

Orangutan Infants: From Hand-Rearing to Surrogate Mothering

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Introduction

Today, hand-rearing infant great apes is becoming less of a necessity and is certainly not practiced routinely as it once was in the past. Occasionally it is still required despite the best efforts to avoid it. Over the last few years, in several North American zoos, infants have been successfully mothered by surrogates when the dam failed, for a variety of reasons, to raise her own infant. In two separate cases at the Houston Zoo, infant orangutans were hand-reared until they could be introduced to the same surrogate mother. During these projects, a number of guidelines and protocols were formulated for hand-rearing and preparing for surrogacy.

Planning for a First Birth

When orangutans become pregnant for the first time, a maternal training plan should be developed, even if the dam has been mother reared. If the dam has been hand-reared, and particularly if she has never had the opportunity to see any maternal care, the chances are greater that she may not properly care for her infant. Once pregnancy is indicated by labial swelling, a training plan can be implemented. Maternal training may improve the chances that an inexperienced mother can be directed into appropriate care of her infant. In the event that this training is not successful, or illness or death of the mother occurs, a hand-rearing and subsequent surrogacy program may need to be considered.

The Hand-Rearing Decision

The Orangutan SSP® Husbandry Manual lists what to consider when evaluating maternal behavior after parturition. A variety of aberrant or dangerous behaviors towards the infant have also been compiled that continue to stand as justifiable reasons for hand-rearing, or at least pulling the infant for evaluation before making the final determination. Note that temporary medical intervention, rehydration or treatment of injuries does not constitute hand-rearing if the infant will be reintroduced to the mother within a few hours or even days.

Once the decision has been made to hand-raise the infant, care and feeding regimes should be instituted that are in accordance with the guidelines outlined in the Hand-Rearing Chapter (this volume). This chapter will focus mainly on behavioral and social considerations that

will minimize stress to the infant and promote positive contact between the dam or surrogate mother and the infant.

Hand-Rearing Considerations

Since dependent infant orangutans cling to their mothers for an extended period of up to one year, and juveniles ride intermittently for three to four years, some zoos have committed their resources to providing 24-hour human care to hand-reared infants. On two separate surrogacy projects, Houston Zoo has had success with recruiting, training and supervising a large team of staff and volunteer caregivers, responsible for primary daily care of the orangutan infants. Zoo staff was solely responsible for the night caregiving duties, as well as the planning and execution of the introduction to the surrogate.

The intensive nature of a project like this does call for a large team, committed staff members, and a budget that allows for such a comprehensive round-the-clock approach. Setting clearly defined standards for infant care and handling to simulate orangutan mothering behavior is paramount to the success of the project. Caregivers must be monitored closely and continuously to ensure consistent standards are applied and all protocols are followed. A large team is helpful to avoid infant dependence on any one set of caregivers, as well as to ensure that all the staffing needs are met.

Another important consideration is the time the infant spends in the holding area of other orangutans. Keeping the infant in the same space with other orangutans is critical to being eventually reintroduced to the dam, a surrogate, or a social grouping of orangutans anywhere in the future. The goal should be for the infant to spend the majority of the day in the orangutan area, to immerse the infant into the daily routine of the animals it will eventually join. The infant should be exposed to other orangutans even when it is sleeping, to acclimate the surrogate or other group members to the physical presence of the infant around the clock. Visual and olfactory “saturation” is a daily goal.

Physical contact and interaction with humans should be limited to keepers, volunteer caregivers on their regularly assigned shifts, veterinarians and any other critical staff. Since orangutans are less interactive, social and gregarious than other ape species, there is a danger of the infant becoming more interested in the handling it receives from humans than in interacting with conspecifics. The humans that do by necessity have authority to interact with the infant must avoid encouraging play behavior or in any other way making themselves the primary focus of the infant. Whenever possible, the infant’s behavior and attention should be redirected

toward orangutans, and the caregivers should behave more like semi-solitary orangutans than like social humans.

Surrogate Mothering

If the infant cannot be reintroduced to the dam, then the next best choice is a surrogate mother. There are a number of zoos that now have proven surrogate orangutan mothers, and this number is increasing as more zoos try this option. Even if an adult female has never had her own infant, she may be a good choice as a potential surrogate. If the female has been raised with her own dam, has had exposure to a sibling's birth and rearing, shows indications of appropriate interest in the infant during introductions, and is socially competent, she may be adaptable enough to try as a surrogate. Successful surrogate mothers have ranged in age from 8 to nearly 35 years of age.

Until the infant is introduced to a surrogate orangutan mother, the human caregivers are the surrogates. A large team of qualified individuals were recruited and assigned to regular shifts to cover 24-hour cycles. They were trained by the curator and supervisor to imitate orangutan mothering behavior at all times. Instructions and new protocols were read and initialed as understood prior to each 8 hour shift change.

The following guidelines were incorporated into the surrogacy program:

From birth to three months of age:

- A cage in the orangutan nighthouse with an introduction panel was chosen for infant care and adapted for that purpose. If a cage is not available for such use then an area of the keeper aisle may be selected. For the first few months the infant was transferred from the animal area to the animal hospital for overnight housing. Infant-sized props were built in both areas to facilitate climbing even at this early stage, as some accelerated development of motor skills is likely with hand-reared youngsters.
- Caregivers provided full bodily contact with the infant for a majority of the first months of age. The infant was placed briefly in an incubator only when caregivers required night restroom or water breaks while the infant was located at the hospital setting. While in the incubator for these short periods of time, the infant was placed on a stuffed orangutan doll surrogate, in order to continue clinging. Light cycles while at the hospital were maintained as close to "natural" as possible. The infant was moved into the nighthouse for 24 hours per day in the early months of life. Home care was never

considered a viable option, which minimized transport risks and lack of consistency in care.

- The infant was encouraged to cling rather than be held at all times, and a shaggy synthetic “fur” vest was used to facilitate clinging in the first few months until more mobility was achieved.
- Caregivers were instructed *never* to hold, pick up or feed the infant as a human baby is handled or fed. Simulating orangutan maternal behavior included lying down in hay nests and hammocks with the infant, grooming the face and hands and occasionally imitating more forceful behavior that an adult female might be expected to exhibit, such as dangling by or pulling at the infant’s limbs.
- Behavior initiated towards caregivers was always redirected back to an orangutan in some way, sometimes by repeatedly turning the infant towards the surrogate and encouraging visual access.
- Care was taken not to over-stimulate the infant. Conversely, over-protective handling was not the norm.
- Caregivers were asked not to allow the infant to suck or teeth on human fingers, as it could, in time, lead to biting human handlers. Biting or teething on inanimate objects was encouraged.

From three to nine months of age:

- Caregivers were taught to help maintain visual contact between the infant and the intended surrogate mother, and proximity to any other orangutans in the area (for example, when the surrogate mother was outside). A portable “jungle gym” was constructed, first of bamboo and later of PVC, which provided a place in the keeper aisles for the infant to maintain visual contact with other orangutans, even during cage cleaning. The infant was removed only from the immediate area of hosing or disinfection, but not from the building. No negative health effects were noted from this proximity to routine daily cleaning.
- Safe contact between the infant and other orangutans was encouraged with the use of introduction doors and enrichment items with which both animals could interact. Soft rubber hose sections, short bamboo or other browse limbs, and rolled paper items were used to initiate positive contact between orangutan group members and the infant.

NOTE: Only experienced staff members directed full contact introduction sessions in the initial months of the project, and

certain adult orangutans were not allowed to make full contact with the infant for safety reasons.

- Play behavior that the infant tried to initiate towards humans was always redirected back to an orangutan. Once successfully redirected, positive interaction was rewarded with verbal praise.
- Food sharing was mandatory with the exception of the formula fed from a bottle. All biscuits, greens, cereal, and produce that the infant was fed was shared with the surrogate mother. There were a variety of methods used for sharing: smearing the soft foods (like baby food or yogurt) on either side of an introduction door, and placing solid foods into enrichment devices that both infant and surrogate could reach. The surrogate's tolerance of food sharing can be a good indicator of the future level of altruistic behavior towards the infant.
- The infant was trained at an early age to accept the bottle through the mesh of the cage, so that it could be fed a bottle once in with the surrogate if not yet weaned by the time of introduction. The surrogate was trained not to touch the bottle by extending a baby bottle through the mesh and giving her juice from a separate squeeze bottle. If the surrogate attempted to interfere with the bottle, the juice was withdrawn.
- The infant was exposed and acclimated to all indoor and outdoor areas to which it would eventually have access once it was introduced to the surrogate. On props that were too large or high to accommodate an infant, tightly fastened ropes as well as 2" firehose were added to allow the infant to safely explore these unwieldy or arboreal areas.
NOTE: Strangulation via frayed or loose ropes is always a danger. All ropes must be securely fastened, have little to no slack, and be used only with proper supervision.
- Hay and other substrates used by adults were gradually substituted for blankets, although blankets were never completely withdrawn.

Guidelines applicable without regard to age:

- Masks were mandatory for all caregivers, as was frequent hand washing. Gloves were required in the beginning of the project, but discontinued as a hindrance when the infant became more interactive (especially during introductions).
- Training the infant to locomote through a "crept" door began early, by creeping or sizing down the door opening, and offering a reward

when the infant passed through it. The infant quickly became adept at this and shifted on command through a variety of differently positioned doors. The creep door size can be measured and marked for ease of setting the doors to the proper width. Temporary ropes were fastened through some creep doors to facilitate brachiation and more arboreal pathways through the door. Training the youngster to come inside, shift from room to room, and generally go wherever it will be called upon to go once with the surrogate or group is an important part of the learning curve that must take place prior to the introduction. This was accomplished at first with the caregivers taking the very young infant through the widely open doors as a mother would (with infant riding ventrally or occasionally on a caregiver's back), and later accomplished by the infant alone, and rewarded heavily once completed successfully.

- The infant was never diapered throughout the hand-rearing/introduction process, for many reasons. Infants in contact with feces and urine can develop rashes, hair loss and urine burns if not changed often enough, the diaper can become a focal point of interest to the other orangutans, and it can be grabbed during close introduction interactions. Moreover, the importance of public perception cannot be overstated. If the infant is to be on exhibit at all, a diaper should be discouraged. Zoo guests can interpret a diaper in an anthropomorphic way that will perpetuate harmful stereotypes of infant apes as pets. It was quite simple to be vigilant about cleaning up soiled areas quickly, rather than be burdened with the diapering process. At night, caregivers used a clean, soft piece of fabric between the infant's ano-genital area and themselves to avoid getting wet throughout the night.
- The infant was exposed to male and female human caregivers as well as both sexes of orangutan, to avoid dependence on or fear of one sex or the other.
- Over time, as the full introduction approached, some space in keeper aisles was withdrawn, as was exposure to infant toys, and the "safe" cage was repped to more closely resemble adult cages.
- Complexity of stimulation should increase with the age and developmental stage of the infant, as should escalating orangutan contact. Exposure to conspecifics should be incrementally increased until a plateau of behaviors are seen, when the next, more advanced step can be implemented.

Goals Prior to Full-Contact Introduction

The ultimate goal for the infant is physical, social, and psychological competence prior to the full introduction. How quickly this is achieved will vary depending on the individual, and should be evaluated by all staff most familiar with the infant and surrogate.

Independence from human caregivers should be encouraged. Keeping the delicate balance between the infant's natural dependence on caregivers and placing value on independent behavior is an important goal. A confident and flexible youngster will assimilate into the social network of orangutans more easily.

Deciding on when to fully introduce the infant to the surrogate is complex and involves multiple factors, from the infant's level of cognitive ability to the surrogate's apparent interest and willingness to take or carry the infant. Preparation time may take longer if the surrogate is not expected to let an infant cling to her, as a more independent and mobile youngster will be accepted more readily.

The Full Introduction

The actual introduction between infant and surrogate should be timed and planned for optimal success by gauging past positive interactions and duplicating those conditions where possible. (For example, if the most relaxed and gentle interactions occur in the afternoon, consider doing the introduction in the afternoon.) Familiar arboreal travel pathways should be in place, near or through the creep door, and large amounts of bedding or thick substrate added just prior to the full introduction. Minimize staff observers to ones with whom the infant and the surrogate are already comfortable. The team should plan for best and worst case scenarios.

Providing the infant with the choice to enter the surrogate's space for the first time is ideal, for it allows the youngster to have the control that is essential to make the psychological leap from human caregivers to the surrogate. Although it is up to the surrogate to decide whether or not the infant can return to a "safe cage," the choice for the more vulnerable infant is an important option.

Post-Introduction Considerations

Keeper staff and volunteer caregiver observers are needed to follow up on progress of an introduction once full contact has been established. Caregivers have a role in not only documentation, but in potentially being able to reassure the infant during moments of stress. Care must be taken not to distract the infant or divert it from the surrogate, but the presence of a familiar caregiver can be a helpful addition.

Providing a “safe cage” via a creep door after the full introduction can give the infant a place to withdraw for various reasons. As the youngster assimilates into the daily routine, his or her comfort level will probably fluctuate. Again, providing a choice in the ability to separate from the surrogate or group may improve the chances of long term success. It also may aid in the feeding routine by giving the infant a place to eat favored items that may be taken away by more dominant individuals.

Lastly, documentation of all interactions (both in writing and video) is a valuable learning tool for other managers of orangutans. An extensive period of observation can be essential for documenting changes and behaviors over time.

Surrogate-Rearing Survey

A survey generated by the Orangutan SSP© was sent to several institutions that have completed at least one orangutan surrogate mothering project. The following table summarizes the information gathered, which can be found in full by contacting the SSP© Husbandry advisor (casodaro@brookfieldzoo.org). The information gleaned from these case studies may assist other zoos in future surrogacy projects.

ORANGUTAN SURROGATE-REARING SURVEY RESULTS

Institution: Surrogate Mother/ Infant	Length of Hand-rearing Prior to Surrogate Introduction	Visual Access/Exposu re to Orangutans During Hand- rearing	Tactile Exposure to Orangutans During Hand- rearing	Group Composition at Time of Introduction	Infant Weaning Status	Nursing and Lactation from Surrogate	Creep Door Usage	Factors Contributing to Outcome (as per survey respondents).
Audubon Zoo: "Sara"/"Ibu"	7 months.	3-4 weeks, 2 hours per day.	Contact limited by fine mesh.	Adult sire and dam, juvenile male and female siblings, unrelated juvenile male,	Not weaned.	Yes, with lactation.	No.	Good previous maternal care.
Brookfield Zoo: "Katie"/"Pepper"	17 months with 2+ month introduction time.	Via introduction cage.	Contact for 10 weeks via the introduction cage.	Surrogate mother only.	Weaned.	No.	Yes, built inside an introduction cage.	Katie had raised 4 of her own infants and was an excellent mother; also was interactive with unrelated juveniles.
Brookfield Zoo: "Maggie"/"Mukah"	12 months.	Daily visual access to dam/sire at Lincoln Park.	Contact through a mesh door.	Surrogate mother only.	Not weaned.	Yes, lactation was induced in surrogate.	Yes.	Maggie's exposure to other juveniles at San Diego Zoo helped her to be a good surrogate, as well as her gentle nature.
Cleveland Metroparks Zoo: "Chiquita"/ "Kera Wak"	17 months. Most time spent with human care- givers at Como Park.	Overnight through a fine mesh screen. 24 hours total.	Overnight through a fine mesh screen. Only 24 hours total.	Surrogate mother only first; later adult male, adult female, & juvenile male.	Weaned.	No.	No.	Had she experienced birth, it may have been helpful.
Houston Zoo: "Cheyenne"/ "Luna bela"	24 months, with introductions ongoing the entire time.	During most of entire project.	Extensive: to surrogate, dam and sub-adult male.	Surrogate mother only.	Weaned just prior to introduction.	No.	Yes.	Round the clock exposure; caregivers trained to mimic orangutan mothering behavior; training infant to use creep door; supervised extensive contact.
Houston Zoo: "Cheyenne"/ "Elok"	15 months.	First year: 1 hour per day at Memphis. Last 3 months: 24 hours per day contact at Houston.	Extensive: to surrogate mother and juvenile female.	Surrogate mother and her adopted female juvenile (age 4).	Not weaned.	No, but he does suck Cheyenne's index finger when he seems to want comfort.	Yes.	Round the clock exposure; caregivers diverted infants human orientation back towards orangutans; extensive training to shift and use creep door; much tactile contact between surrogate/infant as well as between infant & juvenile female.
Topeka Zoological Park: "Daisy"/"Batang"	10 months.	Visual access at Lincoln Park.	Two days of contact prior to acceptance.	Surrogate, geriatric female, adult female, and sub-adult male.	Not weaned.	No.	No.	Being housed with the old female who had surrogate mothered 4 infants led to Daisy's success. She also had operant conditioning for presenting body parts.
Toronto Zoo: "Puppe" & "Ramai"/ "Sekali"	Approximately 6 months to first surrogate; 14 months old at introduction to second surrogate.	Visual access to natal group from 2 months on. Exposed to group until 14 months old.	Some touching with natal group from 2 months on. Continued through both introductions.	Two surrogate mothers; adult male; adult female; infant male (3 yrs); two juvenile males (6 and 9 yrs);	Not weaned.	Yes, from first surrogate, with lactation. Yes, from second surrogate, w/o any lactation.	No.	Being raised in a group situation; seeing good parenting skills of other females. Playing with infants from an early age. Conditioning of all orangutans to having some access to the baby from birth until reintroduction.

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