SugarSow

Sugar to sows for more uniform litters

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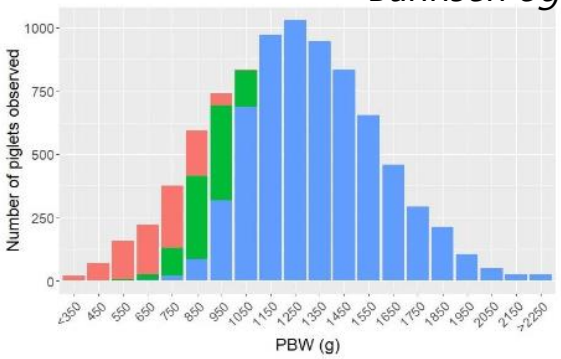
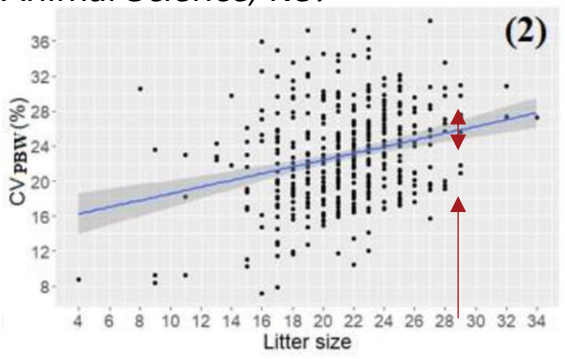
DVHS
DANSK VETERINÆR HYOLOGISK SELSKAB
Danish Pig Veterinary Society

How it all started…

Bahnsen og Riddersholm, 2020. Master thesis in Animal Science, KU.





Total piglet mortality: **23.4%**

Van den Brand et al., 2006

Feeding before estrus affects birth weight variation

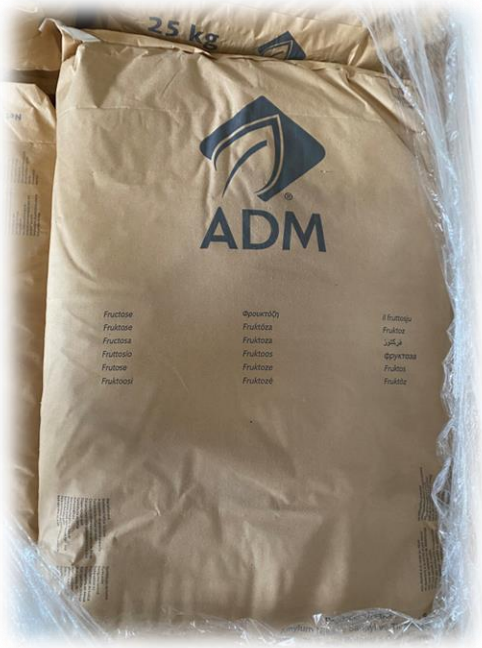
"Supplementation of dextrose to the diet **during the weaning to estrus interval** affects subsequent **variation in within-litter piglet birth weight (CV_{PBW})**."

Table 2
Effects of dextrose supplementation during the weaning-to-estrus interval on average piglet weight and variation in piglet weight within a litter (LS mean)

Variable	Dextrose		S.E.M.	*P*-value
	Yes	No		
Number of litters	91	85		
Birth				
Live born piglets	12.91	12.71	0.62	0.83
Piglet weight (g)	1608	1591	49	0.81
CV birth weight (%)	17.5	21.2	1.3	0.03
Litters with piglets <1000 g (%)	40.7	45.9	–	0.49
Piglets <1000 g (%)	5.1	8.1	1.5	0.17
% Female piglets	52.3	52.7	3.0	0.93
Pre-weaning mortality (%)	6.9	7.4	–	0.68

Van den Brand et al., 2006

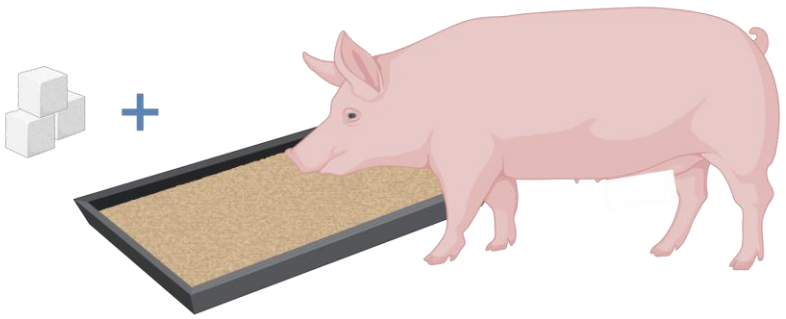
SugarSow - Sugar to sows for more uniform litters

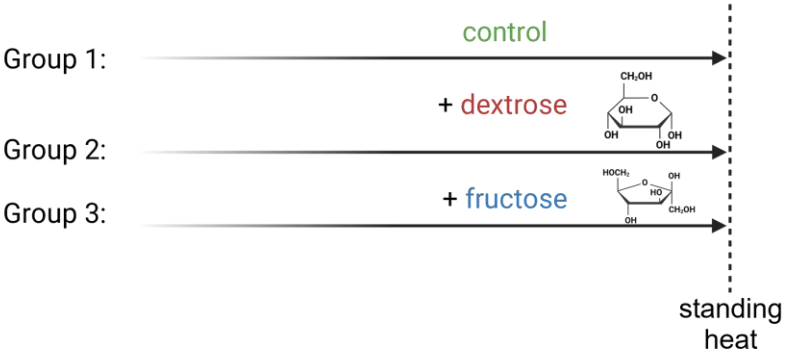


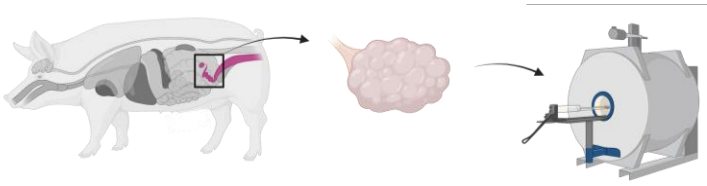
Question:

Will supplementation with sugar to Danish high productive sow's feed in the period between weaning and oestrus reduce within litter variation *(and piglet mortality)* ?

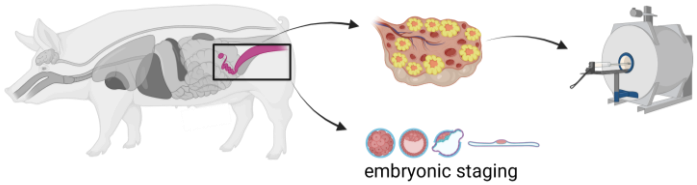
Study design



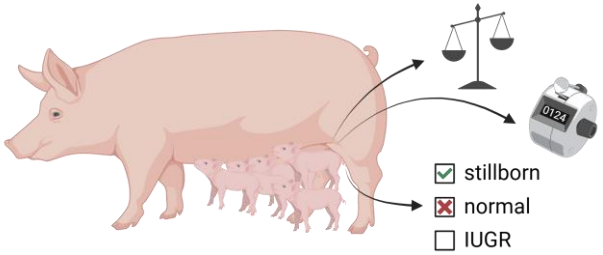




WP1: variation of follicle size



WP2: variation in embryonic developmental stage



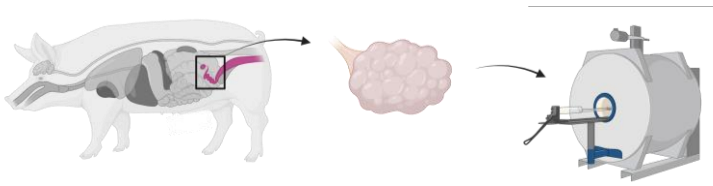
WP3: within litter variation of PBW

Hypothesis:

↑Blood sugar → ↑ Insulin & IGF-1 → stimulating effect on the development of ovarian follicles

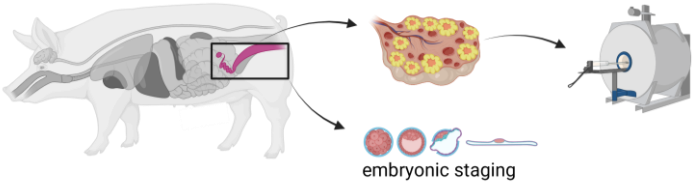
→ reduced variation in embryonic development → less variation in CV_{PBW}

Methods



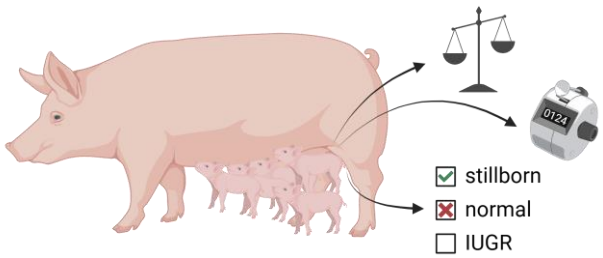
WP1: variation of follicle size

- Blood samples: blood glucose, insulin and IGF-1 T_0 / T_1
- post-mortem sampling and MRI scanning of ovaries (follicles)



WP2: variation in embryonic developmental stage

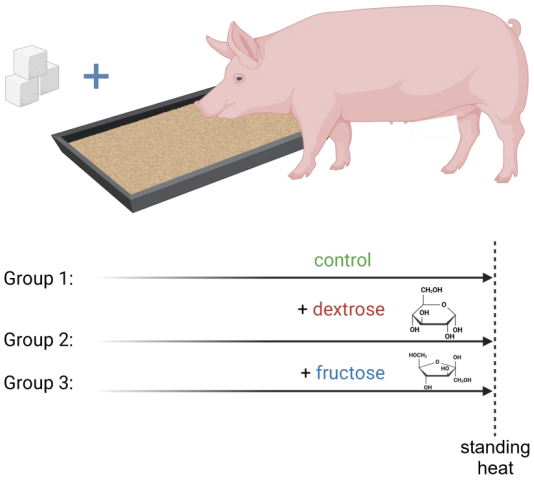
- post-mortem uterine flushing for embryos and staging using stereomicroscopy
- post-mortem sampling and MRI scanning of ovaries (corpora lutea)

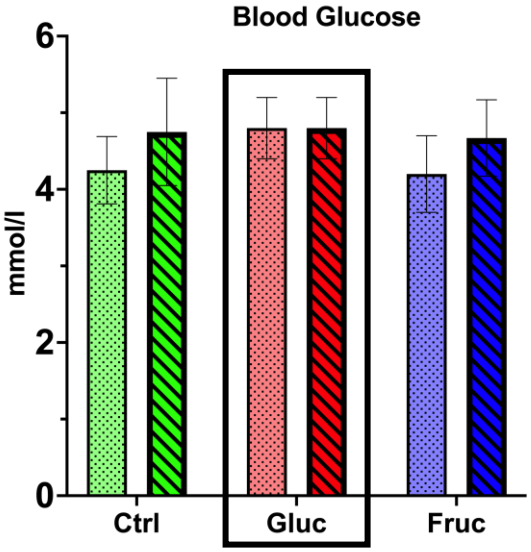


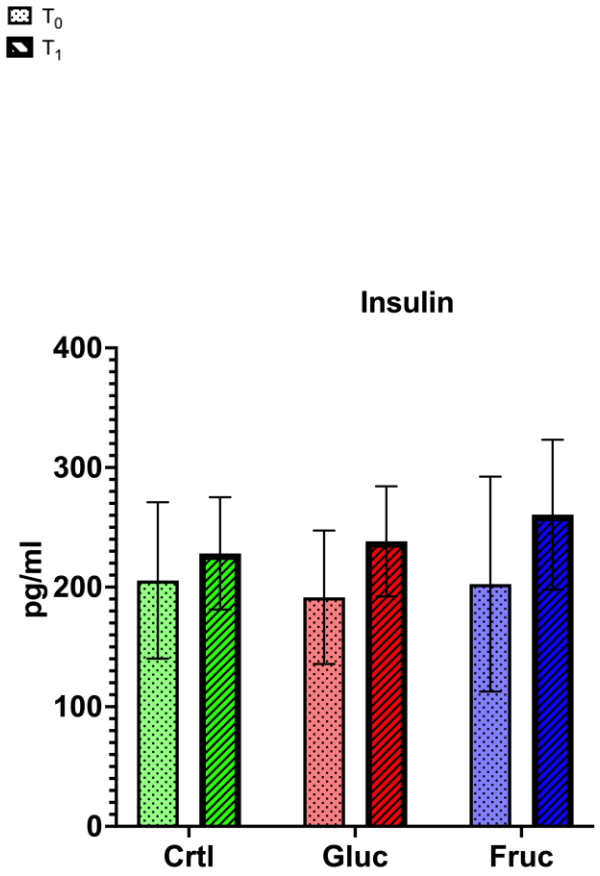
WP3: within litter variation of PBW

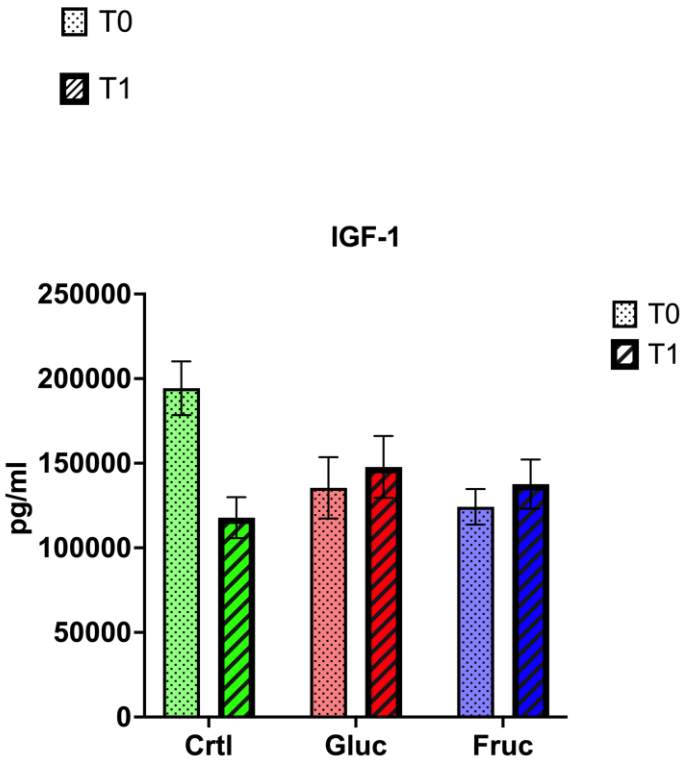
- Registration of piglets born alive, stillborn, birth weight, IUGR and mummified piglets

How it's going... - Results





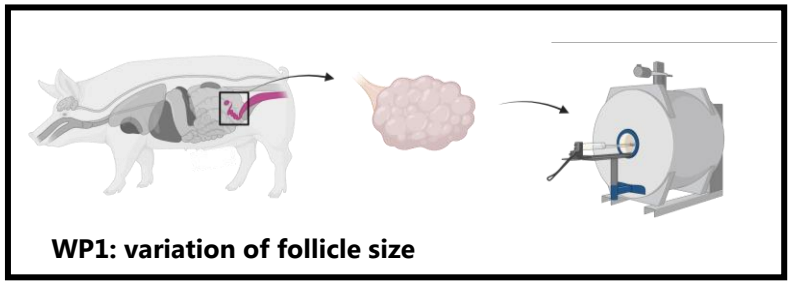


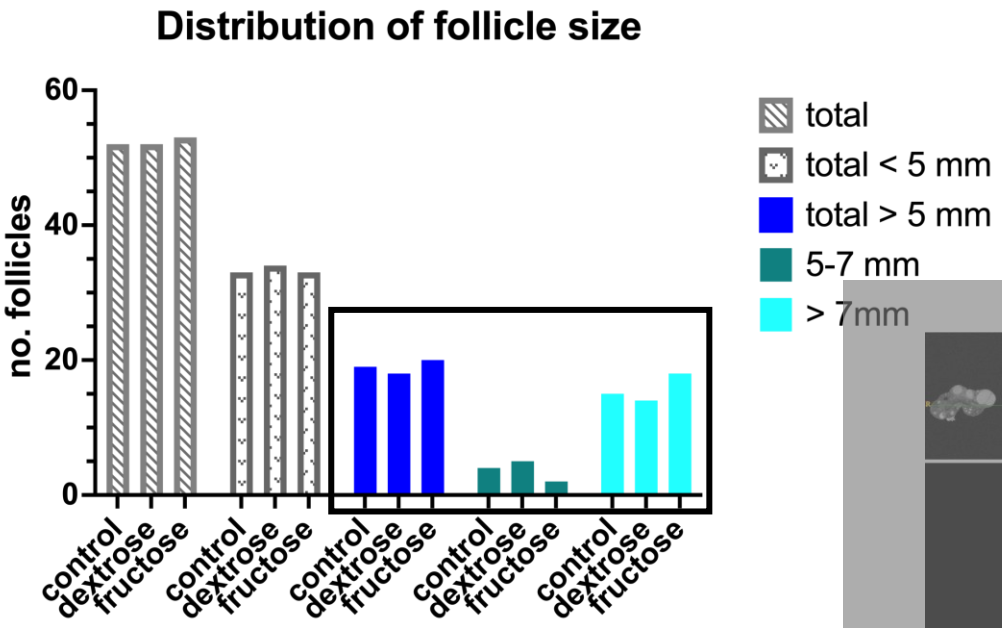


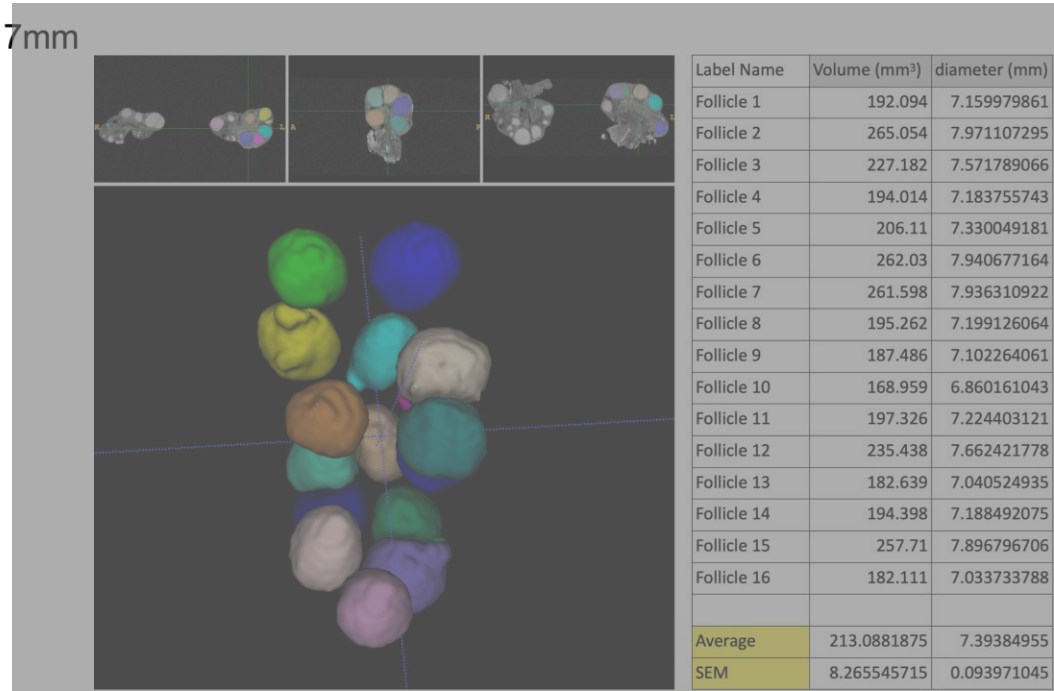
T_0= baseline at weaning

T_1= at termination

Unpublished data, Fenner et al. 2024

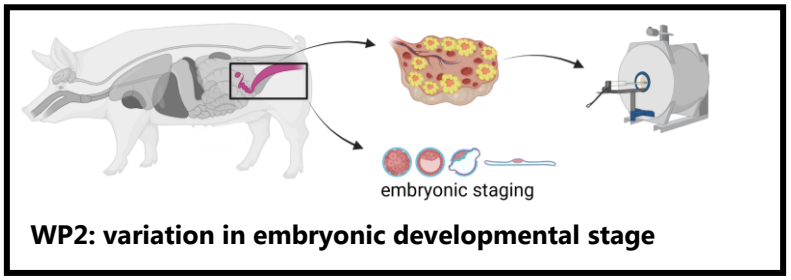




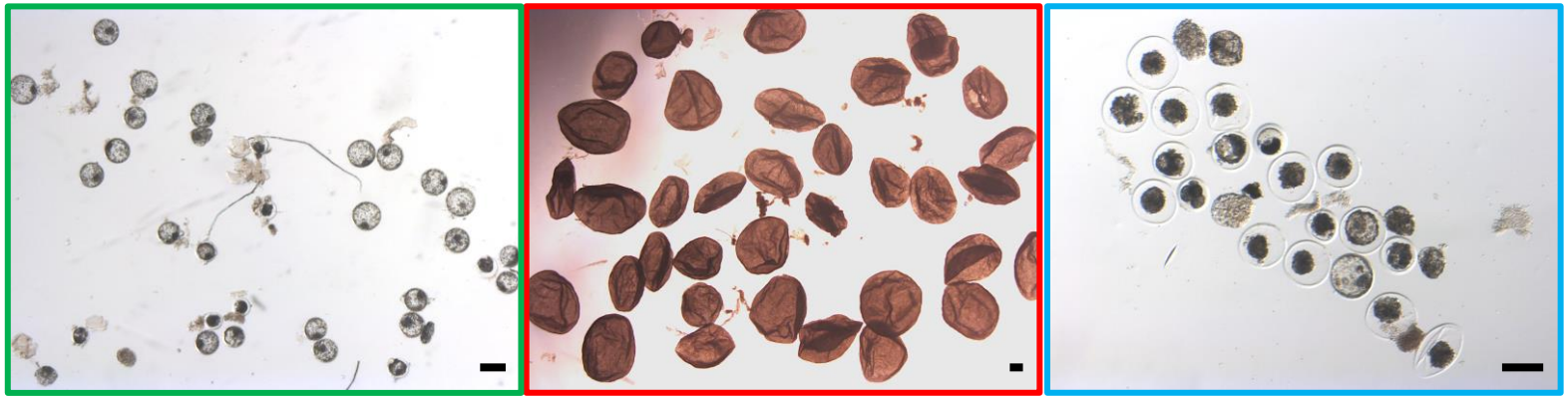


Label Name	Volume (mm³)	diameter (mm)
Follicle 1	192.094	7.159979861
Follicle 2	265.054	7.971107295
Follicle 3	227.182	7.571789066
Follicle 4	194.014	7.183755743
Follicle 5	206.11	7.330049181
Follicle 6	262.03	7.940677164
Follicle 7	261.598	7.936310922
Follicle 8	195.262	7.199126064
Follicle 9	187.486	7.102264061
Follicle 10	168.959	6.860161043
Follicle 11	197.326	7.224403121
Follicle 12	235.438	7.662421778
Follicle 13	182.639	7.040524935
Follicle 14	194.398	7.188492075
Follicle 15	257.71	7.896796706
Follicle 16	182.111	7.033733788
Average	213.0881875	7.39384955
SEM	8.265545715	0.093971045

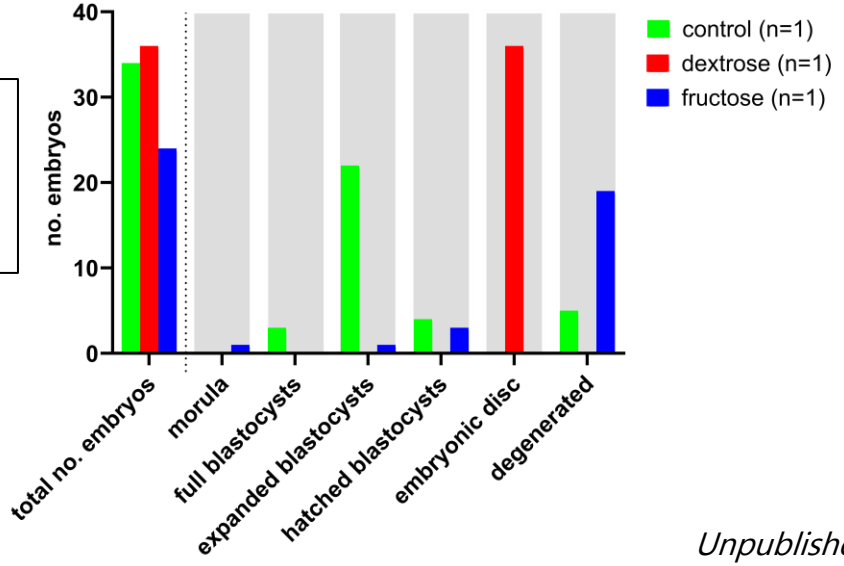
Unpublished data, Fenner et al. 2024



WP2: variation in embryonic developmental stage



More uniformity of embryonic stages in the dextrose group



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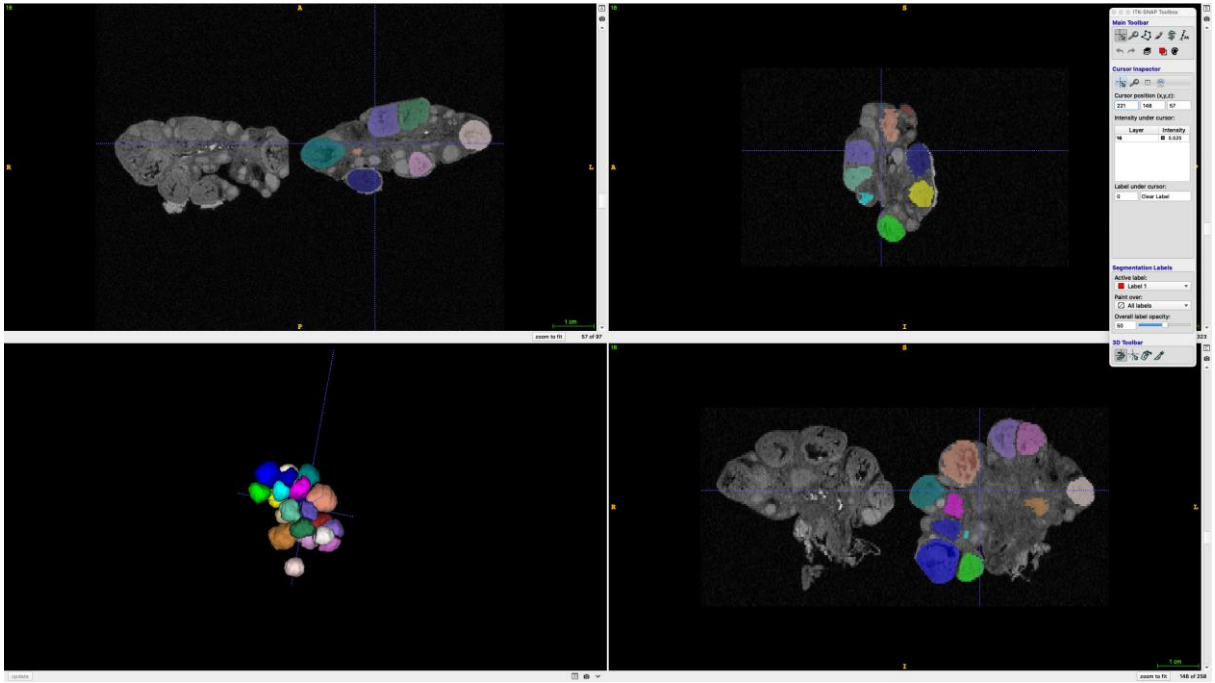
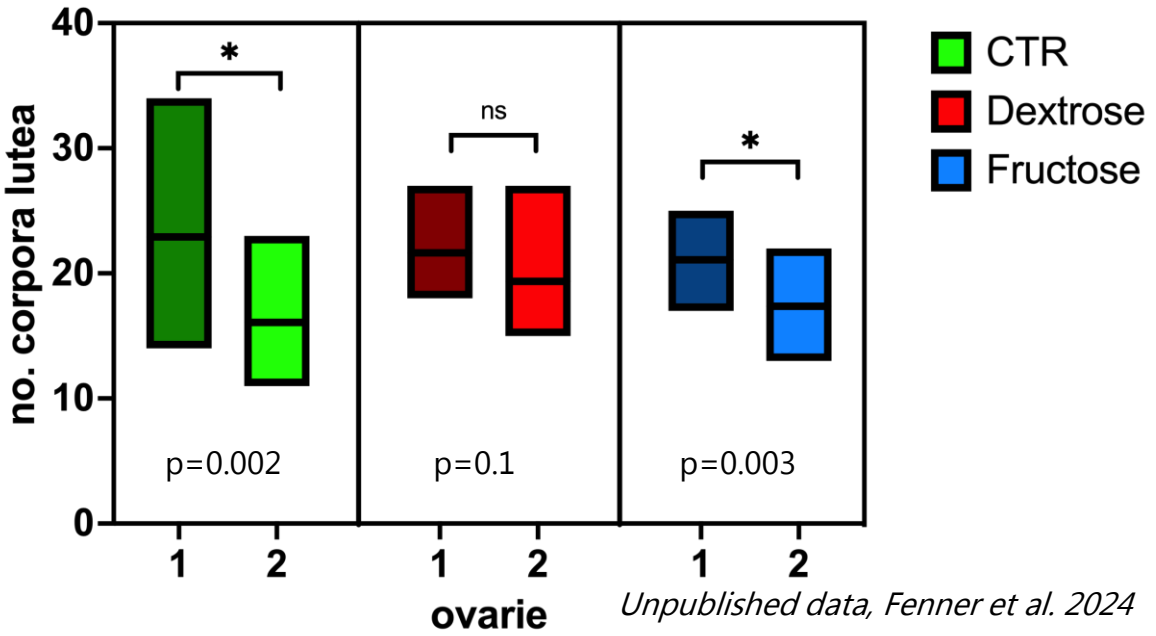
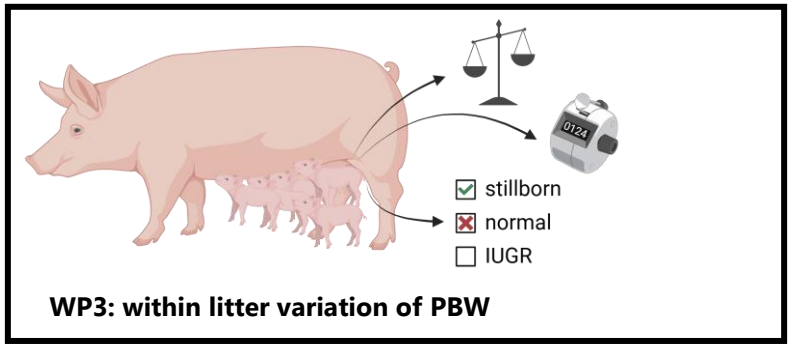


No significant difference in **total number of CL**

More **uniform distribution of CL** on both ovaries in dextrose group



Unpublished data, Fenner et al. 2024



	Gruppe 1	Gruppe 2	Gruppe 3	SEM	P-value			
	Control	Dextrose	Fructose					
					Diet	Parity	DxP	Total born
N sows	93	95	102					
Parity	3.6	3.7	3.6	0.15	0.9534			
Back fat at weaning, mm	11.4	10.9	11.7	0.30	0.2156	<0.0001	0.3048	
Total born	22.8b	23.7a	22.3b	0.38	0.0376	0.5788	0.1079	
Live born	21.3	21.4	20.7	0.35	0.3121	0.3861	0.1004	
Litter weight, kg	28.0	27.5	27.5	0.48	0.1351	0.4058	0.2511	<0.0001
Average piglet birth weight, g	1226	1218	1212	17.1	0.5113	0.7219	0.1839	<0.0001
Within-litter variation in birth weight, g	298	302	312	6.14	0.2793	0.9556	0.4050	0.2298

Unpublished data, Fenner et al. 2024

Summary

WP1
- Supplementation of 400g dextrose / fructose has no negative influence on the sows blood glucose homeostasis
- No significant difference in plasma insulin and IGF-1 levels between the groups at termination, however a tendency towards higher levels in the dextrose group regarding IGF-1
- No difference in total number of follicles ready for ovulation
- No significant difference in follicle size between the groups

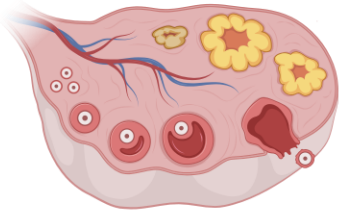
WP2
- More uniformity in within litter embryonic developmental stage in the dextrose group (at day 7-11 post-insemination)
- More uniformity in CL distribution between ovaries in dextrose group

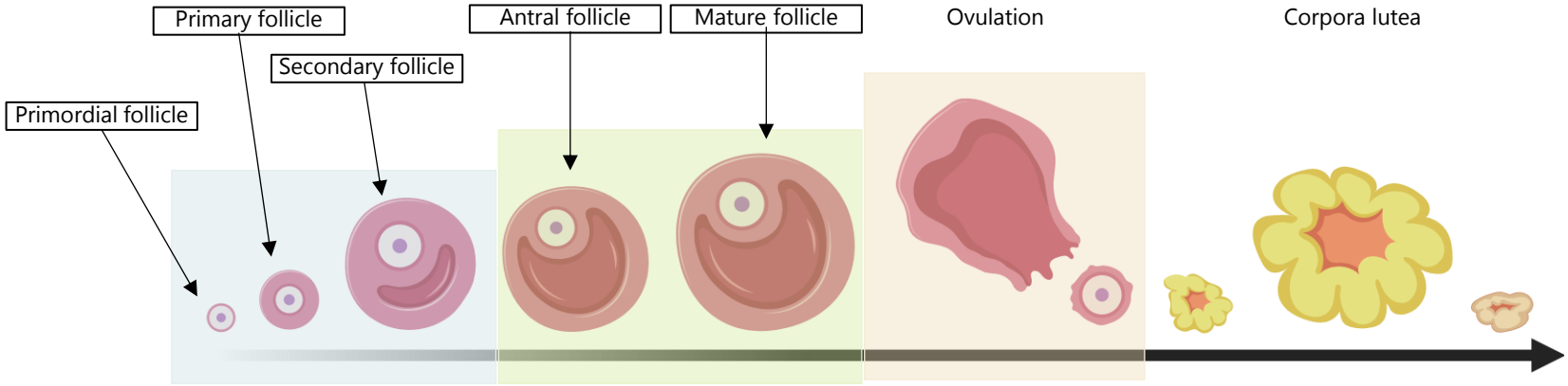
WP3 →
- Significant increase in litter size by 1 piglet per litter

Unpublished data, Fenner et al. 2024

Conclusion / Reflections

Oocyte and follicle development



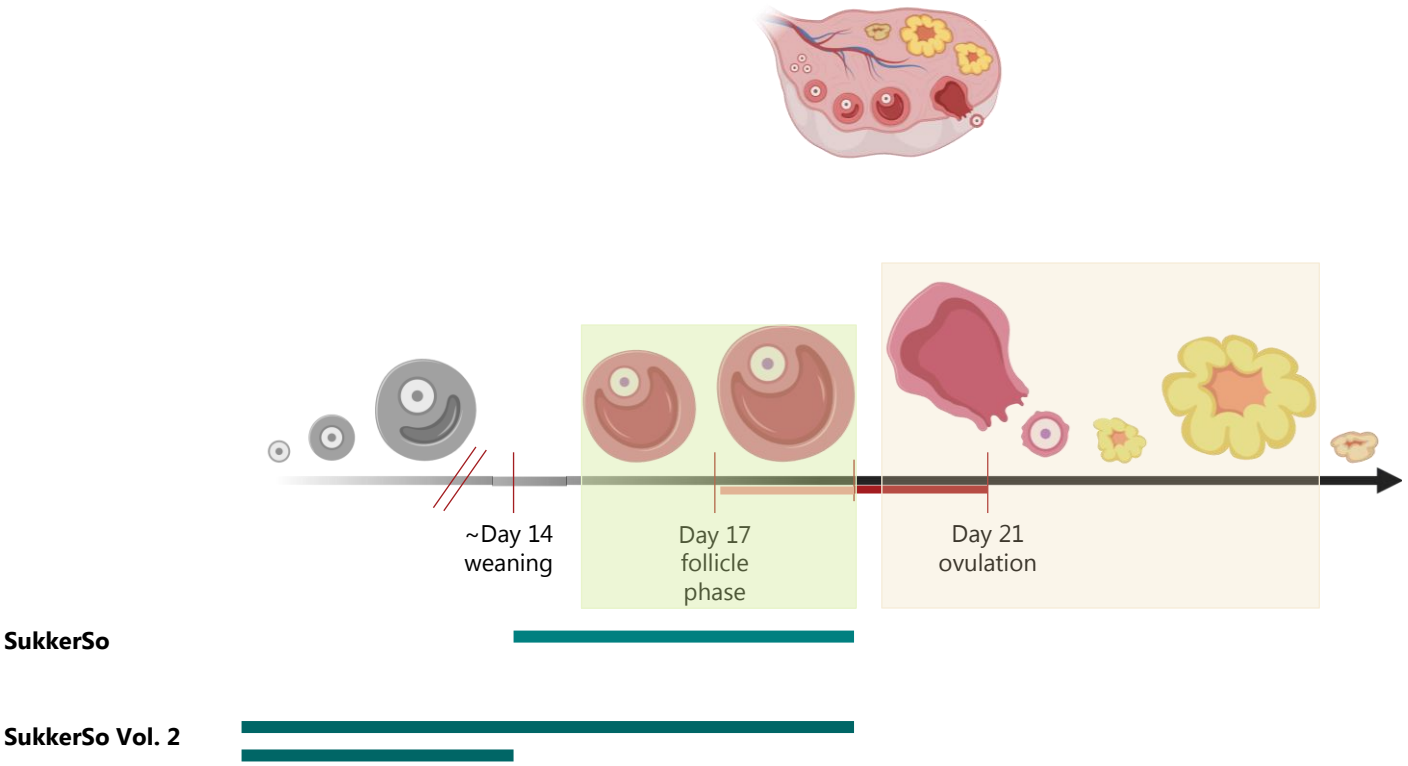


Embryonic development

Follicle maturation in pubescent sows

Ovulation in pubescent sows

Reflection – what could the future hold?



Acknowledgements

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Rasmus Sørensen, operations manager "Sr. Randsigvej 35, Varde"

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Svineafgiftsfonden