Rodent with a human-like menstrual cycle found

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Cairo spiny mouse. Credit: Andy Mabbett/Wikipedia

(Phys.org)—A team of researchers working at Monash University in

Australia has found an example of a rodent that has a human-like menstrual cycle. As the team notes in their paper uploaded to the preprint server *bioRxiv*, such a find is exciting because it offers the possibility of using the rodent for research projects involving the human female reproductive system.

Mice, as most people are aware, are very commonly used to study diseases in humans, and more importantly, to test treatments. Unfortunately, this has not included human female reproductive ailments, such as endometriosis, because until now, it was believe that there were no mice that had a similar reproductive system, which would of course include a menstrual cycle.

The rodents, a type of spiny mice, were discovered by the team to have not only a menstrual cycle, but one that was similar to human females—they had on average a nine day cycle which included bleeding on average for three days—which works out to bleeding for approximately 20 to 40 percent of their cycle. The human cycle is longer, averaging 28 days, but because the bleeding is approximately 15 to 35 percent of the days of the cycle, the range between the two species is similar.

Because it has been widely believed that mice do not menstruate, the researchers conducted a very careful study. In addition to simply watching and recording females, the team also flushed the vaginas of some of them to make sure they were getting the right counts. And then to make sure the rinsing was not the cause of the bleeding, they did the same to another species of mice that do not menstruate, and found no bleeding. They also killed several specimens and dissected their uteri at different stages of their observed cycles. Notably, the genome of spiny mice was just recently sequenced by another team, which means that studies can begin immediately to ascertain which genes are responsible for regulating the menstruation cycle.

More studies will have to be conducted to better understand the reproductive system of spiny mice in general, of course, before they can be used as a test case for disease or treatments in humans, but the finding of a rodent that menstruates has researchers excited because just 1.5 percent of mammals do so, and most of them are primates. Currently, most such research is carried out with baboons, but it is expensive, difficult and fraught with animals rights issues.

More information: First evidence of a menstruating rodent: the spiny mouse (Acomys cahirinus), biorxiv.org/content/early/2016/06/03/056895

Abstract

Background: Advances in research relating to menstruation and associated disorders (such as endometriosis and pre-menstrual syndrome) have been hindered by the lack of an appropriate animal model. Thus, many aspects of this phenomenon remain poorly understood limiting the development of efficacious treatment for women. Menstruating species account for only 1.5% of mammals, and less than 0.09% of these are non-primates. Menstruation occurs as a consequence of progesterone priming of the endometrial stroma and a spontaneous decidual reaction. At the end of each infertile cycle as progesterone levels decline the uterus is unable to maintain this terminally differentiated stroma and the superficial endometrium is shed. True menstruation has never been reported in rodents. Objective: Here we describe the first observation of menstruation in a rodent, the spiny mouse (Acomys cahirinus). Study Design: Virgin female spiny mice (n=14) aged 12-16 weeks were sampled through daily vaginal lavage for 2 complete reproductive cycles in our in-house colony at Monash Medical Centre, Clayton, Australia. Stage-specific collection of reproductive tissue and plasma was used for histology, prolactin immunohistochemistry, and ELISA assay of progesterone (n=5 / stage of the menstrual cycle). Normally distributed data are reported as the mean

± standard error and significant differences calculated using a one-way ANOVA. Non-normal data are displayed as the median values of replicates (with interquartile range) and significant differences calculated using Kruskal-Wallis test. Results: Mean cycle length was 8.7 ± 0.4 days with red blood cells observed in the lavages over 3.0 ± 0.2 days. Cyclic endometrial shedding and blood in the vaginal canal concluding with each infertile cycle was confirmed in all virgin females. The endometrium was thickest during the luteal phase, when plasma progesterone peaked at ~102.1 ng/mL and the optical density for prolactin immunoreactivity was strongest. The spiny mouse undergoes spontaneous decidualisation, demonstrating for the first time menstruation in a rodent. Conclusion: The spiny mouse is the first rodent species known to menstruate and provides an unprecedented natural non-primate model to study the mechanisms of menstrual shedding and repair, and may be useful in furthering our understanding of human specific menstrual and pregnancy associated diseases.