Steroidome and metabolome analysis in gilt saliva to identify biomarkers of boar effect receptivity

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Introduction

Hormone treatments based on progestogens are commonly employed to induce and synchronize estrus and ovulation in gilts for batch management. However, the use of synthetic progestogens results in contamination of the environment. In organic farms, hormones are not permitted, and organic herds have less ability to operate batch management. Our objective was to develop alternatives to hormonal treatments to synchronize estrus of gilts.

Before puberty, gilts exhibit a pre-puberty period during which boar exposure could induce and synchronize first ovulation. To develop practical non-invasive tools to identify this period and improve the efficacy of boar to stimulate puberty, we searched for salivary biomarkers of this boar-sensitive period.

Material and methods

30 Large-White X Landrace gilts

125 days → Collection of saliva samples twice a week for steroidome analysis using GC-MS/MS and metabolome analysis using ^{1}H-NMR spectroscopy → 175 days of age

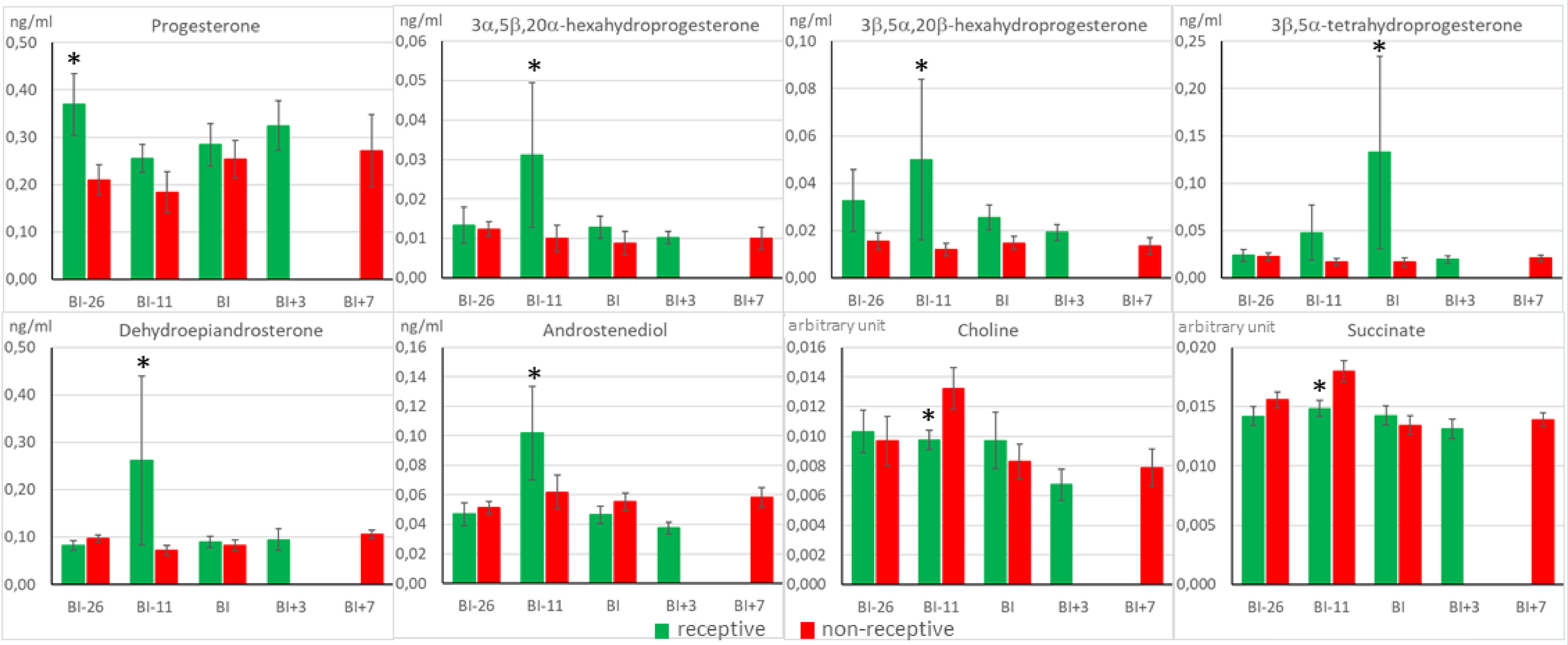
150 days → Exposure of gilts to a boar twice a day + estrus detection (standing estrus response) → 175 days of age → Slaughter for puberty confirmation

Results

Among the 30 gilts exposed to the boar:
- **10** showed standing estrus response 4 to 7 days after the first exposure to the boar: **receptive** to boar effect,
- **14** showed standing estrus response more than 8 days after the first boar exposure,
- **6** did not show estrus behavior, had immature tractus at slaughter: **non receptive** to boar effect.

Saliva samples were analyzed for steroidome and metabolome in **6 receptive gilts** and **6 non receptive gilts**
- 26 days before boar introduction (**BI-26**),
- 11 days before boar introduction (**BI-11**),
- the day of boar introduction (**BI**),
- 3 days later for receptive gilts (**BI+3**) or 7 days later for non-receptive gilts (**BI+7**).

➡ 30 steroids and 35 metabolites were detected in gilt saliva. The concentration of 6 steroids was higher and the concentration of 2 metabolites was lower in receptive gilts than in non-receptive gilts.



Mean concentration in saliva ± sem; ∗ concentrations significantly different between receptive and non-receptive gilts ($p < 0.05$)

Conclusion

Six steroids and two metabolites could be potential salivary biomarkers to detect receptive gilts 26 to 11 days before boar introduction. However, their low and variable concentrations in saliva make their measurement expensive and difficult to use in pig farms.

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