



Equine embryo size does matter!

Emilie Derisoud, Luc Jouneau, A. Margat, C. Gourtay, C. Dubois, Catherine Archilla, Y. Jaszczyszyn, Michèle Dahirel, N. Daniel, Nathalie N. Peynot, et al.

► To cite this version:

Emilie Derisoud, Luc Jouneau, A. Margat, C. Gourtay, C. Dubois, et al.. Equine embryo size does matter!. 48th Annual Conference of the International Society of Embryo Technology, Jan 2022, Savannah, GA, United States. , Reproduction, Fertility and Development, 34 (1-2), pp.261, 2022, Proceedings of the Annual Conference of the International Embryo Technology Society, Savannah, Georgia, 10–13 January 2022. 10.1071/RDv34n2Ab52 . hal-03538184

HAL Id: hal-03538184

<https://hal.science/hal-03538184>

Submitted on 20 Jan 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

INRAE Equine embryo size does matter!



E Derisoud^{1,2,*}, L Jouneau^{1,2}, A Margat³, C Gourtay³, C. Dubois⁴, C Archilla^{1,2}, Y Jaszczyszyn⁵, M Dahirel^{1,2}, N Daniel^{1,2}, N Peynot^{1,2}, L Briot³, F De Geoffroy³, L. Wimel⁴, V Duranthon^{1,2}, P Chavatte-Palmer^{1,2}

¹Université Paris-Saclay, UVSQ, INRAE, BREED ²Ecole Nationale Vétérinaire d'Alfort, BREED ³IFCE, Plateau technique du Pin, France ⁵Institute for Integrative Biology of the Cell (I2BC), UMR 9198 CNRS, CEA, Paris-Sud University, France ⁴IFCE, Plateau technique de la Valade

INTRODUCTION

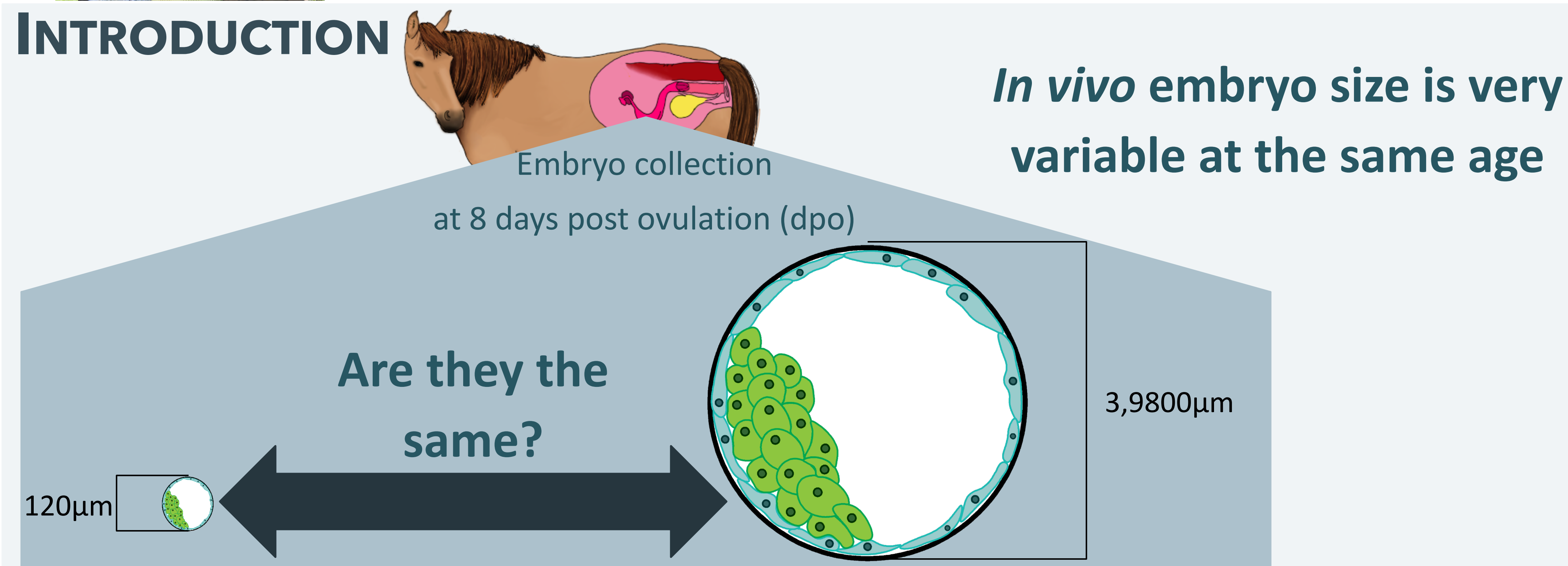


Table 1. DIAMETER OF EQUINE EMBRYOS RECOVERED FROM THE UTERINE LUMEN

Day Postovulation	Number of Embryos	Embryo Diameter (mm)	
		Mean	Range
6	121	0.208	0.132–0.756
7	144	0.406	0.136–1.460
8	142	1.132	0.120–3.980
9	41	2.220	0.730–4.520

Adapted from Squires EL, Cook VM, Voss JL: Collection and transfer of equine embryos. Fort Collins, CO, Colorado State University, Animal Reproduction Laboratory, Bulletin no. 1, 1985; with permission.

Vanderwall, Veterinary Clinics of North America: Equine Practice, 1996

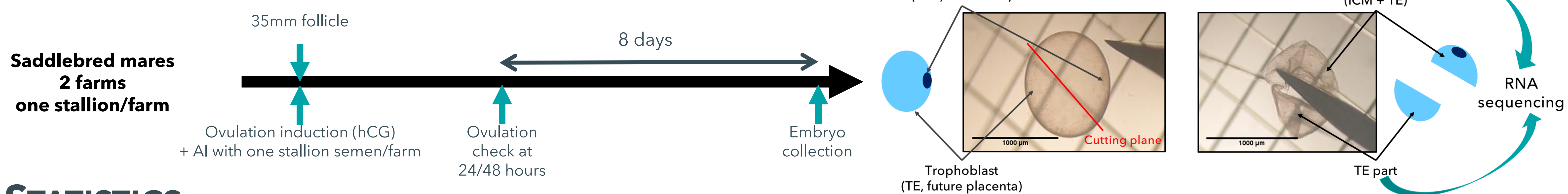
Factors affecting embryo diameter in 215 horse embryos.

Factors	Embryo diameter (µm, average ± SD)
Day of flushing	
7 (N = 12)	404.91 ± 306.50 ^a
8 (N = 189)	660.29 ± 329.33 ^b
9 (N = 10)	912.39 ± 665.11 ^c
10 (N = 4)	1224.50 ± 821.04 ^d

Panzani et al., Theriogenology, 2014

OBJECTIVE: STUDY THE EFFECT OF EMBRYO SIZE ON GENE EXPRESSION

EMBRYO COLLECTION & PROCESSING



STATISTICS

Deconvolution: DeMixT package; estimation of ICM and TE cells in ICM + TE part → Deconvolution of gene expression

RNAseq differential analysis: DESeq2 package on R software with farm and embryo sex as cofactors; padj<0.05 for significance

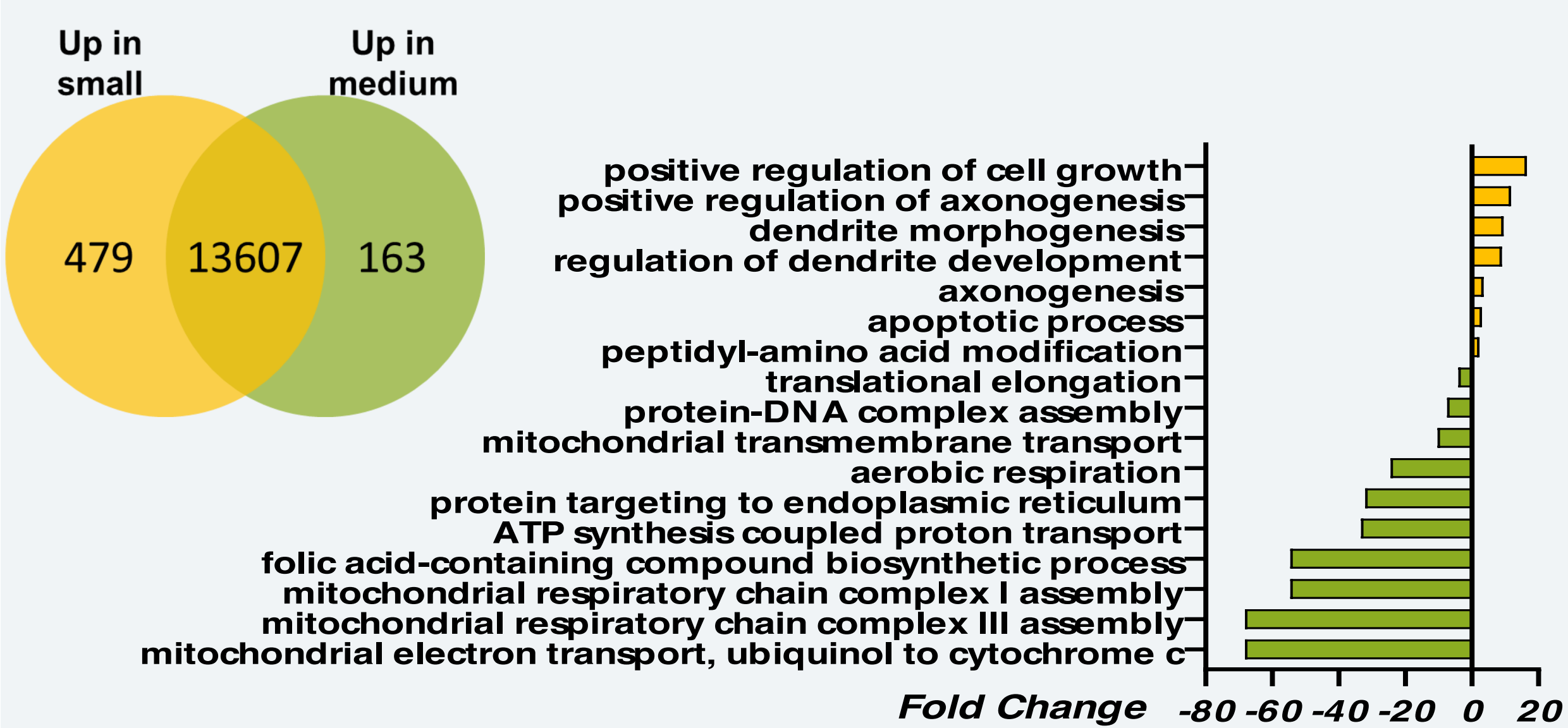
Pluripotency markers: Nanog Homeobox (*NANOG*) & SRY-Box Transcription Factor 2 (*SOX2*); Hormone metabolism: cytochrome P450 aromatase (*CYP19A1*), 17β-Hydroxysteroid dehydrogenase (*HSD17B1*), Insulin Like Growth Factors 1 & 2 (*IGF1* & *IGF2*)

Overrepresentation test (PANTHER web software): on differentially expressed genes using GO BP databases;

Fold change < 0 indicated overrepresentation in medium size embryos

RESULTS

SMALL VS MEDIUM

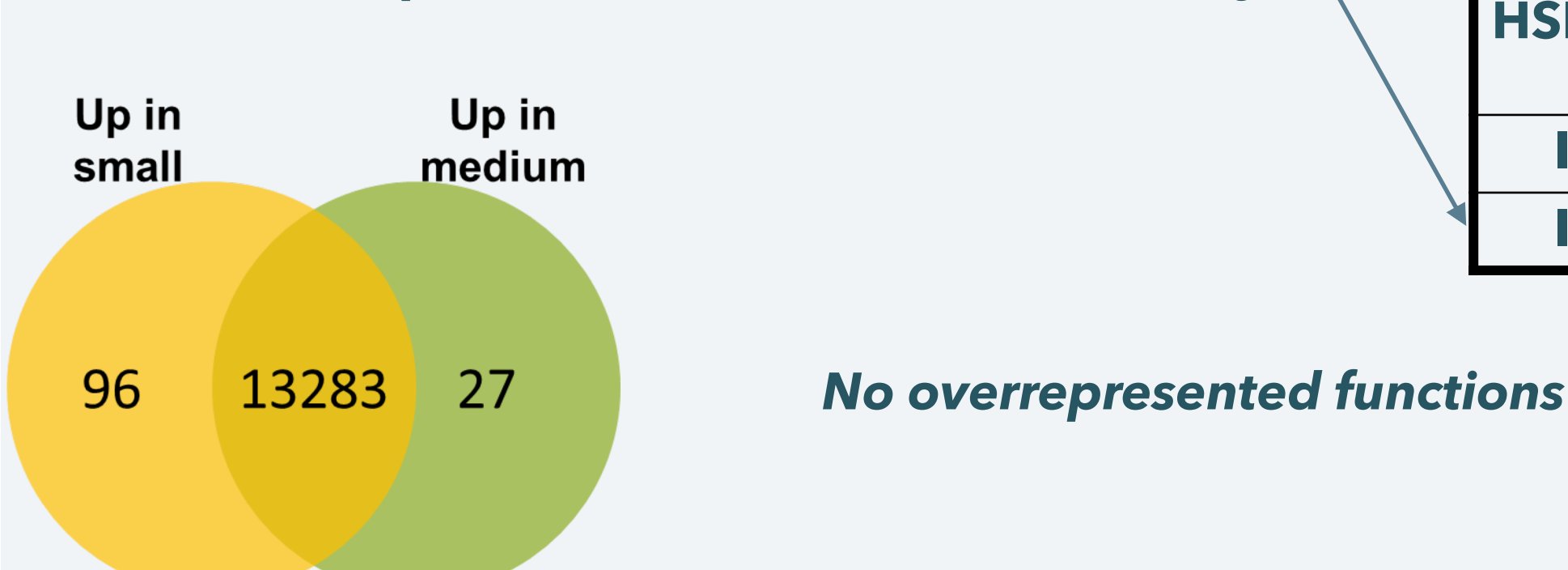


Cell proliferation and differentiation seem to be more active in small embryos ICM

→ Maybe ICM of medium embryos has already enough cells and is less active in cell proliferation at this stage

Mitochondria and aerobic respiration overrepresented in medium embryo ICM → small embryos do not seem to be able of aerobic respiration

IGF2 is more expressed in ICM and TE of small embryos



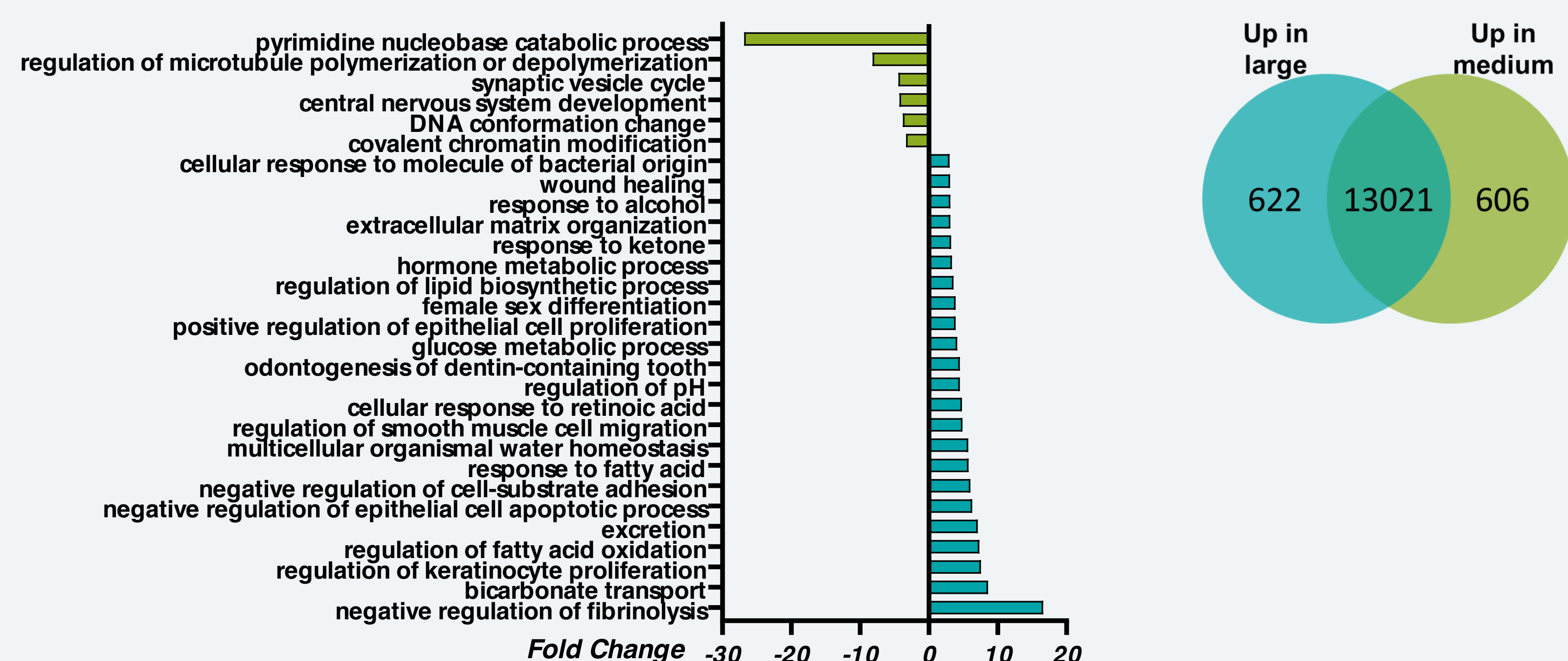
ICM

NANOG	No difference	↘ in large embryos
SOX2	No difference	↘ in large embryos
CYP19A1	No difference	↗ in large embryos
HSD17B1	No difference	↗ in large embryos
IGF1	No difference	↗ in large embryos
IGF2	↗ in small embryos	No difference
CYP19A1	No difference	No difference
HSD17B1	No difference	Tended ↗ in large embryos
IGF1	No difference	↘ in large embryos
IGF2	↗ in small embryos	No difference

No overrepresented functions in large embryos but amino acid and nucleic acid metabolism overrepresented in medium embryos
→ Switch in energy sources?

TE

LARGE VS MEDIUM



Reduced markers of pluripotency

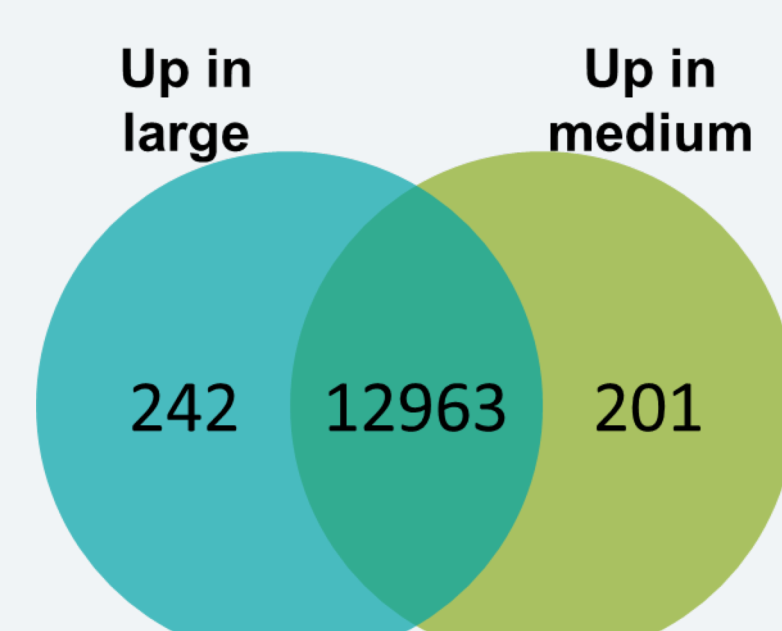
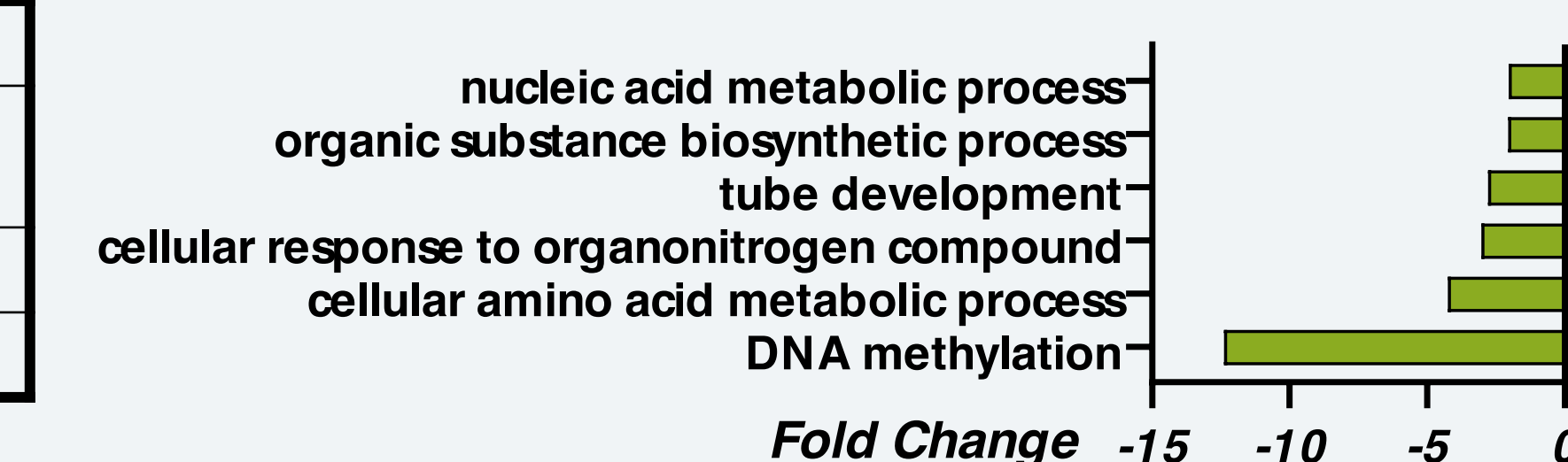
→ End of cell fate commitment?

Estrogen biosynthesis pathways: involved in maternal pregnancy recognition?

IGF1 takes over IGF2 for embryo growth

Modification of metabolic pathways and establishment of regulatory processes

→ glucose metabolism and aerobic respiration seem effective and begin to produce reactive oxygen species, that require regulation pathways to avoid an excess of oxidation in ICM cells



CONCLUSIONS

Gene expression is different between Day 8 small, medium and large embryos, with larger differences in the ICM

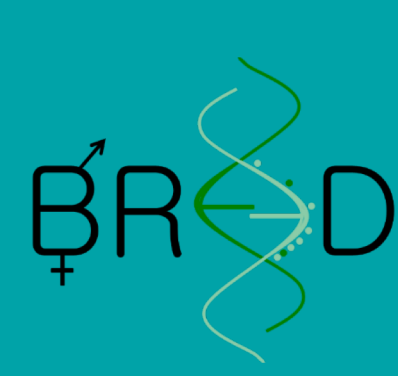
Developmental stage appears different

→ Does a reduced speed growth or a later fertilization explain the differences?

→ What are consequences for further development and implantation?

→ Role of steroid biosynthesis pathways for maternal recognition of pregnancy?

Embryo size is important to consider when studying embryo gene expression



UMR 1198 Biologie de la Reproduction, Environnement, Epigénétiques et Développement - INRAE
Domaine de Vilvert
78350 Jouy en Josas, France

<http://www6.jouy.inra.fr/breed>

Corresponding authors: emilie.derisoud@gmail.com / pascale.chavatte-palmer@inrae.fr