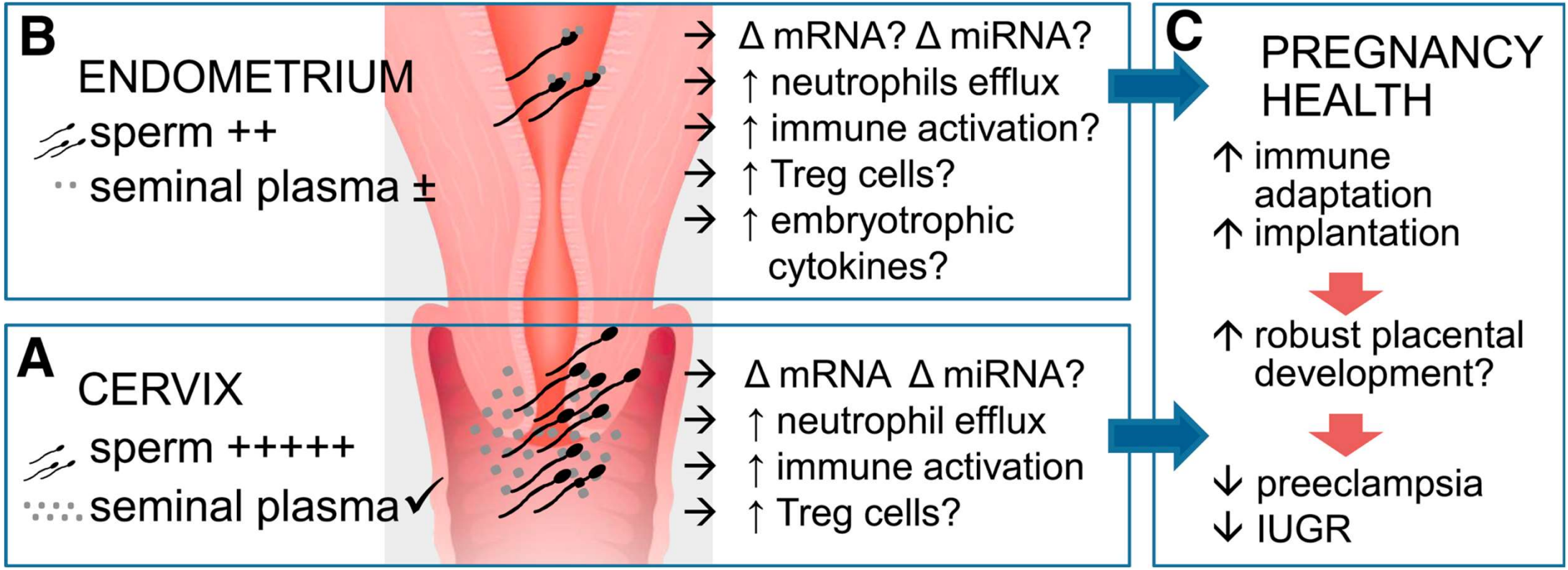


Sakr OG et al. Theriogenology 2023

HUMAN



Oluwayiose OA Front Cell Dev Biol 2023



Seminal fluid and fertility in women. Roberson S.A, Sharkey D. 2016 106(3):511-519

TAKE HOME MESSAGE

- **Multifactorial** origin of male-female complex interactions
- **Periovulatory** signaling travels through time
- Multiple **dysregulation** of coding and non-coding RNA
- **miRNAs** as promising intra- and inter-species biomarkers
- Relevance of **EVs** as key signaling molecules

FINANTIAL SUPPORT

DNR LIU-2016- 184 00641. 2016-2018

LIONS FORSKNINGSFOND
mot folksjukdomar

Grant 2019-00288. 2020-2022

FORMAS

FORSS-745971. 2017-2019

FORSS
FORSKNINGSRÅDET I SYDÖSTRA SVERIGE

PID2022-136561OB-I00. Research project 2023-2026

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CNS2023-144564. Consolidator Grant

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Jóvenes Investigadores. PID2019-108320RJ-I00

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Thanks for listening!

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