

Pubescence in Captive Orangutans (*Pongo abelii* and *P. pygmaeus*)

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In order to properly manage primates in captivity, it is important to determine when females and males become fertile if they are housed together. This knowledge is necessary to make management decisions such as when to start administering contraception if these would be matings that the SSP does not deem valuable, such as in the case of related animals. In many species mating and sexual behavior can be used as a proxy for onset of fertility. In orangutans however, this behavior is not a reliable indicator of sexual maturity as sexual behavior can take place in a variety of social contexts, not just for reproduction.

Because primates are social beings, individuals who are not a desired pairing (from a genetic point of view) are housed together for social interaction and contraception is a key tool needed to allow this grouping without reproduction. Moving animals to new institutions where they may have breeding recommendations is one alternative but may not come readily or even be possible as in the case of hybrids.

One of the main contraceptive methods used in great apes is the oral contraception pill. It is easily available and exists in multiple formulations so that administration can be easily adjusted without the need for anesthesia, as is the case of hormone implants. Important questions for the administration of contraceptives to maturing females are always *when do we need to start?* and *with what?* The answer to *when* is usually when managers see sexual activity because there is always the probability that the female may indeed be fertile. There is little information other than the record of the youngest ever female to conceive a baby. Although these are outliers, the rest of the population receives contraceptives at this age because no institution wants to be the next one to report a young conception. The result is that females as young as 4.5yr old are being treated with hormonal contraceptives, although the studbook reports that females “reliably” give birth at 7yr of age.¹ This difference in age between captive and wild animals is common as animals in captivity are well fed and a good plane of nutrition is associated with earlier onset of sexual maturity.[Kaplowitz 2001][beef]

As more studies in the wild gather and publish long-term data, information on life histories becomes available. In a wild population age at first reproduction was 15.4yr (13-18),⁶ while in a population of mothers that were released, first generation mothers gave birth for the first time at 14.2yr (12-16) and second generation mothers reproduced for the first time at 12.1yr (11-13).² A rehabilitation center for orangutans reported age at first reproduction as 11.6yr, although females as young as 7yr were seen mating with young males.³ Because in captivity females that give birth at 7yr is not an exception¹ and the high rate of sexual behaviors in orangutans, managers need to contracept young females “just in case”.

Data on when orangutans begin to menstruate (and presumably first become fertile) have been collected from a population at the Perth Zoo, where the average age at menarche (n=8) was 8.1 ((5.8-11.1), the authors point out that early menarche may be related to nutrition, as the youngest female had a tendency to be over conditioned and the later ones had a tendency to be anorexic.⁴ Data on

menarche in orangutans managed in N. American institutions is lacking, but necessary to inform decisions on when to start contraception.

The main goals of this project are to collect information to improve understanding of reproductive onset in orangutans, thereby fine-tuning reproductive management of young females. The present request for endorsement is for a two pronged approach to try to address the issues of what contraceptives are currently being used and effective? As well as at what age do female orangutans need contraception?

Goal:

Improve knowledge of orang sexual maturation to refine administration of contraception to young females.

Objectives:

- 1) Summarize the contraception used in the North American population of orangutans (via a survey)
- 2) Determine the age of menarche in captive orangs.

A second part to this issue is to find out and summarize at what age managers have started their females on contraception as well as to summarize the type and dose of contraception used.

Study design and methods

- 1) **Use of contraceptives in Captive Orangutans.** This part of the study will be performed in collaboration with the AZA Reproductive Management Center (RMC) and will rely on a survey (Survey Monkey) sent to the institutions that hold or have held orangutans. The survey will be tailored to the orangutan population and will be based on surveys already sent for gorillas and bonobos, but will focus on age at which females start contraception and type and dose of contraception used. Institutional representatives will be asked to fill out the survey and data will be analyzed and summarized, and reported back to the Orangutan SSP.
- 2) **Onset of Menarche in Captive Orangutans.** The golden standard for determining age at menarche would be longitudinal fecal hormone monitoring of prepubescent females through the period of pubescence and into the period of regular cycling. However, this type of monitoring is very expensive and logistically complex. The present study proposes to obtain indirect data that would still contribute to our knowledge of onset of fertility in orangutans. We propose to do this by recording frequency and duration of menses by detecting hematuria. In order to keep this as objective as possible the study proposes to use reagent strips (Hemastix) to sample urine daily.⁴

Institutions with peri-pubescent females will be approached to request daily monitoring blood in urine and recording results on a spreadsheet. Institutions will be asked to contribute the cost of

the urine dipsticks (approximately \$150/ female / yr). One significant advantage of this approach is that there is no storing, shipping or costly analysis of samples. Additionally, the results can be summarized quarterly to provide “real-time” updates on results.

In humans, oral contraceptives can be used to arrest precocial sexual development since the hormones will exert a negative feedback. However, because estrogen has been associated with closure of growth plates, the treatment of choice is GnRH agonists. The effect of oral contraceptives on growth or growth plate closure has not been studied in orangutans, but the potential for the same adverse effect is there.

Materials and Methods

Use of contraceptives in Captive Orangutans. The survey will be Monkey Survey based and can be answered online. It will require keeper time, but no materials.

Onset of Menarche in Captive Orangutans. For this part we will ask keepers to test urine from pre- or peri-pubescent females daily (or as close as possible), using a hemostix (or other substitute) and recording the results in a log sheet. Keepers will moisten the reagent end of the hemostix in morning urine of the female in question, and compare to the colors on the container, scoring the presence of blood as 0, 1, 2, 3. Because often young females still overnight with mom, it may be necessary to observe them urinating to correctly identify the urine as belonging to the young female. We recommend the use of latex gloves anytime great ape bodily fluids are handled to prevent the transmission of zoonotic diseases.

Log sheets will be emailed monthly or bimonthly to the investigators to enter into the main database. The project will span several years as the goal is to target females BEFORE they are sexually mature and through the early period of irregular cycles. Therefore, there is no predetermined minimum number of samples, but instead when the female has reached regular cycles the sampling can be stopped, this period may vary with each individual. We will plan to update the SSP and renew the request yearly. No materials will be actually collected, stored or shipped, only the electronic log sheets will be emailed (no shipping instructions necessary and no shipping costs involved).

As data accumulates the investigators will be able to graph cycles and provide information about age of onset of puberty in captive orangutans. This information will become more accurate as we can enroll additional females into the study.

Investigators

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Reference List

1. Elder, M. 2014. 2013 International studbook of the orangutan (*Pongo pygmaeus*, *Pongo abelii*).
2. Galdikas, B.M. and Ashbury, A. 2013. Reproductive parameters of female orangutans (*Pongo pygmaeus wormbii*) 1971-2011, a 40-year study at Tanjung Puting National Park, Central Kalimantan, Indonesia. *Primates* 54: 61-72.
3. Kuze, N., Sipangkui, S., Malim, T.P., Bernard, H., Ambu, L.N., and Koshima, S. 2008. Reproductive parameters over a 37-year period of free-ranging female Borneo orangutans at Sepilok Orangutan Rehabilitation Centre. *Primates* 49: 126-134.
4. Markham, R.J. 1990. Breeding orangutans at Perth Zoo: twenty years of appropriate husbandry. *Zoo Biol.* 9: 171-182.
5. Shumaker, R.W., Wich, S.A., and Perkins, L. 2008. Reproductive life history traits of female orangutans (*Pongo* spp.). *Interdiscip. Top Gerontol.* 36: 147-161.
6. Wich, S.A., Utami-Atmoko, S.S., Mitra Setia, T., Rijksen, H.D., Schürmann, C., van Hoof, J.A.R.A.M., and van Schaik, C.P. 2004. Life history of wild Sumatran orangutans (*Pongo abelii*). *Journal of Human Evolution* 47: 385-398.