

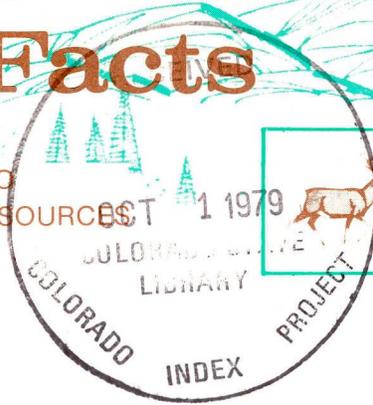
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Game Information Leaflet

Number 106

PROCEDURES FOR REARING WILD RUMINANTS IN CAPTIVITY¹

Each spring and summer Division of Wildlife field personnel are faced with the problem of rearing and maintaining apparently abandoned young wild ruminants. This period of fosterhood may vary from a few hours to several months. Regardless of the length of captivity, knowledge of the care, feeding, and transportation of these young ruminants is crucial to their growth and survival. Each young animal has individual needs, depending on the species, previous nutritional state, age, physical condition, and temperament.

Offspring of many wild species have been reared successfully in captivity with numerous techniques (Murphy 1960; Silver 1961; Trainer 1962; Youngson 1970; Reichert 1972; Hightower 1973; Buckland *et al.* 1975; Schwartz *et al.* 1976; Halford and Alldredge 1978; and Hobbs and Baker 1979). In addition, each year a few conscientious farmers and ranchers rear young ruminants with a variety of "home-brewed formulas". Obviously there is no single procedure for rearing wild ruminants.

The purpose of this leaflet is to describe general procedures specifically relevant to the maintenance of wild young ruminants. These procedures are based on knowledge of the nutritional requirements of young ruminants and on experience at the Division of Wildlife Research Center, Fort Collins, in successfully rearing mule deer, elk, bighorn sheep, Rocky Mountain goats, and antelope in captivity.

FEEDING

Equipment

Eight-ounce baby bottles and formula nipples are sufficient for small ruminants throughout the milk feeding period. Larger capacity bottles with lamb nipples are required for larger ruminants as intake increases. Preferably, each bottle is numbered and used to feed only one animal. Nipple holes must be enlarged to facilitate flow of the formula; this is easily accomplished with a heated sewing needle. Sterilization of nipples and bottles is not necessary; they are washed in soap and hot water and rinsed thoroughly.

Separate sponges are used to clean the animal's facial and rear areas. Facial sponges can be kept and

washed with milk bottles. Rear sponges must be kept and washed separately and are disinfected with an antiseptic solution and rinsed clean with water after each use.

Milk Formula

The base formula consists of 2 parts homogenized whole cow's milk to 1 part canned evaporated milk. This formula is supplemented with buttermilk twice each day to promote development of *Lactobacillus* in the abomasum. The amount of buttermilk added totals 1/10 the daily formula intake (Table 1). One ml of a liquid multiple baby vitamin supplement (Vi-Daylin, Ross Laboratory) is also added to the formula daily or on alternate days until the two-feedings-per-day schedule begins. Buttermilk and vitamin supplements are added to base formula during different feedings — never in the same feeding.

Feeding Schedules

Suggested milk feeding schedules based on animal ages are presented in Table 1. Unfortunately, there are no totally reliable criteria for determining the age of young ruminants. Aging criteria which have been investigated for wild ruminants found in Colorado include condition and growth of hooves, degree of healing of the umbilicus, behavior, and weight.

Bottoms of hooves of white-tailed deer during the first day after birth are covered with a soft, sulfur-yellow pad (Haugen and Speake 1958; White *et al.* 1972). During the first 27 days after birth the hooves of white-tailed deer reportedly grow 0.45 mm each day as measured along the front edge of the outside half of a front hoof. This new growth can be distinguished from hoof material present at birth by a ringed groove (Haugen and Speake 1958; White *et al.* 1972). Robinette *et al.* (1973) reported hooves of mule deer grow about 0.40 mm each day during the first 2.5 mo after birth. Regression equations based on hind foot measurements (hoof tip to tip of calcaneus) developed by Robinette *et al.* (1973) with captive mule deer were tested by Anderson (1975) with wild mule deer. Resulting calculated age values ranged from plausible to impossible.

Presence or absence of a short segment of the umbilical cord is a useful criterion for determining whether or not an animal is very young. Condition of the umbilical cord after birth in young white-tailed deer born in captivity in Alabama was usually wet

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TABLE 1 — Feeding schedule for bottle-rearing wild ruminants

Small ruminants (Deer-Sheep-Goats-Pronghorns)			Large ruminants (Elk)		
Age, days ^a	Feedings/day ^b	Volume/feeding, ^c fluid oz (ml)	Age, days	Feedings/day ^b	Volume/feeding ^c fluid oz (ml)
0-28	5	2 (59)	0-2	5	3.2 (95)
14-42	4	3 (89)	3-27	4	6.2-21.5 (185-636)
28-56	3	3-5 (89-148)	28-48	3	25.0 (739)
42-84	2	5-6 (148-177)	49-69	2	30.0 (887)
70-98	1	6 (177)	70-92	1	48.0 (1,419)

^a Days overlap because entries represent the range of days during which animals have been maintained on the corresponding feeding schedules.

^b Feeding schedules are as follows: A. 4-5 feedings/day, spaced at regular intervals from 0600 to 2200 hrs; B. 3 feedings/day, morning, mid-day, and evening; C. 2 feedings/day, morning and evening; D. 1 feeding/day, anytime with consistency.

^c Buttermilk should be added to base formula twice each day and total 1/10 daily formula intake. Example--When feeding 5 times/day at 2 oz/feeding the formula should consist of 1.5 oz base and 0.5 oz buttermilk during 2 feedings.

and fresh during day 1, moist to scabbed by day 2, scabbed by day 3, and scab dropped and naval healed by day 14 (Haugen and Speake 1958). The umbilical cord was always 1-3 in. (2.5-7.6 cm) long and dried on seven bighorn sheep lambs when captured at 2-3 days of age in Colorado (Woodard, unpublished data).

Behavior is another criterion for determining if an animal is very young. Jackson *et al.* (1972) reported white-tailed deer fawns less than 1 week old would usually drop to the ground and assume a freeze position when alarmed. Fawns 2-3 weeks old would be just as liable to run as to freeze when alarmed. One-day-old mule deer fawns remained immobile when approached (Truett 1977). This freeze response is variable in deer (White *et al.* 1972), and was not observed during the capture of seven bighorn sheep lambs in Colorado (Woodard, unpublished data).

Variability in birth weights and weight gains after birth makes weight a poor criterion for estimating ages of young animals. Weights of 172 newborn mule deer in Colorado ranged from 6.0 to 11.0 lbs (2.7 to 5.0 kg) (Robinette *et al.* 1973). Birth weights for white-tailed deer as reported by White *et al.* (1972) ranged from 2.5 to 8.75 lbs (1.1 to 4.0 kg). Weights of bighorn sheep born in captivity have ranged from 6.2 to 12.7 lbs (2.8 to 5.8 kg) (Geist 1971; Blunt *et al.* 1977).

If the actual age of a young animal is not known, it is fed based on estimated age and adjustments made in the amount of formula intake as required. It is considered important to limit milk intake in young ruminants to reduce the possibility of diarrhea (F.M. Blunt, pers. comm.), so age estimates should be conservative, and milk is fed accordingly. Also, all animals, regardless of estimated age, are started on the lowest milk intake levels listed in Table 1 for about 2 days to allow them to adjust to the new diet.

Feeding Procedures

Acceptance of the formula bottle and active nursing by the animal are often difficult to achieve. Young animals are isolated in an enclosed stall or small room until they have begun nursing and have

accepted the handler's presence. When possible, animals are reared by a single person and contact with other people is kept to a minimum. Evidence indicates (Trindle *et al.* 1978) stress on young ruminants may be increased when they are fed by numerous people. This increased stress may adversely affect the animals' immune systems. Initially, many animals require some restraint when first attempts at feeding are made. This is best accomplished by kneeling behind the animal to prevent backward movement. When the nipple is in place a small amount of milk, warmed to body temperature, is squeezed into the animal's mouth. Simultaneously, stroking of the throat and gently pressing on the sides of the mouth may stimulate swallowing and sucking responses. Considerable patience is important at this stage of the rearing effort. If an animal refuses the bottle, the next attempt is made in 2-4 hrs. Newborn animals (0-5 days old) usually accept the bottle and begin actively nursing within a maximum of 2 days. Older animals may take as much as 4 days to begin voluntary nursing.

If animals begin weakening before accepting the milk bottle it may be necessary to force-feed the formula to prevent hypoglycemia. This problem has arisen during elk-rearing efforts in Colorado. If force-feeding is necessary, an eye dropper or soft plastic tube, fitted on the barrel of a syringe filled with formula, can be inserted in the corner of an animal's mouth and the milk delivered as the animal swallows (Hobbs and Baker 1979). This procedure is continued at regular feeding intervals until the animal is sucking the tube; at this time a baby bottle can be presented. In most situations, forced feeding is a last resort for insuring adequate intake of nutrients. Extreme care and patience must be exercised to prevent young animals from choking and inhaling fluid into the lungs.

Alfalfa hay leaves, grain, block salt, and water are made available to the animals *ad libitum*. It is important young animals begin ingesting solid food soon after birth (F. M. Blunt, pers. comm.). After young animals have accepted the presence of the

handler, fresh forb leaves or palatable grass blades are rolled or folded and placed between the back molars a few times each day to stimulate chewing and ingestion of solid food. Young, captive ruminants begin voluntarily ingesting solid food at 2-3 wks of age and will frequently eat dirt.

HEALTH CARE

General

A newly received animal is first inspected for general health. Iodine is applied to the naval area and blotted with cotton. The umbilical cord is never cut. It should dry up and fall off within 2 wks after birth. If the naval area or lesions on the body are infected, they are cleaned with hydrogen peroxide, swabbed with a topical antibacterial dressing, and the animals injected intramuscularly with a broad-spectrum antibiotic twice a day for 5 days. If signs of respiratory or other ailments are evident, animals are also treated with a broad-spectrum antibiotic. An antibiotic is never used for more than 5 consecutive days because of potential detrimental effects on developing microbiota in the rumen. In some cases the young animals are too weak, injured, or sick to realistically attempt to sustain them, even temporarily. In these cases humane disposal of the unhealthy animal is the only alternative.

When possible, young animals are kept in an enclosed native pasture with shrubs, trees, and an artificial shelter. Animals and their pens are always kept clean and dry. Heat lamps are utilized in shelters during nights and cool days during the first few weeks to prevent hypothermia or unnecessary homeothermic energy drains. Facial areas are wiped clean with a sponge after each milk feeding to reduce the attraction of flies. Anal areas are washed with warm water or lightly rubbed with a wet sponge 1-2 times each day to stimulate defecation and remove fecal material. This "force-defecation" is especially important for deer, elk, and antelope during the first few weeks (F. M. Blunt, pers. comm.).

Diarrhea

A recurring problem during attempts to rear wild ruminants in captivity is gastrointestinal dysfunction manifested by diarrhea. At the onset of diarrhea, sick animals are separated from healthy ones. Diarrhetic animals and their isolation pens are cleaned several times each day. Often hair on the lower abdomen, hock, and anal areas is clipped to facilitate animal cleansing. If flies are a problem, fly spray (Cutter KRS, Cutter Animal Health Laboratories; Pfizer Livestock Spray, Pfizer Agriculture Division) is used and animals are thoroughly inspected at regular intervals for deposits of fly eggs and larvae.

Treatment of diarrhea initially consists of discontinuing milk feedings for 1 day. If, after this period, diarrhea is still prevalent regular feeding schedules are resumed with one of the following treatment regimes: 1) Chloramphenicol administered orally with milk at a dosage level of 250 mg during the first feeding and 100 mg during subsequent scheduled feedings for no longer than 2-3 days; 2) Kaopectate

(Upjohn Laboratories) administered orally with milk at a dosage level of 1 tablespoon (15 ml) twice a day; or 3) Calf Bacterial Scour Treatment, Neomycin Base (Franklin Laboratories) administered orally with milk at a dosage level of 1 teaspoon (5 ml) 3 times a day during the first day and 0.5 teaspoon (2.5 ml) 3 times a day for the next 2-3 days. If an animal does not recover with one of the above treatments, another is tried. Additionally, an electrolyte-glucose solution (Lifeguard, Norden Laboratories) is used to replace half the milk formula during treatment efforts. If animals improve, amounts of milk formula are gradually increased concurrent with a decrease in electrolyte-glucose solution until the animal is being fed full-formula rations.

Transportation

The transportation of young ruminants to their final destination requires special consideration. Young animals should be placed in a covered and well ventilated holding box, regardless of length of trip, and are never hog-tied. For long trips (>200 mi) air transportation is the least stressful on the young animals. To minimize digestive upsets the animal should not normally be fed immediately prior to travel. However, if the animal appears weak or the trip is longer than 1 day a regular feeding regimen should be followed.

Disposal

In most instances wild young ruminants reared in captivity cannot be returned to the wild. Their docile nature acquired during the hand-rearing process predisposes them to a variety of domestic and wild predators. Locations for disposal of these animals, in order of priority, include the Division of Wildlife Research Center; Wildlife Disease Center, Colorado State University; and local zoos.

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Paul H. Neil, Wildlife Technician
Thomas N. Woodard, Wildlife Researcher
Dan L. Baker, Wildlife Researcher
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