Smart Estrus Detection Technique on Sows Suitable for Less Productive Regions

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Accurate prediction of ovulation time remains one the fundamentals to improve reproductive performance in swine and yet a very difficult process to detect in modern production systems. The objective of the present study was to improve sow estrus detection accuracy by combining several estrus detection methods to limit the potential false alarms from group-mixing and further predict ovulation time from behavioral and temperature interactions. Data were collected from 32 Meishan X Large White X Duroc sows housed in group pens with 28.2 ˚C average temperature. Weaned sows were observed for 11 days, and estrus was detected twice, daily. Estrus detection comprised live observations for sow mating behaviors, and the body temperature of the animals was obtained from six control points (vulvar skin, intra-vulvar skin, gluteal area, udder, ears, and the back) using a hand held infrared thermometer (FUNET EM-350B), and the back pressure test was conducted in conjunction with an adult boar to confirm standing heat. The findings revealed that at Day 1 post weaning animals spent most time lying down and the animals maintained a normal body temperature in the 6 control points. However, 32-24 hours prior to standing heat, marked increased sow activity. A similar trend was shown by increasing sow temperature during proestrus and reached the peak 12 hours before standing heat; vulvar skin (35.3 ˚C), intra-vulvar skin (34.8 ˚C), gluteal area (33.6 ˚C), udder (33. 8 ˚C), ears (35.6 ˚C), and back (33.7 ˚C). Temperatures remained at peak for 36 hours, then decreased remarkably 12 hours prior to ovulation with vulvar skin (33.4 ˚C), intra-vulvar skin (33.6 ˚C), gluteal area (32.1 ˚C), udder (32. 6 ˚C), ears (33.8 ˚C), and back (32.8 ˚C). Since behavioural change and temperature variations are influenced by hormones, the findings suggest that available literature can be as a reference point to match observed behaviours and temperature variations with time frame to reliably predict the time of ovulation. In conclusion, sow mating behavior and temperature variations observed on the onset of estrus can be used as a marker to predict ovulation.

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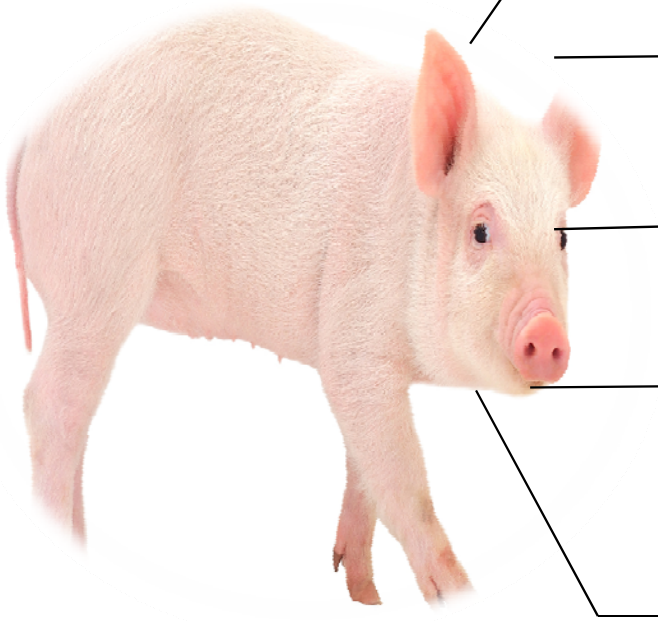
Presentation outline

Menu



1. Introduction
2. Literature Review
3. Materials and Methods
4. Results
5. Conclusions

1. Introduction (1/2)

Menu

Estrus detection is really difficult, even with Application of High-tech heat detection protocols

Artificial insemination (AI)

Swine production & technology
(Simoes et al., 2014)

Induce estrus in pigs

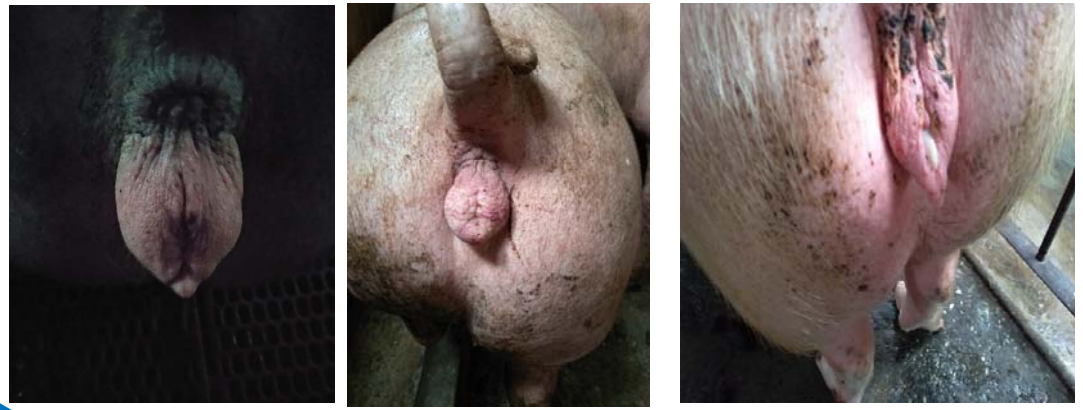
Estrus detector in pigs

1. Introduction (2/2)

Menu

Vulval mucus discharge, reddening and swelling is perhaps the easily recognized and perhaps mostly used

To develop a very easy way to detect sows on heat, but smart enough to be more accurate and efficient



Purpose of the study

Visual evaluation of the vulva, lacks the scientific evidence

- The study aims to bring that by using Infrared thermo-digital equipment in black pigs (Meishan)

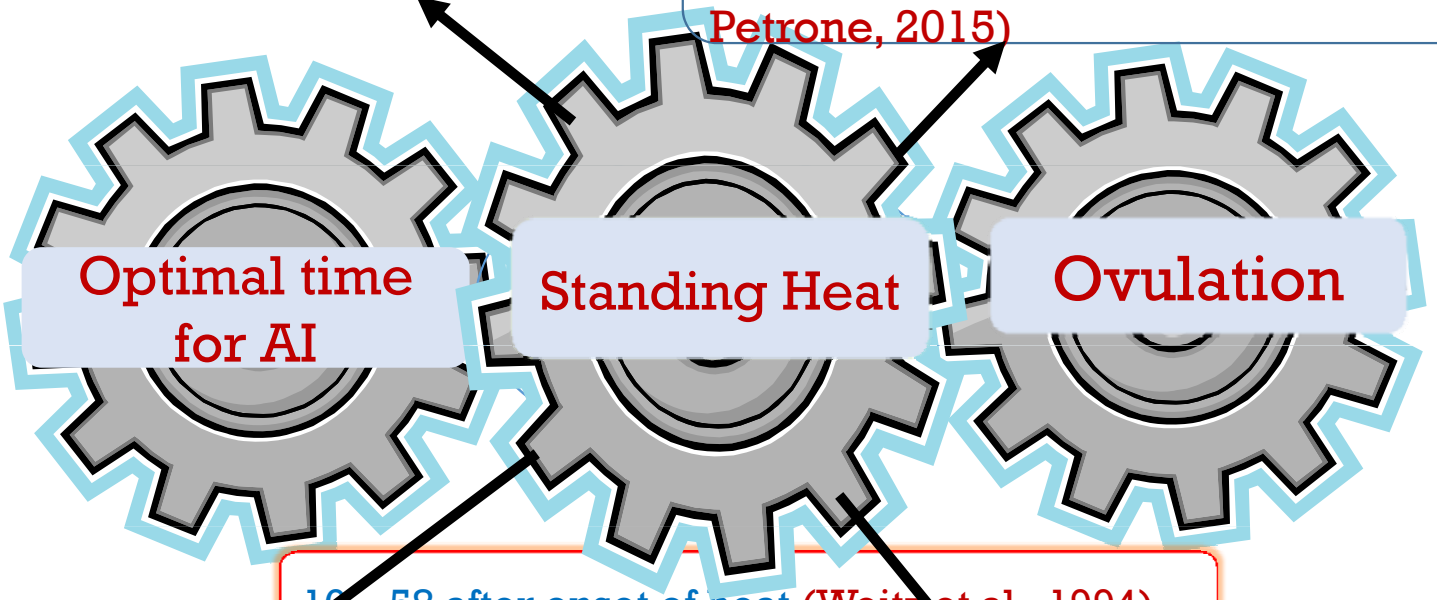
2. Literature Review

Behavioral change (Cornou 2006; Levis et al., 2011; Krsnick, 2005; Williams, 2009)

Anatomy and physiological processes (Simoes et al., 2014; Scolari et al., 2011; Luno et ai., 2013; Petrone, 2015)

Temperature changes

Vulva Mucas Discharge



10 – 58 after onset of heat (Weitz et al., 1994)

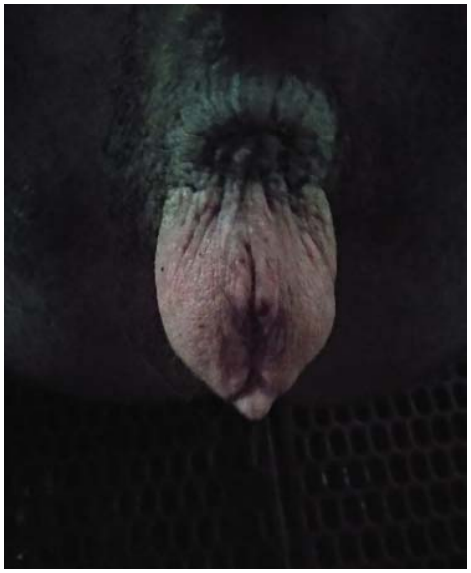
Immobile Response(Worwod, 2007; Petrone, 2015)

Back pressure Test (Hartmann *et al.*, 2015)

3. Materials and methods (1/3)

3.1 Observations for estrus detection

- Detected twice daily Morning and Afternoon (3:00 – 5:00) based vulva appearance, replacement behaviors

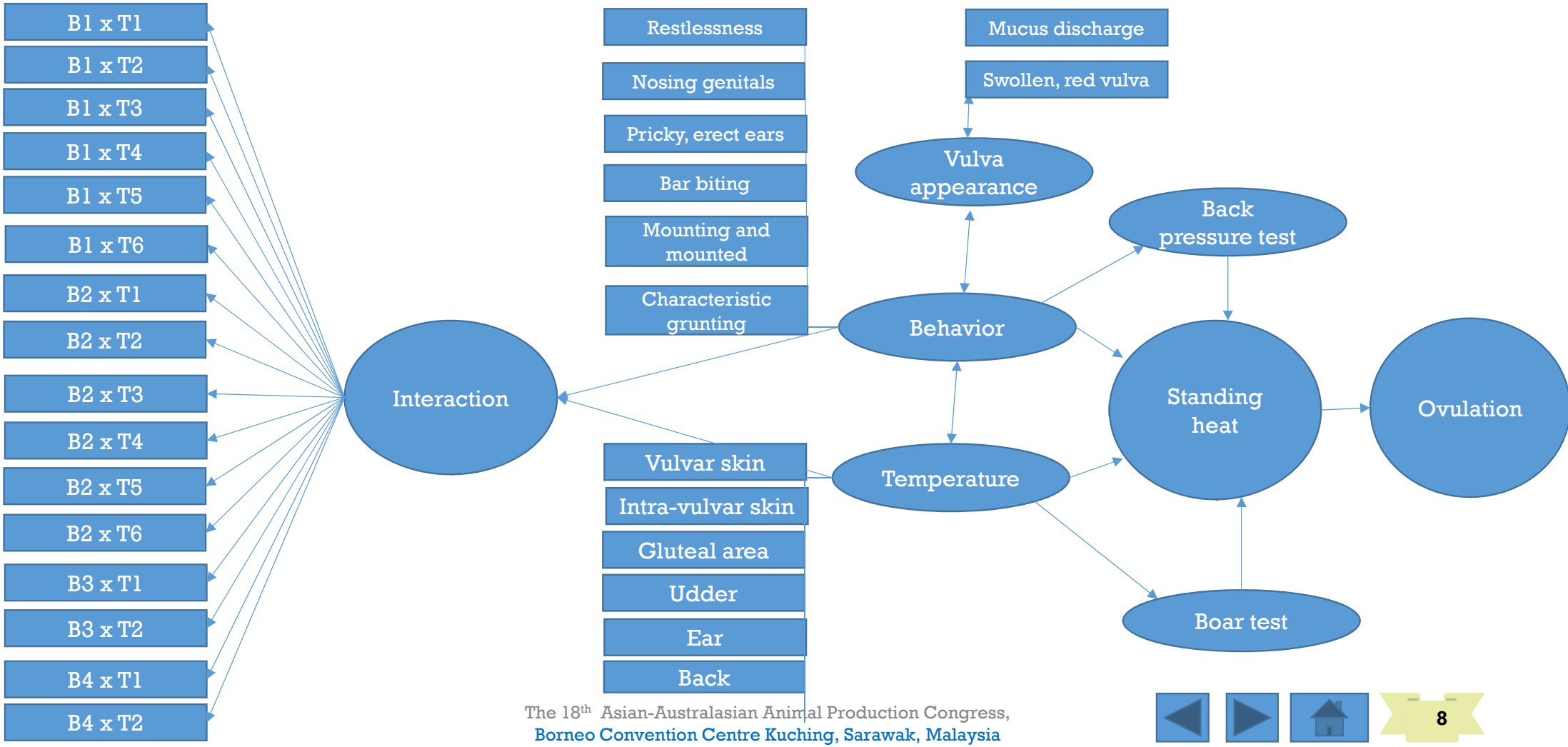


3. Materials and methods (2/3)

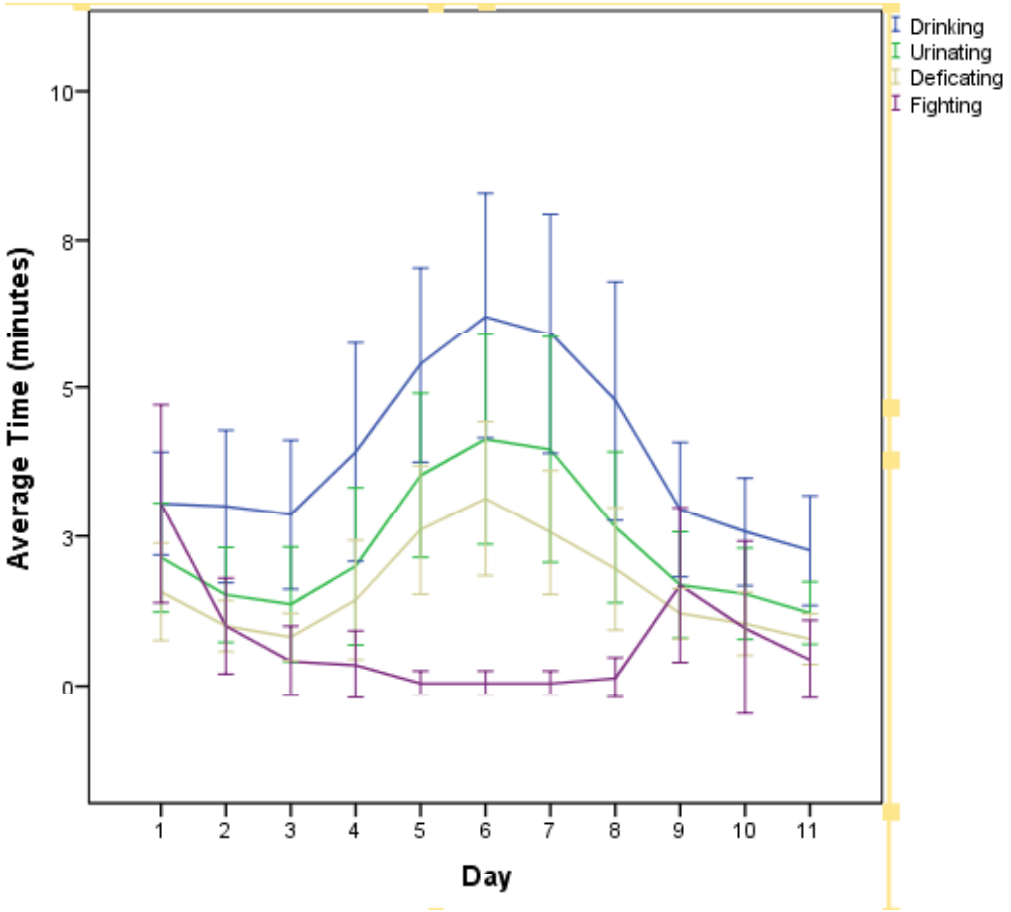
3.2 Infrared thermography

- Temperature measurements of the ear, back , front udder, gluteal area, vaginal skin and intra-vaginal skin at (09:30) and afternoon (4:30)
- To confirm sows were on standing heat, a back pressure test along with boar test were conducted

3. 3 Experimental Design (3/3)



4. Results (1/4)



Most time spent lying (Ekkel et al., 2003)

Toward onset of heat increased time on standing (Cornou, 2006; Altmann, 1941)

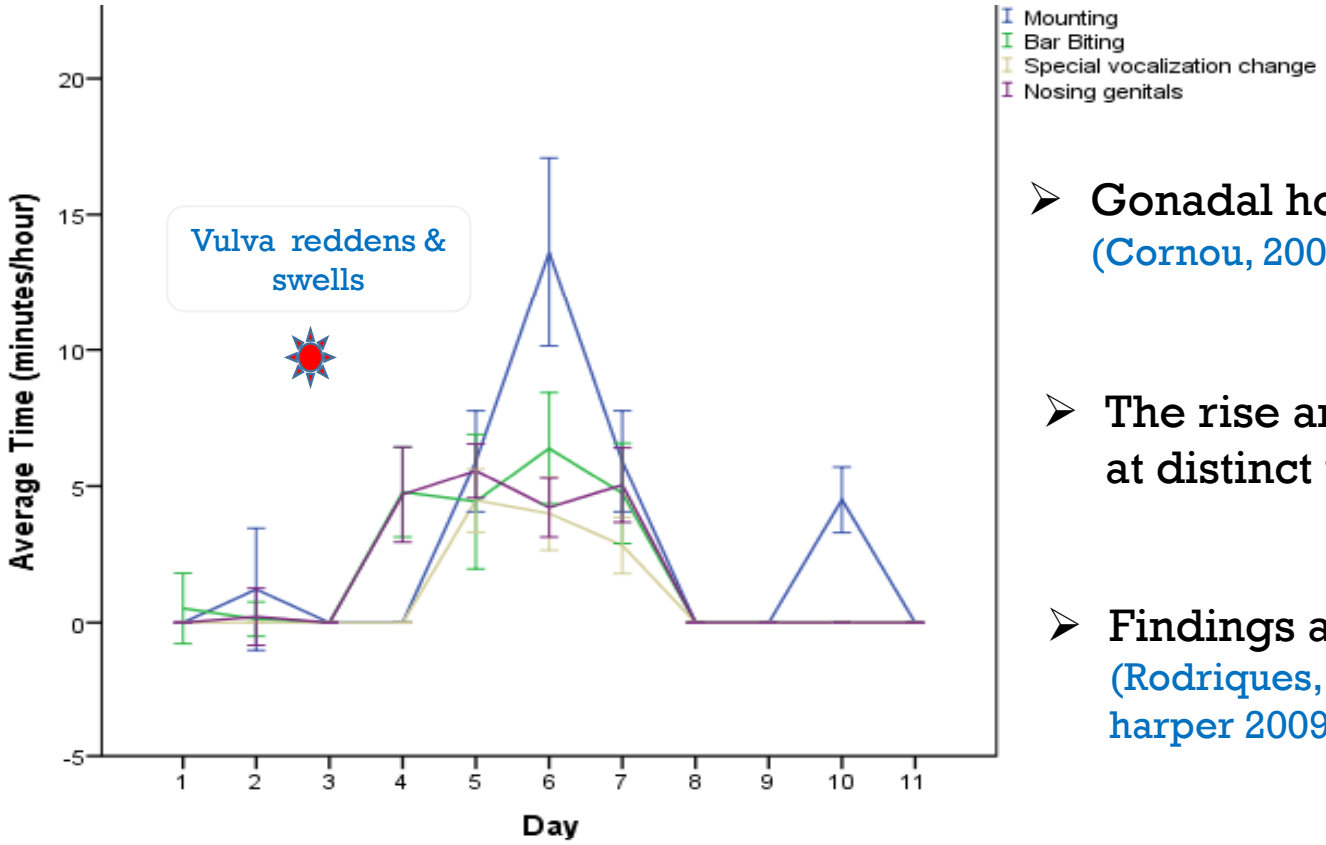
Less interest on feed (Worwod 2007; Cornou, 2006)

- Variability on feed (Sollested, 2001)

- Fighting only 6 hors – 2days (Bauer, 2005; Barnett et al., 2001)

Figure 2. Frequency of observed general behavior (minutes per hour) in sows during oestrus (*n*= 32)

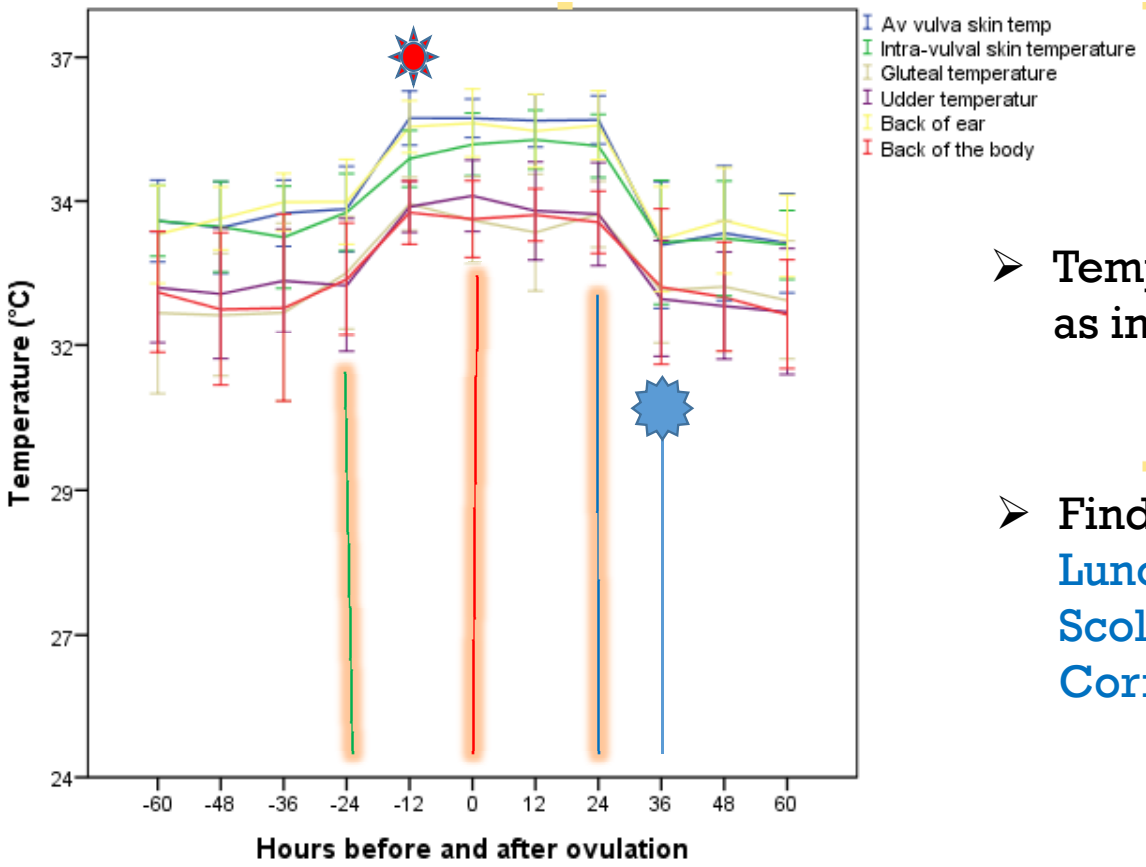
4. Results (2/4)



- Gonadal hormones sexual behavioral (Cornou, 2006; Beach, 1976;Whitternmore, 1993)
- The rise and fall of replacement behaviors at distinct times
- Findings are in line with several studies (Rodriques, 2018; Scolari, 2010; Estienne and harper 2009; Corneu 2006; Altman, 1941)

Figure 3. Summary of observed replacement behaviors (minutes per hour) in sows during ostrus (*n*= 32)

4. Results (3/4)



- Temperature fluctuations at specified times as in literature

- Findings are in line with several studies (Luno et al., 2013; Simoes et al., 2014; Scolari, 2010; Estienne and harper 2009; Corneu 2006; Altman, 1941)

Figure 4. Changes in sow body temperature (mean ± SEM , SD) in sows during ostrus (*n*= 32)

4. Results (4/4)

Responsible variable	Controlled variables	R^2	R^2 (pred)	Coefficients	Durbin Watson Statistic	T-value	P-Value
	Constant			-125.4		-3.66	0.005
Mounting	Udder temperature	.609	.381	3.91	2.46466	3.74	0.005
Regression Equation:				Mounting = -125.4 + 3.91 Udder temperature			
	Constant			-107.3		-4.73	0.001
Bar biting	Intra-vulva skin temperature	.723	.611	3.240	1.71672	4.84	0.001
Regression Equation:				Bar biting = -107.3 + 3.240 intra-vulva temperature			
	Constant			-80.41		-13.35	0.000
	Gluteal temperature			1.850		2.94	0.022
Special vocalization change	Udder temperature	.967	.924	2.158	1.99918	4.69	0.002
Equation:				Y = -80.41 + 1.850 gluteal temperature + 2.158 udder temperature – 1.524 back temperature			
	Back of the body			-1.524		-1.94	0.094
	Constant			-92.0		-3.09	0.013
Nosing genital	Intra-vulva skin temperature	.527	.382	2.782	2.33441	3.17	0.011
Regression Equation:				Nosing genitals = -92.0 + 2.782 Intra-vulva skin temperature			

Table 1. Summary of results from stepwise regression

6. Conclusions

Based on the findings of the study, it appears that;

- Rise and fall behaviors and temperature at distinct times a window to attach literature for accurate prediction of ovulation
- specific rise and fall allowed the development of prediction models
- Special vocalization was found to be the best replacement behavior for estrus prediction, followed by bar biting and mounting
- The udder, gluteal, intra-vulva and back temperature were found to have a high correlation with replacement behaviors performed by sows

Acknowledgements

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7. References

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Thank you!!!

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Questions and Answers!

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