Researchers solve mystery of long elephant pregnancy

June 21 2012, by Bob Yirka

African Bush Elephant in Mikumi National Park, Tanzania. Taken by Oliver Wright, via Wikipedia.

(Phys.org) -- For years biologists have puzzled over how it is that elephants are able to maintain such long pregnancies, which typically run to nearly two years. While many theories have been tossed around, no one really knew. Now a team of researchers working out of research centers in Canada and Germany have finally solved the mystery. As they write in their paper published in the *Proceedings of the Royal Society B: Biological Sciences*, elephants are able to carry their young so long because they create more of the temporary glands that monitor hormone levels during ovulation and pregnancy.

In order to reproduce, female mammals have ovaries that produce eggs that when fertilized by sperm grow into babies. In humans, in addition to

producing an egg, inside of each ovary, a gland called the corpus luteum develops during ovulation that helps to regulate hormone levels by generating progesterone. If the egg is fertilized, the gland continues to help monitor hormone levels to keep things in the uterus as they need to be to allow a baby to develop. If the egg is not fertilized, the gland shrivels and disappears, paving the way for a new one to emerge the next time an egg is produced in the ovary. All of this allows humans to carry a baby for the typical nine months needed before delivery.

In elephants, it turns out, things are quite a bit different. Instead of creating just one corpus luteum they create on average five. Like humans, one of the glands is formed by the same follicle in the ovary that generates the egg during each menstrual cycle. Unlike humans, however, the other glands are created by other follicles in the ovary, though they all appear to serve the same basic service, namely, stabilizing the hormonal environment to ensure the successful conception and then carrying of a baby. But what's really interesting is that the glands don't all form at the same time, they arise over time. As one gland begins to slow its production of progesterone, another is created to take its place, and this is how the elephant manages to keep a baby going inside of it for so long.

To find all this out the research team studied fifteen female Asian and two African elephants over a five year period in zoos around the world, employing ultrasounds, rectal thermometers and taking blood samples. They suspect the long gestation period allows for longer brain development times which allows newborns a better chance of survival.

More information: Gestating for 22 months: luteal development and pregnancy maintenance in elephants, Published online before print June 20, 2012, doi: 10.1098/rspb.2012.1038

Abstract

The corpus luteum, a temporally established endocrine gland, formed on the ovary from remaining cells of the ovulated follicle, plays a key role in maintaining the early mammalian pregnancy by secreting progesterone. Despite being a monovular species, 2–12 corpora lutea (CLs) were found on the elephant ovaries during their long pregnancy lasting on average 640 days. However, the function and the formation of the additional CLs and their meaning remain unexplained. Here, we show from the example of the elephant, the close relationship between the maternally determined luteal phase length, the formation of multiple luteal structures and their progestagen secretion, the timespan of early embryonic development until implantation and maternal recognition. Through three-dimensional and Colour Flow ultrasonography of the ovaries and the uterus, we conclude that pregnant elephants maintain active CL throughout gestation that appear as main source of progestagens. Two LH peaks during the follicular phase ensure the development of a set of 5.4 ± 2.7 CLs. Accessory CLs (acCLs) form prior to ovulation after the first luteinizing hormone (LH) peak, while the ovulatory CL (ovCL) forms after the second LH peak. After five to six weeks (the normal luteal phase lifespan), all existing CLs begin to regress. However, they resume growing as soon as an embryo becomes ultrasonographically apparent on day 49 ± 2. After this time, all pregnancy CLs grow significantly larger than in a non-conceptive luteal phase and are maintained until after parturition. The long luteal phase is congruent with a slow early embryonic development and luteal rescue only starts ‘last minute’, with presumed implantation of the embryo. Our findings demonstrate a highly successful reproductive solution, different from currently described mammalian models.