Onset of sexual maturity in female Göttingen minipigs

B. Peter1, E.P.C.T. De Rijk1, H. Lorentsen2, A. Zeltner2, H.H. Emmen1
1 WIL Research Europe B.V.,  ‘s-Hertogenbosch, The Netherlands
2 Ellegaard Göttingen Minipigs A/S, Dalmose, Denmark

Introduction

In drug development, minipigs are used as a non-rodent alternative to dogs or non-human primates, though the exact age range when female minipigs reach sexual maturity is unknown. This, however, is pivotal for the design of general toxicity studies when a reliable interpretation of female reproductive functioning is required. Based on breeding experience, female Göttingen minipigs are considered to reach sexual maturity at 4–5 months of age. To investigate this further, a study with young sows at 3–4 months of age was initiated to determine the age range when sexual maturity is reached.

Method

A total of 14 female Göttingen minipigs (3–4 months old) were used that were housed in the same room as adult boars. Twice weekly, they were observed for signs of heat (vulva redness/swelling, mounting) and blood samples were taken for measurement of the reproductive hormone progesterone. In addition, body weights were recorded every 2 weeks. Females were sacrificed either after completion of 1-2 cycles of progesterone release or at an age of 7 months, if no progesterone was detected. The reproductive organs (ovaries, uterus, pituitary gland) were weighted, and histopathological examination of reproductive-related organs (ovaries, uterus and cervix, vagina, mammary gland and pituitary) was performed to confirm sexual maturity.

Results

Before reaching sexual maturity, very low concentrations of progesterone (< 1 ng/mL) and/or signs of heat were sporadically detected. The first cycle of progesterone release, indicative of a functional corpus luteum, was noted in 7 sows at 3.7–4.2 months (8.4–12 kg) and for another 6 sows at 5.1–6.5 months (12.1–16 kg) of age. Neither body weight nor weight of the reproductive organs appeared to be a useful predictor for the onset of sexual maturity. Based on progesterone data, the estimated cycle length was 17–22 days. Signs for heat were not always noted around the expected ovulation. Histopathological examination of the reproductive organs confirmed that all 13 sows with progesterone peaks were sexually mature. One other female did not show the expected ovulation. Histopathological examination of the reproductive organs confirmed that she had not reached sexual maturity. The estimated cycle length was 17–22 days. F/P = Follicular phase/Proliferation phase; EL/ES = Early Luteal phase/Early Secretory phase; ML/MS = Mid Luteal phase/Mid Secretory phase; LL/LS = Late Luteal phase/Late Secretory phase.

Discussion/Conclusion

The age range when female Göttingen minipigs reach sexual maturity (3.7–6.5 months) is much longer than generally thought. Hence, care should be taken when designing toxicity studies with young sows and interpreting the data hereof. For minipigs, a detailed description of the normal morphological changes of the reproductive organs during the various phases of the estrous cycle is lacking. In the present study, progesterone analysis proved to be a reliable method to detect sexual maturity during life and to determine the stage of the estrous cycle. This provides an accurate tool to investigate in the minipig the normal morphology of the reproductive organs during the various phases of the estrous cycle, which will ultimately allow the evaluation of female minipig reproductive function as a relevant endpoint within toxicity studies.

Acknowledgments

The authors would like to thank the dedicated staff of Ellegaard Göttingen Minipigs A/S and WIL Research Europe B.V. for their expertise and assistance during the conduct of this joint project.

Do you want more information on our services?

Visit our website or contact us at:

www.wilresearch.com

birgit.peter@wilresearch.com

eveline.de.rijk@wilresearch.com

www.wilresearch.com

We have listening down to a science.