Birth Management/ Surrogate/ Hand Rearing Packet

Photo by: Dave Liggett

COLUMBUS ZOO
AND AQUARIUM

GORILLA SPECIES SURVIVAL PLAN®
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Welcome to the Birth Management/Surrogate Hand Rearing Packet
“So you have received a Breeding Recommendation”

You are receiving this packet because your zoo has received a breeding recommendation from the Gorilla SSP Master Plan Meeting. This packet is a result of a Committee designated by the Ape TAG to assist zoos in birth management. This is a tool to promote mother rearing. As you will see when you read through the packet, there are many factors that can have an effect on a gorilla to raise her baby. Preplanning is the key to success. We strongly encourage that you start your birth management plan as soon as you have received your breeding recommendation. There are many factors to take into consideration prior to the pregnancy. Exhibit design may need to be addressed; renovation during pregnancy is not advised. If you are going to start a behavioral training program, it is best to start prior to pregnancy as well. There should be minimal changes in a routine after a female has become pregnant.

There is a lot of information in this packet, take your time, read through the articles and protocols, and watch the DVD.
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Excerpts from AZA Draft Animal Care Guidelines

Birth Management, Hand Rearing, & Surrogate Guidelines
- **Nurseries:** A nursery is a dedicated space devoted exclusively to hand-rearing an infant gorilla. It must be next to conspecifics, have auditory, visual, olfactory and supervised tactile capabilities, share common features with living space of gorillas (e.g., structures, etc.), mimic the adult program, be capable of being an intensive care unit if necessary and provide opportunities for age-specific movements, activities etc. A nursery area is important if hand-rearing an infant is the only option. Nurseries, hand-rearing suites, or portable modules have met with success; ideally, they should be situated within visual contact adjacent to the holding area of the natal group. These areas should permit easy access to the infant for feeding and care while still being within the holding area. This permits early exposure to the sights, smells, and sounds of future family members and provides accelerated learning of behaviors. Interconnected passageways that are sized for the youngster provide access when integration occurs (Lindburg & Coe 1995). Even if a stand-alone nursery is present, the holding facility should have introduction facilities suitable for early socialization of neonates.

3.1. Address what, if any, circumstances might warrant hand-rearing and identify acceptable hand-rearing and reintroduction protocols.

The AZA Gorilla SSP recommends that in virtually all circumstances, mothers have the opportunity to rear their infants themselves and without human intervention. The rare circumstances of human intervention include maternal abuse, neglect, and significant illness or injury to the mother or infant. In these conditions, where the life of the mother or infant is in danger, managers may be forced to intervene. In some circumstances, the infant may be able to be reintroduced to the mother soon after the initial separation, and mother-rearing may be continued. However, in cases of life-threatening abuse or neglect, alternative rearing strategies must be considered.

A birth management plan should be established as early as possible, starting from when breeding recommendations have been received. This should include a review of social reproductive and medical history of the pregnant female, staff assignments, determination of due date, pre-partum plan, birth day plan, and other considerations relating to the birth. It should also include history of the expectant female, discussion of intervention types, record keeping or documentation, housing situations, previous maternal skills, labor and delivery, problems associated with birth and delivery, physical appearance of the newborn, postpartum behavior, diet and supplementation during lactation. A local OB/GYN and neonatologist should be recruited for the mother and infant. Training, monitoring and medical intervention needs, as well as planning for a rapid retrieval of the infant, should be established if it becomes necessary. Each birth event and neonate/mother relationship should be evaluated on a case by case basis, but if the mother does not clean the membranes from the face, hold the infant soon enough to prevent hypothermia, or if nursing is not confirmed within 72 hours, the infant should be given a thorough examination. In most cases, this will require at least light...
sedation of the mother. During this time the infant can be placed on her breast and allowed to suckle and the breast can be further manipulated by hand or via breast pump, in an attempt to stimulate milk production. The results of the exam should be used to determine what level of further medical/nutritional attention is needed.

Often, one or more reintroduction attempts can be made, once the infant’s condition is stabilized through intensive care. Reintroduction attempts of neonates can generally be accomplished safely by placing the youngster on bedding in a warm enclosure and giving the mother access. If the mother does not respond appropriately, the youngster should be removed within a short period of time to prevent chilling.

Care should be taken against the premature removal of infants due to anticipated or perceived maternal incompetence. Inexperienced gorillas have proven to be competent mothers, and many gorillas show improvement in maternal care during the first few days of an infant’s life. According to Bahr (1995), physical and psychological stress can potentially inhibit the initiation and early maintenance of lactation. Milk letdown may not occur until 72 hours postpartum, although increased fluid intake may help to stimulate milk production (Bahr 1995). Drugs such as oxytocin and metaclopramide may also aid in milk letdown (Gabay 2002).

The Lincoln Park Zoo (Rosenthal 1987) developed a 72-hour, postpartum observation protocol for gorillas based on their experience that an infant can be pulled and successfully hand-raised after 72 hours of not nursing. The birth management section of the EEP Gorilla Husbandry Guidelines (Abello, et al., 2005) recommend allowing only 48 hrs of not nursing to elapse before staff members should become concerned and consider intervention options.

The protocol lists four aspects that should be checked immediately after a birth:

- The ability of the infant to cling to its mother. Fossey (1979) reports that a 1-day-old infant can cling, unsupported, for 3 minutes.
- The presence of mucus and placental membranes that could obstruct the mouth and/or nose of the infant.
- The care the mother provides the infant. Has she cleaned the infant? Does she keep the infant with her, and in what position does she carry the infant? Is she protective of the infant?
- Whether the placenta has been passed. Some, but not all females, eat the placenta. If the umbilicus remains attached to the infant, it should dry and detach by the third day.

Another useful guide is the continuum developed by Rogers & Davenport (1970) to evaluate maternal behavior in chimpanzee mothers in the first 12 hours postpartum. However, it should be noted that even successful chimpanzee mothers exhibited inappropriate behaviors early on (Bloomsmith et al. 2003) and that these monitoring methods should be used with caution.

Some institutions have the capability of remote observations, thereby allowing the mother and infant more privacy. This method may be particularly useful for situations in which the female or other group members become nervous when observed. An
additional benefit is that volunteers (i.e., "strangers" to the gorillas who may disturb the mother) could be used if remote monitoring is in place; increasing the amount of time the mother and infant could be observed.

**Promoting appropriate maternal care:** It is very important to keep females in their natal group until they reach sexual maturity. Some females separated at an early stage from their groups and that have not had the opportunity to observe, even practice maternal behaviour, show some difficulties in developing maternal behavior (Abelló & Colell, 2006). If females have a history of poor maternal care, or in situations where proactive measures are taken to ensure females show appropriate care, one possible management strategy involves incorporating an ‘at-risk female’ into a breeding group where she can observe other mothers raising their infants (Meder 1989). Hand-reared females placed in familiar groups where they can observe maternal behaviour are usually able to take good care of their infants (Abelló & Colell, 2006).

See section 5.2 for information on behavioral training approaches that can be used to promote appropriate infant care. Females that have shown a range of appropriate maternal behaviors, but have failed to raise an infant due to an identifiable behavioral deficiency, may prove to be good candidates for a training program. This approach could be used in tandem with the management strategies discussed above.

Aspects of the physical environment that may also influence maternal competence include, an established daily routine, cage size and amount of vertical space; access to privacy; opportunities for activity, play, and exploration to reduce stress and boredom; access to live vegetation; access to nesting material and diet. Important social factors may include group composition, maternal rank and temperament, access to familiar companions, experienced staff and relationship to human caretakers.

**Alternatives to hand-rearing (see also Abelló, et al. 2005):** If observations indicate that the infant gorilla is not nursing after 72 hours, and human intervention is necessary, the following alternatives to hand-rearing should be considered.

- **Additional time and close monitoring:** If the mother is exhibiting aspects of maternal care, but the infant has not been observed to nurse during the 72 hours, it may be appropriate to provide the mother and infant with more time to coordinate nursing behavior by removing the infant, rehydrating it, and returning it to its mother.

- **Temporary separation of the mother and infant from group, or of aggressive group members from the group:** If the mother is fatigued or inexperienced, temporarily separating her and the infant (with continued visual access to the group) may relieve tension and allow her to rest and recover properly. Alternatively, if one or more other group members are harassing the new mother-infant pair, temporarily separating the aggressive group member(s) may also provide relief for the new mother.

- **Promoting natural nursing:** With a female that prevents an infant from nursing, it may be possible to sufficiently distract the mother to allow the infant to nurse. The prior development of a positive and flexible relationship with the female by one or more members of the caretaking staff would be beneficial.
Alternatively, anesthetizing the female to permit the infant to suckle may stimulate further nursing. Such a procedure may be particularly helpful if the female’s breasts are very full and tender, as milking will relieve her discomfort.

- **Supplemental feeding**: If the female gorilla exhibits acceptable to good maternal behavior, prevents the infant from adequately nursing or has insufficient milk, a supplemental feeding program may be possible (e.g., distracting the mother with hand-feeding while supplementing the infant with a bottle). This innovative method can allow the infant to be raised within the social group. This method must be established during early pregnancy.

- **Surrogate lactating mother**: An alternative to hand-rearing is possible if a surrogate mother is available to adopt the infant. A lactating female would be ideal, but the timing of such occurrences is mostly chance. Communicating with the AZA Gorilla SSP, and initiating a nationwide search may improve chances.

**Negative consequences of hand-rearing**: Hand-reared infants have often been observed performing a range of abnormal behaviors, including digit sucking, lip sucking, and rocking (Meder 1989). These behaviors generally declined by the third year of life, but the time spent engaged in stereotypies increased “strikingly” under stressful conditions (e.g., during introductions). Gould & Bres (1986a) find that the abnormal regurgitation and reingestion habit occurs more frequently in hand-reared versus parent-raised gorillas. The consequences are far reaching, because not only does this habit affect the health and educational/display value of the individual, other members of the group can observe and learn to perform the behavior.

Even as sub-adults, Meder (1989) found that hand-reared animals showed significantly more aggression and less social play than mother-reared ones, especially when raised in pairs as opposed to groups. It was also found that hand-reared gorillas, especially males, frequently directed aggression indiscriminately against conspecifics when later introduced to them.

Stoinski et al. (2004b) found that hand-rearing negatively affects a male’s ability to succeed in an all-male group. Hand-rearing may affect long-term success in a group because of a lack of affiliative social behavior initiated by hand-reared males. All-male groups should contain at least one mother-reared male to promote positive social interactions.

According to Beck & Power (1988), hand-reared gorillas, especially those with limited access to conspecifics early in life, experience moderate to severe social deprivation. Hand-rearing can detrimentally affect the intellectual, behavioral, and social development of the gorilla. Additionally, Ryan et al. (2002) found that mother reared gorillas were more likely to become nurturing mothers themselves and produced more offspring than hand reared mothers. Therefore, it is strongly recommended that gorillas be raised by their mothers, and that they be hand-reared only in life-threatening situations (e.g., inadequate maternal care, including rejection of and/or mutilation of the infant). The AZA Gorilla SSP also strongly recommends that all institutions develop management programs that increase the likelihood infants will be mother-reared within a social group.
Criteria of hand-rearing protocol: The following components of hand-rearing are necessary to ensure an early successful introduction to a surrogate. Gorilla-holding institutions that might need to hand-rear should contact the AZA Ape TAG's Hand-Rearing Committee. The following protocol is based on a non-lactating surrogate.

- 24-hour or continual care is needed to be responsive to the infant's needs at all times, until the successful introduction of a surrogate takes place. The infant is not to be left alone or placed where there is a physical barrier from the caregiver.
- Dedicated space is provided for hand-rearing solely a gorilla.
- The infant is raised by a caregiver that simulates age appropriate mother rearing at all times.
- The infant is raised next to conspecifics from the day it is pulled, to the day of introduction.
- The institution's management must commit to the philosophy of the program.
- Accurate, consistent record keeping is an important part of the hand-rearing protocol. The records should include description of formula, amount fed and actual consumption, stool amount and consistency, daily weight of infant, and vitals. In addition, notes on veterinary care, description of infant activity levels, response to specific stimuli, description of the infant's general development, notes on the hand-rearing methods used, times next to conspecifics, interest shown from infant to the group and group to the infant, should be included.

The infant must be raised with an early introduction in mind. Two precursors must be met prior to the physical introduction. The first precursor is to identify an appropriate surrogate. Staff must evaluate the suitability of surrogate or gorilla groups to accept hand-reared/surrogated infants. Since the infant is raised next to conspecifics, the caregiver will be able to observe the interactions between the infant and the group. This will help to determine the surrogate. The second precursor is that the infant meets the following criteria: 1) bond between infant and surrogate is established; 2) infant is trained to come to the mesh for bottle, or surrogate is trained to bring infant to mesh; 3) infant is familiar with exhibit and husbandry; and 4) veterinary/curator approval is given for the next step.

A hand-rearing protocol must meet the physical, psychological, and social needs of the infant. Upon determination of confirmed pregnancy of the female, a hand-rearing protocol must be in place.
Table 8: Recommended elements of a hand-rearing protocol for captive gorillas

<table>
<thead>
<tr>
<th>Rearing protocol</th>
<th>Description</th>
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</table>
| Physical environment | - Dedicated hand-rearing space next to conspecifics, and preparation of area.  
- Auditory, visual, olfactory, supervised tactile access  
- Retro-fitting adjacent facilities, and any area that holds gorillas  
- Means of maintaining records  
- Adequate supplies/devices (scale, available sanitation/disinfection, food storage, incubator)  
- Proper ambient temperature  
- Age and species-appropriate stimulation/environment, including that for locomotion (mesh) |
| Hand-rearing staff training | Selection of staff is based on prior experience, availability, primate knowledge, and ability to follow protocols. Trainees work with an experienced hand-rearing keeper prior to being on their own. The trainee must be knowledgeable with the protocol, the infant, conspecifics, and equipment. |
| Veterinary care | - Veterinary assessment  
- Routine health monitoring/assessment (vitals according to protocol)  
- Vaccinations (see section 3.2.2) |
| Veterinary care | - Veterinary assessment  
- Routine health monitoring/assessment (vitals according to protocol)  
- Vaccinations (see section 3.2.2) |
| Psychological needs | Simulating 24-hour mother-rearing next to conspecifics (see ‘Human-animal interactions’ below) |
| Formula | Many formulas have been successful. Using a formula containing docosahexaenoic (DHA) and arachidonic (ARA) omega fatty acids is strongly recommended. Milk and/or soy-based formulas (20k/cal) have been used with good results. Special formulas including 24k/cal can be used if there are problems. Specific ones can be formulated (see NRC 2003). Determine the amount and strength of formula. Start at 10% of infant’s body weight. |
If the infant tolerates the formula, and is not gaining weight, then go to 15% of the infant’s body weight. The formula is: Infant weight (ounces) x 0.15% (15% body weight) x 30ml. Divide by # of feeding in a 24 hour period. This formula can also be used for 20% body weight (bw), 30% bw, etc.

Bottle feeding and frequency

The infant is bottle-fed formula every 2 or 3 hours for approximately 3 months. If the infant becomes hungry between feedings, small amounts of Pedialyte or water (about ½ the volume of the formula) should be fed. As solid foods are added, it is possible to stretch the feedings to once every 4 hours. The infant should be fed a bottle through the mesh as early as 2 months old, and mesh-feedings should be continued until the infant becomes relaxed with this method. This is the only way the infant can be fed after the introduction to the surrogate. Night bottles are discontinued before the introduction. Depending on the age of the infant, gorilla keepers may stay to give an evening bottle after the introduction. Formula should be the basis of the diet for the first 12 months, but the infant should be given solids foods as soon as teeth erupt and interest is shown.

Solid foods

Having food around to be smelled and touched, even if not eaten, is part of a learning process. Before solid foods are offered, let the infant observe the keeper eating. The infant can smell the food and the keeper’s
breath to inspire his curiosity. Solids foods are offered when interest is shown and teeth begin to erupt. The first solid items are large pieces of raw carrot and celery for teething, but infants should be watched for choking. Solids may be cooked to soften food and put into small bites (1-2g for easier chewing). No baby food or baby cereal should be offered as this prolongs the introduction process. Food items offered to the infant should be the same as the adult diet. Offer vegetables before fruits, as fruit is a favorite item and easily consumed. A three-day time span is used with the introduction of each new food item to avoid allergic reactions. Always use gorilla food vocalizations while eating or feeding. Food should be placed close to the infant and also next to conspecifics in adjoining cages. The infant can watch the gorillas eat and listen to them vocalize while eating near them.

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Human-animal interactions: The infant is raised by a caregiver that simulates age appropriate mother rearing at all times. Eye contact, appropriate gorilla vocalizations, tactile and olfactory stimulation, locomotion, feeding, play behavior, and discipline, are all important components of the program. For the first few weeks of life, the infant should be carried constantly to provide warmth and contact. The infant should be held close to the keeper’s chest. The keeper must hold or stay in close contact with the infant while performing tasks. If anything necessitates removing the infant from the keeper’s body (diaper change, weighing etc.), the infant should be placed in a safe location on
the infant’s stomach, holding a fuzzy toy or blanket. As the infant becomes older and aware of the surroundings, the infant should be given the choice to climb off and move around. Even then, the keeper should remain close through touching and voice contact. When there is a staff change, the transfer should be calm and slow. The infant will become more accepting of any new experience or situation because of close contact with the keeper. When interacting with the infant, the animal keepers should be quadrupedal as much as possible. This allows the infant an opportunity to grab the keeper’s arms or legs so they can locomote together. As the infant grows older, the infant can be carried on the keepers’ backs as they crawl around. Constant contact without a barrier between a keeper and the infant occurs from the day the infant is pulled to the day it is introduced to a surrogate. Never being alone gives the infant a sense of security. It does not instill a bond with a keeper as much as it does a bond to the comfort and attention. Criteria for an early introduction: Staff should agree on readiness of the surrogate and infant. As time passes, a female may spend more time and often displace other females from sitting near the infant, or it may be more subtle and the female may watch from afar. This is called “gorilla choice”. It is helpful in the selection of the surrogate. Once the surrogate is chosen she should be placed on birth control if she is not post-reproductive. A surrogate must be able to focus on the young gorilla, not a possible mate. An adult male gorilla might also be considered to be a surrogate in the correct circumstances.

Ideally the infant and surrogate have established a comfortable bond. The infant feels secure beside the surrogate. The surrogate reacts if the infant shows distress. The surrogate has to allow the infant to receive nourishment. Cooperative feeding may exist. Either the infant is mobile and comes to the bottle, or the surrogate brings the infant to the bottle.

An introduction should not proceed with a potential surrogate that displays aggression. If affiliative behaviors are not observed, contact the hand-rearing, surrogate team of the AZA Ape TAG for possible relocation of the infant. Have a pre-introduction health assessment on the infant and adult by the vet staff. Prepare for a “Plan B” if possible. This involves having an alternative surrogate if the introduction does not go as expected.

**Introduction of infant to surrogate:** The following introduction protocol (Table 9) is based on introducing a 5-month-old hand-reared gorilla to a surrogate animal.

Table 9: Description of introduction protocols on the day of introduction, and after the introduction has been completed

<table>
<thead>
<tr>
<th>Time</th>
<th>Introduction protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction day</td>
<td>Daily routine for feeding and cleaning is normal.</td>
</tr>
<tr>
<td></td>
<td>- Surrogate is separated from the group, and placed in an area next to the infant.</td>
</tr>
<tr>
<td></td>
<td>- Keep observers to a minimum (remote cameras can be used to facilitate observations).</td>
</tr>
<tr>
<td></td>
<td>- While the infant is offered a bottle through the mesh, the</td>
</tr>
</tbody>
</table>
hand-rearing keeper attending the infant leaves quietly.

- The door is opened for the surrogate to enter.

- Be patient. Surrogate and infant will determine contact time. There may be variations in care from a surrogate that may affect the timing.

- In a successful introduction, surrogate and infant are never separated. In some cases, an introduction make take place for only short periods of time during the first days so the surrogate goes back to its group (keeping its position and relations) while the infant continues to be cared for by keepers.

- Allow time for a strong bond to develop between surrogate and infant before integrating other group members. Infant or surrogate should seek each other in times of stress. Infant and surrogate should sleep, play, transfer, and rest together. Observation datasheets are available from the AZA Ape TAG Hand Rearing Subcommittee that allow for detailed, quantifiable recording of surrogate-infant behavior. Section 4.3.4 of the EEP Gorilla Husbandry Guidelines (2005) provides a protocol for introducing an infant to adults.

- Carefully select which group member(s) will be introduced next, and allow time to adjust and solidify a level of comfort before integration of more group members. This should be the animal that the surrogate is most comfortable with, and may be a silverback.

- Once the silverback and all group members are spending 24 hours a day together, the introduction is considered complete.

After the introduction

Once the infant is introduced, it is important for the infant to stay on schedule. A daily visual inspection is necessary to determine the infant’s physical appearance and demeanor, food intake, stool and urine output, behaviors and bonding with the surrogate. In this scenario the surrogate is taking care of the psychological needs and some of the physical needs. The human caregiver is responsible for feeding the infant formula and solid foods. The infant is never taken from the surrogate, but fed through the mesh.

- 6 months: Infant is offered approximately ¼ of the adult diet throughout the day.
- 1 year: Formula, which is given 3 times a day, is gradually changed to whole milk as long as the infant can handle cow’s milk.
- 3 years: Bottles are decreased to 2 times a day
- 4 years: Infant is given 1 bottle a day
- 5 years: Infant is weaned. Hydration is important. Juices are offered and water is always available.

Birth Management Plans
Birth Management Outline

1. Overview
   A. Description of present social and housing situation
   B. Species Gestational Information
      1. predicted due date
      2. history of past gestations
      3. statement about what’s known about species gestation
         (in general)
   C. Goals statement
      1. goals of birth management plan
      2. goals of maternal training plan (if applicable)

2. Staff Assignments
   A. Keepers/trainers
   B. Hand Rearing staff
   C. Animal managers
   D. Veterinary staff
   E. Nutrition staff
   F. Other support staff
      1. night keepers
      2. volunteers
      3. night keepers
      4. medical specialists

3. Pre-partum preparations
   A. Physical facility review
      1. needed modifications to manage birth
      2. areas of concern for an impending birth
      3. lighting/audiovisual review if videotaping birth
   B. Hand-rearing equipment review/needs
   C. Notifications of impending birth
      1. Animal managers
      2. Veterinary staff
      3. Hand Rearing staff
      4. Night keepers
      5. Nutritionists
   D. Animal management plan for onset of labor
      1. Notification tree of who to call when labor is confirmed
      2. specifics for birth watch (who, how long, documentation)
   E. Assessing the condition of the infant
      1. physical condition of the animal
      2. species norms (if known)
      3. management plan for problem infants
   F. Additional considerations
1. Plan for medically compromised infant
2. Scenarios for potential reintroduction

G. Plan B – if all scenarios fail
   1. Immediate reintroduction plan
   2. Removal of infant and plans for a future introduction to dam
   3. Surrogate mothers

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Birth Plan Tracking Summary

1. Day of birth
   A. When labor is confirmed
   B. When the infant is born
2. After hours birth
   A. If the night keeper discovers the parturient female is in labor
   B. If the night keepers discovers that birth has occurred
3. Post-partum
   A. If the infant is medically compromised
   B. If the dam is aggressive to the infant
   C. If other group members (if present) are aggressive to the infant
   D. If the dam is ignoring the infant or interested in the infant but not carrying it
   E. If the infant nurses within 24 hours
   F. If no nursing is observed within 24 hours
   G. If the infant’s condition deteriorates
   H. If the infant is healthy and a reintroduction could take place
   I. If the dam shows no interest in the infant
   J. If all efforts fail to get the dam to care for the infant
Columbus Zoo and Aquarium
Birth Management Plan
Birth Management Plan for 0.1 Gorilla “Jumoke”

OVERVIEW

0.1 Gorilla Jumoke is recommended to breed with 1.0 gorilla Annaka.

SOCIAL HISTORY

Jumoke is a 19 year old female owned by the Columbus Zoo and Aquarium. Jumoke was pulled from her mother after 6 days due to maternal neglect and was subsequently hand reared at the Columbus Zoo. Circumstances in the gorilla group delayed Jumoke’s introduction and she was 17 months old when she was introduced to Sylvia, her surrogate mother. Sylvia and Jumoke lived in an age diversified gorilla group. While Jumoke was in this group several other infants were born or introduced giving Jumoke the opportunity to observe mother and surrogate rearing. Around the age of six Jumoke was given access to an 11 year old male named Anakka. During her first pregnancy Jumoke lived with her Grandmother, Colo and Anakka. Shortly after she gave birth, another young female was introduced to her group. Although this group was not completely stable they remained loosely together until Kebi’s pregnancy caused her to change groups. At this time another adult female (Pongi) and her daughter (Cassie) were added to the group. Jumoke never fully bonded with Pongi or Cassie, but the group remained together until Jumoke and her second offspring (Muchana) were removed due to inappropriate behavior by the silverback, to which she contributed. At this time Jumoke was placed back into the group in which she grew up. Many of the members of this group were the same including her surrogate mother, Sylvia.

BEHAVIORAL AND REPRODUCTIVE HISTORY

This is Jumoke’s third pregnancy. Jumoke gave birth to 1.0 “Jontu” on January 27th, 1997. Prior to the birth Jumoke, Colo and Annaka were living together. However before the birth occurred Jumoke sustained an injury from Annaka that caused the keeper staff to separate this group. During the birth she was housed with her grandmother, Colo. The day before she gave birth keepers noted that Jumoke spent time in the chute, touch tasted, and was acting under the weather. That evening she was more restless, moving approximately every hour. She was seen stretching her legs and moving them frequently. At 11:00 am on the 27th she expelled a notable amount of fluid. Over the next two hours visible contractions were seen. Birth occurred at 1:12 pm. Keepers noted that the infant appeared to be weak, limp, and had a gray coloration. Before intervention was necessary Jumoke put her mouth over the infants face and sucked out mucous plugs. She then began mouthing the infant’s arm to stimulate the baby. Within a half hour after birth Jumoke had severed the umbilical cord. Although she was a first time mother, Jumoke was seen carrying the baby properly and a majority of the time the infant was ventral/ventral. Rooting was seen within the first hour, but nursing was not confirmed until the next day. On the 28th the infant had a strong grip, bright eyes and good coloration. By the second day Jumoke’s breasts were noted as being full, shiny and 3 inches in diameter.

Jumoke gave birth to her second offspring, 1.0 Muchana, on June 23rd, 2000. The birth of Jumoke’s second infant went smoothly. Muchana was born around 8:00am and by 11:00am there was a confirmed nursing. Colo and Jontu were housed with Jumoke for the birth. It was stated in the records that she
was doing an excellent job taking care of her newborn and Jontu as well. Records indicate that at times she was separated from Jontu and Colo to get some rest as it appeared she was tired.

Jumoke has allowed both of her offspring to nurse and she has carried them, groomed them and shown general maternal care; however Jumoke’s mothering skills have been relaxed in other areas and she has benefited from the assistance of other adult females with both offspring. When Jontu was three months old another adult female (Kebi) was integrated in with Jumoke and Colo. Jumoke was young and the two females spent a lot of time playing together. During this time, Colo became the primary caretaker of Jontu. Colo was often the female who would carry Jontu onto and off of exhibit. On some occasions, Kebi would snatch Jontu away from Jumoke; Jumoke showed little concern when this happened and Colo ended up being the one that would get Jontu back.

With her second infant, Muchana, Keepers observed Jumoke “goading” the silverback into stealing the infant. Annaka would take the baby and run around the yard with him, in an effort to get the girls to chase him. Jumoke never reacted to Anakka’s behavior, but once another adult female, Pongi, had retrieved Muchana, Jumoke would run at her, coughing and take the baby back.

During her previous pregnancies, Jumoke became introverted, lethargic, and exhibited a loss of appetite. In at least one pregnancy she was noted as having a small amount of blood spots a few days after giving birth. In addition her stools were pelleted so the amount of fluid was increased.

Keepers did not have the ability to take monthly weights during Jumoke’s last two pregnancies. However current protocol dictates that all gorillas are weighed monthly. If Jumoke’s weight gain is not considered to be acceptable, her diet will be increased as needed.

REPRODUCTIVE SUMMARY

The Gorilla SSP has recommended Jumoke to breed with Anakka. Jumoke was taken off of oral birth control pills in mid to late March, 2008. She began showing signs of cycling on April 14th. Jumoke is currently housed with two other females, of similar age. These three females are currently being introduced to another female, age 35, as well as to Anakka. This introduction occurs 3-4 days a week. Breeding between Jumoke and Anakka was confirmed on April 15th and 16th. Jumoke tested positive for pregnancy on May 17th. Her pregnancy was reconfirmed on June 21st, 2008. The gorilla staff will continue to test her urine each month to see when the test turns negative per the protocol set by the animal health staff.

The average gestation for a gorilla is 250-285 days. During her first pregnancy Jumoke had a gestation of 241 days. Using Jumoke’s previous gestation gives us a due date of December 11th. Using the average gestation, her due date range is December 21st to January 24th.

PRE-PARTUM PREPARATION

Jumoke’s current group consists of Kebi and Cassie. However we are working on integrating 0.1 “Toni” and 1.0 Anakka. Once formed, this group might not reside together 24/7, but rather they might only be together during the day. Our current plan is to continue with the formation of this group and maintain a consistent daily routine. As the birth approaches the gorilla team and management will discuss the
status of this group to decide whether any changes need to be made in order to accommodate the birth (i.e. pulling the male when she goes into labor, etc.). These decisions will be based on the comfort level of Jumoke and the behavior of the other group members.

Jumoke will continue to be weighed on a monthly basis. If necessary, supplemental nutrition will be offered. Amounts and types of food will be determined by the Animal Nutrition Center Manager.

Prenatal vitamins will be offered once pregnancy has been confirmed. At the present time Jumoke has been taking them regularly in her morning juice.

Maternal training will be implemented once pregnancy has been confirmed. This will include the following behaviors:

- Nipple presentation/ manipulation of the nipple
- Ultrasound training. (In order to accomplish this without anesthesia the vet staff will need to be involved).
- Hand injection in either the hip or the shoulder
- Baby Presentation
- Vaginal presentation (in case it is necessary to take a swab)
- Desensitization to a baby bottle (in case supplemental feeding is necessary)

A birth watch will take place staffed by docents and volunteers. Birth watch training classes will be taught on two separate occasions by a member of the gorilla keeper staff and the head keeper of African Forest. The start date for the birth watch will be one week prior to the predicted due date. Currently the gorilla groups may be housed in either the old or new gorilla building. For comfort reasons, Jumoke should give birth in the old gorilla building. Beginning December 1st, Jumoke and her group will be housed in the old gorilla building at all times. Cameras will be placed above cages 1 and 2 and one will be placed on the wall in front of cages 1/2 in order to cover the chute area. When the birth watch starts she will need to be housed in these cages overnight. (if by any chance she is spending the night with Anakka at that time or if it is determined that her group needs more space, then it will be necessary to have more cameras to cover more cages). Cameras need to be installed by December 1st in case any issues need to be addressed once we have them in place with regards to coverage.

At the present time no cage modifications are needed. This will be re-evaluated in August.

In the event that Jumoke is unable to raise the baby for any reason, potential surrogate mothers should be identified: A lactating female is the ideal choice, but may not be possible. The Columbus Zoo has three proven surrogates (Lulu, Pongi, and Colo) and two potential surrogates (Cassie, Kebi) Mac acted as a surrogate to Mo’ana in some ways, but his behavior has changed since then. Does he get added to this list? How about Nia?

**STAFF ASSIGNMENTS**

Audra and Mandi will submit work orders for camera placement by August 1st. Audra will meet with Dusty and Kelly to determine the number of cameras that will be available for the birth watch.
No cage modifications are needed at this time. Another assessment will be done by Mandi, Dan, and Audra in August in order to determine if new needs have arisen.

The nursery staff should be notified once a due date has been determined. The nursery staff will make sure that the nursery has been cleaned and is prepared to receive an infant in the off chance that hand-rearing is necessary. In addition, they will be responsible for ordering all supplies needed for hand-rearing.

All African staff members should review tape of previous gorilla births to familiarize themselves with signs of labor. This should be done within two months of her due date.

Debby will begin maternal training.

Dusty will investigate potential surrogates at other institutions.

**LABOR**

When the birth watch staff identifies signs of labor, Mandi and Dan will be called (Audra will be on maternity leave). Once labor has been confirmed other members of the primate team, curatorial staff, vet staff and nursery staff will be notified.

If labor occurs during normal working hours, keepers may continue to perform regular job duties with the following conditions:

- Staff should be kept to the minimum amount that is necessary to service the other animals in the building. Cleaning can be skipped for the day if necessary.
- If keeper presence in the building appears to be causing any stress, Jumoke’s progress can be monitored via cameras.
- Keeper staff working in the building should be those that Jumoke is most comfortable with.

**POST-PARTUM**

No changes to group composition should be made after delivery unless a problem is noted. Decision to change group composition should be discussed with other keepers in the building as well as the curatorial staff and the head keeper of African Forest (however I probably will not be here 🙃). Jumoke, the infant and her group members will stay off exhibit. Permission to put them on exhibit must be obtained from Dusty Lombardi.

A visual health assessment of the mother and infant will be made by a keeper with gorilla baby experience and a member of the veterinary staff. At the present time Jumoke is comfortable with our full time veterinary staff and should not be stressed by their presence. Fluids will be offered to Jumoke on a regular basis. However if she chooses not to take drinks because she is tired we should not push the issue. If at any time Jumoke appears to be off, a veterinarian and a member of the curatorial staff should be notified.

The baby should have a strong grip and a good coloration. An experienced staff member should watch for nursing behaviors. Nursing may be difficult to see and may not occur for several hours after birth.
Regular communication with the curatorial staff (Dusty) and the vets regarding nursing is essential. If nursing has not been observed in the first 72 hours the mother may be anesthetized so that the condition of the infant can be determined. The presence of milk will also be confirmed. If all is well the infant will be allowed to nurse extensively. If the infant appears healthy and the mother is producing milk, the baby will be placed ventro-ventral on the mother as she is recovering. The decision to pull the infant for hand-rearing will be made by the curatorial and vet staff. Hand-rearing protocols are listed later in this document.

If needed, a nursing watch will be set up via the birth watch cameras for the first few nights.

In order to help with lactation and to minimize post birth bleeding, a raspberry and fennel tea will be offered.

**Hand Rearing**

In the event that hand rearing is necessary, the Columbus Zoo Gorilla hand rearing protocol will be followed. This protocol calls for 24 hour care of the infant with maximum time spent next to conspecifics. During the day the hand rearing staff will sit in cage 3 of the new gorilla building next to the gorillas who are being targeted as surrogates. At night the infant will return to the primate nursery located in the gorilla building.

**Essential personnel**

Gorilla focus team
- Mandi Demczyk
- Dan Nellis
- Debby Ames
- Audra Gibson

Keepers with gorilla baby experience
- Mandi Demczyk
- Dan Nellis
- Audra Gibson
- Marsha Vaughan

Curatorial Staff
- Kelly Vineyard
- Dusty Lombardi
- Don Winstel
- Doug Warmolts
Nursery team
- Barb Jones
- Maureen Casale
- Dusty Lombardi

Vet Staff
- Dr. Barrie
- Dr. Myers
- Dr. Harris
- Mary Jo King
- Cheri Edwards
Mother Rearing
By Beth Armstrong
How to Achieve Mother-rearing

Information compiled by Beth Armstrong, Brevard Zoo, elynn57@aol.com

Mother-rearing is mandated as a priority of the Gorilla SSP and the Great Ape TAG. The intent of these documents is to offer some guidance as to how to promote mother-rearing. The key to this process is to take a step back and examine your respective institution’s husbandry protocol with an objective and open-minded approach.

Key issues to examine are:

- What is the philosophy of your husbandry program? Remember, your philosophy will drive your program.
- Do you have management buy-in for support of mother-rearing and all the levels of commitment required to achieve mother-rearing? If no, what is your plan to get buy-in.
- Cohesive group dynamics is a must prior to a birth.
- What is the level of keeper involvement in setting and implementing husbandry protocol?
- Cage design:
  - Does it work for gorillas?
  - Are there escape options (from other troop members) for each individual within the troop?
  - Does the design alleviate stress within the troop?
- Are your gorillas together 24 hours a day? (except cleaning and feeding times).
- How much bedding and browse do your gorillas receive daily? Is it sufficient?
- Do you have a diverse and interesting diet? Do keepers have the option of adjusting the diet on a daily basis if need be (more calories for underweight animals, less for overweight)?
- If an altercation within the troop occurs do the keepers:
  - Immediately intervene?
  - Let the gorillas to work it out amongst themselves
  - Do an operant conditioning session to solve the problem
- During a birth:
  - Do you separate the female out of the troop? If yes, why?
  - How many people are in the building?
  - Do staff members such as veterinarians and curators have access to the female during labor? And if yes, does it have a negative or positive affect on the pregnant female as well as other group members?
  - Who is your point person for managing the birth?
- After the birth:
  - Do you have mother/infant observation protocol in place?
  - Did you develop it yourself or did you get it from another zoo?
  - Have you consulted with experienced institutions such as the Columbus Zoo in the US, Howletts in the UK and Apenheul in the Netherlands?
  - Who is your point person for researching and gathering mother/infant (M/I) information prior to the birth (from other institutions)
  - Who is the point person(s) for compiling and analyzing the M/I data everyday?
  - Daily assessment meetings about the M/I should take place.
Mother-rearing Profile

This document is meant to be used as a tool for your staff as well as an information source for the Birth Management Committee.

Please return a copy to:
Beth Armstrong at elynn57@aol.com
Brevard Zoo
2885 N. Wickham Road
Melbourne, Florida 32940
Cell: 614 506 7368

Please return this within several weeks of receiving. Thank you!

Name of female:    Studbook #: 

Birthdate:    Birthplace:

Your institution:    
Address:    City:    State: 
Contact Person:    Email:    Phone: 

How many years has the female lived at your institution?

Does this female have any health issues? Please describe

Does this female have any past health issues related to a past pregnancy? Please describe

Previous institutions female has lived at:
Institution:    Number of years there?
Institution:    Number of years there?
Institution:    Number of years there?
Institution:    Number of years there?

First-time mother? Y N

If not, how many times has the female given birth previously?
Dates of births:

Any of these births at your institution?

Has she reared any of her offspring? Y  N  How many?

Current group make-up including female above (i.e. 2.3):

MR = Mother-reared
MRG = Mother-reared in this group

List individual troop members:
Name:    Age:  Sex: M  F  MR? Y  N  MRG? Y  N
Name:    Age:  Sex: M  F  MR? Y  N  MRG? Y  N
Name:    Age:  Sex: M  F  MR? Y  N  MRG? Y  N
Name:    Age:  Sex: M  F  MR? Y  N  MRG? Y  N
Name    Age:  Sex: M  F  MR? Y  N  MRG? Y  N
Name:       Age:  Sex: M   F  MR? Y  N  MRG? Y  N

Do the group members spend 24 hours a day together (other than individual feeding and cleaning?) Y  N

If No, why not?

Do you give bedding on a daily basis? Y  N
What kind?  Hay  Woodwool  Straw  Other;

How much bedding per day?

Please describe your cage(s) design:
Please include digital photos and a drawing of the entire exhibit.
Does your cage design include the following?

Mesh walls?  Y  N

Mesh Ceilings?  Y  N

Round-abouts?  Y  N  How many?

Foot/hand holds on walls?  Y  N  How many?

Sleeping beds on walls?  Y  N  How many?

Climbing platforms in middle of cage(s)?  Y  N  How many?

Dead-ends?  Y  N  How many?

Please include a rough sketch of your cage(s) with this questionnaire.
Keeper Profile

In order to get an idea of the level of keeper experience in your department, please fill in the following and return to:
Beth Armstrong at elynn57@aol.com
Brevard Zoo
8225 N. Wickham Road
Melbourne, Florida 32940

Name:

Institution:

Institution’s address:

Phone: Email:

Please check which ape species is pregnant:
___ gorilla ___ chimpanzee ___ orangutan
___ siamang (specify) ___ gibbon (specify)

How many years have you worked with this species?

Do you have experience with mother-rearing of this species? ___yes ___no
How often? And describe your involvement

Have you any experience with a surrogate introduction of an infant? ___yes ___no
How often? And describe your involvement
Mother-Rearing Article
By: Beth Armstrong
Mother-rearing: What To Look For

In order to promote mother-rearing, a close examination of husbandry protocol should be done well prior to the birth. In the vast majority of instances a mother does not raise her infant not because she was incapable of it but rather the husbandry techniques that were used or not used prior to, during and after the birth were not adequate. From my experience I can count only one female that did not raise her young because of her own inability or lack of interest, in all other instances mothers who did not rear their young were the direct result of changes in routine, bad cage design, or staff that did not react to the mother’s negative behaviors and thereby give the female what she needed. Below are some of the basics to examine before a birth:

1.) Do not label the mother. If a female has not raised an infant in the past it does not mean she is not capable, most likely it was the result of the above-mentioned topics.

2.) Basic cage design and enhancements that create a feeling of comfort and well being for gorillas is a must. If need be cages that have dead-ends or trap corners can be retrofitted to give the semblance of escape routes well in advance of the birth. Using hand-holds on solid walls, mesh sleeping benches and a variety of connecting platforms, climbing structures and ropes can be distributed throughout the cage.

3.) Keeper input and direction based on their daily observations are essential if the mother is to rear her young. Senior staff must trust the keepers’ ability to read the situation. Meetings to establish protocol during and after the birth should take place, this should include establishing how observations and information will be disseminated to curators and veterinarians so that staff are comfortable at all levels.

4.) If the troop lives together they should be together throughout the birth process and after, do not pull group members out unless the mother is stressing out (this usually happens because the facility is inadequate, too many people there during the birth and routine has been changed or she has never been comfortable in her group).

5.) Protocol for cleaning should be established before the birth. Sticking to daily routines both in cleaning and feeding are essential, although after the birth it is best to concentrate on the birth group and get their cleaning done first thing in the morning so they can get back together again ASAP. This enables them to relax early in the day and also allows the keeper(s) conducting observations to collect solid mother/infant interactions without interruptions.

6.) Be willing to give the gorillas their privacy. If a facility has the ability to shut down a building to the public, do it or if the gorillas are in an off-exhibit holding area that they are comfortable with, keep them off exhibit for a while. Have a plan in place well in advance.
7.) Have an observation routine set up prior to the birth as to who will be doing observations, only one person at a time usually in four-hour shifts.

8.) If the mother to be is not comfortable within her troop, is there a possibility of integrating her into another troop prior to the birth? This may sound extreme and most likely fairly uncommon but it did occur at the Columbus Zoo. This particular female readily bred with her male but they did not get along and she was continually stressed when with the group. She was removed from the group and integrated into another troop where she successfully raised her daughter. There have been cases of infanticide when a pregnant female has been moved to another breeding group, so careful consideration should be given to any proposed move.

9.) Have a philosophy in place that will allow for the staff to react to the mother’s needs based on her behavior. Be willing to adapt to whatever the mother wants.

Basic Information:
- Many gorillas give birth at night
- Look for nesting behavior, shaking of hands which may indicate the onset of labor
- Once the mother’s water breaks, onset of actual labor may not occur for a couple of hours. Once labor begins birth may occur within a few hours but six to eight hours is not unusual and may be a bit longer in a first-time mom. But keep in mind there can be a huge degree of difference in each individual labor/birth, some mother’s give birth fairly quickly. The point is not to overreact if the birth has not occurred within a few hours.
- Lactating mothers’ breast size may vary greatly. Smaller breasts are not indicators of lack of milk.
- A healthy infant who is not abandoned and in a warm environment can remain viable for 72 hours and then still feed and be mother-reared.

Prebirth routine:
- Establish and stick to routine
- Gorilla troop should be cohesive and comfortable with one another well prior to the birth
- Play soothing music (classical, light jazz) in the building, do not play any music that is loud or sharp sounding music
- Raspberry and alfalfa tea = given to pregnant females prior and after birth as uterine tonic as well as for milk production. Also may aid in limiting blood loss after birth.
- Fenugreek tea, fennel seeds and oatmeal water = production of milk in lactating females
- Vitamin K supplement = given to females that have had difficult births in terms of excessive blood loss. It is given well prior to the birth.
- Plenty of bedding materials provided
- Set up video monitoring equipment off-site
- Have a 24-hour birth-watch schedule in place. Once the birth occurs be willing to adjust the schedule (shorten) as needed.

What to do during the birth:
- Low lights (if night birth) or Red lights
• Limit the number of staff present to only one keeper
• Minimum staff in the immediate vicinity.
• Stick with routine
• Leave all group members together i.e. do not remove the Silverback from the group
• Night vision goggles could be useful

Infant/mother interaction: Positive behaviors to look for:
• Mother appears calm in the setting she is in (no pacing or nervousness)
• Eye contact between mother and infant
• Mother supports infant, cupping infant’s rear in her hand is quite common
• Infant has a strong clinging grasp using both feet and hands
• Mother softly vocalizes to infant in response to infant vocalizing
• Mother examines infant’s feet, hands, eyes, ears, genitals but not obsessively
• Infant actively roots (head back and forth in a searching manner) for the nipple
• Mother responds to infants vocalizations i.e. infant uncomfortable or infant fussy because hungry
• Mother responds to infant’s rooting and places infant near nipple and/or shifts her own position which then allows for the infant to nurse.

Tips:
• Beer or ale = sometimes given to new mother’s to relax them and also release milk
• Chamomile tea = given to animals exhibiting nervousness

Confirmation of Nursings: Look for patterns
• If the mother’s back is turned and you can not see the infant but the infant is antsy/fussy or vocal then becomes quite still and quiet that may indicate it has begun to nurse.
• Once infant on the nipple, confirm cheek pouches blowing in/out (Dizzy Gillespie-like) if mother is turned toward observer.
• Infant should sleep after nursing
• Nursings should ideally be short in duration with short periods in between each nursing. Excessively long nursing in duration occurring with big breaks in between nursing is not ideal. Nursing every one to two hours is usual.

What to note:
• Note all infant urination and passing of stool in particular, meconium stool, which is black and tar-like, should pass within 48 hours.
• Milk stool: Look for transition to milk stool after 48 hours
• Milk stool will eventually become gold/yellow and quite glue-like in substance
A Word of Caution:
The Columbus Zoo gorilla keepers created the surrogate-rearing program in the mid-1980’s as a response to several generations of mother gorillas not rearing their infants at Columbus due to then standing husbandry philosophy of pulling infants automatically. The intent of the surrogate program was to create an age-diversified troop that would mimic a troop in the wild thereby allowing the next generation to be raised in a normal age-diversified group setting with all its attendant complexities. The means as to how we got there may have had an alternative bent but the results would be the same; give the adults the jobs they had always been capable of doing i.e. raising young; adults enforcing behavioral parameters for juveniles in regards to more vulnerable infants; and allow infants to be raised in a nurturing environment where they could flourish under the watchful protective eye of the adults and have numerous play and social experiences with various group members. The hope was that this new generation of infants that were adopted into a troop would then go on in the future to rear their own youngsters.

Although the surrogate program is a valuable tool it was never meant to replace mother-rearing, it should be used only when all the components mentioned above in this article are in place and the mother still did not rear her youngster. It is incumbent upon us to continually try to create an environment that is conducive to a mother raising her own offspring. If these factors are not in place how can you reasonably figure out how to get the same mother to rear her infant next time around?

Additional Birth Preparations:
- Contact Birth Management team
- Compile data from other institutions
- Compile SSP/TAG forms (infant development forms)
- Ob/Gyn lined up in advance for consultation, preferably have him/her visit the gorillas prior to the birth so they are used to his/her presence.
- Supplies should be ready: clock with second hand; plenty of Mother/Infant observation sheets; flashlight and extra batteries; plenty of labeled folders for filing observation sheets
- Emergency phone list by phone; also would include contact numbers/names at other zoos that have experience with mother-rearing
- Nursery materials on hand (in case)
- Hand-rearing information in section (in case)

Other thoughts:
- Key words to think about “Routine” coupled with “Flexibility”
  ✓ Do whatever works for that particular gorilla troop that will make the mother feel comfortable
- “Communication” is key, frequent brainstorming and daily assessment.
  ✓ Frequent updates to: veterinarians, upper level administration, PR Director (have 3 press releases ready prior to the birth 1.successful mother-reared infant, 2. death of infant, 3. nursery reared infant/surrogate story
Labor/Birth Description:
Columbus Zoo and Aquarium 1997
Gorilla Labor/Birth Description: Columbus Zoo 1997

Mother: Jumoke - 1st time mother. Age: approximately 8 years of age
Cagemates: Colo – 0.1, 41 years
Annaka - 1.0, 15 years (Sire), do not think he was in cage with Jumoke during birth, he was a young male and rough.

Date: 27 January 1997

10:00 a.m.: Jumoke placing woodwool on back. Staying for most part in chute #2 making nest. Did not eat greens although she ate normal a.m. diet.

10:10 a.m.: In #1 with woodwool on back – appeared to be straining- small amount clear fluid discharge – urine?

10:15 a.m.: In chute #2 making nest. Displaced by Annaka. Jumoke takes nest to back rear corner of #1. Colo resting nearby.

10:20 a.m.: Resting on belly – stood - strained 4x’s while on all 4’s with belly heaving upwards – then sat down.

10:24 a.m.: stood and strained like above one more time – back to nest.

10:28 a.m.: stood on tire (which was lying down) and appeared to be straining somewhat – returned to nest.

10:30 a.m.: same as above. Small amount of thick, clear fluid on floor.

10:34 a.m.: another “contraction” while standing on tire – more fluid discharge

10:36 a.m.: “contraction” on tire – no fluid.

10:39 a.m.: same as above

10:43 a.m.: stood and strained – lowering rear while thrusting belly upwards – returned to nest. Dr. Wack came by and said he thinks there’s a good possibility Jumoke’s in labor.

10:50 a.m.: Colo and Jumoke in cage #2

10:55 a.m.: Leaned forward and to one side and strained

10:57 a.m.: stood, strained – passed water (clear fluid). Moved to elevated corner bed.

11:01 a.m.: standing in nest, straining
11:03 a.m.: same as above

11:08 a.m.: stood on edge of bed – straining. No “strains/contractions” have lasted more than 30 seconds. Colo continues to sit in chute #2 watching Jumoke.

11:17 a.m.: stood in nest to strain

11:21 a.m.: same as above

11:27 a.m.: on stomach in nest straining – 30 seconds

11:32 a.m.: moved to floor with nesting material. Straining

11:37 a.m.: contraction – Respiration: 56 /minute

11:40 a.m.: More fluid discharge

11:42 a.m.: Respiration: 65/minute

11:43 a.m.: Now taking deep breaths during contraction.

11:49 a.m.: Hard contractions – water discharge

11:52 a.m.: Hard contractions – water discharge  Respiration: 65/minute

11:56 a.m.: Hard contractions – while lying down –feet clenched tight.

11:59 a.m.: Hard contractions – small amount of water discharge

12:03 p.m.: Hard contractions – heard “burbly” sounds not heard before – small amount water discharge.

12:05 p.m.: contraction while lying down

12:08 p.m.: contraction while lying down

12:11 p.m.: hard contraction

12:13 p.m.: More mild contraction

12:16 p.m.: Hard contraction while lying on back

12:19 p.m.: Mod. Contraction – Respiration: 57/minute

12:23 p.m.: Mod. Contraction
12:26 p.m.: Mod Contraction
12:29 p.m.: mod contraction
12:32 p.m.: Hard contraction
12:35 p.m.: Mod contraction
12:38 p.m.: Mod contraction. Held right foot with right hand
12:41 p.m.: Respiration: 49/minute – Contraction
12:44 p.m.; Moved nest to side mesh bed and had contraction
12:48 p.m.: Moved to wood beam – contraction
12:51 p.m.: Contraction
12:57 p.m.: Touch – tasting (T/T)
12:57 p.m. Contraction – hard
1:00 p.m.: Contraction
1:03 p.m.: Contraction – T/T
1:07 p.m.: Contraction – T/T Infant crowning
1:10 p.m.: Contraction – T/T....... gave birth at 1:10 according to separate notes. Infant unresponsive, white/grey. Jumoke immediately began mouthing(sucking?) infant’s nose/mouth. Possibly breathing into infant? Possibly ten minutes later infant observed taking deep breath, eyes open

Same scenario/different time version/different observer
(1:12 p.m.: Giving Birth)
(1:15 p.m.: Baby born. Jumoke kept he mouth over baby’s face for some minutes. Then was sucking on arm. Baby took deep breath.)

1:28 p.m.: Chewing cord off
1: 30 p.m.: Infant holding on with hands, Jumoke supporting infant’s head
1:35 p.m.: Infant supporting own head, clinging. Jumoke changing position often.
1:38 p.m. Jumoke T/T. Blood loss. Jumoke sucking placenta

1:42 p.m.: Respiration: 52 – Baby

1:50 p.m. Infant color improved. Dry. Annaka vocalized, Jumoke responded. Infant moving head side to side (rooting). Jumoke T/T

1:53 p.m.: Infant moving legs

2:08 p.m.: Baby respiration: 108/minute

2:15 p.m. Infant rooting. Jumoke sucking umbilical cord, moving her position frequently.


2:49 p.m.: Jumoke moved with Infant to corner shelf. Infant’s eyes open – blinking – looking around.

2:54 p.m.: Jumoke goes to floor. Infant gripping with feet( ? Incomplete sentence). Jumoke on her back. Infant on her chest. Infant respiration: 49/minute

3:10 p.m. Jumoke drank 32 oz. Gatorade and protein drink, refused more

3:15 p.m.: two orange slices

3:17 p.m.: Jumoke Respiration: 53/minute

3:25 p.m.: Jumoke resting. She has hand covering baby’s body….can not see infant’s respiration, but color and grip good.

3:37 p.m.: still no respiration count due to Jumoke keeping hand on infant’s back. Infant, great grip with hands and feet.

3:40 p.m.: Infant rooting, sucking sounds from infant. Jumoke on back.

4:00 p.m.: Jumoke on green mesh shelf sleeping. Colo on floor

4:20 p.m.: Jumoke raised arm

4:28 p.m.: Movement of head - Jumoke

4:30 p.m.: Moved hand and arm – Jumoke
Nursing Case Study:
Columbus Zoo and Aquarium 1991
Nursing Case Study: Columbus Zoo 1991

Mother: Lulu (0.1); Infant: Kebi (0.1); Sire (1.0) Sunshine
Born: 13 January 1991, 7:45 a.m.

Lulu was not in Sunshine’s troop for Kebi’s birth. She had been integrated at seven months pregnant into the surrogate (Mumbah’s group) prior to the birth.

Reasons: Lulu was not comfortable with Sunshine, Mumbah was much more relaxed, he did not feel the need to show he was dominant. Lulu would not be submissive to Sunshine so loads of tension.

The group make-up at the time of Lulu’s infant birth (January 1991) was:
1.0 Mumbah (26 years old)
1.0 Mac (8 years old)
0.1 Colo (35 years old)
0.1 Sylvia (26 years old)
0.1 Lulu (26 years old)
1.0 Fossey (4 ½ years old)
1.0 J.J. (4 years)

13 January 1991: Infant born at 7:45 a.m.

<table>
<thead>
<tr>
<th>Time</th>
<th>Length of nursing</th>
<th>Breast</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:27 p.m.</td>
<td>2 seconds</td>
<td>R</td>
</tr>
<tr>
<td>2:25 p.m.</td>
<td>2:40</td>
<td>R</td>
</tr>
<tr>
<td>2:32 p.m.</td>
<td>40 seconds</td>
<td>R</td>
</tr>
<tr>
<td>2:43 p.m.</td>
<td>Infant passed meconium (small amount)</td>
<td></td>
</tr>
<tr>
<td>3:15 p.m.</td>
<td>Small amount of meconium passed</td>
<td></td>
</tr>
<tr>
<td>6:20 p.m.</td>
<td>Infant: vaginal and rectum red/bloody</td>
<td></td>
</tr>
<tr>
<td>6:34 p.m.</td>
<td>1:00</td>
<td>R</td>
</tr>
<tr>
<td>7:22 p.m.</td>
<td>6:00</td>
<td>R</td>
</tr>
<tr>
<td>7:44 p.m.</td>
<td>2:00</td>
<td>R</td>
</tr>
<tr>
<td>9:24 p.m.</td>
<td>4:00</td>
<td>R</td>
</tr>
<tr>
<td>11:00 p.m.</td>
<td>3:00</td>
<td>R</td>
</tr>
</tbody>
</table>
**TOTAL: 19:22 minutes**

14 January 1991

<table>
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<tr>
<th>Time</th>
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<th>Breast</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:17 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>12:30 a.m.</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>1:29 a.m.</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>2:09 a.m.</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>2:14 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>2:32 a.m.</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>3:11 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>Time</td>
<td>Length of nursing</td>
<td>Breast</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------</td>
<td>--------</td>
</tr>
<tr>
<td>3:14 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>3:18 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>4:25 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>6:17 a.m.</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>6:19 a.m.</td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>6:34 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>7:08 a.m.</td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>8:28 a.m.</td>
<td>2:10</td>
<td>R</td>
</tr>
<tr>
<td>9:20 a.m.</td>
<td>3:00</td>
<td>R</td>
</tr>
<tr>
<td>9:36 a.m.</td>
<td>2:10</td>
<td>R</td>
</tr>
<tr>
<td>11:40 a.m.</td>
<td>30 seconds</td>
<td>R</td>
</tr>
<tr>
<td>11:45 a.m.</td>
<td>30 seconds</td>
<td>L</td>
</tr>
<tr>
<td>12:00 noon</td>
<td>2:30</td>
<td>L</td>
</tr>
<tr>
<td>2:50 p.m.</td>
<td>49 seconds</td>
<td>R</td>
</tr>
<tr>
<td>3:01 p.m.</td>
<td>10 seconds</td>
<td>R</td>
</tr>
<tr>
<td>5:54 p.m.</td>
<td>3:00</td>
<td>L</td>
</tr>
<tr>
<td>9:55 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
</tbody>
</table>

TOTAL: 15:39 minutes  *many unconfirmed nursings @ night

15 January 1991

<table>
<thead>
<tr>
<th>Time</th>
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<th>Breast</th>
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<tbody>
<tr>
<td>5:22 a.m.</td>
<td>7:00</td>
<td>L</td>
</tr>
<tr>
<td>5:57 a.m.</td>
<td>10:00</td>
<td>L</td>
</tr>
<tr>
<td>6:49 a.m.</td>
<td>3:00</td>
<td>R</td>
</tr>
<tr>
<td>8:45 a.m.</td>
<td>1:40</td>
<td>L</td>
</tr>
<tr>
<td>10:07 a.m.</td>
<td>2:00</td>
<td>R</td>
</tr>
<tr>
<td>10:30 a.m.</td>
<td>2:00</td>
<td>R</td>
</tr>
<tr>
<td>10:41 a.m.</td>
<td>2:00</td>
<td>L</td>
</tr>
<tr>
<td>12:11 p.m.</td>
<td>50 seconds</td>
<td>R</td>
</tr>
<tr>
<td>12:45 p.m.</td>
<td>6:00</td>
<td>R</td>
</tr>
<tr>
<td>1:25 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
<tr>
<td>2:13 p.m.</td>
<td>4:00</td>
<td>L</td>
</tr>
<tr>
<td>2:34 p.m.</td>
<td>3:00</td>
<td>R</td>
</tr>
<tr>
<td>3:52 p.m.</td>
<td>1:00</td>
<td>R</td>
</tr>
<tr>
<td>3:56 p.m.</td>
<td>1:10</td>
<td>R</td>
</tr>
<tr>
<td>4:10 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
<tr>
<td>4:35 p.m.</td>
<td>30 seconds</td>
<td>L</td>
</tr>
<tr>
<td>4:36 p.m.</td>
<td>50 seconds</td>
<td>R</td>
</tr>
<tr>
<td>4:49 p.m.</td>
<td>2:00</td>
<td>L</td>
</tr>
<tr>
<td>5:45 p.m.</td>
<td>2:22</td>
<td>R</td>
</tr>
<tr>
<td>6:15 p.m.</td>
<td>4:30</td>
<td>R</td>
</tr>
<tr>
<td>6:43 p.m.</td>
<td>30 seconds</td>
<td>R</td>
</tr>
<tr>
<td>6:49 p.m.</td>
<td>2:30</td>
<td>R</td>
</tr>
<tr>
<td>7:48 p.m.</td>
<td></td>
<td>L</td>
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</tbody>
</table>

TOTAL: 59:22 minutes  * many unconfirmed nursings during night shift
### 16 January 1991

<table>
<thead>
<tr>
<th>Time</th>
<th>Length</th>
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<tbody>
<tr>
<td>12:08 a.m.</td>
<td>9:00</td>
<td>L</td>
</tr>
<tr>
<td>1:32 a.m.</td>
<td>3:00</td>
<td>R</td>
</tr>
<tr>
<td>2:58 a.m.</td>
<td>3:40</td>
<td>L</td>
</tr>
<tr>
<td>3:51 a.m.</td>
<td>4:53</td>
<td>R</td>
</tr>
<tr>
<td>4:02 a.m.</td>
<td>5:00</td>
<td>L</td>
</tr>
<tr>
<td>4:55 a.m.</td>
<td>1:00</td>
<td>R</td>
</tr>
<tr>
<td>6:49 a.m.</td>
<td>4:00</td>
<td>L</td>
</tr>
<tr>
<td>7:58 a.m.</td>
<td>1:00</td>
<td>R</td>
</tr>
<tr>
<td>9:46 a.m.</td>
<td>1:45</td>
<td>R</td>
</tr>
<tr>
<td>9:50 a.m.</td>
<td>2:10</td>
<td>L</td>
</tr>
<tr>
<td>10:35 a.m.</td>
<td>1:25</td>
<td>R</td>
</tr>
<tr>
<td>10:37 a.m.</td>
<td>1:05</td>
<td>L</td>
</tr>
<tr>
<td>11:03 a.m.</td>
<td>2:43</td>
<td>R</td>
</tr>
<tr>
<td>11:10 a.m.</td>
<td>42 seconds</td>
<td>L</td>
</tr>
<tr>
<td>11:12 a.m.</td>
<td>1:00</td>
<td>R</td>
</tr>
<tr>
<td>1:15 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
<tr>
<td>1:18 p.m.</td>
<td>2:20</td>
<td>R</td>
</tr>
<tr>
<td>1:35 p.m.</td>
<td>4:30</td>
<td>R</td>
</tr>
<tr>
<td>2:21 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
<tr>
<td>3:08 p.m.</td>
<td>4:20</td>
<td>R</td>
</tr>
<tr>
<td>4:22 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
<tr>
<td>4:25 p.m.</td>
<td>1:30</td>
<td>R</td>
</tr>
<tr>
<td>4:31 p.m.</td>
<td>30 seconds</td>
<td>L</td>
</tr>
<tr>
<td>5:42 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
<tr>
<td>5:50 p.m.</td>
<td>1:30</td>
<td>L</td>
</tr>
<tr>
<td>6:07 p.m.</td>
<td>1:30</td>
<td>R</td>
</tr>
<tr>
<td>6:24 p.m.</td>
<td>1:30</td>
<td>R</td>
</tr>
<tr>
<td>7:19 p.m.</td>
<td>1:00</td>
<td>L</td>
</tr>
<tr>
<td>7:21 p.m.</td>
<td>3:00</td>
<td>R</td>
</tr>
<tr>
<td>9:01 p.m.</td>
<td>4:00</td>
<td>R</td>
</tr>
</tbody>
</table>

**TOTAL: 72:03**  
Several unconfirmed nursings between 7:30 and 9:00

### 17 January 1991

<table>
<thead>
<tr>
<th>Time</th>
<th>Length of nursing</th>
<th>Breast</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:05 a.m.</td>
<td>2:00</td>
<td>R</td>
</tr>
<tr>
<td>6:00 a.m.</td>
<td>2:25</td>
<td>R</td>
</tr>
<tr>
<td>7:52 a.m.</td>
<td>4:18</td>
<td>L</td>
</tr>
<tr>
<td>8:54 a.m.</td>
<td>3:34</td>
<td>R</td>
</tr>
<tr>
<td>9:16 a.m.</td>
<td>30 seconds</td>
<td>L</td>
</tr>
<tr>
<td>9:55 a.m.</td>
<td>1:30</td>
<td>R</td>
</tr>
<tr>
<td>2:34 p.m.</td>
<td>1:00</td>
<td>R</td>
</tr>
<tr>
<td>2:42 p.m.</td>
<td>30 seconds</td>
<td>L</td>
</tr>
</tbody>
</table>
2:53 p.m. 1:10 R
3:00 p.m. 1:30 R
3:07 p.m. 1:00 L
4:55 p.m. 1:30 L
4:59 p.m. 1:00 L
5:05 p.m. 1:00 R
5:08 p.m. 2:00 R
5:14 p.m. 2:00 R
6:09 p.m. 1:00 R
6:10 p.m. 1:00 L
6:12 p.m. 1:00 R
6:50 p.m. 2:00 R
7:24 p.m. 2:00 L
7:39 p.m. 4:00 R
8:21 p.m. 1:00 R
9:09 p.m. 4:00 R
10:08 p.m. 3:00 R
10:47 p.m. 2:00 R

TOTAL: 47:57 minutes * many unconfirmed nursings 10 a.m. to 2:00 p.m. due to gorilla reacting to observer in an aggressive manner

<table>
<thead>
<tr>
<th>Daily nursing minutes</th>
<th># of nursings</th>
<th>Watch Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 January 1991</td>
<td>19:22</td>
<td>10 nursings(2 confirm)7:45 to 12 a.m.</td>
</tr>
<tr>
<td>14 January 1991</td>
<td>15:39</td>
<td>17 nursings 12 a.m. to 12 a.m.</td>
</tr>
<tr>
<td>15 January 1991</td>
<td>59:22</td>
<td>23 nursings 5 a.m. to 8 p.m.</td>
</tr>
<tr>
<td>16 January 1991</td>
<td>72:03</td>
<td>22 nursings 12 a.m. to 9 p.m.</td>
</tr>
<tr>
<td>17 January 1991</td>
<td>47:57</td>
<td>26 nursings 5 a.m. to 11p.m.</td>
</tr>
<tr>
<td>18 January 1991</td>
<td>44:39</td>
<td>25 nursings</td>
</tr>
<tr>
<td>19 January 1991</td>
<td>61:57</td>
<td>29 nursings</td>
</tr>
<tr>
<td>20 January 1991</td>
<td>51:24</td>
<td>24 nursings 6 a.m. to 11 p.m.</td>
</tr>
<tr>
<td>21 January 1991</td>
<td>58:53</td>
<td>29 nursings 6 a.m. to 11 p.m.</td>
</tr>
<tr>
<td>22 January 1991</td>
<td>73:19</td>
<td>27 nursings</td>
</tr>
<tr>
<td>23 January 1991</td>
<td>69:15</td>
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<tr>
<td>24 January 1991</td>
<td>61:13</td>
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<tr>
<td>25 January 1991</td>
<td>62:00</td>
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<td>29 January 1991</td>
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<td>1 February 1991</td>
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<tr>
<td>2 February 1991</td>
<td>59:10</td>
<td></td>
</tr>
<tr>
<td>6 February 1991</td>
<td>66:30</td>
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</tr>
<tr>
<td>7 February 1991</td>
<td>56:07</td>
<td></td>
</tr>
<tr>
<td>8 February 1991</td>
<td>48:50</td>
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<tr>
<td>9 February 1991</td>
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<td>10 February 1991</td>
<td>42:30</td>
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<tr>
<td>21 February 1991</td>
<td>40:10</td>
<td></td>
</tr>
<tr>
<td>23 February 1991</td>
<td>36:10</td>
<td></td>
</tr>
</tbody>
</table>
*Fluids given to mother (Lulu): juices are always diluted*

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 January 1991</td>
<td>8 a.m. to 10 a.m.</td>
<td>124 oz. (3 Ensures, 10 oz cranberry)</td>
</tr>
<tr>
<td></td>
<td>10:15 a.m.</td>
<td>8 oz. cherry juice (diluted)</td>
</tr>
<tr>
<td></td>
<td>11:00 a.m.</td>
<td>10 oz. cran/raspberry juice</td>
</tr>
<tr>
<td></td>
<td>12:00 p.m.</td>
<td>12:00 oz. cran/raspberry juice</td>
</tr>
<tr>
<td></td>
<td>4 p.m. to 8 p.m.</td>
<td>80 oz. diluted cranberry</td>
</tr>
<tr>
<td></td>
<td>8 p.m. to 12 midnight</td>
<td>35 oz.</td>
</tr>
<tr>
<td>14 January 1991</td>
<td>8 a.m. to 12 noon</td>
<td>112 oz.</td>
</tr>
<tr>
<td></td>
<td>11 p.m. to 4 a.m.</td>
<td>45 oz. diluted cranberry</td>
</tr>
<tr>
<td>17 January 1991</td>
<td>8:45 a.m.</td>
<td>74 oz. cranberry juice</td>
</tr>
<tr>
<td></td>
<td>a.m.</td>
<td>32 oz power drink</td>
</tr>
<tr>
<td></td>
<td>a.m.</td>
<td>10 oz. cranberry juice</td>
</tr>
<tr>
<td></td>
<td>1 to 3:00 p.m.</td>
<td>48 oz. cranberry juice</td>
</tr>
<tr>
<td></td>
<td>3:30 p.m.</td>
<td>4 oz. Ensure</td>
</tr>
<tr>
<td></td>
<td>p.m.</td>
<td>32 Oz. diluted milk</td>
</tr>
<tr>
<td></td>
<td>p.m.</td>
<td>20 oz. diluted milk</td>
</tr>
<tr>
<td></td>
<td>p.m.</td>
<td>32 oz. diluted milk</td>
</tr>
</tbody>
</table>

**Other Births:**
- Fossey 1.0 born 13 August 1986 at 10:00 p.m.
- Fossey passed meconium at 8:57 a.m. on 14 August 1986
- Fossey respiration: 68 immediately after nursing; 52 asleep
2004 Gorilla Birthwatch
Signs of Impending Birth

Following are some behaviors and events you might see to indicate that labor has begun. More than likely, if Nia goes into labor on your shift you will notice the difference in her actions compared to previous shifts. Don’t hesitate to make phone calls, false alarms are OK.

- Nest building and re-building (this differs from normal as they seem as if they “just can’t get it right).

- Shifting positions frequently, unable to get comfortable—squatting, pushing down, or other signs of pressure.

- Pacing or wandering throughout the areas, climbing (there may be periods of inactivity interspersed with restlessness).

- Stretching, stretching and holding position.

- Water breaking may or may not be evident as a gush of tea-colored fluid. It could be mistaken for urinating (or vice versa).

- Sudden discharge of blood. May appear to have a wet bottom. There may be mucous discharge from the vaginal area. Blood may be seen on or dripping from vaginal area.

- Touching and tasting (T&T) of vaginal area. This does not usually happen after urination.

- Lying on belly with legs drawn up.

- Contractions may be visible on the abdomen.

- Panting, accelerated or uneven respiration.

- Diarrhea.

- Hand shaking or flapping in any position.
<table>
<thead>
<tr>
<th>TIME</th>
<th>HOLDING POSITION</th>
<th>NURSING BEHAVIORS</th>
<th>Vocal</th>
<th>MATERNAL BEHAVIORS</th>
<th>ELIMN./ I/D</th>
<th>COMMENTS/ DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dam Posture</td>
<td>V/V</td>
<td>V/D</td>
<td>Inverted</td>
<td>Groin</td>
<td>Abdomen</td>
</tr>
<tr>
<td></td>
<td>How</td>
<td>Where on her body</td>
<td>Rooting</td>
<td>Suckling</td>
<td>Rooting</td>
<td>L/R</td>
</tr>
<tr>
<td></td>
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## Gorilla Birthwatch Observation Form

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**Page #: ______________**  **Exhibit Access:**  **Group makeup:** ________________________________

**Date: ______________**  **Shift time:** __________________________  **Observers:** ________________________________
Cheyenne Mountain Zoo
Birth Management Plan
Cheyenne Mountain Zoo
Gorilla Birth Protocol

Prior to pregnancy:
1) Female should receive pre-natal vitamins daily, dosage prescribed by vet staff.
2) Discuss maternal training needs with training coordinator and supervisor.
3) Discuss group training needs – cooperative feeding/drink offering, separation, den-training, desensitization to baby bottle/scrubs/masks/gloves etc.
4) Implement training

3 months prior to first possible due date:
1) Evaluate facility:
   a. Perching – make sure there are “ramps” so a baby can escape upward.
   b. Doors – operational and able to creep
   c. No birds in gorilla yard
   d. Hot wire gaps no more than 6-8 inches
   e. Identify best nursery location(s) – near conspecifics is best
2) Select enclosures where birth will take place and stick with those enclosures well before and after the birth.
3) Any changes in routine should be implemented with as much time as possible for gorillas to get accustomed to them, prior to the birth.
4) Go through nursery supply list
5) Contact hospitals to secure donation relationships in case of hand-rearing (formula, diapers, etc.)
6) Contact OB/GYN and pediatrician human doctors to establish relationships
7) Inform all staff that no after-hours functions should be scheduled in ape building starting 6 weeks prior to first due date.

6 weeks prior to first possible due date:
1) Have cameras and monitor set up with remote viewing.
2) Have birth protocol, hand-rearing protocols and birth watch protocols & forms finalized.
3) Have hand-rearing team designated.
4) Set up training for birth-watch volunteers, distribute guidelines & protocols.
5) Get wish list out on website; baby shower?

4 weeks prior to first possible due date:
1) Train hand-rearing team. Meet as a group. Distribute protocol.
2) Start 24 hour gorilla watch. Some gaps in the schedule are okay. The purpose is to collect baseline data on the pregnant female.
3) Have nursery area(s) prepared, all supplies in stock and ready for possible hand-rearing.
4) Make sure there is an oxygen tank in ape building and keepers are trained to use it.
5) Have hand-rearing forms/computer programs in place.
6) Have post-birth observation forms finalized and in place.

1 week prior to first possible due date:
1) Make sure that 24 hour birth watch is in place. The purpose is to observe and watch for signs of possible labor and impending birth.
2) Make sure all staff is familiar with signs of impending birth.
3) Add more hay to exhibits; by first possible due date – more than double indoor hay
Cheyenne Mountain Zoo
Gorilla Birth Protocol

When female goes into labor:

1) Birth watch volunteer will put a tape in VCR and press record with monitor on the best view.

2) Birth watch volunteer will inform a keeper immediately (during day) or start calling at the top of their call list (at night).
   a. Refer to Birth Watch Protocol for details; first person they reach will give guidance based on observations that are communicated.

3) Close building to all zoo guests and staff; monitor her on cameras
   a. Inform front gate
   b. Put signs on PW doors
   c. All-call to all staff – do not enter public area, kitchen is okay

4) Primary keepers can observe during day through glass; no night disturbances unless emergency
   a. Time contractions if possible
   b. Offer drinks (Gatorade etc.) if it does not stress dam/group – only during day

After female has given birth:

1) No staff in public area except primary keepers; in emergency vet staff also.

2) If birth during night, leave lights off; if unable to get good visual on camera (you probably won’t be able to) one primary keeper evaluate dam/infant through glass as briefly/calmly as possible (lights off, red lights are on).

3) If birth during day, and dam/infant are in no immediate distress, do not disturb (shift, offer food/drinks, etc.) for 2 hours.

4) Evaluate infant visually – primary keepers
   a. Breathing – get respiration rate if possible
   b. Good grip – is infant able to hold onto dam’s hair
   c. Alertness – is infant looking around at all, looking at dam, or sleeping
   d. What is the condition of the umbilical site/cord

5) Evaluate dam – primary keepers
   a. Breathing – get respiration rate
   b. Discharge, stool, urine, blood
   c. Alertness
   d. Was placenta delivered

6) Evaluate situation
   a. Who is carrying infant (hopefully dam)
   b. How are other group members behaving toward dam/infant
7) **If infant is a disposition**
   a. Retrieve at the first opportunity with as little stress to dam/group as possible.
   b. If body is being carried, re-evaluate every 24 hours.
   c. If animals are behaving inappropriately toward infant’s body discuss with animal management and veterinary staff.
   d. Keep ape building closed to zoo guests until body is recovered.

8) **Observe dam/infant interactions - watch for/evaluate:**
   a. Good eye contact between infant and dam
   b. Rooting and suckling behaviors; if nursing – time it
   c. Holding position
   d. Vocalizations
   e. Grooming/touching
   f. Genital inspection
   g. Play
   h. Urine/stool/blood/discharge – dam & baby
   i. Refer to positive & negative behaviors listed further in this document

9) **If major aggression of other group member(s) toward dam and/or baby:**
   a. Is dam protecting baby
   b. What is silverback doing – is he being protective of dam/infant
   c. May need to consider separating troop; PRIMARY KEEPERS have the authorization to make any decisions necessary in an emergency situation. All safety protocols must be followed; no entering an enclosure with an adult gorilla.
   d. Only use outdoor enclosure if emergency; dam is not to be given this option the first two days under any circumstances.

10) **If major aggression or mistreatment of dam toward infant** – consider trying to separate dam from infant or immobilizing dam. Only if infant’s life is at risk. Give dam some time if at all possible.

11) **If dam or infant is in critical distress** – separate from troop, notify vet staff and supervisor immediately.

12) **If birth was during night**, and dam/baby are in no immediate distress, wait until 7 or 8am to disturb group – see below.
Cheyenne Mountain Zoo
Gorilla Birth Protocol

13) If birth was during day, wait 2-3 hours to disturb group.
   a. Offer dam LOTS of fluids (some to whole group).
   b. Give extra food & enrichment – use skylights & dens.
   c. Collect placenta if possible; this is NOT a priority, especially if it will stress dam/group to shift them; if shifting animals, add hay.

14) Operant conditioning – After discussion with Supervisor and/or General Curator, if it is deemed necessary, a primary keeper, preferably the primary trainer for the dam, will attempt to improve maternal response to the infant using maternal training behaviors. These behaviors will also be used to visually inspect the infant as needed.

15) Mother/Infant observations
   a. Should be made consistently on a daily basis
   b. Experienced observers should be used especially during the crucial first few days.
   c. Frequent meetings among keepers to assess how the mother/infant bond and frequency of nursings are progressing.

16) Behaviors to look for if the dam is uncomfortable or stressed:
   a. She may appear agitated, antsy; pacing a lot
   b. Putting the infant down then picking up frequently
   c. Putting the infant down and leaving it
   d. Non-attentive
   e. Dragging the infant
   f. Non-responsive to infant’s cries
   g. Excessive shaking

17) Positive behaviors to look for with mother and infant:
   a. Eye contact between mother/infant
   b. Mother examining the infant (toes, fingers, genitals)
   c. Mother responsive to infant when fussy (may indicate the infant wants to nurse)
   d. Frequent confirmed nursings
   e. Mother calm, comfortable
   f. Mother in charge in terms of who gets to touch the baby
   g. Group members respect and are responsive to the mother

18) If infant is being carried by dam and is not in critical distress, but is not nursing, give them 72 hours to try to establish nursing behavior. Use this 72 hour guideline for an infant that is NOT in distress or showing signs of weakness or dehydration.
   a. If dam is showing some appropriate behaviors, but is not nursing infant, consider intervening – evaluate frequently, immobilize her on 3rd day after birth (72 hours).
      i. Keep staff/participants at a minimum.
      ii. Glucose level on infant.
      iii. Weigh infant (1500g average for females, 2kg average for males).
      iv. Facilitate nursing for at least one hour, both breasts; give infant fluids while nursing if needed.
      v. Weigh dam if possible.
      vi. Recover female with infant in ventro-ventral position.
Cheyenne Mountain Zoo  
Gorilla Birth Protocol  

b. Do not pull infant for hand rearing unless all other options have been tried and exhausted.

19) **If infant is being carried by dam and is nursing, monitor closely.** Dam may not have adequate milk supply, so infant well-being and ability to grip would be indicators. Reglan may be prescribed by veterinarian to increase milk production, or supplemental bottle/formula feedings may be necessary. Hands-on intervention may be necessary as well.

20) **If pulling infant for hand-rearing:**
   a. Start one-on-one quiet time immediately with caregiver
      i. No other staff present except one vet staff to quickly examine & get glucose levels; infant carried on caregiver's body during exam.
      ii. Do not use isolette unless infant is in critical condition; he/she will warm up on caregiver's body with blankets.
      iii. Weigh infant (1500g average for females, 2kg average for males).
      iv. Start howdy time with adults on day 1 of hand-rearing if possible.
      v. Refer to hand-rearing protocol for further instructions

21) **Building access for zoo guests**
   a. We will evaluate on a daily basis.
   b. May put up stanchions to minimize crowds close to gorilla group depending on situation.

22) **Other important information**
   a. Dam will probably not act “normal” for the first week after the birth; may have decreased appetite.
   b. Sticking to routine (feeding, cleaning, group composition) is essential after the infant if born. Any change in routine can throw a mother off.
   c. Priority should be placed on cleaning/preparing enclosures for the birth group ASAP each morning, but follow normal routine.
   d. Regular meetings with supervisor, curator and vet staff to update and brainstorm.
## Gorilla Birth Watch - Observation Log

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<th>Possible Labor</th>
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**Focus animal:**

**Date:**

**Observers:**

**Exhibit Access:**

**Page #:**

**Shift Time:**

**Group Makeup:**

**Location:**

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57
### Dam/Infant Gorilla Observation Log

**Date:** ________________  
**Observers:** ______________________________________  
**Exhibit Access:** ________________  
**Page #:** ____________  
**Shift Time:** _____________________  
**Group Makeup:** _____________________  
**Dam:** ____________________________  
**Infant:** ____________________________  
**DOB:** ____________________________

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<td>Play</td>
<td>Staring/eye contact</td>
<td>Genital Inspection</td>
<td>Other</td>
<td>Urine</td>
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</table>

**Dam Posture:** Rest=L,R,F,B; Lc=Locomote; T=siT; D=stanD  
**Total Nursing Time this sheet:** ____________
Woodland Park Zoo
Birth Management Plan
BIRTH MANAGEMENT PLAN

Species:          Scientific Name:

Date Last Updated:       Prepared by:

Team Members:

Plan for: Dam#          Sire#
Expected Birth Date:

Previous births:

NOTES:

☐ SSP/TAG Recommendation:
PRE BIRTH

- **Housing Recommendations:**
  - Holding:
  - Den:
  - Training Plan
  - Signs of Pending birth:

- **Pre-Birth Precautions/Concerns:**
- **Night Keeper/Security/monitoring:**
  - Night Keeper:  
  - Security:
  - Video/other recording:

Post Birth

**Post-Birth Precautions/Concerns**

**Plan**
- For the first 24 hours following parturition:
  - FIRST Day:
    - DEN temps:
    - SIGNS for Concern:
    - PLAN:
- Who’s on exhibit/off:
  - How Long:
- Video/recording plans
- Training plan
- Night Keeper/Security
Housing Recommendations

Outside:
- Environmental parameters:
- Shelter:
- Restrictions:

Time out of Den

Noise issues:

Additional Needs:

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Health Check
First Neonatal Check-
- Physical: nose to toes with attention to oral cavity and umbilicus
- Rectal culture
- Temperature (should be 100-101)
- Weight
- Fecal

- Average Birth weights:
- Average weights at 1 week –

Health checks following initial neonate exam

- Who:

- Where/how:

- Needed vaccines/dates:
- Plan for administering:

Developmental Norms for this Species
- Developmental "Milestones":
  - Average weights:
  - Birth
  - 1 week
  - 2 week
  - 3 week

Locomotion:
### Hand Rearing Outline

<table>
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<tr>
<td><strong>1st milk:</strong> First bottle pedilyte to gage suckle strength.</td>
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<th>Other Considerations:</th>
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</table>

#### Marketing/PR/Development

- **Profile:** HIGH | MED | LOW | NONE

- **Visitor Assistance:**
  - **PR:** Notify PR upon birth and provide updated info following neonatal exam. Within 24 hours of the birth and exam, PR would like to issue a press release along with pool footage and digital stills. Ric has provided a digital video cam for keepers. Until Ric is given access for photos, it is hoped that animal management can provide stills for PR. Ric is on stand-by whenever staff are ready to permit access for him to take pictures and film. PR is trying to establish that a standard policy that birth announcements be made the first day, even under a worse-case scenario. The press release will also serve as an internal announcement for staff and volunteers.

- **Media Access:**

- **Web:**

- **Development:**

- **Volunteers:**
  - **Crowd Control:**

- **Observations:**
Other observers/students/research:

- Interpretation:

- Outside contacts: SSP Chair:

- Reference Materials:
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<th>Team and contact numbers:</th>
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Infant Development Sheets
Gorilla Infant Development
Carol Sodaro, Brookfield Zoo
GORILLA INFANT DEVELOPMENT SHEET

Date ___________ Institution _____________________________

Infant Name ___________________ Studbook # _________

ISIS # ___________ Sex __________ Date of Birth ___________

Time of Birth _________ Location of Birth __________________

Dam Name __________ Dam ISIS # __________ Dam Studbook # ______

Sire Name __________ Sire ISIS # __________ Sire Studbook #____

Names, Sex, Studbook #’s of other animals present for birth
________________________________________________________________
________________________________________________________________
________________________________________________________________

Were the above listed animals housed with the dam after birth? _________
If not, why? ________________________________________________
________________________________________________________________
________________________________________________________________

When were they re-introduced to the dam and infant? ________________
________________________________________________________________
________________________________________________________________

Description of labor, birth and post-partum behavior _________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

Did Dam ingest the placenta? ______________________________________

Time of first nursing ___________ Length of first nursing _________
GORILLA INFANT DEVELOPMENT SHEET

Group Composition:

<table>
<thead>
<tr>
<th>Sex/Name</th>
<th>Studbook #:Age (m/d/y)</th>
<th>Relationship to Infant</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Date 1st

PHYSICAL DEVELOPMENT/BEHAVIOR

<table>
<thead>
<tr>
<th>Foraging</th>
<th></th>
<th>Age</th>
<th>Location</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempts to touch food</td>
<td>_________</td>
<td>___</td>
<td>_________</td>
<td>_______</td>
</tr>
<tr>
<td>Describe</td>
<td>____________________________</td>
<td></td>
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</tr>
<tr>
<td>Mouths food</td>
<td>_________</td>
<td>___</td>
<td>_________</td>
<td>_______</td>
</tr>
<tr>
<td>Describe</td>
<td>____________________________</td>
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<tr>
<td>Ingests food</td>
<td>_________</td>
<td>___</td>
<td>_________</td>
<td>_______</td>
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<tr>
<td>Describe</td>
<td>____________________________</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinks water</td>
<td>_________</td>
<td>___</td>
<td>_________</td>
<td>_______</td>
</tr>
<tr>
<td>Describe</td>
<td>____________________________</td>
<td></td>
<td></td>
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<tr>
<td>Food share solicit</td>
<td>_________</td>
<td>___</td>
<td>_________</td>
<td>_______</td>
</tr>
<tr>
<td>Describe</td>
<td>____________________________</td>
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</tbody>
</table>
GORILLA INFANT DEVELOPMENT SHEET

<table>
<thead>
<tr>
<th>Locomotion</th>
<th>Observed</th>
<th>Age</th>
<th>Location</th>
<th>Partner</th>
<th>Date 1st</th>
<th>I.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes position on dam</td>
<td>________</td>
<td>___</td>
<td>________</td>
<td>_______</td>
<td>________</td>
<td>______</td>
</tr>
<tr>
<td>Describe</td>
<td></td>
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<tr>
<td>Horizontal surface(assisted)</td>
<td>________</td>
<td>___</td>
<td>________</td>
<td>_______</td>
<td>________</td>
<td>______</td>
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<tr>
<td>Describe</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Horizontal surface(unassisted)</td>
<td>________</td>
<td>___</td>
<td>________</td>
<td>_______</td>
<td>________</td>
<td>______</td>
</tr>
<tr>
<td>Describe</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical surface(assisted)</td>
<td>________</td>
<td>___</td>
<td>________</td>
<td>_______</td>
<td>________</td>
<td>______</td>
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<tr>
<td>Describe</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Vertical surface(unassisted)</td>
<td>________</td>
<td>___</td>
<td>________</td>
<td>_______</td>
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<td>______</td>
</tr>
<tr>
<td>Describe</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Bipedal standing</td>
<td>________</td>
<td>___</td>
<td>________</td>
<td>_______</td>
<td>________</td>
<td>______</td>
</tr>
<tr>
<td>Describe</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bipedal walking</td>
<td>________</td>
<td>___</td>
<td>________</td>
<td>_______</td>
<td>________</td>
<td>______</td>
</tr>
<tr>
<td>Describe</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Object Manipulation

| Tactile manipulation | ________| ___ | ________| _______| ________| ______|
| Describe             |          |     |          |         |          |      |

-3-
GORILLA INFANT DEVELOPMENT SHEET

<table>
<thead>
<tr>
<th>PHYSICAL DEVELOPMENT/BEHAVIOR</th>
<th>Observed</th>
<th>Age</th>
<th>Location</th>
<th>Partner</th>
</tr>
</thead>
</table>

Object Manipulation

Oral manipulation

Describe

Sociosexual Behaviors

Infant mounted by Dam

Describe

Genital touch/inspect by Dam

Describe

Social Development

Independence from Dam

Out of contact

Describe

Out of reach

Describe

Greater than 2 meters

Describe

-4-
GORILLA INFANT DEVELOPMENT SHEET

Physiological Development/Behavior

<table>
<thead>
<tr>
<th>Carried by animal other than Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>____   ____  ____  ____</td>
</tr>
<tr>
<td>Describe ..................................</td>
</tr>
</tbody>
</table>

| Infant independently shifts from cage to cage(or exhibit) |
|_______  ____  ____  ____               |
| Describe .................................. |

| Nest builds |
|_______  ____  ____  ____               |
| Describe .................................. |

| Tool use |
|_______  ____  ____  ____               |
| Describe .................................. |

Vocalizations

| Stress Cry |
|_______  ____  ____  ____               |
| Describe .................................. |

| Hunger cry |
|_______  ____  ____  ____               |
| Describe .................................. |

| Laughter |
|_______  ____  ____  ____               |
| Describe .................................. |

Anger Cough
<table>
<thead>
<tr>
<th>Describe</th>
</tr>
</thead>
</table>
# GORILLA INFANT DEVELOPMENT SHEET

<table>
<thead>
<tr>
<th>PHYSICAL DEVELOPMENT/BEHAVIOR</th>
<th>Observed</th>
<th>Age</th>
<th>Location</th>
<th>Partner</th>
</tr>
</thead>
</table>

## Interactions with others

### Contact - other initiates

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

### Contact - infant initiates

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

### Grooming - other initiates

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

### Grooming - infant initiates

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

### Play - other initiates

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

### Play - infant initiates

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

## Interactions with others

### Aggression - towards infant

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

### Aggression - infant initiates

- Date: 
- I.D.:
- **Observed**:
- **Age**:
- **Location**:
- **Partner**:

**Describe**: 

---

-6-
Additional observations/comments

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

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Names/Titles of staff members who participated in this project:

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

Date_________
Name: _________________________________  Birth: ___________  MR _____ NR ______

<table>
<thead>
<tr>
<th>PHYSICAL DEVELOPMENT</th>
<th>Date First Observed</th>
<th>Date Repeated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolls front to back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rolls back to front</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head up with support on forearm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creep: pulling with forearms with stomach &amp; legs on substrate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sits: supported by arms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unsupported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadrupedal stand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadrupedal walk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>feed flat on substrate (not curled into fists)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>spider style</td>
<td></td>
<td></td>
</tr>
<tr>
<td>legs straight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knuckle walk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climb (upright bar or rope):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pull up using hands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pull up using hands/ pushing w/ feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pull up using hands &amp; grasping feet/ hanging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back riding:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>climbs on dam’s/keeper’s back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rides comfortably w/ dam/keeper quadruped</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rides comfortably w/ keeper bipedal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bipedal stand:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>supported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>unsupported</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strutting/lip tucking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jumping (from higher to lower surface or across space)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transporting objects while moving:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in one two hands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in one two feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>in mouth</td>
<td></td>
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<tr>
<td>combination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(describe)</td>
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</tbody>
</table>

| VOCALIZATIONS                                              |                     |               |
| Smiles/laughs                                              |                     |               |
| response to stimuli                                       |                     |               |
| self initiated                                             |                     |               |
| Scream                                                    |                     |               |
| Cough                                                     |                     |               |
| Hoot                                                      |                     |               |
| Feeding                                                    |                     |               |
### AWARENESS/COORDINATION

- Localizes sound source
- Eyes focus (visual tracking)
  - near (hand before face)
  - distance (across room)
- Hand-to-hand contact (conscious)
- Feet-to-feet contact
- Hand-to-feet contact
- Coordinated reaching:
  - eye-hand
  - eye-hand-mouth
  - feeds self bottle
  - feeds self solids
- Chest beat:
  - involuntary reflex
  - voluntary reflex
- Slap surfaces/objects
- Genital touching
- Coprophagy
- Tool use

### PEER INTERACTION

- Seek physical contact
- Play face
- Slapping
- Play biting
- Chest beating
- Wrestling
- Chasing
- Choo-choo/snake dance
- Mock breeding
- Back riding

### OTHER

Response to self in mirror; response to nursery shift change; response to new foods; misc.

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77
Surrogate Hand Rearing Protocols
Columbus Zoo and Aquarium
Gorilla Hand Rearing Protocol
Columbus Zoo Gorilla Surrogacy Hand Rearing Protocol

By
Dusty Lombardi, Director of Living Collection
Maureen Casale, Zoo Keeper
Barb Jones, Zoo Keeper
Columbus Zoo and Aquarium
Columbus, Ohio

With a breeding recommendation from the SSP, a birth management plan must be in place. The Columbus Zoo promotes mother rearing of primates. Only if a mother or infant’s health is in jeopardy or there is maternal neglect or abuse will the infant be pulled for hand rearing. This Gorilla Surrogacy Hand Rearing Protocol will then be used as the guide for a successful, early introduction. It can be achieved by simulating mother rearing, early exposure to gorillas and 24/7 continual care from the time the infant is removed from the mother until infant is reintroduced to the mother or a surrogate.

Education of the gorilla hand rearing team is essential. This has been learned through the observation of gorillas that have successfully mother reared infants, by a visitation of the Ape TAG hand rearing team at least two months prior to the impending birth, and through videos from zoos that have a successful program. These videos include, hand rearing techniques, appropriate and inappropriate maternal care and introduction of infants to surrogates.

Communication must take place on many levels. Hand Rearing staff, primate staff, curator staff and veterinary staff must cooperate within and between their departments. Meetings should occur regularly and each staff is responsible for reading the records.

Criteria of Hand-Rearing Protocol
The following components of hand-rearing are necessary to ensure an early successful introduction to a surrogate. The following protocol is based on the introduction to a non lactating surrogate.

24-hour or continual care – a caregiver will be responsive to the infant’s needs at all times, until the successful introduction of a surrogate takes place. The infant is not to be left alone or placed where there is a physical barrier from the care giver.
Simulating mother rearing - the infant is raised by care givers that simulate age appropriate mother rearing at all times.
Infant reared next to conspecifics – this will begin the day he is pulled, to the day of introduction.
Dedicated space – Formally known as a nursery, this is an area that must be provided for hand rearing solely a gorilla.
Commitment from management - the institution must commit to the philosophy and support of the program.
The infant must be raised with the goal of an early introduction. Two precursors must be met prior to the physical introduction.

1. **Identify Surrogate** Staff will evaluate the suitability of a surrogate or a gorilla group to accept hand reared/surrogated infant. Since the infant is raised next to conspecifics, the care giver will observe the interactions between the infant and the group. As time passes a female may spend more time and often displace other females from sitting near the infant. It may be more subtle and the female may watch from afar. This is called “gorilla choice”. It is helpful in the selection of the surrogate. Once the surrogate is chosen she should be placed on birth control if she is not post-reproductive. A surrogate must be able to focus on the young gorilla, not a possible mate.

2. **Infant meets criteria**
   A hand-rearing protocol must meet the physical, psychological, and social needs of the infant.

**Dedicated Hand Rearing Space**
- Be next to conspecifics
- Have auditory, visual, olfactory, supervised tactile stimulation
- Share common features with living space of gorillas (structures, etc.);
- Mimic adult routine
- Capability of being intensive care unit if necessary
- Provides opportunities for age-specific movement, activity, etc.

If there is infant/caregiver safety or gorilla disruption concerns during the gorilla’s sleeping hours, a more remote space within the building can be utilized at night.

1. This area is relatively “primate-proof” (they eventually find a way to get into everything).
2. It is essential to have a small kitchen and bathroom in proximity to this space containing a refrigerator, microwave, sink and storage (washer and dryer is optional).
3. The entrance area is equipped with a footbath. It is where the keeper leaves his/her shoes, street clothes and changes into scrubs. It also can be used for storage.
4. The remote space is only used when keeper and infant cannot be beside gorillas.
   a. This room contains playing apparatus and enrichment items for an age appropriate infant.
   b. A mattress is on the floor, so keeper and infant can sleep together for warmth and contact.
   c. An Isolette is available for potential I.C.U. If used, keeper should maintain continual contact with the infant by placing hands on infant through isolette openings.
5. **Computer access** is vital for record keeping. A file cabinet for paper daily records and office supplies is needed.
6. An ambient environment is consistent with temperature and humidity of the existing primate building.
7. Diffuse lighting is provided at night to allow keepers to care properly for infant.
8. This space should have mesh and or climbing structures for strengthening motor skills.
9. A scale is mandatory to record daily weights.
Preparations one month before impending birth
1. Meet with appropriate staff to organize and have a plan.
2. Clean and disinfect designated hand rearing area.
3. Determine formula to be used (Nestle Good Start, Similac, etc.) and order small amount.
4. Order small amount of 5% glucose, sterile water and pedialyte. This may be necessary to mix with or substitute for formula.
5. Order supplies and equipment to manage area for several days (see supply list).
6. Create a tentative staffing schedule to provide dedicated 24 hour coverage.
7. Review visitation notes from Ape TAG Hand Rearing Team and the first two week records of previous hand reared infant gorilla records if available.

Keeper Staff Selection and Training
A requirement for training, working or entering the hand rearing area is a negative TB test. Selection of staff is based on prior experience, availability, primate knowledge and ability to follow protocols. Trainees work with an experienced hand rearing keeper prior to being on their own.

The trainee must be knowledgeable with the protocol, the infant, conspecifics and equipment. New staff members should work all shifts to become familiar with the entire program. Fewer than ten caregivers are recommended to be the 24/7 care team. If this is your institution's first time for hand rearing, a member of the Ape TAG hand rearing team should be present to assist.

1. Proper hand washing is the best way to prevent disease. Keepers are asked to wash their hands before entering the area, after changing diapers, before preparing food and other appropriate times.
2. Dedicated attire must be provided for staff to wear while on duty. Masks and gloves are worn when the infant is young. Foot covers should be worn, if this is not possible remove your shoes.
3. Anyone that is ill should not be in the area. If one becomes ill during a shift, put on mask and gloves and call in a replacement.
4. Arrive early to allow a slow, calm transfer of the infant and to discuss instructions and changes with previous shift keeper.
5. Keeper on duty should read records from the last time they worked.
6. Keeper must complete records from their shift before leaving.
7. New staff will be introduced to the gorilla group slowly.
8. Hand rearing staff does not feed or touch the gorilla group.

Record keeping
Accurate, consistent record keeping by the keeper is an important part of the hand-rearing protocol. The records should include description of formula, amount fed and actual consumption, stool amount and consistency, daily weight of infant, and vitals. This information should be recorded daily into the computer. Paper copies can also be used. See Attachment.

1. It is extremely important to number each page on paper copies and to indicate AM or PM when recording time.
2. The unit of weight used is grams. This is decided by the vet staff and kept constant (but you can also use pounds for the people that don’t think in grams.) The infant’s weight gain or loss is a factor for formula change and general health.
3. There is a section for urine weight if a measurement of output is required.
4. Medication, amount and instructions are listed under medications.
5. The comment section is for pertinent information such as time spent next to gorillas, tooth eruption, development of motor skills, behaviors of both infant and gorillas,
6. “Total sheets” are an abbreviated form of a 24 hour day. This is convenient for the vet staff and management who require a brief update (see attached record forms.)

Potential decision to examine Infant
An individual is assigned to notify hand rearing staff. Meet with key staff to decide how soon the baby can be returned to the mother. Try to accomplish this procedure in several hours.
1. While dam is sedated, remove the infant for a visual physical by vet staff to determine health for potential immediate reintroduction
2. Examine the infant. Check for dehydration. Weigh the infant, axillary temperature should be above 97 degrees before returning to dam for nursing or offering a bottle, Mouth should moist and gums should be pink
3. Dextrose stick – the only time to use it is when a newborn is pulled. Prick the heel of the infant and express a small amount of blood. Put the blood on the stick to measure the amount of sugar in the blood. Below 40 mg% is a good indicator that the infant has not nursed
4. If possible reintroduce infant in two or three hours, try not to wait more than three days. Protocol will be set depending upon the situation for the reintroduction.

If the reintroduction is not successful
1. Veterinarian will perform a complete physical.
2. Depending on infant’s health, decide how often to take vitals.
3. Veterinarian will determine the amount and strength of formula. We start at 10% of the infant’s body weight. If the infant tolerates the formula and is not gaining weight then we go to 15% of the infant’s (Ounces (infant weight) x .15% (15% body weight) multiply answer x 30 mls. Divide by # of feeding in 24 hour. This formula can also be used for 10% body weight, 20% body weight etc.)
4. The age, degree of hydration and temperature must be considered. Do not bottle feed a recently pulled infant if his temperature is under 97.

Bottle Feeding Procedure
1. Disposable volufeeders and disposable nipples are used for all liquids for the first few months. Eight ounce plastic bottles are used as volume increases. The nipple is determined by the infant’s ability to suckle. We stock preemie, special care and regular nipples.
2. For a bottle under 20 mls, heat by immersing in hot water which gives us more control of temperature for a limited volume. Always shake any bottle well before wrist testing
3. Infant is held close to keeper’s breast and fed slowly to prevent aspiration. Emulate nursing position of dam ventral/ventral (V/V).

4. For the first few days the infant is fed approximately 10 mls and then burped. As infant’s sucking ability and volume of formula increases, larger amounts can be given between burps.

5. The infant is fed a bottle through the mesh, during the day, as early as 2 months old. This will help the infant become comfortable with this type of feeding as this is the only way the infant can be fed after the introduction to the surrogate.

6. The infant is bottle fed formula every 2 or 3 hours for approximately 3 months. If the infant becomes hungry between feedings, you may offer small amounts of pedialyte, or water (about ½ the volume of the formula.) As solid foods are added it is possible to stretch the feedings to once every 4 hours.

7. Night bottles are discontinued before the introduction. Depending on the age of the infant, gorilla keepers may stay to give an evening bottle after introduction.

**Solid Foods - see video**

1. Before solid foods are offered, let the infant observe the keeper eating. He can smell the food and the keeper’s breath, to inspire his curiosity. Mother gorillas teach the infant to eat by dropping bits of food on him (see video). Having food around to be smelled and touched, even if not eaten, is part of a gorilla learning process.

2. Large pieces of raw carrot and celery are offered first for teething. Hold food or place in infant’s hand. Watch closely that small pieces do not break off and cause choking.

3. Food items offered to the infant should be the same items offered to the adult gorillas but modified by cooking. Solids foods are offered when interest is shown and teeth begin to erupt. Soft biscuits soaked in formula are given first, followed by cooked sweet potatoes, cooked carrots and bananas. Some foods are cooked at the beginning for easier chewing. A three day time span is used with the introduction of each new food to avoid allergies. Additional vegetables are started before other fruits. Offer 1 or 2 grams (very small, soft bites) of each new food, and when they accept this increase in 5 gram increments. Increase as the infant grows.

4. When starting to feed solids, hold infant in an upright position. Smash small bites between fingers and put in infants mouth. Be sure they swallow all food before offering more. Make gorilla food vocalizations while they are eating.

5. Food should be placed close to the infant and also next to conspecifics. The infant can watch the gorillas eat and hear them vocalize while he is eating near them. When gorilla keepers are feeding the group, they can also feed the infant through the mesh. This is a helpful preparation for an early introduction.

**Vitals:**
The first two weeks after the infant has been pulled, vitals should be taken between each bottle feeding while the infant is in a quiet mode or asleep. If active, this procedure is too stressful for infant and keeper. By the third week if the infant is stable, vitals can be taken once each shift at
approximately the same time. Taking vitals consistently establishes a pattern. When there is a deviation to this pattern, it may be an indication that something is wrong. A follow up on unstable vitals can lead to early diagnosis, treatment, and a quicker recovery. These records also give a guideline for future hand reared infants. When the infant sleeps through the night, vitals are discontinued on this shift. This is subject to change if infant’s health is a concern.

1. **Weight:** On awakening and before the morning bottle, weigh infant without diaper. Always put the infant on his stomach. For security he can hold a blanket or stuffed animal that has been tared to zero on the scale.

2. **Resting Respiration:** Hold infant against your body or on your lap. Visually watch infant’s breathing or place your hand on his back or stomach. Count breath for 15 seconds using a watch or clock with a second hand and multiply by 4 for respirations per minute.

3. **Resting Pulse:** Use infant stethoscope on infants chest, count each beat for 15 seconds and multiply by 4 for pulse per minute. Each beat has a two sound cadence (ba-boom); count as 1. Practice on yourself or another human. If there is an irregular heartbeat notify the vet.

4. **Resting Temperature:** rectal temperatures can cause prolapse and stress to the infant. Use a digital thermometer and take an axillary temperature (under the arm). Thermometer should beep when temperature has been reached. Average temperature is about the same as a human. It is not unusual for the infant’s temperature to drop at night to the low 97 degrees. Covering and/or holding the infant can help to raise the temperature. If over 100 degrees, check more frequently and alert veterinarian. The temperature may increase if the infant is teething or after inoculations. Under these circumstances, it is still imperative to follow these same procedures.

5. **Girth:** Holding the infant, slowly lower him on his back; this can be done on your lap or a flat surface, while the girth is being taken. Make sure the girth tape (measuring tape) is available. Keep him calm and occupied by giving him a blanket or toy to hold. With diaper off, use a measuring tape with centimeters, circle waist with top of tape touching bottom of navel. All staff must be consistent. This procedure is an indicator to determine any gastric distention which may be a sign on enteritis.

**Signs of concern:**

**Physical:** Loose stools, constipation, increased girth size, increase/decrease in temperature, cough/congestion, nasal mucous, changes in normal pulse or respiration, lethargy or decrease in activity, loss of appetite, dull hair coat, weight loss, white coating on tongue, infant not gripping keeper

**Behavioral** Distress that is behavioral is usually verbalized by a cry (hoo, hoo) or scream. The infant may also cling tightly to the keeper. There have been incidents where infants have “shut down” (just closed their eyes and appear to be asleep). This has been seen in stressful situations with several young gorillas i.e., when they are in a noisy, crowded environment, when refusing foul tasting special formula, refusing food when suffering from a mouth infection and being in close proximity to an intimidating gorilla.
Components necessary to expedite an early introduction

Dedicated twenty-four hour care continues from the time the infant is pulled from the dam, until he is returned to her or a surrogate. For the first few weeks of life, the infant is held constantly to provide warmth and contact. He is held close to the keeper’s chest. The keeper must hold or stay in close contact with the infant while performing duties. If anything necessitates removing him from the keeper’s body (weighing etc.) he is placed in a safe location on his stomach, holding a fuzzy toy or blanket. As the infant becomes older and aware of his surroundings, it is his choice to climb off the keeper and move around. Even then, the keeper remains close through touching and voice contact. At night, he falls asleep on his keeper and they share a bed. The infant becomes more accepting of any new experience because of his close contact with the keeper.

Never being alone gives him confidence and a sense of security. It does not instill a bond with a keeper as much as it does a bond to the comfort and attention. This program makes the transition to the surrogate stress free. See Video

Training program

Infants are trained or behaviors are captured at a very young age. Behaviors such as open mouth, sticking out tongue, presenting hand, foot and belly, going to the mesh for bottle, hand feeding at the mesh, blood draw, gaiting through a baby door are all worked on at age appropriate times.

Simulating Mother Rearing

The infant is raised by a care giver that simulates age appropriate mother rearing at all times. Eye contact, appropriate gorilla vocalizations, tactile and olfactory stimulation, locomotion, feeding, play behavior are important components of the program. (See video).

Eye Contact begins the day the infant is pulled. This develops a bond between the infant and keeper.

Vocalizations are used to identify various behaviors. While eating, it is a guttural, open mouth chewing sound repeating ummm-ummm-ummm. Play is a big part of a little gorilla’s day. They love to run, pounce, roll and be gently tickled. Play is vocalized with a mouth open whisper, a deep ha-ha-ha. We encourage age appropriate play, as they will experience this with other juveniles (but no hard biting!). Greeting or soothing, reassuring sounds are made with the mouth closed, and a deep gurgle from the throat m-m-m-m. When an infant makes a soft hoo-hoo sound, it indicates stress in some form. At times, if not dealt with, it will escalate into louder hoo-hoos followed by a scream (see video). Reassurance is needed immediately.

Tactile and Olfactory Stimulation is used 24/7. Grooming and examining the infant occurs daily.

A gorilla’s olfactory sense is superior. When a surrogate is chosen, there can be a blanket exchanged between her and the infant. This way they become accustomed to each other’s scent.

Locomotion Infant is either carried V/V, placed on the back of the keeper, or around the forearm for movement. V/V is a common holding position for infants. As he develops he is
held in a sitting position in the groin area and over the arm. Do not hold the infant as if he is a human primate. Non human primate babies cling to their mother’s instinctively. Therefore, infant should be held loosely to encourage clinging.

**Feeding through the mesh** starts at approximately 2 months old when the infant becomes more aware of his actual bottle. A hand rearing keeper holds him in her arms on one side of the mesh while a gorilla keeper gives him a bottle through the mesh. Feed this way during the daytime so that it becomes a relaxed way for the infant to get his bottle. Prior to the introduction, mesh feeding is imperative. The gorilla must reliably come to the mesh for his bottle. When the gorilla group is fed their diet the infant is also offered food. Familiarity of the keeper staff with the infant is important, because as soon as the introduction is made they start taking a more active role. These keepers learn to be care-givers by doing shifts in the hand rearing program, giving bottles through the mesh and offering food.

**Exposure to gorillas** should start the day after the infant arrives for hand rearing (with veterinary permission). Infant should go without diapers when next to gorillas. This allows for tactile contact with conspecifics without fear of danger to the infant or adults. It is important that he experiences visual, tactile, auditory, and olfactory stimulation from gorillas from the beginning. It is imperative that he will be raised in the environment where he will eventually live. Experience shows infants that spend time next to gorillas from the beginning are much calmer and have an easier transition.

Hand rearing keepers have a dual responsibility when they spend time next to the gorillas. Constantly observing interaction within the group provides valuable information. Every action, even sitting quietly, is an opportunity to show the infant appropriate gorilla behavior. It is important that the infant learn to respond appropriately to any behaviors or sounds in the building. If there is a gorilla confrontation or high tension, the keeper reacts to the sounds as if she was a gorilla mother and part of a group. She holds the infant close, as if protecting him. This teaches the infant to go to his surrogate at times of “fright or flight.” and to ignore the day-to-day noises. The infant gorilla develops appropriate responses to his surrounding environment. During gorilla play times, the keeper is relaxed and playful.

Bedding materials cover the floor of the on hand rearing space, allowing the infant to become accustomed to handling and maneuvering this element of his exhibit. Once the infant is moving on his own, he needs to have the confidence to move around his whole habitat. We expose him to all parts of his exhibit, including the chutes, door gating, platforms and water sources (see video).

He must learn to gate through a baby door only large enough for him to pass through. The infant is encouraged to enter through the door to an empty cage. This will be a familiar experience when the infant needs to follow his surrogate to another area.

**24/7 or Continual Care**
The program is broken down into two week intervals for ease of understanding the keeper care and interaction with the infant. The keeper responds to the infant’s needs based on age appropriate behaviors observed in mother rearing.
**Day 1 to 15**
This is when new staff is trained, see staff training section
Take vitals every two hours unless medical issues require more frequently. Weigh every morning at the same time.
Infant should be next to conspecifics from the first day with vet approval. He must never be left alone when he is this area. Stay quiet and do not interact with the other gorillas, be within observation proximity. This is the introduction period for you and for the infant gorilla. Diapers should not be worn
The keeper will familiarize the infant with hay. Stay away from the mesh so infant can’t be grabbed.
Gorilla behaviors are observed and placed in note pad to record important information.
Females may have blood spots on their diapers from the vagina. This is normal. Umbilicus may also ooze and require medication or treatment.
Tooth eruption has been noted as early as day one.
Thrush (candida), a white coating on the tongue is a common occurrence for infants. Treat immediately. Condition painful, may refuse bottle.
Disposable volufeeders and nipples are used for every feeding. Heat the bottle in a cup hot water.
Bottle feedings are every two hours. Infant is held in an upright position ventral/ventral next to chest area for feedings, emulating mother nursing’s. During this time the keeper uses very soft gorilla vocalizations, for food and comfort. The infant is never cradled as a human infant for feedings
The infant is held almost constantly ventral/ventral, including throughout the night. He should only be put down if necessary. Then he should be placed on his stomach in a safe, secure area. The infant is encouraged to hold onto the keeper not vice versa. See photo
Motor skills at this age consist of grasping, holding the head up, rooting and eye contact. He follows movements and looks at objects.
The keeper grooms and inspects the infant’s body.
Stool and urine output is frequent. When adjusting to formula, stools may be inconsistent. Infant may have muscle spasms when they fall asleep, note them in records. If there is concern with frequency and severity of spasms notify the veterinarian.
During nice weather expose infant to sunshine for Vitamin D, 15 to 20 minutes a day if possible

**Day 15 to 30  Continue pertinent protocol from above**
Bottle feedings are every two to three hours and formula is increased based on infant’s weight.
Take vitals at bottle time.
Infant and keeper should be next to conspecifics 10 hours a day
Tooth eruption is just beginning, do regular mouth checks.
The infant is held ventral/ventral, ventral/dorsal, over the forearm, in the groin area, between keeper’s legs on tummy with head facing outward. This encourages forward movement and reaching by infant.
Infant begins to smile and make quiet laughter.
The infant may root, become vocal, or suck on his or keeper’s fingers before feeding time.
While sitting next to conspecifics, the infant may be placed in hay between your legs for short periods. Emulate gorilla behaviors as they occur.  
Infant may roll over at this time from tummy to back. 
Infant sleeps and is awake for longer periods. 
Infant is exercised by limb movement. 
Keeper and gorilla infant both initiate soft play 
Infant is exposed to other food items by smell and touch and watching keeper eat. 

**Day 30 to 45  Continue pertinent protocol from above**
Take vitals once a shift unless medical issues require more frequently.  
Solid food is scattered at times around the infant for familiarity. 
Tooth eruption: Usually lower incisors come in first. Infant may experience running nose, slight elevated temperature, or lack of interest in bottle. Teething may increase on objects. Raw carrots and celery are given for teething, watch very carefully for choking. Any change in vitals should be monitored carefully.  
Infant is given more freedom of movement but always within keeper’s reach. 
Infant should be turning over, raising tummy off of floor, may start to scoot on keeper’s lap, then on floor and becoming more aware of gorillas 
Depending on comfort level between keeper and gorillas, infant may be held at mesh for smelling and touching conspecifics. The gorilla group may pass hay or browse through the mesh.  
Observations are very important to determine maternal interest. Gorilla choice begins to become evident. 
At night, infant sleeps on or besides keeper. When infant is asleep, keeper can spend more time on records/chores but stays in close proximity to infant.  
Begin training, start with open mouth and tongue. 

**Day 45 to 60  Continue pertinent protocol from above**
Bottle feedings occur every three hours, formula is increased based on infants weight. 
If vitals are disruptive to sleeping at night, discontinue. 
During this time frame a bottle feeding can be dropped during the night based on infants sleeping patterns and weight gain.  
BPA free bottles are used when the amount goes above 60 mls. Use bottle warmer to heat 
A small water bowl is filled and available to the infant.  
Upper central incisors may be erupting. 
Infant increases rolling over, scooting longer distances, pushing with legs and pulling with arms, when held infant starts to hold onto mesh, (need to watch for other gorillas during this time), raise head up while on back, continue to scoot on keepers lap, can sit up for a few seconds at a time, will pull up on objects while they are on their back. 
Infant is more aware of conspecifics, keepers will follow gorilla group behaviors.  
Group members are touching the infant frequently, infant allows contact and interacts back with certain members of the group. 
Keeper and infant are exploring all aspects of the cage and environment.  
At night Infant sleeps on or besides keeper. When infant is asleep, keeper can spend more time on records/chores but stays in close proximity to infant.
Day 60 to 75  Continue pertinent protocol from above
Bottle feedings are every three hours. Amount increased based on infant’s weight.
Drop one bottle during the night based on infant’s sleeping pattern and weight gain.
Begin to feed day bottles through the mesh by the gorilla keeper.
Tooth eruption, lower and upper lateral incisors usually have erupted.
Infant may be sitting up, and begin pulling to a standing position on the mesh.
He is scooting more frequently with tummy low to the ground.
Infant begins backriding on keeper. Remember to use kneepads.
Training consist of open mouth, tongue, bottle through the mesh, and starting to ask for body parts
Infant is aware of conspecifics and will react to gorilla behavior.
Certain group members may touch the infant. He may interact back with some of the gorillas.
During this time frame the baby is moving around and off of the keeper more, but always stays close.

Day 75 to 90  Continue pertinent protocol from above
See solid food protocol and video. Baby food is never used. Start with 5 grams twice a day with apple biscuit soaked in formula. Continue each new food, one at a time, at three day intervals to assure that there are no food allergies. Add cooked vegetables such as sweet potatoes, carrots, white potatoes, then add fruits until all foods given to gorillas are added. Use food vocalizations.
Baby will begin to pick up food items and place it in mouth.
Start lixit training.
Pulling up on mesh more often
Keeper will lie on stomach allowing infant to climb on back for back riding
Climb in and out of rubber tub or other objects
Crawling knuckle walking is now happening. We train to gate through a baby door.
There should be more interaction between baby and troop. Usually one female is showing interest and spending more time with the baby and keeper.
Keeper and baby are exploring all aspects of the exhibit, chutes, and outside environment, doing whatever the troop is doing, transferring outside, eating, playing, etc.

Day 91-105  Continue pertinent protocol from above
The infant should be weighed each morning before the bottle until he/she is introduced to a surrogate.
Bottle feedings are every three hours during the day and are slowly eliminated at night. The total intake of formula for 24 hours either remains the same or is slightly increased to promote weight gain.
Surrogate should be identified. This gorilla should be pulled away from the group a few hours a day so the baby, keeper and surrogate can spend time alone in an area next to each other.
**Day 106-120  Continue pertinent protocol from above**
During this time frame the amount of formula remains constant or is decreased. Vitals are taken once a day unless there is a health concern. The baby usually can go from a crawling to a sitting position. More time is spent picking up food and putting it in their mouth. Happy times are identified by clapping and laughter. Keeper and baby are emulating troop behavior.

**Day 121 to 135  Continue pertinent protocol from above**
Bottle feedings are every four hours, 5 times a day during the day with no night feedings. If the infant awakens during the night, offer a little pedialyte for comfort. During this time frame the total intake of formula for 24 hours remains the same. He is crawling quicker, standing upright and holding onto surfaces for a longer period of time.

**Day 136 to 150  Continue pertinent protocol from above**
This is the final stage prior to introduction. See Criteria for early introduction. The total intake of formula for 24 hours remains the same. Full gorilla diet has now been completed, except for scatter foods like popcorn. The infant starts hitting objects repeatedly and gating through doors following a keeper. He can free fall with eyes closed, and look at himself in the mirror. He can climb to the top of the mesh while holding objects, beat his chest, and is comfortable with back riding. Time spent next to conspecifics is increased to prepare the infant for introduction.

**Criteria for an early introduction:**
1. Staff should agree on readiness of the surrogate and infant. Ideally, the infant and surrogate have established a comfortable bond. The infant feels secure beside the surrogate. The surrogate reacts if the infant shows distress.
2. The surrogate has to allow the infant to receive nourishment. Cooperative feeding may exist. Either the infant is mobile and comes to the bottle or the surrogate brings the infant to the bottle.
3. An introduction should not proceed with a potential surrogate that displays aggression.
4. If affirmative behaviors are not observed, contact the hand rearing surrogate team of the Ape TAG for possible relocation of the infant.
5. Infant is completely familiarized with all routine and husbandry practices.
6. Have a pre introduction health assessment by the vet staff on the infant.
7. Prepare for a “Plan B” if possible. This involves having an alternative surrogate if the introduction does not go as expected. Contact the hand rearing surrogacy committee for assistance.
8. Five days before the introduction, keeper and infant spend 24 hours a day in the gorilla area. The nighttime atmosphere of this area becomes familiar to the infant, which completes his pre-introduction criteria. We do not intend to separate infant and surrogate once they are successfully introduced, therefore, all components must be in place.
Introduction Day:
1. Daily routine for feeding and cleaning is normal. Cage is prepped for introduction, heavy bedding, scatter food (no popcorn or seeds) and soft enrichment items.
2. Surrogate is separated from the group and placed in an area next to the infant.
3. Keep observers to a minimum (remote cameras can be used to facilitate observations)
4. While the infant is offered a bottle through the mesh, the hand rearing keeper attending the infant leaves quietly.
5. The door is opened for the surrogate to enter.
6. Be patient. Surrogate and infant will determine contact time. It may take a half hour or more.
7. When infant needs to rest or nap, he may lie down apart from surrogate. Possible, surrogate will pick him up and relocate him as she moves around area.
8. In a successful introduction, surrogate and infant are never separated. There may be variations in care from a surrogate. The surrogate is now the primary care giver.
9. Due to the fact that the infant was raised in this program, there is minimal stress to the infant and surrogate. A bond that began during the introduction process can now be secured.

After the introduction:
1. Allow time for a strong bond to develop between surrogate and infant before integrating another group member.
2. Carefully select which group member will be introduced next and allow time (few weeks) to adjust and solidify a level of comfort before integration of the next group member.
3. Once the silverback and all group members are spending 24 hours a day together, the introduction is considered complete.

Once the infant is introduced it is important for the infant to stay on schedule with his bottles. At 1 year the formula is gradually changed to whole milk as long as the infant can handle cow’s milk. This is completed in 10 days. Bottle schedule: Days 1-3, ¾ formula to ¼ milk, days 4-6, ½ formula to ½ milk, days 7-9, ¼ formula to ¾ milk, day 10, 100% milk.
At 3 years of age the bottles are decreased to 2 times a day, at 4 years 1 bottle a day, and at 5 years the infant is weaned. Hydration is important. Juices are offered and water is always available.

Food intake, weight, hair coat, brightness of eyes, stool and urine output, behaviors and bonding with the surrogate is visually monitored daily.
Columbus Zoo and Aquarium
Primate Hand Rearing Supply List

Room Supplies
☐ Single mattress
☐ Waterproof mattress cover
☐ Fitted single sheets
☐ pillow, pillow cases
☐ Blankets
☐ Infant scale
☐ Area rug (on floor program)
☐ Wall hooks for hanging ropes, ropes
☐ Climbing structure
☐ Boxes and lids for storage
☐ Cleaning supplies and disinfectant
☐ Washer, dryer
☐ Sink
☐ Refrigerator, microwave
☐ Cupboards for supplies
☐ Telephone
☐ Radio and charger
☐ Computer
☐ File cabinet
☐ Bathroom availability
☐ Office supplies (paper, pens, scissors, etc.)
☐ Flashlight, batteries
☐ Bulletin Board
☐ Chair or stool
☐ Dish, hand, laundry soap
☐ Silverware, cups and bowls
☐ Trash cans and liners
☐ Record sheets; daily observations and totals
☐ Wall clock
☐ Wall thermometer
☐ Lamps, bulbs and nightlights
☐ Footbath
☐ Oxygen tank
☐ Isolette
☐ Fire extinguisher
☐ Smoke detector
☐ Duck tape, tape
☐ Broom, dust pan, sweeper
☐ Paper towels
☐ Towels, washcloths
☐ First aid kit
☐ TV, radio
☐ Phone list and emergency #
☐ Bottle warmer

Keeper Supplies
☐ Scrub sets (different sizes)
☐ Disposable foot covers
☐ Masks
☐ Disposable gloves (different sizes)
☐ knee pads
☐ Eye wash

Infant Supplies
☐ Diapers
☐ Diaper wipes
☐ Disposable pads
☐ Volufeeders, bottles (4 oz. and 8 oz.)
☐ Disposable nipples (preemie, special, regular)
☐ Bottle brush
☐ Infant blankets
☐ Underarm thermometers
☐ Infant stethoscope
☐ Tape measure
☐ Formula (Isomil, Similac, Nestle Good Start)
☐ Sterile water
☐ Glucose water
☐ Pedialyte
☐ Vitamins (infant liquid)
☐ Food scale
☐ Infant toys
☐ Sheets or material to make hammocks
☐ Heating Pad
☐ Hot water bottle
☐ baby cap
☐ Infant Tylenol
☐ Fecal cups w/lids
☐ Alcohol swabs
☐ temperature measure spoon
☐ pitcher and lid
☐ plastic container and lid
☐ measuring cup
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### Columbus Zoo and Aquarium Hand Rearing

**TOTALS FOR THE DAY**

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## Columbus Zoo and Aquarium Weight Chart

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Columbus Zoo and Aquarium Hand Rearing
Daily Input/ Output

<table>
<thead>
<tr>
<th>Time</th>
<th>Input</th>
<th>Stools/Urine</th>
<th>Output</th>
<th>Time</th>
<th>+ / -</th>
<th># of Stools</th>
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</thead>
<tbody>
<tr>
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</table>
Average Weight Gain

Average Weight of Males vs. Females

AGE IN MONTHS

Weight (grams)
Gorilla Tooth Eruption Records
Columbus Zoo and Aquarium

Data Source:
5 Hand Reared Gorillas

Days

Range in Days

Canines

Lower Primary Molars

145

341

167

247

110

376

Upper 1st Primary Molars

Upper 2nd Primary Molars

Upper Lateral Incisors

52

116

Upper Central Incisors

37

118

Lower Central Incisors

8

69

COLUMBUS ZOO AND AQUARIUM
Columbus Zoo and Aquarium Tooth Eruption Records

To clarify terms, primary (or deciduous) teeth include the incisors (central and lateral), canines (or cuspids), and primary molars (1\textsuperscript{st} and 2\textsuperscript{nd}) are a total 20 teeth. There are no premolars in the primary set of teeth.

Permanent teeth include incisors (central and lateral), canines (or cuspids), bicuspids (or premolars), and molars (1\textsuperscript{st}, 2\textsuperscript{nd}, and 3\textsuperscript{rd}) total of 32 teeth.

Primary tooth eruption patterns generally are: lower before upper; incisors (central before lateral) before primary molars (1\textsuperscript{st} before 2\textsuperscript{nd}). Canines usually come in last. And, of course, things vary from one individual to another. Gorillas seem to get their teeth ½ to 1/3 sooner than humans (e.g. gorillas get their human-equivalent-6-year-molars when they are 3 to 4 years old). They may get some permanent molars before losing primary teeth.

<table>
<thead>
<tr>
<th>Gorilla</th>
<th>Eruption Order</th>
<th>Age (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mac</td>
<td>lower left central incisor</td>
<td>66 (male)</td>
</tr>
<tr>
<td></td>
<td>lower right central incisor</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>both upper central incisors</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>upper left lateral incisor</td>
<td>116</td>
</tr>
<tr>
<td></td>
<td>lower right lateral incisor</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>2 upper 1\textsuperscript{st} primary molars</td>
<td>195</td>
</tr>
<tr>
<td></td>
<td>2 upper 2\textsuperscript{nd} primary molars</td>
<td>247</td>
</tr>
<tr>
<td></td>
<td>3 canines (not upper left)</td>
<td>371</td>
</tr>
<tr>
<td>Nik</td>
<td>Lower central incisors</td>
<td>8 (male)</td>
</tr>
<tr>
<td></td>
<td>upper right central incisor</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>upper left central incisor</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>upper lateral incisors</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>lower lateral incisors</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>unrecorded</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>upper 1\textsuperscript{st} primary molars</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>unrecorded</td>
<td>161</td>
</tr>
<tr>
<td></td>
<td>lower right ? primary molar</td>
<td>165</td>
</tr>
<tr>
<td></td>
<td>upper right 2\textsuperscript{nd} primary molar</td>
<td>167</td>
</tr>
<tr>
<td></td>
<td>lower left ? primary molar</td>
<td>168</td>
</tr>
<tr>
<td>Nia</td>
<td>lower left central incisor</td>
<td>37 (female)</td>
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<tr>
<td></td>
<td>unrecorded</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>upper and lower incisors present</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>upper 1\textsuperscript{st} primary molars</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>lower 1\textsuperscript{st} primary molars</td>
<td>145</td>
</tr>
</tbody>
</table>

<p>| Kambera | lower central incisors | 27 (female) |
|---------| upper left central incisor | 52 |
|         | upper right lateral incisor | 52 |
|         | upper right central incisor | 57 |
|         | upper left lateral incisor | 58 |
|         | lower right lateral incisor | 60 |
|         | lower left lateral incisor | 64 |
|         | upper right 1\textsuperscript{st} primary molar | 120 |</p>
<table>
<thead>
<tr>
<th>Teeth Description</th>
<th>ID</th>
<th>Sex</th>
</tr>
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<tbody>
<tr>
<td>upper left 1&lt;sup&gt;st&lt;/sup&gt; primary molar</td>
<td>150</td>
<td></td>
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<tr>
<td>Mo‘ana</td>
<td></td>
<td>(female)</td>
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<tr>
<td>2 lower teeth</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>upper tooth</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>2 lower primary molars</td>
<td>341</td>
<td></td>
</tr>
<tr>
<td>lower right canine</td>
<td>344</td>
<td></td>
</tr>
<tr>
<td>upper right ?</td>
<td>369</td>
<td></td>
</tr>
<tr>
<td>upper left canine</td>
<td>374</td>
<td></td>
</tr>
<tr>
<td>upper left primary molar</td>
<td>376</td>
<td></td>
</tr>
<tr>
<td>lower left canine</td>
<td>383</td>
<td></td>
</tr>
<tr>
<td>all 20 primary teeth present</td>
<td>478</td>
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</tr>
</tbody>
</table>
Eruption dates of deciduous and permanent teeth

Months

10 7 8
17 i1 i2
13 c m1
22 m2

Years

11 10 8
11 6
12 12
18

C Pm1 Pm2 M1 M2 M3

I, i Incisors
C, c Canines
Pm Premolars
M, m Molars

(lowercase letters stand for deciduous teeth)

Dental Eruption
Cheyenne Mountain Zoo
Gorilla Hand Rearing Protocol
Cheyenne Mountain Zoo
Gorilla Hand-rearing Protocol

The Cheyenne Mountain Zoo promotes mother-rearing of primates. Only if a mother or infant’s health is in jeopardy will the infant be pulled for hand-rearing. Once this occurs it is vital that only appropriate gorilla behaviors, discipline, vocalizations, diet and constant contact be maintained in the nursery.

Education of gorilla hand rearing team is learned through observation of gorillas that have successfully mother-reared infants. If this is not possible it is imperative to communicate with zoos that have this opportunity and/or have accomplished a program for early introduction to a surrogate. Cooperation between gorilla, nursery and vet staff must be on a daily basis.

What follows is a brief description of the procedures developed to successfully hand-rear these infants with the goal of returning them to a functional family unit.

A sterile nursery area should be prepared a month before any impending primate births.

We Prepare:

1. An easily cleanable area.
2. An area where temperature and humidity can easily be maintained.
3. An area that is relatively “gorilla-proof” (as you will discover, they eventually find a way to get into everything).

At Cheyenne Mountain Zoo:

1. Nurseries are located in the gorilla building. One is in the kitchen/office area to be used during non-public hours, when the infant is under 10 weeks old. The other nursery is in the small primate exhibit to be used when the infant and caregiver are not in the gorilla exhibits or service areas.

2. The entrance area to each nursery is equipped with a footbath. Caregivers change into scrubs in the PW chemical storage room, then change footwear just outside the nursery.

3. The main area to the nursery is where all activity (playing, sleeping and feeding) takes place. This room contains all playing apparatus and enrichment items for an age appropriate infant. This room also has a mattress on the floor, so caregiver and infant can rest or sleep together. This provides warmth and contact for the infant. An Incubator is used only if necessary and the infant is in the hospital.

4. The kitchen/office area contains a refrigerator, microwave and all daily supplies. The caregiver will always have access to a cooler and bottle warmer if not in the kitchen/office nursery.

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5. During the daytime the infant should be in the adult gorilla enclosures as much as possible, but he/she should also get a lot of howdy with conspecifics as well.

When infant is initially removed from gorilla group:

1. Start one-on-one quiet time immediately with caregiver.

2. No other staff present except one vet staff to quickly examine & get glucose levels; infant carried on caregiver’s body during exam.

3. Do not use isolette unless infant is in critical condition; infant will warm up on caregiver’s body with blankets.

4. Weigh infant (1500g average for females, 2kg average for males).

5. Start howdy time with adults on day 1 of hand-rearing if possible.

6. Refer to hand-rearing protocol for further instructions.

Our Caregivers Wear:

1. Hospital scrubs or gown, head covers, disposable gloves, surgical mask and shoes covers.

2. When infant’s health is stabilized, mask, disposable gloves and head covers are optional. For healthy infants this will be optional at 2 weeks or older. If a second infant is added to the nursery we will use the age of the youngest infant.

3. Scrubs or a gown are always worn by anyone entering nursery. Foot covers are worn until the infant is at least 3 months of age. Use the footbath prior to putting on foot covers whenever applicable.

4. If a caregiver (or roommate/family member) is ill, they must call the staff Veterinarian and describe the symptoms, and a decision will be made on whether a substitute should be found. If the staff veterinarian can not be reached, call the primate supervisor. If in doubt, make a phone call!

5. If a caregiver becomes ill during their shift, a mask and gloves would be put on and a replacement must be called.

6. If a caregiver has a child at home that is ill, the caregiver must shower on zoo grounds and wear clean scrubs prior to entering the ape building. There is a key hanging by the PW back door for the ARV basement, which has shower facilities. Alternatively, the caregiver must shower and put on clean clothes at home and go to the zoo asap. It is important that after the shower there is no contact with other individuals in the home and clean scrubs are worn during the shift.

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Gorilla Hand-rearing Protocol

7. No shag smocks are to be worn.

Our main goal is to raise the infant in a manner similar to how his/her mother would and to prepare the infant for reintroduction:

1. Twenty-four hours a day, care is given from the time the infant is removed from the mother until he/she is introduced. A minimum number of caregivers provides better communication in the nursery and less stress on the infant.

2. For the first few weeks of life the infant is carried constantly to provide warmth and contact. Until the infant is 5-6 weeks old it should be in constant ventro-ventral contact with a caregiver. Infant can be transferred to a towel or blanket for bathroom breaks.

3. To encourage muscle development newborn infants are supported under their rear end only; they should cling to some degree.

4. As the infant becomes more aware and curious, he/she is placed on the ground for short periods. The nursery staff is responsible for encouraging the infant to develop motor skills.

5. Gorilla vocalizations are used for feeding and play; caregivers should do feeding grumbles, happy/contented grumbles, and the quiet gorilla laugh.

6. Gorilla-like discipline is also employed. A gorilla “no,” cough, or actual physical intervention (arm or leg grab) is used to terminate inappropriate behavior. This must be used appropriately and consistently. If the baby bites a caregiver, either during a tantrum or while playing too roughly, immediately respond by gently but firmly hold his/her arm and do the disciplinary cough about 1 foot from his ear. If this warning does not seem to help, pin him/her gently but firmly by the neck and “get in his/her face” with the cough. Note every instance of discipline in the hand-rearing logs and put *** by that record.

7. Infants should periodically be groomed and inspected as a gorilla mom might, by grooming against the grain of the hair (looking for dry skin or parasites), pulling on the hair a little, and manipulating different body parts and limbs in the process. A gorilla mom might not always be gentle.

8. Other gorilla simulations are used such as back riding and tickling. At 8 to 16 weeks, depending on the individual, the infant can start riding on caregivers’ backs.

9. Caregivers do not have to lay perfectly still when the infant is napping – ape mothers don’t! There should be a balance between letting the infant get some quality sleep and moving around the enclosures sometimes. Night time (8pm-7am) caregiver should shift positions as needed but no running around.

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Dietary Information – Formula Feedings:

1. To determine the amount of formula start at 10% of the infant’s body weight. If the infant tolerates the formula and is not gaining weight then go to 15% of the infant’s body weight. The infant will probably be started on:
   a. 25% strength formula for the first 2 feedings
   b. 50% strength formula for the next 2 feedings
   c. 75% formula for the next 3 feedings
   d. Full strength formula (according to the directions on the formula container) within 24 hours of the first bottle feeding.

2. We will use Enfamil Lipil with DHA/ARA. Many more formulas are available for infants with problems. Use sterile water to prepare powdered formula for the first 2 weeks. Use distilled water for infants 2-8 weeks old. Infants older than 8 weeks – it is fine to use tap water, as they should be introduced to exhibit lixits at this point.

3. If switching the infant from one formula to another, switch gradually: 25%, 50, 75, 100% of new formula with changes every 24 hours unless infant is having a critical reaction to formula — call vet staff. Any formula changes will be directed by vet staff.

4. Disposable volume feeders are used for all liquids at amounts under 2 ounces (60mls). Clean bottles and nipples can be used for amounts over 2 ounces. They should be scrubbed with bottle and nipple brushes and dish soap after every feeding and sterilized daily in the microwave sterilizer.

5. Use a bottle warmer or soak bottles in hot water to warm them. Do not microwave bottles. Test the formula on your wrist prior to feeding, it should feel like nothing is there. DO NOT feed an infant formula that is too hot.

6. In preparation, before an infant is born, the nursery is stocked with 5% Glucose, sterile water, Pedialyte and several different formulas.

7. The infant is fed every 3 hours for approximately 3 months. If an infant acts hungry between scheduled feedings, he/she can be offered 5-10ml of Pedialyte. As solid foods are added it is possible to stretch the feedings to once every 4 hours.

8. Night bottles are discontinued before the introduction. Eliminate 1 night feeding per week leading up to the introduction. Depending on the age of the infant, gorilla keepers may stay to give an early evening bottle after introduction.

9. If stool becomes “loose” the veterinary staff may decrease the formula and add Pedialyte to prevent dehydration. If the stool looks like yellow toothpaste then it is normal.

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10. Start Polyvisol when infant is 2 weeks old, dosage prescribed by vet staff.

Bottle Feeding Procedure:

1. Infant is held close to breast and fed slowly to prevent aspiration.

2. At first, infant is fed approximately 10 mls and then burped.

3. As infant’s sucking ability and volume of formula increases, larger amounts can be given between burps.

4. Since mesh is available in the nursery, infant is fed bottles through the mesh as early as possible. Starting at 2 weeks of age, the infant should be fed daytime bottles through mesh. By approximately 2 months of age, infant should move 5 feet to the mesh for bottle feedings. It is crucial that the infant moves to the mesh on his/her own for bottles as much as possible once he/she is old enough.

Solid Foods:

1. Raw celery and carrot are offered first for teething.

2. The infant is introduced to solid foods when the first teeth erupt. Small food pieces can be “dropped” on caregiver’s clothing for infant to find and eat. Caregiver can also hold large food items for infant to mouth and chew on.

3. No baby food or cereal is given and no feeding utensils are used with the infant.

4. As the infant’s number of teeth and chewing ability increase, new foods are added. Some are cooked at the beginning for easier chewing. A three day time span is used with the introduction of each new food. Always introduce new foods in the morning (so that an allergic reaction will hopefully be evident during the day).

5. Vegetables are started before fruits. The regular gorilla diet is phased in. By 60 days adult diet should be available to infant 24/7. By 8 weeks the infant should have a buffet of fresh foods available to him/her at all times. Perishable items (produce) should be changed out for new fresh items every 2 hours during the day (7am – 8pm). Fresh foods are not available during “sleeping” hours.

6. Food is scattered throughout the intro cage and hidden in hay in nursery. It is also fine to hand-feed the infant as the keepers hand-feed the adult gorillas.

7. Non-toxic browse is important for infant. Make sure it has not been treated with chemicals, and confirm with a keeper that it is an approved non-toxic species.

8. During feeding caregiver makes feeding vocalizations and encourages baby to eat. With solids this may involve caregivers pretending to eat foods to inspire the
Cheyenne Mountain Zoo
Gorilla Hand-rearing Protocol

infant’s curiosity. It also may help for the caregiver to act reluctant to share food with the infant, as we often see with the successful orangutan mother.

Vitals:

1. Respiration, heart rate, temperature and girth taken and recorded before each feeding when the infant is under roughly 4 weeks of age. Girth is measured ½" below the naval (changes can indicate formula intolerance, digestive problems or major illness).

2. This monitoring changes to once every 8 hours as infant matures and begins to sleep through the night.

3. Once the infant is over 12 weeks of age he/she will have vitals taken and recorded once per day, the same time each day, as long as there are no health problems.

4. If a caregiver suspects a possible health problem they should take vital signs right away and call vet staff.

5. Weight is taken without diapers before the first feeding in the morning throughout the hand-rearing process. The gray digital scale will be used for all weights – note in the hand-rearing logs if another scale is used. Tare the scale with the tub and blankets prior to weighing as needed.

Howdy Time with Gorillas & Exploration of Gorilla Enclosures:

1. Keeper and infant go inside the introduction enclosure next to gorillas where the infant will have visual, tactile, auditory and aromatic stimulation. It is imperative that the infant be raised in the environment that it will eventually live in. Keeper is always present.

2. No diaper in gorilla area, except during the hours of 8pm-7am when gorillas can not see the infant.

3. Keeper and infant start daily visits to the introduction enclosure(s) when infant’s health permits. Visits can start as early as the day the baby is pulled if possible.

4. Initial time of visit is dependent upon the comfort level of the infant. Time of visits increase until entire day is spent in intro enclosure(s).

5. Gorilla keepers are involved in feeding the infant through mesh, so that the infant is trained to approach keeper/mesh for bottles.

6. As the infant matures try to give him/her some freedom.

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7. Don’t be afraid to play rough with the infant (especially after 8 weeks of age). Exposing the infant to loud noises is important at every age.

8. Infant becomes familiar with a creeped door to learn to shift and to have an escape route in case of an emergency during the introduction process.

9. Only caregivers (animal keepers) that are familiar with the gorilla group are involved with infant howdy sessions.

10. Infant is allowed to climb howdy mesh and touch/be touched by members of gorilla group – use best judgment.

11. “Gorilla choice” is used to determine who will surrogate the infant. Gorilla keepers observe and record all behaviors. Keep in mind – the gorilla that seems to show the most interest isn’t always the best candidate. Other factors such as age, past behavior, reproductive status, and type of attention shown toward the infant also play a role in choosing a surrogate.

12. Keeper does not interact with adults during howdy sessions, but should facilitate and encourage quality interactions whenever possible. Infant should be brought over to the howdy mesh if an adult shows interest.

13. Only reward/enrich potential surrogate when getting close to introduction and separating her.

14. Three days prior to introduction, keeper and infant move from nursery to intro area, next to the gorilla group, for 24 hours a day.

Record keeping is a crucial part of the nursery. Infant data is recorded consistently each shift, and entered daily into the computer (vitals, behaviors, development, food consumption, sleep patterns and time spent with gorillas).

Other important information:

1. Prior to each shift (before the infant is transferred from one caregiver to another) the caregiver must retrieve the update clipboard from the nursery and read all new notes and information. This applies to every shift, day and night. A lot can change in 24 hours.

2. Hygiene – prior to each shift, and after bathroom breaks the caregiver must wash hands thoroughly. Also, do not allow infant to put his/her fingers or mouth to caregivers’ mouth; this is to minimize transmission of illness in both directions. Infant should not directly share food, water bottles, etc. with caregivers for the same reasons.

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Gorilla Hand-rearing Protocol

3. Towels/blankets are given to adult gorillas (or potential surrogate) then to infant so he/she can smell gorillas at night; infant-scented towels are also given to surrogate/group.

4. Infant should receive the same enrichment each day as the gorilla group, provided the infant has been introduced to the food item (if food enrichment) and keeping safety precautions in mind. A list of infant approved items is posted on the caregiver clipboard. If a caregiver is in doubt or has enrichment suggestions, make a note and notify a PW keeper.

5. Infant needs to learn how to use adult water lixits and their locations, how to climb perching, location of perching "ramps" for escape routes, and layout of all exhibits, yard, dens, shifts. It is extremely important that all caregivers take an active role in this process during daytime/waking hours.

6. This is an on-the-ground program. Caregiver should crawl around and sit on ground or mattress while infant is awake.

7. Keep the nursery dark during night hours, no talking or encouraging play. Night hours are 8pm-7am. This is similar to the normal diurnal schedule of CMZ's gorilla troop.

8. If the outside temperature is over 60 F, take the infant outside in the sun for 20-30 minutes per day (minimum), preferably in the gorilla yard.

9. No clothes on infant ever.

10. When changing diapers, either change them while infant is on caregiver's body or transfer him/her to a towel or blanket. Put diapers on backwards for easier changing.

11. No humans under 18 can be near the gorilla infant for health reasons, no exceptions.

12. Nursery areas are off-limits to visitors and staff; infant can be viewed through glass unless it is an official/approved visitation.

13. See introduction protocol for further information.

Transfers from one Caregiver to another:

1. New caregiver (person relieving) should sit down next to the other caregiver for 1-5 minutes. If infant is sleeping, slowly move infant one limb at a time to the next caregiver. If done correctly infant will probably stay sleeping.

Revised 27 January 2007
Cheyenne Mountain Zoo
Gorilla Hand-rearing Protocol

2. Don't rush. Take your time with transfers. Use this time to talk about new information.

3. If the baby is awake, the transfer is similar. Sometimes infants don't want to let go of a caregiver (this has been "mom" for the last number of hours). Do NOT rip an infant off of a caregiver. Take your time. If you need to peel hands or feet off that is okay, but go slowly.

4. Once the transfer is complete the departing caregiver needs to leave right away. Your replacement is someone the baby knows and should be comfortable with if given a few minutes with only the arriving caregiver present for the baby to re-bond.

5. Infants may pick favorite caregivers. Sometimes infants may hoot or chase after a departing caregiver. That is not abnormal but staying to "comfort" the infant (or yourself) makes the situation worse. Once the departing caregiver is gone the infant will usually calm down. If not, call Primate Supervisor.

6. The infant will have preferences from day to day; it is not appropriate to be possessive of the baby or competitive with other caregivers.

Visitors outside of caregiver team:

1. Must be approved by General Curator.

2. A maximum of two visitors can be present in the nursery area. They may be able to touch the infant, but only one new person might possibly hold the infant.

3. Recommend no more than one visit per day, two at most.

4. Visitors need to wear a mask, disposable gloves and head cover until infant is 4 weeks old, and with infants of any age if visitor is not TB tested. Need to wear gown and shoe covers at any age.

5. After the age of 2-3 months the infant is more aware of his/her surroundings and is able to recognize people. If he/she is too stressed during visits they will be discontinued at the discretion of the General Curator. Problems must be recorded in hand-rearing records and reported to a PW keeper.

6. It is the infant's choice, whether or not to go to a new person. The infant will never be forced to go to anyone.

7. A visit should be no longer than 15-20 minutes, and should not coincide with feedings. Visits will be scheduled during non-public hours.

Revised 27 January 2007
Surrogate Selection and Introduction
By Beth Armstrong
Selecting a Surrogate and the Basics of an Introduction

1. Do not presume who will be interested in adopting the infant prior to the infant even coming in the gorilla building (age and placement/standing of a potential surrogate in troop do not necessarily matter). Do not project your own perspective.

2. Always base your surrogate selection on your observations (the surrogate’s behaviors will tell you). And I might add if you select a "surrogate" that is not displaying any particular interest they will let you know, by possibly injuring the infant......so go with what you see and your gut not on what you hope or wish to see.

3. Keepers must be integral to the process of surrogate selection so their direct observations must be the deciding factor in picking a surrogate. They know the animals best and will see subtle signals that may not be as obvious to other staff members.

4. A (nursery or gorilla) keeper should be with the infant 24 hours a day, 7 days a week......using several keepers is ideal and break up into 8-hour shifts per day, this will ensure that the infant won’t become too attached to any one person.

5. The infant should be in an adjacent cage to the troop members all day (with a keeper).

6. Start training the infant early on to come up to the mesh (while clinging to the keeper initially and later when it is mobile on its own) to be fed and take a bottle from a keeper on the outside of the cage.

7. Also train the infant once it is mobile to use a “baby” door either into an adjacent cage or up into a chute system. This way the infant will be familiar with an escape door if the introduction goes badly.

8. Do Not reward an interested surrogate .....this muddies the water and you won't truly know if the potential surrogate is interested in actually adopting the infant or in getting a reward associated with interest in the infant.

9. Select your surrogate after enough time has gone by and you feel sure you are seeing positive consistent behaviors from the surrogate.

10. Once a female (or male for that matter) shows consistent interest, try and separate them from the troop to be by the infant everyday so they can interact without interruption.

   - While feeding/giving bottle to the infant via the keeper aisle mesh, feed the surrogate in the adjacent cage as well so they get used to eating side-by-side as a matter of routine.
   - This can be tricky if the surrogate does not want to be separated but usually if the surrogate is really interested in the infant that is not an issue and often times a subordinate won't mind being separated at all.
   - If the "surrogate" gets really agitated because of being separated from the troop then you may have selected the wrong animal.
   - The best cage set up is: 3 mesh cages (front and side mesh) in a row: infant in cage #1; surrogate in cage # 2; and all other troop members in cage #3 or at least access to #3.

11. Before putting the infant and surrogate together the infant must be able to come and get food and milk on his/her own.

12. During the introduction only a few key keepers should be present. No additional personnel such as curators and/or veterinarians should be in the vicinity. The building should be calm.
13. Dress the introduction cage with extra foods such as cereal, seeds in cereal boxes or paper towel cones; drizzle honey, yogurt along the mesh walls; provide extra burlap bags; extra bedding.

14. Once a decision is made to put the surrogate/infant together, open the door all the way. Don’t use an infant door, this can frustrate the surrogate...Please read the December 1996 Gorilla Gazette article, "Introductions of Infant and Juveniles: A Cautionary Note"

15. If all goes well, they are usually left together that same day (do not separate for the night) but do the intro early enough in the day to get a good feel if they will do OK together overnight.

16. Time must be allowed for the Infant/Surrogate to bond and then troop members are added in one-by-one with the silverback introduced last. Please see the documentary: "Infant Gorillas: A Gorilla Family Portrait" This is about the surrogate program at Columbus, there is a great piece of footage showing the juveniles, a young female and the surrogate-mother all surrounding the adopted infant in a protective manner when the silverback is introduced.

17. Average length of infant/surrogate introductions from start to finish (assessment of potential surrogate behaviors; to separating surrogate from the troop; to putting infant with surrogate; to surrogate/infant bonding; to inclusion of all troop members including the silverback (24 hours a day) was around 2 months). This was not a created artificial time-table just the way it seemed to play out.

**Surrogate Behaviors: What to look for?**

Interest may manifest itself in a number of ways or a combination of them:

- close proximity to infant through the mesh, sitting side-by-side
- leans against the mesh and allows the infant to approach and investigate at their own pace
- quiet vocalizations to infant
- vocalizes to infant if infant emits a distressed vocalization
- willingness to patiently wait for other group members to leave the vicinity of the infant so they can approach the infant
- gently touching the infant via the mesh
- sharing of food via the mesh
- sharing of a blanket or burlap bag via the mesh, i.e. place a burlap sack in the adult’s cage overnight and note where it is the next day.....is it in the infant’s cage?
- sharing of a branch or enrichment item via the mesh
CAGE PREPARATION
Cage Retro-fitted Prior to an Introduction

✓ Ideally cages should have mesh sides, fronts and ceilings.
✓ If cages have limited mesh, then solid walls must be fitted with wall handles* to be used as hand and foot holds for climbing (in essence they serve as escape routes if need be). Space between each must allow for both adult and infant reach. They can be placed at vertical, horizontal and in-between angles but just fill in the space.
✓ Infant ladders* should be installed (horizontal slats on two vertical frames)
✓ Corners can be fitted with mesh beds* (double-deckers like bunk beds). Walls can be fitted with horizontal beds.
✓ Round-a-bouts should be the norm in adjacent cages. Ideally no dead-end should exist, so front and back doors should be installed to allow for a round-about effect.
✓ All light-weight ropes that could entangle an infant should be removed, heavy wide fire hoses can be installed.

*all can be made in-house and are fairly inexpensive
INTRODUCTION PROTOCOL
Introductions

✓ Introductions should occur in the same cages every day and the gorillas should have been given enough time to become comfortable in these “home cages” prior to the start of the introduction.

✓ Cleaning intro cages should be a priority each day in order to get the intro started as early in the day as is possible allowing for longer period of time together.

✓ An experienced keeper must be present during the intros even when things seem quiet. It is only through direct observations can a decision to proceed to the next step be made.

✓ Dress cages properly:
  - plenty of bedding
  - paper bags and/or paper towel rolls filled with treats
  - scattered fruits and vegetables chopped small
  - drizzled honey and yogurt on the mesh
  - seeds and cereal scattered
  - feeding stations (peanut butter, yogurt, baby food, honey) with plenty of browse for making sticks.
  - Honey drizzled on yellow pages phone book (covers gone)

✓ Minimum amount of observers (keepers only)

✓ Once an introduction starts, it must be done consistently

✓ Infant bottle and food must be fed at the same time daily

✓ If you are an inexperienced keeper with intros, read as much as is possible on the topic and talk to more experienced keepers. Keep asking questions.

✓ Remember: The progress of each introduction must proceed based on the behaviors of the gorillas themselves not on artificial timetables. Forcing an intro to proceed before the gorillas have indicated they are ready can result in injuries to the infant and/or group members.

✓ You can also cause stress by not moving along fast enough. (see Cautionary Note article below). It always come back to this: Listen to the gorillas, they will tell you when to proceed and when to hold-off
Introductions of Infants and Juveniles: A Cautionary Note

Recently we have been contacted by a number of institutions that are considering or are in the process of introducing youngsters back into a troop. Although we applaud this philosophy we would like to point out that risks are involved. We would strongly encourage all institutions to incorporate the following into their introduction protocol in order to reduce some of the risks.

Cage Design and Enhancement

Cage design is of the utmost importance when proceeding with an introduction. Alternate pathways that provide options for escape, therefore creating a sense of security are essential. By providing choices I believe that the stress of the introduction has already been reduced. Whether the gorillas choose to use these options is not the point but, rather realizing that they know they have choices is the key factor. A one-way door that serves as both the entrance and exit as the only option for escape is not the optimum setting for an introduction. Cages should be modified to include this philosophy.

Climbing structures, wall handles and mesh beds should be added to exhibit space to offer alternate escape routes. Cages must be prepped with items to keep the gorillas occupied - ie cages must be heavily bedded for several reasons:

1. a cushioning affect
2. option for nest-building
3. a way to hide treats/browse that will require some effort to find, thereby displacing attention away from the infant.

Cages can be "dressed" with an number of items:

1. Empty cereal boxes with "goodies" inside (yogurt, raisins, seeds, peanut butter, etc.).
2. Yellow pages (with the covers removed)(NOT white pages)
3. Drizzled with honey or yogurt (in Ohio our yellow pages are printed with soy based ink, this must be verified prior to using).
4. Wrapping Paper tubes can be stuffed with "goodies" as well.
5. Drizzling yogurt, peanut butter or honey on the wire mesh or bars.
6. Rolls of paper towels (no ink) wrapped around climbing structures, mesh, bars etc.

Off-exhibit Introductions

Due to the stressful nature of introductions they should be done off-exhibit. There is a need to recognize that this is a short-term investment and well worth closing an exhibit temporarily. The public will, for the most part understand, if proper signage explains what is to be gained in the long-term, which is an age-diversified gorilla troop. With age-diversity comes the willingness, I believe, of the public to spend a greater amount of time at a gorilla exhibit. My point being is that a group of adult gorillas is not as nearly effective or as entertaining as a group comprised of adults, juveniles and infants.

Surrogate Selection

The gorilla chosen to be the surrogate must exhibit positive interest consistently. By observing the gorillas' reaction to an infant it will become abundantly clear as to which gorilla will be a suitable surrogate. Positive feedback from the gorillas themselves must be in place prior to the introduction. Never force a situation or the potential for harm to the infant/juvenile may be the result.

Timing

Timing is critical during the introduction process, moving too quickly can result in injury. It is important that a strong protective bond be in place between the surrogate and infant and later with subsequent sub-group members before moving on to the next phase. Just as importantly waiting too long for each phase of the introduction can result in frustration on the part of the surrogate and therefore may manifest itself in negative behavior. A commitment to increased time spent together on a daily basis should be made. Daily cleaning activities should be prioritized to get infant and surrogate together as early as possible thus enabling the keepers to analyze the behavioral progress of the infant and surrogate.

Keeper Staff

The daily keeper staff must play an integral part in the decision-making process. If they are not seen as a strong and necessary component, my recommendation is to not even consider an introduction. During the introduction phases it is preferable to have only the keeper staff in the back aisle. Interactions between gorillas and staff should be kept to an absolute minimum.

Nursery Protocol

If the infant is being nursery-reared, it is important to provide a sense of security by providing 24 hour a day keeper staff. I cannot stress how important it is to start with a confident and secure infant. These are just a sampling of the most basic modifications that should be a part of the introduction process.

Article written by:
Beth Armstrong, Field Conservation Columbus Zoo
614-645-3592

The Columbus Zoo staff is more than willing to consult on introductions, please call us if you have any comments or questions.

Susan White, Head Keeper
African Forest Columbus Zoo
614-645-3426

Charlene Jendry
Partners In Conservation Columbus Zoo
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Columbus Zoo and Aquarium
Surrogate Introduction History

Integration History
Mumbah’s Group as of April 1995 (from March 1988)

1987 - Introduction of 3 ½ year old 2.0 gorillas (twins)
1988 - Introduction of 14-month old 1.0 infant to a first time surrogate
1990 - Introduction of 4 year old orphaned 1.0 to group
1991 - Introduction of pregnant 0.1 to Mumbah’s group where she subsequently gave
birth and raised her 0.1 infant within the group (Mumbah not the sire)
1991 - Introduction of 16- month old 0.1 infant to a first-time surrogate
1992 - Introduction of 10-month old 1.0 to a first-time surrogate mother
1993 - Introduction of pregnant 0.1 and her 5 year old son to group where she
subsequently gave birth and raised her 0.1 infant (again, Mumbah not the sire)
1994 - Introduction of 8-month old 0.1 infant to an experienced surrogate (surrogate to
1991 infant)
1999- Introduction of 13 month old 0.1 infant to an experience surrogate
   * Oklahoma Infant
1999- Introduction of 5 month old 0.1 infant to proven surrogate
   (Infant born by C- section)
2003- Introduction of 23 month old 0.1 infant to proven surrogate
   * Oklahoma
2004- Introduction of 6 month old to first time surrogate
2006- Introduction of 7 month old 1.0 infant to proven surrogate
   * Colorado Springs
Post Introduction Diet & Observation Forms
<table>
<thead>
<tr>
<th>Dam</th>
<th>Infant</th>
<th>Sire</th>
<th>Other(s)</th>
<th>Day from Intro:</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**COLUMBUS ZOO and AQUARIUM SURROGATE MOTHER/INFANT OBSERVATION LOG**

**SHIFT TIME:** ____________________________  **PAGE:** ________

**STAFF:** ____________________________  **DATE:** ________

<table>
<thead>
<tr>
<th>Time Start and Time End</th>
<th>Dam Posture</th>
<th>Holding Position</th>
<th>Vocalization</th>
<th>Maternal Behaviors</th>
<th>Elimination-Dam/Infant</th>
<th>Comments/Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HOW?</td>
<td>WHERE?</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>V/V</td>
<td>V/D</td>
<td>G=Groin</td>
<td>G=Grooming/Touching</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I=Inverted</td>
<td></td>
<td>A=Abdomen</td>
<td>P=Play</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>C=Chest</td>
<td>S=Staring/Eye Contact</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B=Back</td>
<td>I=Genital Inspection</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>O=Other</td>
<td>Z=Other</td>
<td></td>
</tr>
</tbody>
</table>

**Dam Posture Codes:**
- T=Sit
- L=Locomote
- Zbl=Rest on belly
- D=Stand
- Zbk=Rest on back
- Zs=Rest on side

**Elimination-Dam/Infant:**
- Urine
- Stool
- Blood

**Comments/Descriptions:**
- Formula Total
- Solid Food
Dotty - Diet Sheet

Date: ______________________

Keeper: ______________________

Bottle:

<table>
<thead>
<tr>
<th>Time</th>
<th>Amount Offered</th>
<th>Amount Taken</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Solids:

<table>
<thead>
<tr>
<th>Time</th>
<th>Type of Food and Amount Offered</th>
<th>Amount Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
Dotty’s solids are delivered in a separate bag with the gorilla diet on Tuesday’s and Friday’s. Keep Dotty’s food in the Nursery’s refrigerator. Bananas are not refrigerated. Monkey biscuits and red biscuits are kept in a plastic container on the counter. Cooked items are made in the AM, then divided for AM and PM. Offer bite size pieces only.

**NO POPCORN OR SEEDS**

<table>
<thead>
<tr>
<th>AM</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼ grapefruit or orange</td>
<td>1” banana</td>
</tr>
<tr>
<td>3 or 4 thin sliced uncooked apple</td>
<td>uncooked apple</td>
</tr>
<tr>
<td>soaked monkey biscuit</td>
<td>2 or 3 grapes</td>
</tr>
<tr>
<td>2 or 3 grapes</td>
<td>soaked monkey biscuit</td>
</tr>
<tr>
<td>slice of pear (if available)</td>
<td>* 1 or 2 ck. green beans</td>
</tr>
<tr>
<td>* ¼ ck. apple</td>
<td>* onion slices</td>
</tr>
<tr>
<td>* 2 ck. green beans</td>
<td>* 1” slice ck. carrot</td>
</tr>
<tr>
<td>* onion slices</td>
<td>* ck. sw pot</td>
</tr>
<tr>
<td>* 1” slice ck. carrot</td>
<td></td>
</tr>
<tr>
<td>* ck. sw pot</td>
<td></td>
</tr>
</tbody>
</table>

* cooked foods

Cook: thick slice sweet potato, 3 or 4 green beans, 2” piece of carrot in a bowl cover ‘food with water and microwave for 9 minutes. Put ½ of this food in refrigerator for PM.

Cut ¼ apple with skin on, wrap in paper towel, wet this then cook for 50 sec.

Cut ¼ medium onion wrap in paper towel, wet this then cook for 2 minutes.
Dotty’s Daily Food
2004

Formula

7 AM  220 mls NGS with ½ ml Polyvisol
12 Pm  220 mls NGS (may be given at 11:30 AM)
5 PM  220 mls NGS (may be given between 4:30 and 5PM)

It is very important for Dotty to finish the 5 PM bottle, since she will have no food for the next 14 hours

Cold bottles-heat 58 sec. in microwave in the nursery
Room temp. bottles- heat 30 sec. in microwave in the nursery
Remove nipple before heating, replace nipple shake well, test
7 AM bottle add ½ ml Polyvisol to heated formula and shake well

Nestle Good Start last 24 hrs in bottle, 48 hrs in can. Do not open a new can after 5 PM bottle, wait until the next morning. When opening a can always check the expiration date.

6 cans of NGS are delivered from Animal Nutrition every Tuesday. Dotty uses approx. 5 cans a week. If there is an excess of 6 or 7 cans, cancel order for 1 week, only then resume order.

#79 yellow disposable nipples are ordered from Animal Nutrition. Order when there is ½ box left.
Polyvisol is ordered from Animal Nutrition. Order when there is ½ bottle left.
Wash bottles after using then boil.

When Dotty is 1 year old she will gradually switch to Homogenized milk.
Use this timetable:

3 days: ¾ bottle of NGS and ¼ bottle Homogenized milk
Next 3 days: ½ bottle NGS and ½ bottle Homogenized milk
Last 3 days: ¼ bottle NGS and ¾ bottle Homogenized milk
Day 10: full strength Homogenized milk
Reminder is on yearly calendar next to April
Umande’s formula is Nutramigen. **Once mixed, Nutramigen is good for only 24 hours!!!** Keep mixed formula refrigerated. It is important to leave a note indicating the date and time when the container of formula was mixed. Discard any formula that is older than 24 hours or questionable because no note was left. Read the label on the Nutramigen container for more information.

Umande was started on Nutramigen at an early age because he is allergic to milk (he broke out in hives when given formulas that contained milk proteins). Umande should not be given anything that contains milk, including yogurt.

**Mixing instructions:**

Mixing ratio is 2 ounces of water to 9 grams (1 packed level scoop) of Nutramigen. Accurate and consistent results can be obtained by using a scale to weigh both the formula and the water. Using the scoop to measure out the formula is inaccurate because air pockets in the formula cause a scoop to weigh less than 9 grams. Packing the scoop to get rid of the air pockets can cause a scoop of formula to weigh more than 9 grams.

To 591 grams of water (20 ounces), add 90 grams of formula (9 scoops). Shake vigorously until all of the formula has dissolved (no more clumping). This makes about 650 ml of formula (Umande is currently getting 750 ml per day). Keep mixed formula in refrigerator.

**Heating:**

**Do not place the nipples, caps, or inserts in the microwave!!!**

Shake container of mixed formula well before filling a bottle—the formula may separate after it has been mixed.

**Heating freshly mixed formula:**

<table>
<thead>
<tr>
<th>Bottle Size</th>
<th>Heating Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>170 ml</td>
<td>15 to 20 seconds</td>
</tr>
<tr>
<td>240 ml</td>
<td>25 seconds</td>
</tr>
</tbody>
</table>

**Heating refrigerated formula:**

<table>
<thead>
<tr>
<th>Bottle Size</th>
<th>Heating Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>170 ml</td>
<td>40 seconds</td>
</tr>
<tr>
<td>240 ml</td>
<td>50 seconds</td>
</tr>
</tbody>
</table>

**It is essential to shake the bottle well after heating to dissipate any hotspots!!!** Using a microwave to heat bottles causes hotspots in the formula which can burn an infant’s mouth and throat.

Be sure to test the temperature of the bottle by putting a few drops on the underside of your forearm. If it feels hot to you, cool the formula by running cold water over the bottle until the formula cools. If the drops feel cold on your forearm, heat the bottle for another 5-7 seconds. If you can’t feel the drops on your forearm, or they feel a little warm, then the bottle is at the correct temperature.
Bottle Amounts and Schedule:

Avoid stress around bottle time. This may include shifting, a change in routine, loud noise, tours, etc.

For the first bottle of the day:

<table>
<thead>
<tr>
<th>Time</th>
<th>Amount (ml)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 a.m.</td>
<td>170</td>
<td>Add 1ml PolyViSol to bottle after it has been heated.</td>
</tr>
<tr>
<td>10:30 a.m. to 11 a.m.</td>
<td>170</td>
<td>(If you forget to add PolyViSol to the first bottle it can be added to another bottle)</td>
</tr>
<tr>
<td>2:30 p.m. to 3 p.m.</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>6:30 p.m.</td>
<td>240</td>
<td></td>
</tr>
</tbody>
</table>

If Umande does not finish any/all of a heated bottle—do not put bottle back in refrigerator!!! Use within 1 hour or discard!!! You can re-heat bottle once. After that, discard and use fresh formula.

Cleaning Bottles and Formula Mixing Containers:

Do not place nipples, caps, inserts, or formula mixing containers in the microwave!!!

Rinse the bottle, nipple, cap, inserts and formula mixing container and clean with soap and water. Fill the bottle to the shoulder (near the top of the bottle where the bottle starts to narrow). Heat the bottle, and only the bottle, in the microwave for 2 minutes. Do not heat the bottle for more than 2 minutes!!! If the bottle is boiling over at 2 minutes, decrease heating time slightly.

Caution: heated water in bottle is HOT!!! Place nipple, cap, and inserts in a small bowl and pour heated water from the bottle on them. Hot water from the bottle is also put in the formula mixing container (you may need a second bottle of hot water to do this. Place bottle, nipple, cap, inserts, and formula mixing container in a position that will allow them to drain and dry.

If Umande does not take his bottle:

- Wait 10 minutes and try again
- Offer the bottle cold or colder than usual
- Offer the bottle warmer than usual (but NOT hot)
- Try removing the nipple and inserts and offer the formula as you would a drink. Give the formula slowly so that Umande doesn’t choke.
See the list of foods that Umande can have.

**Umande can not have:**
- Milk
- Yogurt
- Items containing milk or yogurt
- Popcorn
- Bird seeds

**Schedule for solids:**

Right now Umande seems to be eating solids well around bottle time (30 minutes before to 60 minutes after). It is important to feed him during these times as he seems to lose interest in solids outside of these times. But offer solids any time when you think that he might eat them. Try to keep feeding time interesting/fun. Do this by putting foods:
  - In Umande’s mouth
  - In Umande’s hand
  - Smear it on his fingers
  - Smear it on the mesh
  - Put it on your side of the mesh
  - Feed him with a spoon
  - Toss it through the mesh to a spot next to him

**Examples of Favorite food items:**

- Grapes
- Strawberries
- Blueberries
- Banana peel

**Do not over feed these food items!!!** It is important that Umande eat a variety of solids. Try feeding other food items first and use his favorites as rewards for eating well. If Umande is not showing interest in solids you may be able to get him started by offering a favorite food item.

**You may have to decrease Umande’s food handling time so that he can eat the food item before Lulu steals it. For example:**
  - Offer food items in small pieces
  - Remove orange and grapefruit from the peel. And also remove the thin skin from the slice of orange or grapefruit
  - Cut grapes in ½
  - Break open green beans and offer them in small pieces
  - Cook foods that are normally given raw
Cooked and Soaked Food Items:

Examples of food items that are cooked in hot water:

**Cooked for 3 minutes:**
Sweet potato
White potato
Carrot

**Cooked for 1 ½ minutes:**
Broccoli
Onion
Apple
Celery
Green beans

These items are also given raw if the adults are given the same item in the raw form.

- Fill a coffee cup ½ full of water and place items to be cooked in the cup. Cook in microwave for appropriate amount of time.

**Examples of food items that are soaked in hot water:**
Monkey biscuits
Leafeater biscuits

These items are also given unsoaked if the adults are given the same item unsoaked.
Supporting Media
Comfort level with troop member

Beginning stage of crawling
Teething on carrot

Items by mesh to encourage climbing
Picking up solids

Exploring new heights
Learning the lixit

Making it to the top!
Mother reared infant back riding

Resting on surrogate
Another way to back ride

A perfect match
Additional Articles
A mother's love, with a human touch

Since the pinkish-gray, wrinkly baby gorilla was abandoned by his mother in February, keepers at the Cheyenne Mountain Zoo have spent their shifts behind the thick glass inside the Primate World exhibit, where they care for him 24 hours a day.

Dressed in blue hospital scrubs, fitted with knee pads and supplied with "leaf-eater chow," the fleet of surrogate mothers sleeps with the gorilla. They discipline the baby with sharp, barking coughs. They tickle the gorilla when he wakes up and lie still with him snuggled asleep on their chest.

It's all an attempt to simulate the treatment the gorilla would receive from his mother — if he had a mother who knew what to do.

Inside the exhibit, the zookeepers are also on display. And they hope the lessons of their experience reach through both sides of the glass.

To watch primate keeper Mandy Hollingsworth carry Umande on her back, go to RockyMountainNews.com and click on Sonya Doctorian's Video Journal.
Sweet dreams: Debbie Hegner, a primate keeper at the Cheyenne Mountain Zoo, takes a nap with Umande, a baby Western Lowland Gorilla born Feb. 18. Umande means mist or fog.

Moms in the mist
Primate keepers at the Cheyenne Mountain Zoo are mothering a baby gorilla

Story by Jim Shaefer  Photos by Steven R. Nickerson  Rocky Mountain News

Inside the makeshift nursery at the zoo, a woman dressed in blue hospital scrubs locked down at the wriggling baby gorilla on her lap.

Outside the thick glass of the Primate World exhibit, a visitor pointed at the zookeeper, and the tiny endangered Western Lowland Gorilla said, "She sleeps in there with him all the time," the woman explained to her friend. "How'd you like to have that job?"

Inside the exhibit at Cheyenne Mountain Zoo, the zookeeper slung the gorilla onto her back and cradled over her leg into the hay, at the baby gorilla held tight with its chubby, floppy arms.

"Please do not disturb the keeper and the infant," read a nearby sign. "They need their peace and quiet. Thank you."

During her shift, zookeeper Mandy Hollingsworth will do her best to act like a mother gorilla, prattling, cooing around on all fours, carrying the baby around on her back, in an attempt to simulate the care the gorilla would receive in the wild. For the zookeepers, that's the way it's been since the gorilla's birth in February.

For the past several months, the zookeepers have kept the baby, watching the people watching them, and they have had a chance to see the world as the animal see it. In a way, they're on exhibit, too.

From the other side of the glass, they were all kinds of behavior. There are the kids who make horns and leave smudge marks. There are the people who talk on cell phones while they point at the animals. There are the guys who pound their chest like King Kong.

Video journal: To watch, please go to RockyMountainNews.com and click on Sonya Doctorian's video journal.

Hug to BABY on 2A
Baby: Untrained gorilla mom failed to fulfill her role

“Moms in the Mist”

“‘I’m always going to have an attachment to him. Even when he’s a big, 400-pound silverback at another zoo, I’ll go visit and think, ‘That’s my little guy. I helped take care of him.’”

Mandy Hollingsworth

“Then there are the glass tappers.”

“For the most part, people are great,” Hollingsworth said, “but the glass tappers—now I need that saying that really is.”

At the same time, she also sees the venues that make the effort worthwhile.

“Little kids, they usually don’t have a very long attention span. But some little kids, I’ve seen them as they just keep watching him and watching him and the parent have to pull them away.”

And regarding on-as-been, she says she wishes she wasn’t there. As the feet of surveillance human moms cares for him, they’re waiting for the day when they will no longer be able to hold him.

“I hear people say, she has the coolest job in the world,” Hollingsworth said. “But it would be a lot cooler if the mom took care of him.”

Help took a look, then ran

When the zookeepers learned of the pregnancy, they knew they needed a backup plan.

In the weeks leading up to the Feb. 18 birth of the first gorilla at the zoo in nearly a decade, the keepers reached out to the public for the possibility that the baby’s mother—a 13-year-old lowland gorilla named Kataba—wouldn’t raise herself.

Kataba gave up being hand-fed by zookeepers. She began learning how to be a mother.

The keepers are now trying to break that cycle.

This year, the baby gorilla was also found by her mother, but she was abandoned. It was taken to a new home in a new country—Canada.

For the first time, the baby gorilla was raised by the keepers.

“When they’ve grown up with people,” Hollingsworth said, “they don’t want to go in with those crazy, hairy, messy things that are rough with them.”

After learning that Kataba was pregnant, zookeepers consulted with the Columbus Zoo of Ohio, a pioneer in hand-rearing gorillas. The keepers watched over the baby and attended the conferences. They learned how to make the gorillas grumpy. They trained volunteers just like it.

Then, as Kataba gave birth, they waited. Just after the baby was born, the gorilla woke up at the newborn, then she did what none of them wanted.

“Instead of crying, she picked him up and ran away,” said Linda Blandin, the primate keeper at the zoo. “We cried the next day, and the day after, we just kept crying, she was definitely interested.”

“Then we saw her running to touch him when the keepers were holding him, but when you put him back in the hay, she was fine. ‘Whoa, I don’t know about this.’”
Teaching gorilla manners

Gorilla keepers in primates and zoos are always under stress to teach gorillas how to behave in public. The goal is to ensure that gorillas are comfortable around people and other gorillas. Keepers use a variety of methods to train gorillas, including positive reinforcement and modeling.

On the road: Holmstrom, with Ursula clinging to her back, takes an early morning walk through the indoor exhibit at the Cheyenne Mountain Zoo. The keepers are trying to teach Ursula many of the behaviors that a normal gorilla mother would teach her young.

New regard for all moms

As they prepare to enter Primate World, there is no single manager in charge of the baby gorillas. Instead, keepers work together to create a safe and nurturing environment for the young gorillas. The keepers are responsible for their care and education, including teaching them how to interact with other animals and humans.

Cicada! A visitor with a camera takes aim through the glass at the outdoor exhibit that features Ursula and her baby gorilla, a. The primates keepers who tend to Ursula say she feels as though they're in an exhibit, too.

Chew time: Ursula, 4 months old, takes a meal of fruit from a bottle. It's hoped that he'll be able to walk, at 5 months and be included with the zoo's gorilla troop by age 6 months. He will grow to well over 400 pounds.
Gorillas in her midst

Human surrogate mom shows baby apes the ropes

By Jodi Andes
THE COLUMBUS DISPATCH

Crawling around through piles of scattered straw, Barb Jones is playing the role of a typical gorilla mom. Jones, though, is anything but typical.
She has spent 26 years in cages at the Columbus Zoo and Aquarium, tucked away from public view, caring and teaching baby gorillas to be, well, baby gorillas.
The goal is to break the cycle of gorillas born in captivity who never learned how to be good mothers.
Teaching them how to be babies, while their surrogate mothers watch and learn their own roles, will help the babies to one day becoming capable mothers themselves.
This kind of work started only in the 1980s, and she's been at it since then.
"She's probably the only person who can say that," said Ann Rademacher, a gorilla keeper with the Little Rock (Ark.) Zoological Garden.

See GORILLAS Page 43
GORILLAS
FROM PAGE CI

Janet Jones, though, has worked at "surrogacy," guiding baby gorillas from infancy to independence within a pack.

"She doesn't have a degree in primatology," Jones said.

Rather, the schoolteacher started as a volunteer.

"I have two children of my own, one son and one daughter," Jones said. "But she has raised more gorillas than children. The latest is Umannde, who came to Columbus from the Cheyenne Mountain Zoo in Colorado Springs, Colo.

Since early October, Jones and six other zoo workers have been eating, sleeping and playing with Umannde. On Friday, Luba — born 40 years ago in the wilds of Africa — officially became her new mother.

Jones could tell early on that the two would be a pair. They conversed gently, in tones softer than normal gorilla sounds. And when they were placed in neighboring cages, Luba always kept as close to 8-month-old Umannde as she could.

Times have changed since baby Colo was born at the Columbus Zoo — the first gorilla born in captivity anywhere in the world, Colo, her baby and many other gorillas born then were taken from their mothers and raised in nurseries.

At the time, zookeepers thought they were protecting the babies from aggressive adults. They later learned that gorillas need to learn from one another and have the freedom to move or hide if they felt threatened, said Beth Armstrong, an anthropologist and former gorilla keeper at the Columbus Zoo.

The Columbus Zoo started the program of keepers emulating primate behavior and environment. So far, it has reduced the time it takes a gorilla to make the transition into a pack. Now, it takes months rather than years. Umannde and Luba's connection was achieved even sooner.

"We were trying to break the cycle," said Armstrong, who now writes about gorilla-rearing for the American Zoological Society. "We were trying to negate decades of mothers losing their babies quickly."

That means crawling on hands and knees with a 15-pound baby gorilla on your back and climbing up to platforms. At 68, Jones conceded that it's not as easy as it was 20 years ago.

"Now, I need a little help scaling the ropes," she said. "But I can't not do what they are going to do."

After playing in the late morning, Umannde repeatedly climbs into Jones' lap and scratches its bit, and then wanders off. Umannde is fighting a nap. Twenty minutes later, he climbs back into her lap and falls asleep.

"He's like a little heating blanket," she said, smiling. Baby gorillas like to be ticked, and they teethe like human babies. When they misbehave,
_Gorilla Gazette_ 20: 12.


Armstrong, B.? _Gorilla Surrogacy_. Compiled survey results distributed by Columbus Zoo, Powell, OH.


**Fruch, F. 1968. A captive-born gorilla Gorilla g. gorilla at St. Louis Zoo. International Zoo Yearbook 8: 128-131.**


Disney’s Animal Kingdom Protocol
Maternal Care Training of a Western Lowland Gorilla (*Gorilla gorilla gorilla*)

Disney’s Animal Kingdom
P.O. Box 10,000, Lake Buena Vista, FL 32830
Connie Philipp*, Christina Breder, Marty MacPhee

Introduction

Historically, there have been several incidences of insufficient or non-existent maternal care provided by gorillas in a managed captive setting. Gorillas raised by their mothers in a social group are more preferable than those hand-reared by humans (Ogden, J., et al., 1997). At Disney’s Animal Kingdom (DAK), we had recently acquired a 14-year-old female western lowland gorilla (*Gorilla gorilla gorilla*) which had a poor history of raising her infants. When acquired, she was pregnant with her fourth offspring. She had a history of infant abandonment. Our goal was to establish a maternal care training program which would take into account her particular deficiencies in maternal care. Ultimately we wanted our training to support an increased probability that the female would appropriately care for her infant. In essence we would be developing and supporting the continuance of a complex, social gorilla troop.

History

The female “Hope” gave birth to her first offspring when she was 7 years old. This infant was premature and survived only 12 hours after birth. Hope gave birth to two more infants at the age of nine and ten. In both these cases she would place the infant down and allow other members of the group, usually juveniles, to pick up and hold the infant inappropriately. In each of these cases, as a result of the inappropriate handling, the infants sustained some physical trauma and/or there were some nutritional concerns. As a result of the need for medical treatment these two offspring were pulled for hand-rearing by two months of age. There are no behavioral data to explain the motivation behind this abandonment behavior.

Maternal Training

A positive reinforcement training program was developed for implementation immediately after Hope’s arrival at DAK. We had approximately four months left of Hope’s pregnancy to train goal behaviors. We established five main training goals:

1) separation - in case temporary removal from the group was required or a closer assessment of the infant was needed;
2) pick up object - to develop the behavior of picking up her offspring in the instance she would place it on the ground;
3) pick up object and present at the mesh - to develop the behavior of allowing the animal care staff to get a close visual inspection of the infant to assess health status;
4) pick up object and hold ventrally - to develop the behavior which will encourage the female to place the infant in a proper nursing position;
5) breast manipulation - to allow animal care staff to assess if the female was lactating and desensitize the breast to a nursing infant.
Hope responded to the training program immediately. All five training goals were accomplished within three months. We added several other husbandry behaviors to her program as she was very receptive to the training. The added behaviors would only strengthen the overall program.

Hope gave birth on November 4, 1997 to a healthy male gorilla. She immediately displayed appropriate maternal care. A 96 hour behavioral study was done to help assess her maternal care skills (Cory et al.1999). An ethogram was created which contained appropriate and inappropriate maternal behaviors. The ethogram also contained several infant behaviors. The DAK primate team observed Hope with her infant for a 96 hours. The 96 hour data collection were used as a tool to support the team’s assessment of Hope’s appropriate maternal care. There were several possible variables that may have also positively impacted Hope’s behaviors: she was now in a larger facility, part of a smaller social grouping, and training became part of her daily husbandry. Whatever the reason for the success of the maternal/infant bond, the end result was a mother-reared infant.

We tested the success of the training by asking for some behaviors that could now be demonstrated with her newborn infant. Initially the female presented her infant at the mesh to animal care staff. This behavior was constantly repeated as we needed to get consistent health assessments. With the use of the laser pointer, we were able to get Hope to not only touch, but pick up and readjust the infant’s head into the nursing position. The laser pointer acts as a target point. The female initially learns to target her hand only on the red dot. We then connect more advanced behaviors to the targeting behavior such as, pick up and give, which help us establish the maternal behaviors. Overall we felt that if the need had arose, we would have been able to significantly support the female in her efforts to raise her infant. Fortunately there was no need.

**Infant Training**

As a result of the tremendous success with the female, we decided to use her cooperation to help us develop a positive reinforcement program for the infant. The goals of the program would emphasize the medical needs of the infant. They included his pediatric vaccination series, administration of medications, and general husbandry behaviors. Although the specific behaviors of this program required the infant’s participation, it was critical that the female allowed her infant to be interactive with animal care staff.

At approximately three months of age, the infant’s training plan was implemented by the primate team. The first step was to identify an appropriate reinforcer for an infant gorilla. Developing a cooperative feeding situation was also a vital part of this training step. The female was reinforced for allowing animal care staff to give the infant his reinforcement. There was some initial aggression, however, once the female became accustomed to the training she demonstrated cooperative behavior and aggression was minimal and finally extinguished.

The next step in the training plan was to begin to desensitize the infant to medical props such as alcohol, gauze, syringes and needles. The infant received reinforcements for participating and allowing humans to touch him with the medical props, and the female was still being reinforced for the cooperative behaviors. The upper arm was identified as the injection site for the vaccine. The infant would be trained to target his hand outside the mesh barrier on the finger of the keeper/trainer. The keeper/trainer would then clean the injection site with alcohol and gauze and administer the vaccine. The oral polio would be administered by having the infant drink from a syringe.
As the training plan progressed and the infant developed, modifications to the plan were made to achieve the goal. For example, instead of one trainer attempting to work with both mother and infant simultaneously, a second trainer was introduced. This separation became a necessity as the infant developed, especially for safety reasons. At this time, one trainer would work with the female and one trainer would work with the infant, making communication critical. At approximately five months of age, the infant was injected with saline solution on two separate occasions, prior to receiving a tetanus vaccine. The vaccination series was achieved over a period of several months.

Conclusion

In conclusion, implementing a training program based on positive reinforcement to achieve specific behavioral goals is extremely beneficial to managed populations of primates. If we are committed to developing more socially complex gorilla troops, it is imperative that alternative methods of animal management be developed. Positive reinforcement training is a successful and globally beneficial option. The benefits include modification of inappropriate behaviors, minimization of stress for the animals and human caregivers involved in necessary medical procedures, and a more accurate assessment of animals with little or no disruption to the group.

References


Training

Below are the behaviors we train for expecting groups of animals. We focus on the mother but will also train the other animals relevant behaviors in case the mother decides not to care for the infant or is not capable of caring for the infant. We feel that by proactively training some/all of the animals in the group we have the best chance of the infant being reared in an appropriate situation.

Pre-pregnancy and Pregnancy Behaviors:
1. Pee (animal urinates on cue) – use this to collect urine for pregnancy tests and hormone testing if needed
2. Present (The animal should lean back with its legs spread and genitals presented to the mesh) – use this to determine genital changes during cycle
3. Belly (animal presents belly) – use to conduct ultrasound and/or fetal heart rate monitor (this would also involve desensitization to equipment and gel)

Maternal Care Behaviors:
1. Breast and Nipple Desensitization (animal presents breast/nipple and allows manipulation) – use this to help desensitize animal to sensations of the breast/nipple that are similar to nursing
2. Breast pump (use breast behavior to have animal present breast and allow sucking sensation w/ pump or similar tool) – this would be to desensitize to milk collection and also helps desensitize to nursing sensation
3. Hair pull (animal allows hair to be pulled) – use this to mimic hair pulling infant may do while trying to cling
4. Baby present (animal presents a novel object or “baby” to keeper for inspection, supplemental feeding…) – use for various times when a close view or manipulation of infant is required
5. Space bottle (animal presents baby and allows it to be supplement fed via space bottle) – use to supplement feed the infant; the space bottle is a bottle that we designed that allows us to feed through the mesh. We have used it several times with success. I can send you the plans so you can create your own if you are interested.
6. Laser target and retrieve (an object is laser targeted and the animal is to go to it and pick it up) – use to have an animal pick up infant if it is not being carried
7. Hold (animal holds position of whatever behavior is being cued) – use w/ any behavior you wish to have the animal hold for long periods of time
## Birth Management Plan

### Name:
- **accession number**
- M ☐ F ☐
- **DOB:**

### Contraception status:
- ☐ Permanent
- ☐ Temporary
- ☐ Uncontracepted

### Dam’s rearing history:
- ☐ Hand-reared
- ☐ Mother-reared
- ☐ Other/Unknown

### Breeding recommendation:
- Date of last exam:

### Last observed copulation:

### Estimated due date:
- Gestation:

### PrePartuM Preparations

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<td>☐ Assess if diet change, target feeding are necessary</td>
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<tr>
<td>☐ Determine if overnight checks are necessary</td>
<td></td>
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<tr>
<td>☐ Assess current weather conditions</td>
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<tr>
<td>☐ Video camera (check battery charge, memory card)</td>
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<tr>
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<td></td>
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<tr>
<td>☐ Extra hay available</td>
<td></td>
</tr>
<tr>
<td>☐ Place infant development sheet, nursing log and ethogram/data sheets in area</td>
<td></td>
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<tr>
<td>☐ Other</td>
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</tbody>
</table>
Birth Management Plan

Name: Kashata  
Number: 080088  
Gender: F  
DOB: 10 April 1993

Contraception status:  
- Permanent
- Temporary
- Uncontracepted

Dam’s rearing history:  
- Hand-reared
- Mother-reared
- Other/Unknown

Breeding recommendation:  
SSP rec with Gino (970097)

Date of last exam:  
1 May 2008

Last observed copulation:  
18 July 2009

Estimated due date:  
April 2010  
Gestation: 9 months

PrePartuM Preparations

Diets and Supplements
- Prenatal vitamins (request from ANC), growth and reproduction chow to be added to diet
- Assess if diet change, target feeding are necessary

Husbandry
- Inspect cage furniture for infant safety hazards
- Determine if overnight checks are necessary
- Assess current weather conditions

Equipment Check List
- Incubator (check for functionality, supply of distilled water)
- Video camera (check battery charge, memory card)
- Digital camera (check battery charge, memory card)
- Check space bottle for functionality
- Blankets available
- Extra hay available
- Place infant development sheet, nursing log and ethogram/data sheets in area
- Other
New Infant 72-Hour Watch Ethogram
24 June 2009

The goal: One ethogram for all species in order to make it easier for all team members to participate in data collection.

Objectives:

1. To monitor maternal and group behavior toward infant in order to make appropriate management decisions during the first 72 hours.
2. To ensure short term health of infant.

Methods:

- 1/0 sampling in minute increments (behavior was observed or not observed during the minute)
- Observe group 20 minutes out of each hour during normal daytime operational hours for 72 hours

Maternal Behaviors

Appropriate positioning: Mother and infant in contact that allows proper support.

Unsafe positioning: Mother holds or positions infant in way that may be unsafe or unsupported i.e. sitting on infant, dangling infant by one limb.

Support weak infant: Mother compensates for weak infant with extra support and repositioning.

Assists nursing: Mother facilitates positioning at breast.

Prevents nursing: Mother physically interferes with the infant's attempts to nurse.

Unattended infant: Animal puts infant down and moves away so that they are no longer monitoring the infant.

Cooperative Transfer: Infant is allowed to move from one animal to another in a cooperative manner. The animal possessing the infant allows the other animal to take the infant. Adults initiate this behavior.

Non-cooperative Transfer: An infant is taken from an animal that actively resists the transfer. The resisting animal may threaten the other animal and attempt to turn away or leave the area.

Retrieve infant: Individual picks up infant after it has been left unattended or has transferred to another individual. Adult initiates this behavior. Does not matter how infant lost contact with dam.

Groom infant: Use of mouth or hand to inspect or pick at the hair or body of the infant.
Ignore infant distress: Mother does not respond to obvious infant distress.

Not visible: Mother out of sight.

Other: Any behavior not described in ethogram. Record in data sheet notes if significant.

**Infant Behaviors**

**Nursing**: Infant’s mouth is on nipple with a discernible sucking motion.

**Nursing position**: Infant in nursing position but the attachment to the nipple is unclear.

**Rooting, seeking nipple**: Infant’s head moving in side to side motion seeking attachment to the nipple.

**Strong cling**: The infant is grasping hair or body of mother with multiple limbs, seemingly without difficulty.

**Weak clinging**: Infant is struggling to maintain its grip on adult.

**Urinate**: As implied.

**Defecate**: As implied.

**Not visible**: Unable to see infant.

**Other**: Any behavior not described in ethogram. Record in data sheet notes if significant.