Unusual Pet Care

VOLUME IV

23 SPECIES: Sugar gliders, Pygmy goats, Llamas, Deer, Miniature pigs, Genets, Capybaras, Bushbabies, Corn snakes, Blood pythons, Boa constrictors, Horned frogs, Alligator snapping turtles, Mud turtles, Koi, Seahorses, Axolotls, Mudpuppies, Pet chickens, Ornamental geese, Peafowl, Eclectus parrots and Toco toucans

Sugar Glider Pet Care



Courtesy of ASGV™ and www.asgv.org.

VITAL STATISTICS

Life span	12-15 years (captivity)
Adult length	Head and body 13-19 cm (5.0-7.5 in)
Adult weight	
Male	113-170 g (4-6 oz)
Female	85-142 g (3-5 oz)

Cloacal temperature	89.6°F (32°C)
Rectal temperature	97.3°F +/- 0.7°F (36.3°C)
Heart rate	200-300 beats per min
Respiratory rate	16-40 breaths per min

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Sugar Glider (*Petaurus breviceps*)

David M. Brust, DVM

ORIGIN / FREE-RANGING HABITAT

- Sugar gliders are native to Australia and New Guinea.

PHYSICAL CHARACTERISTICS

- Each of the 4 hands possesses sharp, scimitar-like claws and opposable thumbs.
- Teeth do not continually grow like rodents and should not be routinely trimmed unless presenting serious issues.
- Sugar gliders exhibit exceptional muscular control over the gliding membrane (patagium), allowing the animal to glide up to 50 m.
- The semi-prehensile tail is primarily used for steering when gliding.

BEHAVIOR

- Sugar gliders are colony animals; it is strongly recommended they should be housed in groups of two or more.
- If housed alone, owners must be advised to spend at least of 2 hours per day interacting with the animal to provide necessary companionship and prevent malaise.
- Sugar gliders may self-mutilate if not given enough social stimulation.
- Although nocturnal by nature, sugar gliders are able to adjust to any schedule.
- They enjoy playing outside their enclosure; however, careful supervision is strongly recommended to prevent encounters with common household hazards, such as floor or halogen

lamps, metal venetian blinds and houseplants.

- When properly trained, they may exhibit behavior similar to many dogs, e.g., expressing affection, recognizing their name, coming on command. With training, they will ride around in the owner's pocket for hours without restraint.
- Common vocalizations include "crabbing" (when frightened), barking (lonely or playing), purring/chirping (contentment) and sneezing/hissing (grooming or playing).
- Aggression is rare in well-acclimated animals and is typically limited to young joeys or unsocialized adults.
- When threatened, a sugar glider will stand on its back legs and charge at the threat, feigning strikes and making loud sounds similar to a locust.
- Males should be neutered whenever possible to avoid anti-social behaviors and self-mutilation.

CAPTIVE HOUSING

- The recommended enclosure size for 1 or 2 adult animals over 5 months of age is: 36 inches (91 cm) wide by 24 inches (61 cm) deep by 40 inches (102 cm) high.
- Large aviary cages are the most practical option for adult sugar gliders. Additional height is the primary consideration.
- The ideal enclosure size for 1-2 babies or juveniles younger than 5 months out of the pouch is: 18-20 inches (46-51 cm) wide and deep and 24-30 inches (61-76 cm) high.
- PVC-coated wire is preferred over epoxy, paint, powder-coated or galvanized wire due to potential health hazards.
- Rectangular openings should be no larger than ½" x 1" (1.25-2.5 cm).
- Enclosures consisting primarily of vertical bars (e.g., bird cages) are not recommended for babies or juveniles, as

One of the most distinguishing features about sugar gliders is that they have 4 hands. Each hand has 4 fingers and an opposable thumb.



Courtesy of ASGV™ and www.asgv.org.

A sugar glider's nails may become sharp. Nails may be filed but not clipped; clipping nails may reduce the animal's ability to firmly grasp its surroundings, allowing it to fall.



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While the patagium is similar in appearance to that of a flying squirrel, sugar gliders exhibit muscular control over it and can steer themselves to their target.



Courtesy of ASGV™ and www.asgv.org.

Males have 2 scent glands—a diamond-shaped "bald spot" on the forehead and a smaller sternal spot in the center of the chest. Females do not have either of these characteristics.



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soft tissue tears may occur between the digits from sliding down the bars.

- A removable plastic waste tray should be at least 1" (2.5 cm) from the floor of the enclosure.
- Paper lining is preferred over wood shavings.
- Daily removal of feces and soiled papers and cleaning of an enclosure and all supplies are recommended as well as a quarterly sterilization of the housing and accessories.
- The ideal temperature range is 75-80°F (24-27°C). Night-time temperature should not drop below 70°F (21°C).
- The use of a supplemental heat source is strongly recommended.
- A conventional heat rock is preferable to a heat lamp or UV lighting, especially during the bonding period.
- Alternatively, ceramic heat emitters positioned with a linen towel or surgical huck towel can be used for regulating the heat.
- The use of both a conventional water bottle and a weighted secondary water dish is recommended.

ENVIRONMENTAL ENRICHMENT

- Sugar gliders enjoy most traditional pet toys.
- Any item with loose strings or wires that could entangle the animal should be avoided.
- Solid exercise wheels provide an important opportunity for necessary exercise. Traditional hamster or rodent wheels should be avoided because of sugar glider's prehensile tail.
- Plants and branches are recommended to promote leaping and climbing.
- Quality artificial plants are preferred to natural fauna due to health and sanitary considerations.

Sugar Gliders

- Varied sizes of branches of nontoxic trees can be used (for a list of safe plants go to www.asgv.org).
- Trees should be removed and cleaned every 2-3 weeks and must be thoroughly rinsed.
- A preferable alternative to foliage is 1-inch plastic chain.

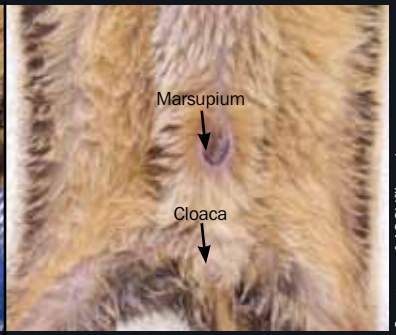
DIET

- Free-ranging sugar gliders' diet consists primarily of pollens, arthropods and plant and insect exudates; however, their diets can vary greatly by season, location and climate.
- Attempts to replicate this type of diet for domesticated animals may be impractical.
- Sugar gliders should not be presented with a wide selection of high-sugar, high-fat items as they will almost always eat these foods to the exclusion of other more nutritious foods.
- Inappropriate feeding practices and inadequate homemade diets are believed to be a substantial contributing factor to many illnesses and reduces the animal's life span.
- Although some homemade diets may be adequately designed, they are rarely practical for the average owner because it is often more difficult for them to secure necessary ingredients and maintain precise feeding ratios.
- Various sugar glider diets/recipes are available, including
  - Nutritionally-balanced kibble 75%/sliced fresh fruits and vegetables 25%/calcium-based multivitamin
  - 50% Leadbeater's Mixture/50% insectivore-carnivore diet
  - Diet reported by the Chicago Zoological Park adapted from AAZK Animal Diet Notebook
  - Diet reported by Taronga Zoo, Sydney Australia
- Fresh portions should be fed in the evening.

Males have a bifurcated penis with a preputial covering; the scrotum is anterior to the cloaca.



Female sugar gliders have a prominent, mid-abdominal pouch (marsupium) where they carry their young.



Courtesy of ASGV™ and www.asgv.org.

Due to an instinctual fear of falling, sugar gliders will become significantly less active when they cannot firmly grasp their surroundings.



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A "starter" cage is better for joeys under 5 months out of pouch. The ideal cage size for 1-2 joeys is 18-20 inches (46-51 cm) deep x 24-30 inches (61-76 cm) high.



Courtesy of ASGV™ and www.asgv.org.

Solid-construction (not wire mesh) exercise wheels provide a good source of environmental enrichment and exercise for sugar gliders.



A nesting cloth, loosely draped over a heat rock is recommended rather than traditional nesting boxes or hanging pouches, as a sleeping area, especially for young joeys.



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Sugar Gliders

- Preservatives, pesticides and excessive fat should be avoided.
- Treats should be no more than 5% of daily intake.
- Acceptable treats include small portions of fruit (e.g., melons, peaches, mangos, blueberries, papaya), yogurt and applesauce.
- Owners should be cautioned against feeding fatty, nutrient-deficient insects as treats because gliders will often refuse anything else once they become accustomed to insects.
- Kibble or supplements designed for cats, primates or reptiles should not be fed to sugar gliders.
- Uneaten fruits/vegetables should be removed from the cage each morning.
- Filtered spring or drinking water (not unfiltered tap water) should be available at all times.

SEXING AND REPRODUCTION

- Males have a large pendulous scrotum and a bifurcated penis. Prominent scent glands are visible on the forehead and chest.
- Females exhibit a ventral pouch (marsupium) with 4 internal teats.
- The breeding cycle is year round for gliders in captivity.
- Gliders average 1-2 litters per year; with twins born 80% of the time.
- Females are polyestrous with a 29-days estrous cycle.
- Gestation lasts 5-17 days. After migration, the fetus will remain in pouch 50-75 days, and weaning is 35-60 days out of pouch.

Sugar Gliders

RESTRAINT

- Manual restraint is best accomplished using either a surgical huck towel or fleece bonding pouch as a glove.
- These animals should not be scruffed or held by the tail.
- Sugar gliders can be transported to the clinic in a zippered, fleece pouch.

BLOOD COLLECTION

- Only small volumes of blood may safely be drawn, up to a maximum of 1% of the animal's body weight in grams.
- A 1-ml tuberculin (or 0.5-ml insulin) syringe, with a 25- to 29-gauge needle, is recommended for most diagnostic sampling, depending on the site selected.
- The cranial vena cava may be accessed at the thoracic inlet by directing the needle caudally at 30° off midline toward the contralateral hind limb. To avoid inadvertent cardiac puncture, insert the needle halfway of its length as the vessel is superficial in location. (View instructional collection videos at www.asgv.org.) With practice, blood collection at this site is usually the most successful regardless of the animal's size or condition.
- The medial tibial artery is highly mobile and easiest to access just distal to the stifle using a 29-gauge needle. As much as 0.5 ml blood may be obtained from each side.
- Cardiac puncture and orbital bleeding are not recommended.

INJECTION SITES

- Intravenous: Cephalic or lateral saphenous veins, using a 25-gauge needle
- Intramuscular: Quadriceps, epaxial muscles of the neck

Gliders can be safely restrained by placing a thumb under the jaw and an index finger on top of the head.



Courtesy of ASGV™ and www.asgv.org.

Large samples (up to 1 ml) may be obtained from the cranial vena cava. Notice the needle is not completely inserted.



Care should be taken not to administer fluids laterally, as they can pool in the patagium, resulting in slow absorption and discomfort to the patient.



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The least stressful method of sedation is achieved by using a large face mask as an induction chamber while 5% isoflurane is inhaled.



Courtesy of ASGV™ and www.asgv.org.

Once induced, 1-3% isoflurane is delivered for maintenance using either a small face mask or 1 mm Cook endotracheal tube.



Courtesy of ASGV™ and www.asgv.org.

and biceps/triceps, using a 25-gauge needle. Avoid the use of medications that sting.

- Subcutaneous: Dorsal midline of the thorax, using a 25-gauge needle. Check for pooling in the patagium.

ANESTHESIA

- Sedation is usually required for a clinical examination or diagnostic sampling.
- Isoflurane may be used at 5% for induction, using a large face mask as an induction chamber, and 1-3% for maintenance with a small face mask.
- A non-rebreathing circuit should be used for both induction and maintenance.
- If isoflurane is used for induction, application of a topical methylcellulose eye lubricant should be used.
- Alternatively, sugar gliders may be sedated first with administration of an anxiolytic, such as midazolam (0.3-0.5 mg/kg IM).
- The use of an electrocardiogram (ECG) may be useful to help monitor the animal if it is anesthetized longer than 5-10 minutes.
- Fluid therapy is required to maintain homeostasis.

MOST COMMON DISORDERS

- Malnutrition, which may be expressed as hind-limb paralysis, blindness, dehydration, cataracts, metabolic bone disease and seizures
- Obesity
- Intestinal parasites
- Hair loss, typically resulting from poor nutrition
- Pneumonia, including discharge from the eyes/nose

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Sugar Gliders

- Diarrhea, resulting from a change in diet, inappropriate diet containing too high sugar content, bacterial overgrowths, *Giardia, Cryptosporidia or Clostridium* sp.
- Stress-related diseases, including self-mutilation (particularly solitary animals), cannibalism of young and eating disorders
- Endocrine disorders
- Trauma (fractures, burns)
- Dental Disease
- Neoplasia

ZOONOTIC POTENTIAL

- There are no records of sugar gliders being susceptible to any specific pathogen or infectious disease.
- In over 15 years of widespread domestication and practical observation, *Clostridium piliforme* infections have been the most common diagnosis, and no documented cases of zoonotic transfer have been recorded.
- Like other mammals, it is believed that sugar gliders naturally host trace levels of various bacteria and flagellates in their digestive tracts. Under normal presentation, no treatment is typically required. During periods of abnormally high stress (e.g., adoption, transportation, introduction of new foods), the immune system often becomes compromised, and bacteria/flagellate levels increase. The most common presentation is diarrhea, with *Giardia* often suspected as the causative agent in chronic cases.
- To date, no documented case has confirmed a *Giardia* transfer from sugar gliders to humans.

Hair loss in an obese sugar glider.



Courtesy of ASGV™ and www.asgv.org.

Cataract causes may include: genetics, vitamin A deficiency, pouch infections and an improper diet too rich in sugars or fat.



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Radiograph shows warped bone development in the rear leg (circle) consistent with metabolic bone disease.



Courtesy of ASGV™ and www.asgv.org.

Sugar gliders are particularly prone to obesity.



Courtesy of ASGV™ and www.asgv.org.

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SPECIAL CONSIDERATIONS AND CAUTIONS

- Owners should thoroughly wash their hands, including under their fingernails, before handling animals in order to avoid accidental transfer of toxins or bacteria.
- Sugar gliders are susceptible to toxicosis and household hazards due to their highly inquisitive nature.
- They are legal companion pets in 46 of the contiguous states (with the exception of California and Pennsylvania); breeding and sales are strictly regulated by the USDA.

REFERENCES AND FURTHER READING

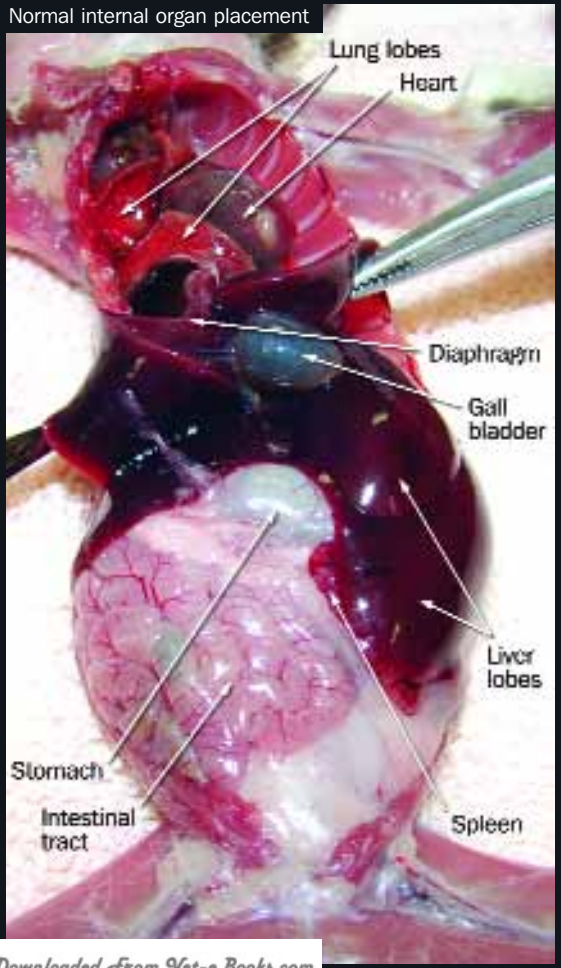
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Sugar Gliders

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Updated veterinary-oriented resources, including an online veterinary care guide, procedural videos and extensive client education materials are available at the Association of Sugar Glider Veterinarians™ website, www.asgv.org. Due to an educational grant, first-year memberships are free for a limited time.

Normal internal organ placement



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HEMATOLOGIC REFERENCE RANGES

Parameter	Reference range	Sample size
Basophills	29.50-62.75 x $10^3/\mu L$	8
Eosinophills	92.02-281.18 x $10^3/\mu L$	10
HCT	51.29-54.49%	62
HGB	15.83-16.86 g/dL	53
Lymphocytes	3693.98-7157.15 x $10^3/\mu L$	62
MCH	18.79-19.39 pg	53
MCHC	30.63-30.99 g/dL	53
MCV	60.17-68.05 fL	54
Monocytes	112.55-170.69 x $10^3/\mu L$	45
Neutrophills	1461.03-2204.57 x $10^3/\mu L$	61
Platelets	292.18-400.32 x $10^3/\mu L$	53
RBC	8.31-8.83 x $10^6/\mu L$	53
WBC	5.49-9.31 x $10^3/\mu L$	62

Values shown are the 95% confidence intervals after outliers were removed. Blood was collected from the cranial vena cava. Statistically, 90% of the population should have values within these limits.

**Glucose levels measured immediately after collection.

BIOCHEMISTRY REFERENCE RANGES

Parameter	Reference range	Sample size
Albumin	3.12-4.64 g/dL	99
Alk phos	89.37-115.04 IU/L	75
ALT	96.76-136.60 IU/L	81
Amylase	2117.18-3350.82 IU/L	8
AST	54.42-99.79 IU/L	38
BUN	15.07-18.07 mg/dL	100
Calcium	8.53-8.85 mg/dL	97
Chloride	105.97-108.64 mEq/L	94
Cholesterol	111.70-123.99 mg/dL	78
CPK	1080.78-1636.71 IU/L	47
Creatinine	0.47-0.59 mg/dL	100
Globulin	2.9-3.1 g/dL	92
Glucose**	152.70-171.89 mg/dL	85
Magnesium	1.63-2.14 mEq/L	13
Phosphorus	4.35-6.12 mg/dL	62
Potassium	4.60-5.53 mEq/L	93
Sodium	138.76-143.06 mEq/L	92
Total bilirubin	0.12-0.70 mg/dL	72
Total protein	6.74-7.01 g/dL	92

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FORMULARY FOR SUGAR GLIDERS*

Although every effort has been made to ensure the accuracy of the information presented herein (particularly doses), in all cases the clinician is responsible for the use of any pharmaceuticals. Most drugs used in exotic companion species are considered extra-label, and few pharmacokinetic studies have been conducted; therefore, the clinician must critically evaluate the information provided and stay informed of recommendations in the literature.

Dosages listed in this formulary are anecdotal as reported in the literature except where noted. Sugar gliders have carnivore/omnivore gastrointestinal tracts; therefore, carnivore guidelines should be followed for antibiotic choice. Pain resulting from an injection can cause the rapid induction of shock in small species of marsupials.[9,15]

Compounding note: *Due to sugar gliders' overwhelming predilection for sweets, most sugar gliders respond favorably to medications that are compounded with a fruity flavor. Tutti-fruity typically works best, although other fruit flavors, such as apple, peach have also been used with favorable results.*

DRUG	ROUTE	DOSAGE	COMMENTS	REFS
Acepromazine (A) + ketamine (K)	SC	(A) 1 mg/kg + (K) 10 mg/kg	Postoperative analgesia and sedation to prevent self-trauma to incision site	6, 20
Acepromazine (A) + butorphanol (B)	PO	(A) 1.7 mg/kg + (B) 1.7 mg/kg	Tranquilization, analgesia post op	6, 20
Alfaxalone-alfadolone acetate (Saffan, Glaxo, London)	IV	0.1-0.2 ml/kg	Immobilization sedation	9,22
	IM	0.25-0.5 ml/kg		
	SC	15 mg/kg		
Amikacin (A) + Penicillin G (P)	SC	(A) 3 mg/kg q12h + (P) 25,000 IU/kg q12h (with fluid support)	Respiratory infection	11
Amoxicillin	PO, IM	30 mg/kg q24h x 14d	Dermatitis, general	6,10
Amoxicillin/clavulanic acid	SC	12.5 mg/kg q24h	Inject form not avail US	6
Atropine	IM, IV, SC	0.02-0.04 mg/kg	Control salivation during sedation	9,22
Bismuth subsalicylate	PO	1 ml/kg q8-12h x 5-7d	Diarrhea related to *Giardia*, coccidia	11
Buprenorphine	IM	0.01-0.03 mg/kg	Analgesic	11
Butorphanol	IM, SC, PO	0.1-0.5 mg/kg q6-8h prn	Analgesic	6,12,15,20
Butorphanol (B) + acepromazine (A)	PO	(B) 1.7 mg/kg + (A) 1.7 mg/kg; dilute with saline to administer	Post-op sedative, analgesic	6

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DRUG	ROUTE	DOSAGE	COMMENTS	REFS
Calcium glubionate	PO	150 mg/kg q24h long term	Calcium deficiency/nutritional osteodystrophy	6
Calcium gluconate	SC	100 mg/kg q12h x 3-5d (diluted in saline to 10 mg/ml)	Calcium deficiency/nutritional osteodystrophy	11
Calcium glycerophosphate/ lactate	IM	7 mg/kg IM	Calcium deficiency/nutritional osteodystrophy	6
Carbaryl powder (5%)	Topical	Sparingly, also in nest boxes	Ectoparasites	6,11,20
Cephalexin	SC	30 mg/kg q24h		6
Ciprofloxacin	PO	10 mg/kg q12h x 7-10d	Similar use as enrofloxacin	6
Cisapride	PO, IM	0.25 mg/kg q8-24h	GI motility enhancer	6,15
Dexamethasone	IV, IM, SC	0.2 mg/kg q12-24h	Antiinflammatory; higher dosages for shock	6,15
Diazepam	IM, PO, IV	0.5-2.0 mg/kg	Calming, higher dosages IV for seizures	6,15,22
Doxapram	IV	2 mg/kg	General CNS stimulant, especially respiration	17
Enalapril	PO	0.5 mg/kg	Vasodialator in the treatment of heart failure and hypertension	17
Enrofloxacin	PO, IM, SC	2.5-5.0 mg/kg q12-24h	Antibiotic; note: may cause tissue necrosis SC	6,15
Epinephrine	IV	0.003 mg/kg	Stimulates heart, antagonizes effects of histamine, raises blood sugar	17
Fenbendazole	PO	20-50 mg/kg q24h x 3d repeat in 14d	Anthelmintic	2,6,11
Fluoxetine	PO	1-5 mg/kg q8h	Self-mutilation	11,16
Furosemide	SC, IM	1-4 mg/kg q6-8h	Diuretic	15,17
Glycopyrrolate	IM, IV, SC	0.01-0.02 mg/kg	Control salivation during sedation	6,22
Griseofulvin	PO	20 mg/kg q24h x 30-60d	Antifungal, *Trichophyton* spp.	26
Hyaluronidase	Fluids	(150 IU/ml) 0.5-1.0 ml/L	Speeds fluid absorption	11
Isoflurane		5% induction/1-3% maintenance	Preferred anesthesia	6
Itraconazole	PO	5-10 mg/kg q12h	Fungal treatment	1,6
Ivermectin	PO, SC	0.2 mg/kg once, repeat in 10-14d	Anthelmintic	2,6,11
Ketamine	IM	20 mg/kg	Follow with isoflurane	6
Ketamine (K) + medetomidine (M)	IM	(K) 2-3 mg/kg + (M) 0.05-0.1 mg/kg	Immobilization. Reverse medetomidine with atipamezole 0.05-0.4 mg/kg IV	22

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DRUG	ROUTE	DOSAGE	COMMENTS	REFS
Lactulose	PO	0.2 ml q24h	Constipation	6
Lincomycin	IM	30 mg/kg q24h x 7d	Dermatitis	10
Meloxicam	PO	0.1-0.2 mg/kg q12h; Use 0.5 mg/ml concentration	Analgesia and nonsteroidal antiinflammatory; animals like sweet taste	11
Metoclopramide	IV, IM, SC, PO	0.05-0.1 mg/kg q6-12h prn	GI motility enhancer	6,15
Metronidazole	PO	80 mg/kg q24h	Infection	10
Midazolam	IM	0.25-0.5 mg/kg	Anxiolytic, preanesthetic sedation	14
Oxfendazole	PO	5 mg/kg once	Anthelmintic	2,6
Piperazine	PO	100 mg/kg	Anthelmintic	26
Prednisolone	IM, SC, PO	0.1-0.2 mg/kg q24h	Corticosteroid	15
Pyrantel pamoate (P) / Febantel (F)	PO	(P) 14.4 mg/kg + (F) 15 mg/kg	Roundworms, strongyles	6
Pyrethrin powder	Topical	Product safe for kittens, same dosage, frequency	Ectoparasites	6
Selamectin	Topical	6-18 mg/kg repeat in 30d	Ectoparasites	11
Sevoflurane		1-5% to effect	Anesthesia	6
Sulfadimethoxine	PO	5-10 mg/kg q12-24h x7-10d	Antibiotic; make sure well hydrated	6,11,15
Trimethoprim / sulfa	IM, PO, SC	10-20 mg/kg q12-24h x7-10d	Antibiotic; make sure well hydrated; SC may cause necrosis	6,15
	PO	50-57 mg/kg q24h		6
Vitamin A		500-5000 IU/kg	Skin disorders	6
Vitamin B complex	IM	0.01-0.02 ml/kg	Vitamin; be very careful of “sting”; administer under anesthetic or dilute	15
Vitamin E	PO	25 mg/animal/day	Vitamin	26
Yohimbine	IV	0.2 mg/kg	Reverse xylazine	22

*Adapted from Association of Sugar Glider Veterinarians’™ web site, www.asgv.org ©2009 by David Brust, DVM and Marsupial Formulary ©2002 by Cathy Johnson-Delaney, DVM, Dipl ABVP (Avian)

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Pygmy Goat Pet Care



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Markhor goat *(C. falconeri)*

VITAL STATISTICS

Life span	15-19 years (captivity)	Rectal temperature	102-104°F (39-40°C)
Adult size		Heart/pulse rate	70-90 beats per min
Height (withers)	16-23 in (41-58 cm)	Respiratory rate	15-30 breaths per min
Adult weight		Contraction/ rumination rate	1-2 per min
Male	40-80 lb (18-36 kg)		
Female	35-60 lb (16-27 kg)		

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Pygmy Goat (*Capra aegagrus hircus*)

Sharmie Johnson, DVM

SPECIES

- There are 9 species in the genus Capra: Markhor (*C. falconeri*), East Caucasian tur (*C. caucasica cylindricornis*, West Caucasian tur (*C. caucasica*), Walia ibex (*C. walie*), Alpine ibex (*C. ibex*), Nubian ibex (*C. nubiana*), Siberian ibex (*C. sibirica*), Spanish ibex (*C. pyrenaicais*) and wild goat (*C. aegagrus*)
- The pygmy goat is a subspecies of the wild goat (*C. aegagrus*). It is smaller and domesticated.

ORIGIN / FREE-RANGING HABITAT

- Ancestors of the modern American pygmy goat originated from west Africa. This subspecies is still in existence and is called the Cameroon dwarf goat.
- The true African pygmy goats come from arid to semi-arid regions along the western coast of Africa. They subsist on grasses and shrubs found along roadsides and villages.

PHYSICAL CHARACTERISTICS

- The National Pygmy Goat Association has established breed standards—to be classified as a pygmy goat, it must be 16-23 in (41-58 cm) at the withers (shoulder).
- Breed standard for color is caramel, agouti or black.
  - Caramel ranges from white to intense red or brown with dark trim on the head, legs, dorsal stripe and abdomen. There is also a light stripe running up the stockings.
  - Agouti includes what is referred to as grizzled (mixing of

light and dark colors) grey or brown with solid, darker-colored legs and no stripes up the stockings.
- Agouti coloration may include a dark trim on the head, legs and dorsal stripe and partial or complete belly bands of white and white stars on the forehead.
- Black may be accented with lighter shades involving the muzzle, forehead, eyes and ears.

- The hair is straight. Bucks have a long beard and mane. Does may also have a small beard.
- Pygmy goats are short and stocky with a well-developed, widened barrel (abdomen) when compared to dairy goats.
- Aging of goats may be done by examining dentition:
  - Eruption rates of deciduous incisors: I1 (birth-1 week), I2 (1-2 weeks), I3 (2-3 weeks), I4 (3-4 weeks)
  - Permanent incisor eruption schedule: I1 (1-1.5 years), I2 (1.5-2 years), I3 (2.5-3 years), I4 (3.5-4 years)

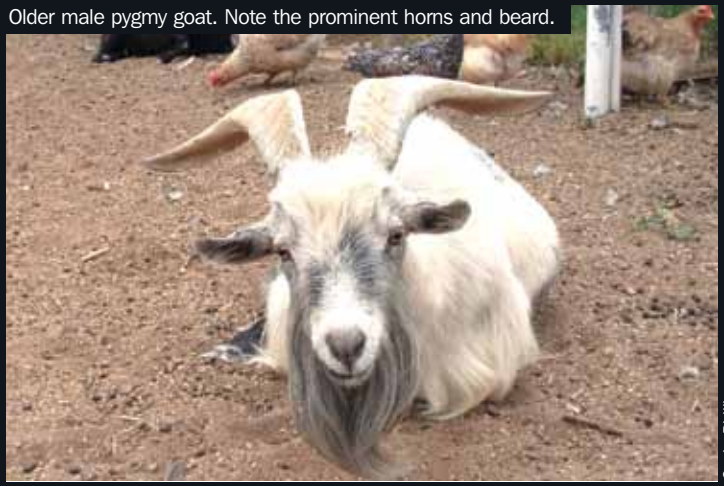
BEHAVIOR

- Pygmy goats are naturally social and inquisitive creatures. They are very gentle and easily trainable.
- They are intelligent and capable of performing small tasks repetitively, such as opening gates and latches.
- Goats jump on everything (other animals, people).
- Goats spar by rising on rear legs while falling head-wise into an opponent.
- Goats ram other goats as well as other animals as a means of establishing dominance.
- They sneeze as part of an alarm call.

CAPTIVE HOUSING

- Housing depends on the climate.

Older male pygmy goat. Note the prominent horns and beard.



Casie Phillips

Solid black coat color in a debudded, female pygmy goat.



Casie Phillips

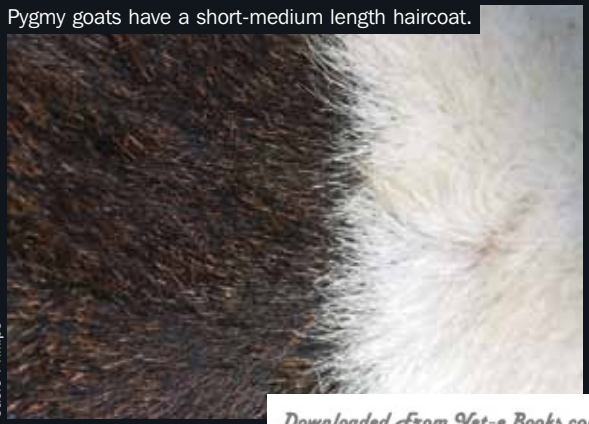
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Grizzled haircoat in an animal with the agouti color pattern.



Casie Phillips

Pygmy goats have a short-medium length haircoat.



Casie Phillips

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Pygmy Goats

- Shade should be provided in warmer areas. Fans and misters may also be considered.
- Barns are a necessity in cold climates. Barn size should be large enough to provide at least 15-20 ft^2 (1.3-1.8 m^2) per animal.
- The barn floor substrate may be dirt, wood, cement or clay. Clay is the preferred substrate. It is generally placed over gravel and packed down. It absorbs moisture and wicks it to the gravel below. It keeps hooves trimmed and is easy to sweep out and replace as needed.
- Regardless of the region, shelter should be available to protect the animals from wind, rain and snow.
- Fresh water should be available at all times. In colder climates, a water tank heater should be considered.
- Fencing is standard for any type of livestock. Chain-link may potentially entrap limbs. Welded wire panels may be used instead.
- Cement footers should be considered because goats like to push their full body weight into the sides of the fence, allowing for escape at the bottom.
- Fences should be tall enough to prevent predators from gaining access. The average fence height recommended for containment is 4-5 ft (1.2-1.5 m). Objects that are easily climbed on should not be placed against the fence.
- Goats should not be housed near toxic plants.
- Goats are enjoy the companionship of other animals and are best housed within a herd.
- Nontoxic browse may be offered frequently. Besides enrichment, it is important for dental and digestive health.
- Toys safe for other animals may be offered, such as Boomerballs.® Goats enjoy objects that they can run and

jump on, such as large wooden spools used for cables, stacked logs or bricks, children's plastic or wooden play forts, car-wash brushes and tether balls. The safety of any object provided should be evaluated before using it.

DIET

- Goats are ruminants and are considered intermediate feeders. They graze (grasses) and browse (leaves, twigs).
- Hay and feeds should be offered off the ground in containers or hay mangers to prevent contamination and soiling.
- A good quality hay, grass or legume (alfalfa) should be fed at a rate of $\leq$ 2% of body weight. Hay-based pellets or cubes may also be offered; however, there is increased risk of choke, urolithiasis and ulcers.
- Cereal grains are available in many formulations. Great care should be taken if offering these because of risk of obesity and rumen acidosis.
- All feeds must be stored in tightly sealed canisters. Animals are very efficient at getting into food containers, and a lot of accidental exposures happen this way.
- A complete mineral mix that is specially formulated for sheep and goats should be provided.
- Salt blocks are not recommended due to mineral imbalance and potential for broken teeth.
- Goats are commonly used for weed clearing, but their potential exposure to toxic plants should be evaluated.

REPRODUCTION

- The reproductive anatomy of bucks and does is similar to other ruminants; however, the buck has a 0.8-1 in (2-3 cm) villiform appendage (urethral process) at the distal

Goats ramming each other



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Pygmy goats are naturally social animals.



Casie Phillips

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Three-month-old kid with eruption of horn buds.



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most aspect of the penis, which is a common place for urethral calculi to lodge.

- Bucks enter puberty as early as 2-3 months of age.
- Does enter puberty as early as 3 months of age. They breed year round. The estrous cycle averages 21 days.
- Gestation period is 147-155 days. Twins and triplets are the usual number of kids born.
- Neonates (kids) average a birth weight of 2.2 lb (1 kg).

RESTRAINT

- Goats should be approached in a quiet and non-threatening manner. They remember bad experiences, making follow-up encounters more difficult.
- Goats should not be restrained by their ears or caught by grabbing a hind limb, which can lead to hip dislocation.
- Recommended methods of restraint involve grabbing the beard, horns, collar or halter. An arm may be wrapped around a goat's neck.
- An assistant may steady a goat against a wall or straddle them and back into a corner. Chutes may also be used.

MEDICATING

- Administering oral medications should be accomplished with the goat standing with the head held parallel to the ground. Elevation of the head/neck may result in aspiration.
- Dose medications into the caudal buccal pouch.
- If using a balling gun, place the device over the base of the tongue, but not into the pharynx: administer the medication, remove the gun and hold the mouth closed until the animal swallows.

INJECTION SITES

- Prior to the administration of any injections, discuss the method with the owner. Medications may cause reactions that affect the quality of the hide or meat in production animals or result in disqualification or loss of placement in show animals. Meat producers prefer that injections be given in the neck, while breeders and show people prefer that medications be administered in the axillary region.
- IM medications may be administered in the neck by forming an imaginary triangle using the nuchal crest dorsally, the cervical vertebrae ventrally and the shoulder caudally. Injections may also be placed in the longissimus (lumbar), triceps, semimembranosus, semitendinosis and gluteal muscles.
- Subcutaneous injections may be given in the neck as for IM injections, in the axilla or in the lateral chest wall.
- IV injections or blood collection procedures are usually performed at the jugular vein. Cephalic and lateral saphenous veins are also visible with dampening of the hair or clipping (if allowed). IV catheters may be placed in any of these veins, but usually the jugular vein is the preferred site, which reduces the risk of entanglement. The author uses a 20-gauge, 1½- to 2-inch needle.
- Intraperitoneal injections are used occasionally—most commonly with neonates. Using aseptic technique, the kid is suspended by its front legs. An 18-20 gauge, 1-inch needle is inserted perpendicularly to the skin, approximately 1.8 cm depth and 1 cm to the left side of the navel.

ANESTHESIA

- Adult animals should be fasted for 12-24 hours prior to

Well-developed testicles in a 3-month-old, male pygmy goat (left). Well-developed udder in a lactating doe (right).



Casie Phillips

Over-grown hooves (left). Trimming should involve the medial, lateral and cranial aspects of the hoof wall on both toes. Normal hoof length (right).



Casie Phillips

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Normal conformation in a pygmy goat.



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This goat has carpal osteoarthritis. The weight is placed over the back legs while rising. Arthritic goats can be placed on anti-inflammatory medications and joint supplements.



Casie Phillips

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the procedure (8-12 hours for water). Neonates should not be fasted due to potential for hypoglycemia.

- Endotracheal intubation is recommended, especially if the animal has not been fasted.
- The trachea is manually palpated prior to induction to estimate the size of the tube. The animal should be placed in sternal recumbency. A technician should extend the head and neck, keeping them parallel to the table or ground, while opening the mouth with gauze loops.
- The oral cavity is narrow and the base of the tongue is thick, which narrows visibility.
- A laryngoscope with an elongated blade will facilitate placement of the tube or guide tube by depressing the base of the tongue. A canine urethral catheter that is smaller and longer than the endotracheal tube may be used as a guide device, allowing for the sliding of the tube over the catheter. A small rigid endoscope can also facilitate intubation.
- A comprehensive list of preanesthetics and injectable and inhalational anesthetics may be found in the references. It is advisable to thoroughly research any anesthetics prior to use, as goats are sensitive to certain drugs.
- Positioning of the head (if possible), where the throat is elevated with relation to the mouth and the thorax, will decrease the risk of aspiration of saliva or regurgitated stomach contents.
- Common complications related to anesthesia are bloat, regurgitation and aspiration of saliva or rumen contents.

MOST COMMON DISORDERS

- Overgrown hooves: firm, compact substrate for prevention.

Pygmy Goats

- Dystocia: breed does to smaller bucks helps prevent this.
- Parasites (internal and external parasites [mites, lice])
- Neoplasia
- Arthritis: carpal area in bucks, stifle and hips in older does
- Caprine arthritis, encephalitis
- Toxicities: mycotoxins in moldy feed, poisonous plants
- Heat prostration/heat stroke: pursuit and manual restraint/ struggling during hot weather
- Gastrointestinal disorders: bloat, choke, diarrhea
- Rumen acidosis (grain overload): severe, often fatal. Avoid feeding concentrates.
- Pregnancy toxemia
- Worn teeth in older animals: pellets may need to be soaked prior to feeding.
- Necrobacillosis (lumpy jaw)
- Caseous lymphadenitis

ZOONOTIC POTENTIAL

- Bacterial: *Brucella melitensis, Chlamydophila psittaci, Coxiella burnetii, Francisella tularensis, Leptospirosis interrogans, Listeria monocytogenes, Yersinia enterocolitica* and *Y. pseudotuberculosis* and *mycobacteria* (*M. bovis* and *M. avium* subspecies *paratuberculosis*).
- Viral: rabies, contagious ecthyma, goat pox; prion - scrapie?
- Parasitic: *Giardia lamblia, Cryptosporidium parvum, Echinococcosis granulosis*
- Fungal: *Trichophyton verrucosum, T. mentagrophytes* and *Microsporum canis*

A wild goat (*C. aegagrus*)



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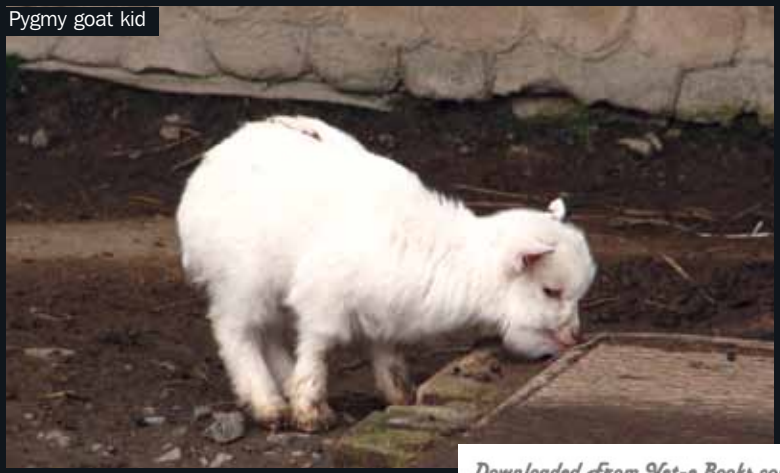
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Pygmy goat kid



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Pygmy Goats

VACCINES

- The most important vaccine administered to goats is a combination product that protects against *Clostridium perfringens* type C and D, and *Clostridium tetani*.
- Unvaccinated goats or those with unknown history receive 1 vaccine, followed by a second in 3-4 weeks, then annually.
- Pregnant does receive their annual vaccine 1 month prior to parturition.
- Animals receiving large amounts of concentrates should be vaccinated every 6 months.
- Kids from immunized dams are initially vaccinated at 4-8 weeks of age, then again in 3-4 weeks.
- Kids from non-immunized or unknown-status does should be vaccinated earlier at 1-3 weeks, then again 3-4 weeks.
- In the event of failure of passive transfer, kids can receive antitoxin made against *Clostridium perfringens* type C/D and tetanus.
- Care should be taken when administering vaccines due to vaccine site reactions. Many goats are used for show or meat, and blemishes can lead to disqualification or condemning of a carcass.
- The recommended route and site for administration of vaccine is subcutaneously in the caudolateral neck or behind the elbow. Avoid the prescapular lymph node area (point of the shoulder), as a vaccine reaction may be confused with caseous lymphadenitis.
- Rabies vaccines are not approved for use in goats, but some veterinarians in endemic areas follow the same protocol used for sheep. Authorities may not recognize the vaccine status of the animal(s) in question.

- Goats may also be vaccinated against contagious ecthyma, caseous lymphadenitis, chlamydia, leptospirosis and campylobacter. Most of these vaccines are extra-label use, and doses are extrapolated from use in sheep.

SPECIAL CONSIDERATIONS AND CAUTIONS

- Because pygmy goats may be used for meat and milk production, the veterinarian and owner need to be cognizant of drug withdrawal times.
- Biosecurity: new and sick goats need to be quarantined from the rest of the herd. Provisions should be made for separate facilities and equipment.
- Because of their non-aggressive nature and small size, they make ideal companions for other non-predatory animals and children—the only caveat being that they are debudded (dehorned).
- Like other breeds of goats, they enjoy head-butting, so one needs to keep this in mind before exposing them to individuals who could be injured by this behavior.

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Llama
Pet Care



Casie Phillips

Normal position of the head, neck, and ears in a calm llama.

VITAL STATISTICS

Life span	12-15 years (captivity)	Body temperature	99.5-102°F (37.5-38.9°C)
Adult size		Heart/pulse rate	60-90 beats per min
Height	4 ft (1.2 m) to shoulders	Respiratory rate	10-30 breaths per min
Length	4 ft (1.2 m) head to tail	Gastric motility rate	3-4 per min at rest
Adult weight	248-550 lb (113-250 kg)		

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Llama (*Lama glama*)

Sharmie Johnson, DVM

CLASSIFICATIONS

- There are no specific subspecies or breeds of llamas.
- Some breed distinctions are made in South America as either heavy-neck fiber (chaku, lanuda, tapada) or short-neck fiber (cara, pelada). Otherwise, classification of llamas is based on fiber length (appearance, weaver's interest), conformation, temperament or color.

ORIGIN / FREE-RANGING HABITAT

- The llama and other camelids (camels, alpacas, guanacos, vicuña) originated from the central plains of North America. Llamas migrated into South America.
- The native habitat is scrub brush and grasses along plateaus from sea level up to 13,123 ft (4,000 m).

BEHAVIOR

- Llamas are very social animals that tend to make other non-predatory animals and humans part of the "pack."
- Because of their tendency to be protective of other animals besides their own species, llamas are commonly used as guard animals for flocks. If a predator approaches, the llama will alert other herd members with a warning bray.
- Llamas have been observed to attack predators by biting, spitting, kicking and butting.
- Female llamas typically attempt to control herd members and other species when disgruntled by laying their ears back and spitting.

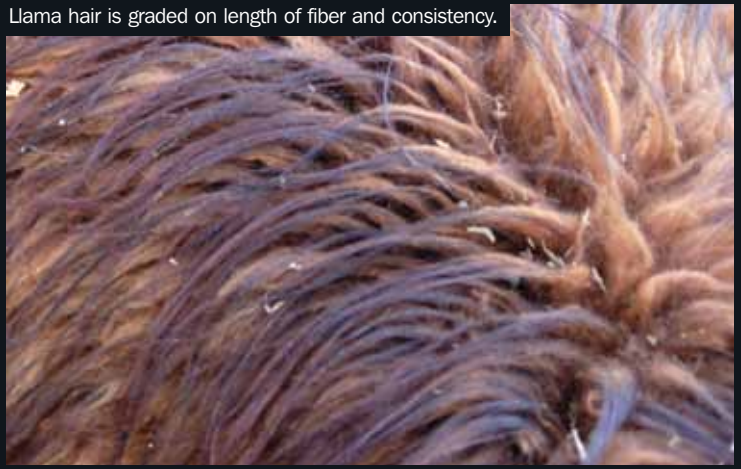
Llamas

- Males will show dramatic displays of chest butting, biting and neck wrestling to the ground. A sign of submission is when an opponent lies in lateral recumbency with the neck extended and tail raised.
- Llamas communicate vocally by humming to one another. They can also make grunting or what has been described as a “mwa” sound when alerted to danger.
- The communal dung heap is thought to represent territorial marking.
- Hand-raised or over-handled baby llamas (crias) may grow to become unpredictable and dangerous to humans. They have come to treat humans as they would each other, by biting, wrestling and spitting to obtain dominance.

PHYSICAL CHARACTERISTICS

- Llamas have long, thick coats that vary in color from solid dark colors to mottled patterns.
- They have 2 toes on each foot with a nail located at the tip (digits 3 and 4) and a thick, leathery pad present on the underside of the sole.
- Llamas carry their head and neck in an almost vertical position. This differs from the alpaca that has a neck carriage at about 70°. Llamas are larger than alpacas.
- The bottom incisors protrude rostrally, while the single upper incisor is positioned caudally and has the appearance and function of a canine tooth.
- The dental formula for deciduous teeth is 2 x (I 1/3, C 1/1, PM 2-3/1-2) and for permanent teeth is 2 x (I 1/3, C 1/1, PM 1-2/1-2, M 3/3).
- The upper lip has a natural division called a philtrum.
- The lips are prehensile, but the tongue is not. The

Llama hair is graded on length of fiber and consistency.



Casie Phillips

Typical fiber length for llamas residing in the southwestern United States.



Casie Phillips

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The upper lip has a cleft called a philtrum (left), which allows independent movement of the lips to sort through food and avoid foreign bodies. The llama is an obligate nasal breather. Note the large nares and small mouth (right).



Casie Phillips

Male llama displaying aggressive facial posture (left). Erect ears in an alert llama (right).



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oropharynx is very narrow, and the oral cavity is occupied primarily by an immobile tongue, making the llama an obligate nasal breather.

- The stomach is divided into 3 compartments, which differ in number, morphology and motility from that of the ruminant forestomach.
- Llamas process ingesta to ultimately form a pellet instead of a fecal ball.
- Llamas have 4 natural gaits: walk, trot, pace and gallop.

REPRODUCTION

- Male llamas have visible external testicles.
- Male llamas are capable of breeding at 1.5-2.0 years of age, but most lack libido and size until 3 years of age.
- Females have a discernible vulva located distal to the anus. Females do not have an estrous cycle, so it is difficult to determine when they reach sexual maturity. Follicular development and hormone assays suggest that they may reach puberty at 5-10 months of age.
- Female llamas are induced ovulators.
- Typically 1 male is housed with 6 females, which is referred to as a harem.
- The length of gestation is 335-360 days.
- Crias (baby camelids) usually weigh 18-45 lb (8-20 kg).

HOUSING

- There are no special housing requirements for llamas other than providing shelter from the elements. Shade, fans and misters may be used in hot climates.
- Barns or shelters should be available in cooler climates; however, it is not unusual to witness these animals out in

the rain or snow even though shelter is available.
- Standard livestock fencing can be used for containment. Llamas are not known for their jumping ability, so a fence that approximates or exceeds their height is appropriate.
- A fence system needs to be set up and maintained so that the animal cannot become entrapped or injured.
- An owner should consider predatory prevention as well. Even though llamas are used for flock protection, they can still be a victim of predation, both human and animal.

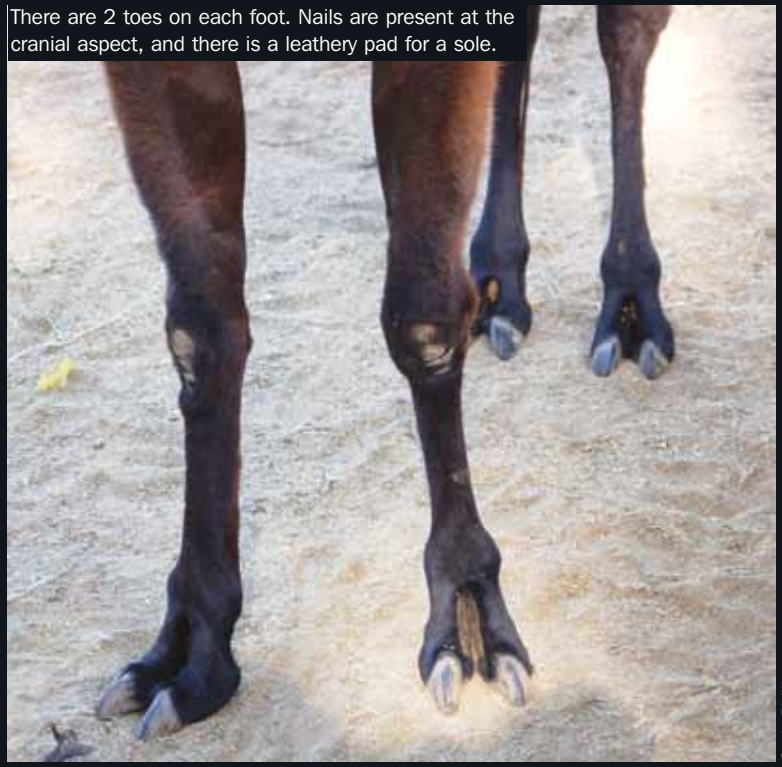
DIET

- Llamas may be maintained on a grass pasture or receive good quality grass or mixed grass and legume hay.
- They consume 1.0-1.5% body weight in roughage daily.
- If there are no excessive energy demands, such as pregnancy or lactation, they do not need to receive concentrates.
- Llamas are prone to obesity and choking.
- Providing a salt-mineral mix and supplemental vitamin E (15-60 IU of dl-α tocopherol acetate/kg of dry matter fed) is recommended.
- Consulting with a local or state agricultural extension service is recommended in order to determine the appropriate supplements for a particular area.
- Llamas do not have the capacity to lick; therefore, salt blocks are unwarranted.
- An ample fresh water must be available at all times.

RESTRAINT

- Llamas are very tractable to work with in general. Exceptions to the rule are hand-reared animals, which

There are 2 toes on each foot. Nails are present at the cranial aspect, and there is a leathery pad for a sole.



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Aggressive stance (left). Note the caudoventral position of the ears and open mouth. Normal posture in a non-aggressive llama (right).



Casie Phillips

Classical facial pose in an angry llama prior to spitting.



Casie Phillips

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Llamas

may inflict serious injury to their handlers.

- Manual restraint is the most common means of subduing llamas. The best technique is to use at least a minimum of 2 people whose objective is to work the animal into a corner of a small pen.
- If possible, clients should be advised to build a small paddock into their pasture or enclosure and feed the animals there in order to desensitize them to the area.
- Outstretched ropes or poles may be used to guide the animal into the area and hold them there until a halter can be placed. Most people find it easier to rope off all the animals and then select the animal in question.
- Halters may be made from ropes or purchased. Llamas typically do not like their head or face touched and may rear their head and neck in different directions, possibly injuring the handler. Also, a spit rag may be placed over the muzzle if indicated.
- During restraint, the llama may communicate displeasure by the position of the ears and tail, vocalizing, spitting and possibly biting. The ears held back and the tail held in a vertical position indicate aggression, as does a snort (short burst of air through the lips).
- Screaming is common when the animal is frightened.
- Cowkicking can also occur during restraint as does spitting of stomach contents. Prior to being spewed on, a handler will hear a gurgling/gulping sound.
- Llamas also have a tendency to kush (sit in a recumbent position) and then rise up frequently during restraint.
- Hand-made (Fowler or Ebel design) or commercial llama chutes work well when trying to perform minimally invasive procedures.

Llamas

ANESTHESIA

- Local anesthesia is used following standard guidelines for other species. Regional blocks are not typically done due to lack of detailed information for llamas.
- Epidural anesthesia is commonly used for procedures involving the perineum.
- Injectable and inhalation anesthetics are commonly used. The references contain information specific to doses, routes of administration, intubation techniques and precautionary statements regarding usage.

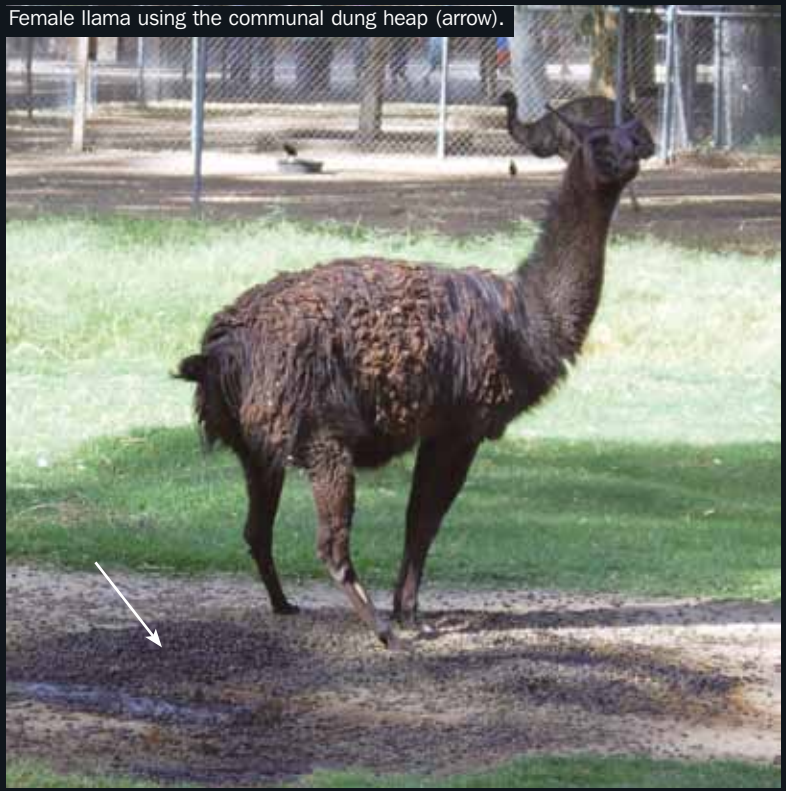
BLOOD COLLECTION

- Venipuncture may be accomplished at the jugular vein, cephalic vein (cranial aspect of the radius), ear vein, ventral midline tail vein or lateral saphenous vein.
- The jugular vein is difficult to identify because of the depth in the neck, lack of a jugular furrow, thick skin and hair. It is best to pursue this vessel low on the neck in the area of the thoracic inlet. The vein lies medial to the ventral projection of the transverse process of the cervical vertebrae. The vein may also be approached high on the neck adjacent to the ramus of the mandible.
- One should avoid clipping the hair because it may take up to 1½ years to grow back.

MOST COMMON DISORDERS

- Neoplasia, nutritional deficiencies/excesses, congenital diseases, toxins
- Parasites (susceptible to ruminant parasites, both endo- and ecto-)
- Fungal (coccidioidomycosis), dermatophytosis

Female llama using the communal dung heap (arrow).



Casie Phillips

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Llamas

- Bacterial (colibacillosis, mycobacterial, enterotoxemia - *Clostridium perfringens* types A, C, D, botulism, tetanus, brucellosis, necrobacillosis)
- Viral (equine herpesvirus type 1, West Nile virus)
- References provide a more complete list of diseases and potential treatment strategies.
- *Actinomyces lamae* - unique to South American camelids. This organism causes soft tissue abscesses and osteitis.

VACCINES

- Vaccine strategies are similar to other ruminants.
- Llamas are vaccinated against tetanus and enterotoxemia, type C and D.
- Killed vaccines against rabies and leptospirosis are given in endemic regions.
- Some practitioners vaccinate against West Nile virus and equine herpesvirus type 1.

ZOONOTIC POTENTIAL

- There are several organisms to which llamas are susceptible that pose health concerns for humans. Among the viruses, rabies virus is paramount.
- Contagious ecthyma, a parapox virus, is known to cause severe ulcerative skin lesions in man.
- Fungal infections resulting from dermatophytes, such as *Trichophyton verrucosum, T. mentagrophytes* and *Microsporum* spp., have also been responsible for causing skin disease in humans.
- Bacterial diseases, such as tuberculosis (*Mycobacterium bovis, M. tuberculosis, M. avium, M. paratuberculosis*), brucellosis (*Brucella melitensis*), listeriosis (*Listeria*

monocytogenes) and leptospirosis (*Leptospira* spp., especially *L. grippotyphosa*), have been identified in lamoids.

- Experimentally, llamas are susceptible to *B. abortus*.

SPECIAL CONSIDERATIONS

- Llamas may require shearing in hot and/or humid climates to prevent heat prostration/heat stroke.
- Hand-raised or over-handled/over-socialized parent-raised crias may become aggressive to humans and inflict severe injury when they become adults. They can force a human to the ground and attempt to trample that person. This is especially a concern with a hand-reared, intact male llama. The animal views the human as another male llama. Castration does not deter this behavior once it has started.
- If hand-raising a male llama is the only option, avoid additional contact beyond feeding and return the animal to the herd as soon as possible. Castration should be considered by 2 months of age in these animals.
- Llamas are susceptible to chemical, plant, mycotoxin and heavy metal toxicosis. Cases of rattlesnake envenomation and stings from bees and ants have been reported.

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Young llamas resting in the shade



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Miniature (Potbellied) Pig Pet Care



VITAL STATISTICS

Life span	10-15 years	Body temperature	37-40°C (99-104°F)
Breed standard weight*	<95 lb (43 kg)	Respiratory rate	20-30 breaths per min
Breed standard height at shoulder*	<18 inches (45 cm) (1 year of age)	Heart rate	70-110 beats per min

*North American Potbellied Pig Association

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Miniature (Potbellied) Pig (*Sus scrofa domestica*)

Valarie V. Tynes, DVM, Dipl ACVB

BREEDS / PHYSICAL ATTRIBUTES

- The most common breed kept as a pet in the United States is the Vietnamese potbellied pig.
- Vietnamese potbellied pigs have a short nose, sway back, pot belly, small upright ears and a straight tail.
- The coat color was originally black, but varieties of black and white or red coats now exist.
- Pet pigs with long snouts, long legs and/or curly tails may be a result of mixing feral or commercial swine with Vietnamese potbellied pigs.

LAWS AND PERMITS

- Many cities, counties and municipalities do not allow pet pigs within their boundaries.
- Laws that restrict the keeping of livestock within city limits are often applied to miniature pet pigs as well.
- Pet potbellied pigs are livestock and transportation is regulated by strict rules that may differ from state to state.
- Most states require a health certificate that has been signed by an accredited veterinarian, and/or an entry permit.
- Many states require that the pigs be tested for pseudo-rabies and brucellosis (performed by state laboratories at a reasonable cost) before a health certificate can be issued.

BEHAVIOR

- Potbellied pigs can make excellent pets if owners are aware of their normal behavior and needs.

Miniature (Potbellied) Pigs

- The pig that is well socialized and trained from an early age is a better pet for the family.
- Miniature pigs are foraging animals that spend much of their day either in search of food or resting.
- When kept as a pet and fed 2-3 small meals daily, the pig may spend as little as 20 minutes a day eating.
- The pig's remaining time is often spent sleeping; therefore, the pig becomes an extremely sedentary animal and prone to obesity.
- Pigs are highly social, and housing multiple pigs together may decrease the chances of behavior problems.
- Aggression toward people is a common problem in the pet pig and may occur when the pig is not given enough enrichment or is not properly trained or socialized.
- Pet pigs may be taught some tricks to keep them mentally stimulated.
- Pigs are usually quiet but will scream when frightened, firmly restrained or when begging for food.
- It is normal for pigs to foam and froth at the mouth when they are excited about food.
- Unpredictable behavior, aggression, urination in the house or destructive nest-building can occur with estrus.
- It is recommended that the pig be spayed at 3-6 months.

CAPTIVE HOUSING AND MANAGEMENT

- A minimum pen size of 8 x 15 feet (2.5 x 4.5 m) per pig is recommended (larger is desirable for exploration/activity).
- An insulated house with 6 ft^2 (2 m^2) per pig for sleeping and nesting is necessary if the pig is housed outdoors.
- The house should be clean, dry, sanitary and draft free. With a linoleum or tile floor, blankets or other bedding

An insulated house for sleeping and nesting is necessary if the pig is housed outdoors.



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A 3-month-old potbellied piglet.



Jenny Blaney

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A rooting box and ample space must be provided for the pig to explore.



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An indoor rooting box requires an accessible entry.



Angela Lennox, DVM, Dipl ABVP-Avian Practice

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material should be provided to improve footing.

- Indoor pigs should be confined to a pig-safe room when unsupervised.
- All house pigs should be allowed outdoor exercise time.
- Pigs that spend time outdoors are more likely to have healthy coats and hooves.
- Outdoor enclosures need at least 1 foot (30 cm) of the mesh fence below ground, as pigs may attempt to dig under the fencing.
- Bedding must be dry and deep enough to allow for rooting or for an animal to completely cover itself.
- Old blankets, comforters, sleeping bags, hay, straw or hardwood shavings are acceptable (cedar avoided).
- Wet or dirty bedding should be cleaned daily.

TEMPERATURE

- The ideal environment range is 60-75ºF (15-24ºC) with a humidity of 50%.
- Pigs do not have the ability to sweat. Supplemental cooling (e.g., shade, fans and water for wallowing) is necessary when the outside temperature exceeds 85ºF (30ºC).
- A mud wallow is acceptable provided it is not used as the defecation area by the pigs.
- Pigs have sensitive skin that can sunburn.
- Commercial pig heating blankets or a heat lamp placed out of reach are recommended during the winter.

LITTER PANS

- Pigs can be trained to use a litter box.
- Older pigs will prefer to go outside to eliminate if given the choice.

Miniature (Potbellied) Pigs

- Pans must be large enough for the pig to turn around completely and shallow enough to step into easily.
- A shallow child's pool with an entry way cut out can be used as long as it is fastened down to prevent being turned over.
- The litter pan should be placed at the opposite end of the room from the sleeping and resting area.

ENVIRONMENTAL ENRICHMENT

- Rooting is a normal exploratory behavior that is also motivated by the pig's drive to forage for food.
- A rooting box and ample space must be provided for the pig to explore. A large, low container (e.g., a child's wading pool) filled with a layer of smooth, large stone may be used as a rooting box.
- The box should be cleaned monthly or if it becomes wet.
- Dry foods and treats may be fed in the rooting box to reduce boredom and help decrease destructive rooting.
- Toys must be disposable, not easily dismantled into small pieces and cleaned at least once a week.
- Safe, chewable toys include beach balls, tennis balls, cardboard boxes and newspapers.
- Indoor damage is likely: the pig may tear up carpet and linoleum, remove loose items from low shelves.
- Destruction of the lawn and landscaping is common if the pig is housed outdoors.

DIET

- Pigs are omnivorous, foraging animals.
- Pet pigs should be fed diets formulated especially for miniature pigs that do not require supplementation.
- Some examples are Mazuri® Mini-Pig, Heartland and Ross

Foraging is a natural behavior for miniature pigs and should be encouraged.



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A miniature pig shown at an ideal weight.



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Another miniature pig shown at an ideal weight.



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Obese pigs often have a red discharge from their eyes that stays in the folds of fat on their face.



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Miniature (Potbellied) Pigs

Mill Farm's Champion™ Premium Pet Pig Food.

- Commercial hog feeds are formulated to produce rapid growth in a relatively short time period and should not be fed to pet pigs. Feeds for miniature pigs are lower in protein and fat and higher in fiber.
- A pig fed a diet too high in fat and protein (e.g., dog or cat food) can exceed its genetic potential and achieve a larger frame size as well as storing an extraordinary amount of fat.
- Feeds are often classified as starter, grower, breeder or maintenance, or alternately as youth, active adult and elder.
- Maintenance rations contain approximately 12% protein, 2% fat and 12-15% fiber and should be given to pigs after about 8 weeks of age.
- Food and water bowls should be fastened to the ground so the pig cannot climb in or tip them over.
- Adults should be fed approximately 2-2.5% body weight or 1 cup pelleted food for each 23 kg (50 lb), divided into at least 2 feedings each day.
- Frequent feedings in multiple locations encourage activity.
- The Manna Ball (www.pigs4ever.com) and Buster® Cube (www.bustercube.com) contain strategically placed holes in which the pig's ration is placed, allowing the pig to manipulate the toys in order to slowly acquire its food.
- Treats may include occasional small amounts of fresh vegetables and fruits cut into pieces, unsalted popcorn or whole grain cereals (without sugar coating).
- Small amounts of grass hay (not alfalfa or clover, which are too high in protein/calories) may be used to control hunger.
- The amount of a commercial diet should be decreased accordingly for pigs allowed to graze or fed supplemental fruits, vegetables or treats.

- Foods to avoid include: sweet or salty snacks, cookies, candy, chips, beef or pork, canned or dry cat or dog foods, chocolate, fried foods, sunflower seeds, iceberg lettuce, dried corn and food containing a high percentage of fat.

WATER

- Food and water should be placed in an easy to clean environment (e.g., shower stall or a large shallow tray).
- If allowed, pigs will alternate between eating and drinking.
- This pattern of moving back and forth between water and food bowls creates a lot of spillage, often resulting in the pet owner restricting water availability to their pig. However, water restriction is related to urolithiasis, cystitis and salt poisoning (sodium ion toxicosis).
- Water for soaking and cooling outdoors should be provided in a separate container from drinking water.
- Water intake appears to be regulated by abdominal fill. A pig that is fed a restricted amount of food will drink substantially more water.
- When the pet pig owner overly restricts the pig's food, it may become polyuric and polydipsic.

RESTRAINT

- The natural fear response of pigs is to flee or to squeal and struggle.
- Pigs must be habituated to human handling.
- A panicking pig is unpleasant to work with and may also be in grave physical danger.
- Potbellied pigs have an unstable circulatory physiology and can easily succumb to the effects of stress.
- Any procedure that appears to be inducing panic in the pig

Placing pellets in a plastic ball with holes helps to prolong feeding time.



Valarie V. Tynes, DVM, Dipl ACVB

The patient is gently corralled after being placed on the exam table.



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Several designs for slings to restrain pigs are commercially available or one can be made, such as the sling shown.



Frederik Frøen

Obese pigs may become “fat” blind when their eyes are covered by rolls of fat.



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should be discontinued until it calms down or until the anesthesia is administered.

- Struggling is often more dangerous than anesthesia.
- A rubber mat or other slip-proof surface will help to keep the pig from panicking.
- A pig may be restrained by corralling it rather than holding it tight, using as little restraint as possible.
- The pig should be anesthetized for anything other than routine exams.
- A pig should not be picked up or restrained by the legs.
- Potbellied pigs are more prone to lower back and leg injuries than commercial swine.
- A small to medium-sized pig may be scooped up with one hand under the rump and the other hand placed in front of the forelimbs and under the neck.
- A lift table must be used for larger pigs.
- While a pig is on the exam table, contact with it must be maintained at all times.
- A pig may be kept calm by offering frequent treats or by scratching/petting its neck, sides or abdomen while it is being examined or vaccinated.
- Snout snares are not recommended for pet pigs.
- Pig slings (www.panepinto.com) may help examinations.

PHYSICAL EXAMINATION

- Semiannual physical examinations are recommended and may include nail trimming, teeth examination, hoof trimming, vaccination and body scoring.
- The pig should be checked for external parasites during the physical exam.
- Fecal samples should be tested every 3 months from 10

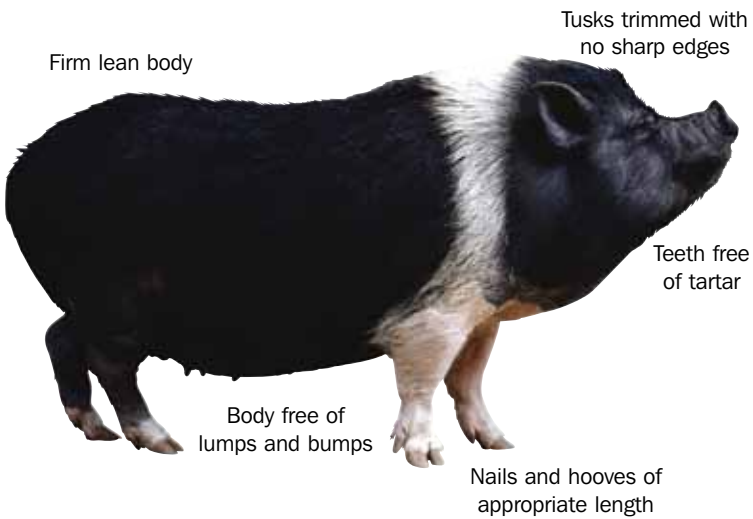
weeks of age to 1 year and rechecked annually.

- Most illness is related to sub-optimal husbandry practices (e.g., inappropriate diet, overheating, trauma from dogs).
- Clear serous nasal discharge is common and may be normal for most pigs, but the snout should be examined for other discharge that might indicate respiratory infection.
- The abdomen should be examined for the presence of umbilical or inguinal hernias (both common).

GROOMING

- **Dental Care:** Pigs' canine teeth (tusks) grow throughout its lifetime and can become sharp. Boar tusks grow longer and thicker than tusks of sows, castrated males or spayed females. Annual trimming is usually sufficient. Tusks may be trimmed short every 6-12 months; removal is not recommended. The pig should be anesthetized to cut the tooth, using a cutting blade on the Dremel™ tool, high speed dental tool, or Gigli wire. A large syringe full of water should be available to squirt over the tusk as it is cut, aimed to ensure the water runs out of the pig's mouth and not down its throat. The tooth is cut even with the gum line. Sharp edges can be removed with a Dremel™ tool, leaving a rounded "button." The handler must wear goggles and a mask for protection during tusk or hoof trimming.
- **Hoof Care:** Hooves require routine trimming once or twice annually starting at 2-3 years of age. Most pigs must be anesthetized. Small horse hoof trimmers may be used. For smoothing and shaping, a Dremel™ tool may be used. Long hooves cause the foot to hyperextend and the pig to become lame.
- **Skin Care:** Dry, scaly, itchy skin is common in pet pigs.

WHAT TO LOOK FOR IN A HEALTHY MINIATURE PIG



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Hematologic Reference Ranges

Basophills	0-0.382 x $10^3/\mu L$
Eosinophills	0.186-4.584 x $10^3/\mu L$
Hematocrit	36.7-51.4%
Hemoglobin	11.1-14.9 g/dL
Lymphocytes	4.464-26.71 x $10^3/\mu L$
MCH	14.1-22.3 pg
MCHC	28.4-33 g/dL
Mean corpuscular vol.	46.7-68 fL
Monocytes	0.558-4.966 x $10^3/\mu L$
Neutrophills (bands)	0-0.382 x $10^3/\mu L$
Neutrophills (segmented)	3.348-24.066 x $10^3/\mu L$
Plasma fibrinogen	100-400 g/dL
Plasma protein	5.4-8.5 g/dL
Red blood cells	6.15-8.25 x $10^6/\mu L$
White blood cells	18.6-38.2 x $10^3/\mu L$

Biochemistry Reference Ranges

Albumin	4.1-5.6 (4.7) g/dL[2] 3.4-4.3 g/dL[1]
Alk phos	35-563 μ/L[1]
ALT	23-83 μ/L[1]
AST	< 109 μ/L[1]
Bilirubin	0.0-0.3 (0.1) mg/dL[2] <0.295 mg/dl[1]
BUN (urea nitrogen)	10-29 (19.2) mg/dL[2] 10.81-46.88 mg/dL[1]
Calcium	9.3-11.6 (10.6) mg/dL[2] 10.16-12.24 mg/dL[1]
Chloride	91-103 mEq/L[1]
Cholesterol	47.3-173.0 (101.8) mg/dL[2]
Creatinine	1.2-2.0 (1.6) mg/dL[2] 0.4-1.10 mg/dL[1]
GGT	21-57 μ/L
Globulin	1.4-3.6 (2.8) g/dL[2] 1.5-3.5 g/dL[1]
Glucose	56-153 (79.8) mg/dL[2] 68.4-154.8 mg/dL[1]
Magnesium	1.48-3.82 mg/dL[1]
Phosphorus	5.0-8.3 (6.9) mg/dL[2] 4.96-10.66 mg/dL[1]
Potassium	3.0-5.9 mEq/L[1]
Protein	6.3-9.4 (7.5) g/dL[2] 4.6-7.8 g/dL[1]
Sodium	134-150 mEq/L[1]

[1]From Merck Veterinary Manual, 8th Edition, 1998.
[2]Braun & Casteel, p.156

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Miniature (Potbellied) Pigs

Skin over the shoulders can be extremely scaly and greasy. Skin secretions are reddish or orange. The pig will scratch itself using stationary objects in the environment (furniture, doors and walls). *Sarcoptes scabiei* should be ruled out. Shedding once or twice a year is normal. Sudden hair loss may occur (sometimes in hours) in response to some stressor, such as pregnancy, lactation, weaning and illness.

- **Eyes:** Excessive tearing may be normal or due to a dry or dusty environment. Tears may leave reddish-brown stains on the pig's face that pet owners often mistake for blood.
- **Ears:** A large amount of reddish-brown debris in the external canal and the inside of the pinnae is normal. Pigs may present with head shaking or head tilt. The pig should be anesthetized to clean the ear canal, and a thorough otoscopic examination should be performed.

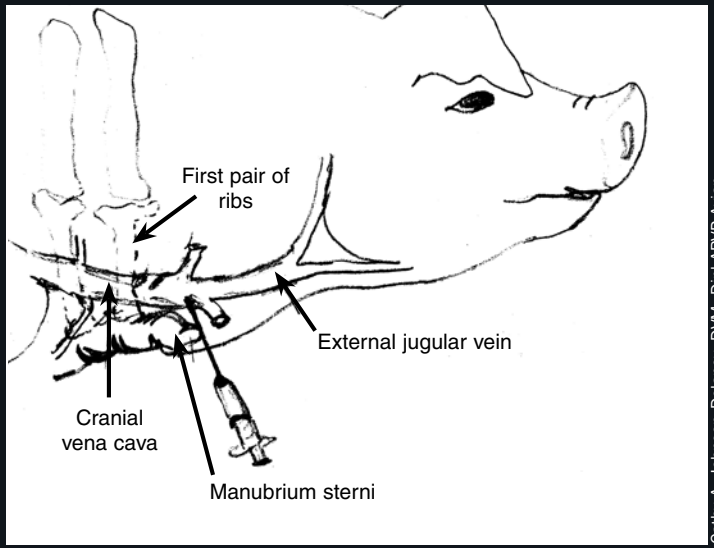
BLOOD COLLECTION AND CATHETERIZATION

- The primary venipuncture sites include the auricular vein, anterior vena cava, jugular vein and subcutaneous abdominal vein.
- Isoflurane anesthesia is preferred for accessing the jugular vein and the anterior vena cava and is necessary for inserting an IV catheter.
- **Lateral auricular vein,** the most accessible vein in the large conscious pig that is ill or traumatized, is found on the outer surface of the external ear. EMLA topical anesthetic may be applied 1-15 minutes prior to venipuncture. A 25-gauge needle and a small tourniquet should be used. An IV catheter must be secured well by taping and suturing it in the auricular vein.
- **Anterior vena cava:** The anesthetized pig is held in dorsal

recumbency with the head and neck extended and the forelimbs pulled caudally. An 18- to 22-gauge, 1½-inch needle is used. The anterior vena cava should be approached from the right jugular furrow at the level of the manubrium, with the needle directed toward the top of the opposite shoulder. A slight vacuum on the syringe should be used so that it will quickly fill with blood.

- **Jugular vein** may be accessed in the conscious or anesthetized pig, but can be challenging to locate due to the short jugular furrow. The anesthetized pig is held in dorsal recumbency with the head and neck extended and the forelimbs pulled caudally. In the conscious pig, an assistant should stand over the pig and back it into a corner. The assistant stretches the pig's neck out by clasping his hands under the chin and lifting upward. An 18- to 22-gauge, 1½-inch needle is directed dorsally and slightly medially into the right jugular groove.
- **Subcutaneous abdominal vein:** The use of the subcutaneous abdominal vein may be less stressful and could be used on conscious pigs for blood sampling or IV catheterization. The vein is dorsolateral to the mammary chain along the ventral portion of abdomen. With the pig standing or in lateral recumbency, the vein is palpated and/or visualized, and firm pressure is applied directly behind the elbow joint, along the thorax, to fill the vein. A longitudinal depression in the abdominal musculature in which the vein lies is palpated. An 18- to 22-gauge, 1½-inch needle is used with care to avoid entering the abdominal cavity.
- **Accessory cephalic vein** runs medially over the anterior surface of the carpus and should be palpable in all but

For the external jugular vein, the needle is directed dorsally and slightly medially into the right jugular groove.



Cathy A. Johnson-Delaney, DVM, Dipl ABVP-Avian

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One hand is used to scratch or pinch the skin behind the pig's ear, while the needle is gently eased into the muscles of the pig's neck and the handler offers food to the pig.



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Once the pig resumes eating, the syringe is gently reattached and the vaccine is slowly injected into the site.



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mature boars that develop thick skin that obscures the vein. A 23- to 25-gauge needle should be used; too much suction collapses the vein.

- **Cephalic Vein:** Some practitioners find the cephalic vein fairly easy to catheterize. A cut-down over the vein is usually necessary due to the thick skin of the pig's legs.

VACCINATION

- Vaccination should be performed for both indoor and outdoor pet pigs, regardless of exposure to other pigs.
- Some swine diseases are zoonotic.
- Vaccines and bacterins for commercial swine are not specifically approved for use in the potbellied pig but may be used safely. Canine vaccines should not be used.
- Routine vaccines (bacterins) for adult pets may include: Erysipelas (*Erysipelothrix rhusiopathiae*); all 6 serovars of Leptospira (*Leptospira icterohemorrhagica, L. canicola, L. pomona, L. hardjo, L. grippotyphosa* and *L. bratislava*); and *Actinobacillus pleuropneumonia*.
- For young pigs and adults exposed to other pigs, other vaccines to consider are: *Mycoplasma hyopneumonia, Bordetella bronchiseptica, Pasteurella multocida,* swine influenza and tetanus toxoid if risk of exposure exists (wounds, post-surgery).
- No rabies vaccine is approved for swine.
- Young pigs begin a vaccination schedule at 6-8 weeks of age. The initial series (regardless of age) consists of 2 injections, 3-4 weeks apart. Semiannual or annual vaccinations are administered thereafter.

COMMON MEDICAL CONDITIONS

- Obesity
- Other nutritional diseases, when fed inappropriate diets
- Dystocia
- Internal parasites: They do not share parasites with dogs or cats. The swine ascarid (*Ascaris suum*) is the most common intestinal parasite and is most likely to be present in a pig under 1 year of age. It is a potential human health hazard. Stomach worms (*Hyostrongylus*), threadworms (*Strongyloides ransomi*), nodular worms (*Oesophagostomum*), whipworms (*Trichuris suis*), lungworms (*Metastrongylus*) and coccidia (*Isospora suis*) also are found. Ascarids, stomach worms, nodular worms, threadworms and lungworms should be treated with ivermectin (300 mcg/kg SC, IM, PO). Pyrantel is also effective against ascarids and nodular worms (6.6 mg/kg PO, repeated as needed).
- External parasites:
  - Clinical signs of scabies (*Sarcoptes scabiei*), which include severe pruritus, erythema and thickened crusty skin, are most noticeable on the forelegs, ears and trunk. Deep skin scrapings allow diagnosis. Scabies can be treated with ivermectin (300 mcg/kg SC; repeat in 10-14 days). Subclinical sarcoptic mange occurs in large groups of swine.
  - *Haematopinus suis* is a large sucking louse, readily seen with the naked eye. Lice are easily treated with ivermectin injections, administered at 18-day intervals or insecticidal powders, dips or sprays applied at 7-14 day intervals.

A 5-month-old female potbellied piglet.



Jenny Blaney

A 2-year-old female potbellied pig.



Jenny Blaney

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A 17-year-old female potbellied pig.



Jenny Blaney

Two 7-month-old female potbellied pigs.



Jenny Blaney

THERAPEUTICS

- Medications approved for use in swine can generally be used at the label doses. If swine medications are not available, most medications/dosages used to treat dogs in an emergency can be used.
- Medications may be hidden in food treats, especially sweet or fruity treats. Capsules can be opened and mixed with food. Flavored pediatric suspensions may also be used. Attempting to "pill" a pig, as is done with a cat or dog, does not usually work well.

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FORMULARY FOR PET PIGS

DRUG	ROUTE	DOSAGE	COMMENTS
Acepromazine	SC, IM, IV	0.3-1.1 mg/kg once	Tranquilizer, preanesthetic
Amforal suspension	PO	5 cc/9 kg q8h x 5d	Diarrhea
Amprolium	PO	1 ml/day	Piglets 5-14 days old, coccidiosis
	Food, water	100 mg/kg q24h	
Amoxicillin	PO	10 mg/kg q12h	
Amoxicillin/clavulanate	PO	11-13 mg/kg q24h	
Ampicillin	IV	4-10 mg/kg	Can be used as loading dose
	IM	10-20 mg/kg q6-8h	
Atropine sulfate injectable	IM, IV	0.02-0.07 mg/kg	Pre-op, pre-dental exam
Azaperone	IM	0.25-0.50 mg/kg (relaxation); 2-8 mg/kg (sedation, ataxia, immobilization); 2.2 mg/kg (calm sows for nursing)	Range of dosages give different effects. Tranquilizer, give 5-10 min before handling
Buprenorphine	IM, IV	0.05-0.10 mg/kg q8-12h	Analgesic
Butorphanol	SC, IV	0.05-0.20 mg/kg q3-4h	Analgesic
	IM, IV	0.1-0.3 mg/kg q8-12h	Analgesic
Ceftiofur (Naxcel)	IM	1.1-2.2 mg/kg q24h x 7d; 3-10 mg/kg q24h	Rhinitis
Ceftriaxone	IM	50-75 mg/kg q24h	
Cephalexin	PO	20 mg/kg PO q12h	
Cephradine	PO	24-50 mg/kg q12h	
Chlorpromazine	IM	0.5-4.0 mg/kg	Antiemetic
	IV	0.55-3.3 mg/kg	Antiemetic
Cimetidine	PO	150-300 mg q12h	Gastric ulcers
Dantrolene sodium	PO, IV	2-5 mg/kg q8h	Malignant hyperthermia
Dexamethasone	IV	1-2 mg/kg	Shock
Dextrose 5% in water	IP	17-22 ml/kg	Piglets, weak, hypoglycemic
Diazepam	SC	0.22 mg/kg	Tranquilizer, pre-op
Detomidine + butorphanol + midazolam + atropine	IM	D: 0.125 mg/kg, B: 0.3 mg/kg, M: 0.3 mg/kg, A: 0.06	Anesthesia; reverse with naloxone and yohimbine; also reverse with flumazenil if needed

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DRUG	ROUTE	DOSAGE	COMMENTS
Acepromazine	SC, IM, IV	0.3-1.1 mg/kg once	Tranquilizer, preanesthetic
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Amprolium	PO	1 ml/day	Piglets 5-14 days old, coccidiosis
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Amoxicillin	PO	10 mg/kg q12h	
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Atropine sulfate injectable	IM, IV	0.02-0.07 mg/kg	Pre-op, pre-dental exam
Azaperone	IM	0.25-0.50 mg/kg (relaxation); 2-8 mg/kg (sedation, ataxia, immobilization); 2.2 mg/kg (calm sows for nursing)	Range of dosages give different effects. Tranquilizer, give 5-10 min before handling
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Dextrose 5% in water	IP	17-22 ml/kg	Piglets, weak, hypoglycemic
Diazepam	SC	0.22 mg/kg	Tranquilizer, pre-op
Detomidine + butorphanol + midazolam + atropine	IM	D: 0.125 mg/kg, B: 0.3 mg/kg,, M: 0.3 mg/kg, A: 0.06 mg/kg combination BB	Anesthesia; reverse with naloxone and yohimbine; Can also reverse with flumazenil if needed

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DRUG	ROUTE	DOSAGE	COMMENTS
Ketamine + diazepam	IM	1-2 mg/kg diaz then 12-20 mg/kg ket	Short-term anesthesia, can prolong with IV additional ketamine as needed 2-4 mg/kg
		7 mg/kg ket + 0.5 mg/kg diaz	Sedation
Ketamine + xylazine	IV	1-2 mg/kg ket + 0.5 mg/kg xyla	Tranquilization
		2 mg/kg ket + 2 mg/kg xyla	Sedation
	IM	5-20 mg/kg ket + 1-2 mg/kg xyla	Anesthesic
		Give 2.2 mg/kg xyla, then 12-20 mg/kg ket	Short-term anesthesic; Can prolong with additional ketamine as needed 2-4 mg/kg IV
	IV	1.5 mg/kg ket + 0.75 mg/kg xyla	Sedation for C-section; Use local anesthetic at incision, inhalation isoflurane for closure
Ketamine + xylazine + butorphanol	IM	11 mg/kg ket + 2 mg/kg xyla + 0.22 mg/kg butor	Anesthesic
Lactated Ringer's solution	IV, IP	17-22 ml/kg	Fluid therapy (IP in piglets if vein cannot be used)
Levamisole	PO, SC	7.5-8 mg/kg	Ascarids, lungworms
Lincomycin	IM	11 mg/kg q24h	Antibiotic
Meperidine	IM	2-10 mg/kg q4h	Analgesic
Metoclopramide	IV, IM, PO	0.2-0.5 mg/kg q6-8h	Anti-emetic
Metronidazole	PO	66 mg/kg q24h	
Midazolam	IM	0.1-0.5 mg/kg	Sedation
Mineral oil	PO	25-300 ml	Lubricant laxative
Morphine	IM	0.2 mg/kg q4h	Analgesic; max dose not more than 20 mg total
Mylanta	PO	Dose per bottle, like human	Symptomatic, gastroenteritis
Naloxone	IV	4 mg total dose	Narcotic reversal
Neomycin	PO	7-12 mg/kg q12h; 10 mg/kg q6h	
Orbifloxacin	IM	2.5-5 mg/kg q24h	
Oxymorphone	IM	0.15 mg/kg	Analgesic
Oxytetracycline	IM, IV	6-11 mg/kg	
	PO	10-20 mg/kg q6h	
	PO	100 mg/pig on day 1, then 200 mg q7d x 3 tx	Rhinitis
Oxytocin	IM	10-20 IU/sow	Dystocia, if not obstructed
Penicillin G, procaine	IM	22,000-45,000 IU/kg q24h	

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DRUG	ROUTE	DOSAGE	COMMENTS
Penicillin G, procaine/ benzathine combination	IM	40,000 IU/kg q3d	Per label
Phenylbutazone	PO	4-8 mg/kg q12h	Analgesic, NSAIDs
Piperazine	PO	200 mg/kg	
Prednisolone injectable	IM	0.5-2.0 mg/kg	For pruritis as in dogs/cats; allergic reactions
Prostaglandin F2a	IM	5 mg/sow	Induce parturition in 24-30 hr when within 3 days of expected parturition. Will cause abortion after 12 days of gestation
Pyrantel	PO	6.6 mg/kg, repeat in 2-3 wk	Ascarids
Ranitidine	PO	150 mg/pig q12h	Gastric ulcers
Spectinomycin	PO	10 mg/kg q12h	
Sulfadimethoxine	PO	25 mg/kg	Coccidiosis
Sulfaquinoxaline	PO	0.0125-0.025% (in drinking water)	Coccidiosis
Tetanus antitoxin	IM	50 IU/23-70 kg pig	Prophylactic if contaminated wound
Thiabendazole	PO	50-75 mg/kg	Ascarids
Thiopental	IP	24-30 mg/kg	Anesthetic
	IV	5-19 mg/kg	Anesthetic
Tiletamine (Telazol)/zolazepam	IM	4-6 mg/kg	Sedation, immobilization, anesthetic
Tiletamine/zolazepam + xylazine	IV	2 mg/kg + 2 mg/kg xyla	Rapid induction
	IM	6 mg/kg + 2.2 mg/kg xyla	Anesthetic
		2.2 mg/kg xyla then 2-4 mg/kg telazol	Anesthetic
Trimethoprim/sulfa (Tribrissen 24% injectable)	IM, SC	1 ml/9 kg q12h; 5 mg/kg IM q24h	
Trimethoprim/sulfa (Sulfatrim oral suspension)	PO	0.07-0.14 ml/kg; 25-50 mg/kg q24h	
Tylosin	IM	8.8 mg/kg q12h not to exceed 3 d; 2-10 mg/kg q24h	Large animal formulation
Vitamins A, D, E	IM	0.25 ml/4.5 kg	Large animal formulation
Vitamin E	PO	100-200 IU/day/adult pig	
Xylazine	IM	1-4 mg/kg	Sedative, immobilization, analgesic
Yohimbine	IV	0.125-0.3 mg/kg	Xylazine reversal

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Deer
Pet Care



VITAL STATISTICS

Parameter	Reeve's Muntjac	Fallow	Red	White-tailed	Axis
Life span (years)	19	12-16	15-20	10-20	18-22
Adult weight	22-40 lb (10-18 kg)	88- 220 lb (40-100 kg)	132-396 lb (60-180 kg)	132-330 lb (60-150 kg)	88-242 lb (40-110 kg)
Heart rate (beats/min)	60 (avg)	55-70	70-80	70-80	95-141
Respiratory rate (breaths/min)	48-60	30-45	13-27	16-20	28-60
Rectal temperature†	98.6-109.4°F (37-43°C)	98.6-104°F (37-40°C)	98.6-104°F (38-40°C)	95-105.8°F (35-41°C)	95-105.8°F (39.9°C)
Age at puberty (months)	12	12-24	12-24	12-24	<12
Estrous cycle (days)	14-21	21-23	18-20	25-30	27-30
Gestation (days)	210	225-234	223-238	210	229
Number of offspring	Usually 1	1	1- 2	1-3	Usually 1

†Temperatures exceeding 40°C are usually associated with hyperthermia. In general all attempts should be made to keep the rectal temperature in the l

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Deer (Cervidae Family)

Sharmie Johnson, DVM

COMMON DEER SPECIES IN CAPTIVITY

- Native deer (44 species) are distributed among all the continents except Antarctica and Australia (introduced).
- Deer comprise the family Cervidae and are members of the order Artiodactyla, the even-toed ruminants.
- Indian muntjac (*Muntiacus muntjak*)
- Reeve's muntjac or Chinese muntjac (*Muntiacus reevesi*)
- Leaf muntjac (*Muntiacus putaoensis*)
- Red (*Cervus elaphus*)
- Wapiti (elk [United States]) (*Cervus canadensis*)
- Axis (chital or spotted) (*Axis axis*)
- Fallow (*Dama dama*)
- Chinese water (*Hydropotes inermis*)
- White-tailed (*Odocoileus virginianus*)
- Mule (*Odocoileus hemionus*)
- Northern pudu (*Pudu mephistophiles*)
- Roe (*Capreolus capreolus*)
- Reindeer (caribou) (*Rangifer tarandus*)
- Moose (elk [Europe]) (*Alces alces*)

LAWS AND PERMITS

- The presence of deer in a municipality may be restricted.
- City, state and federal agencies may have regulations regarding the acquisition, care and transport of deer.
- Testing requirements for diseases may differ; contact the state regarding interstate and intrastate regulations.

Deer

BEHAVIOR

- Deer are social animals. Female deer (does or hinds) and fawns (neonates and juveniles) are frequently found in groups, and it is not unusual for male deer (bucks or stags) to run together during the non-breeding season.
- Hand-raised cervids accept humans as “part of the herd.” Bottle-fed deer are very affectionate with their owners. This may result in dangerous situations once the animals mature, particularly with bucks during rut.
- Even females and castrated males have been known to attack their owners with little or no provocation.
- Deer commonly bite and head butt their conspecifics as part of their social interaction, and they are not afraid to include other species (humans, livestock) if provoked.
- Bucks and female reindeer have antlers and/or canine tusks, while females of other species and non-antlered (post-shed or castrated) males will strike with their forefeet, while supporting their weight on their rear limbs.
- Usually, sexual segregation occurs, and hierarchy revolves around size or age. Males out-rank females.
- All deer have well-developed scent glands located craniomedial to the eyes and between the toes.
- Alarm barking occurs when a threat is perceived.

HOUSING AND MANAGEMENT

- Free-ranging deer live in variety of environments, including deserts, mountains, grasslands, forests and tundra.
- The natural environment should be mimicked in captivity to reduce the stress and subsequently the risk of disease.
- Deer coexist readily with other non-predatory animals (horses, donkeys, pigs, barnyard fowl).

Chinese water deer have specialized canine teeth that are used for self-defense.



Casie Phillips

Deer often groom one another like this male and female Reeve’s muntjac.



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An enclosure for white-tailed deer includes a high chainlink fence to prevent escape.



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Deer

- Deer should be tested for parasites, tuberculosis and brucellosis before adding them to a multi-species habitat.
- Guidelines for enclosure size from the Minimum Standards for Wildlife Rehabilitation: 1-2 neonatal fawns may be housed in an area 4 x 4 x 4 ft (1.2 x 1.2 x 1.2 m); older but pre-weaned fawns (n = 4): 10 x 15 x 6 ft (3 x 4.5 x 1.8 m); and juvenile and adult deer (n = 6): 30 x 50 x 6 ft (9.1 x 15.2 x 1.8 m).
- Deer are capable of jumping great heights; an average-sized deer is capable of clearing a 7-ft (2.1-m) fence. In general, it is best to have a fence height of 10-12 ft (3-3.6 m) to prevent escape and discourage most predators.
- Chainlink is probably the most common fence material used. High tensile wire and electric fencing are alternatives.
- Close spacing of the stay wires prevents entanglement and injury.
- A visual barrier, such as shade cloth attached to the fence, will help prevent a deer's attempt to go through the fence.
- Nontoxic thorny bushes that grow well on fences can serve as attractive biological barriers.
- Double barriers will prevent close contact with free-ranging deer, thus reducing the potential spread diseases.
- Cement footers or recessed rebar may be used to prevent a digging predator from getting under the fence.
- Specialized rollers that are attached to the top of the fence or electric wires placed at multiple levels, prevent predators and humans from climbing over.
- Most pastures used for deer are either grass or dirt lots.
- Ample shade should be available.
- Deer should be provided with "hide" areas (sheds, barns, bushes, trees).

Deer

DIET

- Deer may be offered food once to twice daily based on their physiological needs and weight.
- Deer ruminate. Chewing and re-chewing their cud facilitates digestion and maintenance of a healthy pH in the gut by continually mixing bicarbonate-rich saliva with the food.
- The types and quantities of foods consumed reflect the free-ranging environment as well as seasonality, sex and reproductive status.
- Deer are generally categorized into 3 groups of feeders: concentrate, bulk and intermediate feeders.
- Concentrate feeders are typically small animals with a long, face and narrow incisor arcade. The rumen is small, and the other 3 chambers are not well-defined. Therefore, they rely on highly digestible, low-fiber plants.
- Examples of concentrate feeders are Chinese water deer, muntjacs, roe, mule and white-tailed deer.
- Concentrate feeders may be offered good quality alfalfa hay, which should be very leafy.
- Often, they are housed on a grass lot or pasture and eat the young shoots from the grass or the grass heads when in seed. They also enjoy fruits, vegetables and browse.
- Deer have larger livers and salivary glands compared with most ruminants, which enable them to detoxify plants better; however, it is probably best to consider them relative to horses when considering supplementation with browse.
- Small alfalfa-based mini-pellets or browser-specific pellets may also be offered. One should be careful if feeding pellets with grain or molasses, as even the concentrate feeders can die from rumenitis, which is a condition

A deer's body weight should be checked regularly. The muntjac shown and inset is too thin.



Casie Phillips

Dusty conditions in hay indicate mold. Hay should also be examined for baling string, wires and insects, such as the blister beetle.



Casie Phillips

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Muntjacs enjoy leaves, flowers and branches from nontoxic trees and bushes.



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This axis deer stag is shedding velvet.



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associated with a change in microflora and pH of the gastrointestinal tract. This can happen if the animal consumes greater than 1-2% of its body weight in concentrates within a short time period.

- Bulk feeders (e.g., fallow deer) have a large forestomach with advanced chamber development similar to domestic cattle, enabling them to subsist on poor-quality, high-fiber roughage. They may be offered good quality grass hay, such as Bermuda or Timothy.
- Most deer maintained in captivity fit in the intermediate feeding category. These deer are opportunistic feeders. They have the ability to derive energy from both concentrates and grasses. Reindeer, red, axis and wapiti are intermediate feeders. They are offered a combination of grass and alfalfa hay, alfalfa or Bermuda pellets, browse and a small amount of fruit and vegetables for enrichment (1 handful per head/day, which may be increased as long as the stool remains normal).

FEEDING DISORDERS

- Concentrate feeders will do poorly on a grass-based diet, resulting in starvation, stomach impaction and increased susceptibility to disease due to malnutrition.
- Bulk and intermediate feeders may suffer the same fate if fed diets designed for concentrate feeders. There is also an increased risk of clostridial-associated diarrheas and rumen overload (rumenitis/bloat).
- Overfeeding deer may lead to lameness, dystocia, bloat, inability to tolerate heat and other metabolic disorders.
- Deer normally increase their body weight during the spring and summer for breeding.

Deer

- Supplementation of hay or pasture is dependent on the quality of roughage available, season and physical state of the animals.
- A good rule of thumb for the amount of hay to feed is approximately ¼ flake per animal.
- The clinician should examine the hay and pellets that their client is feeding and make recommendations regarding proper storage to prevent mold and pest infestation. Hay should be dry and smell fresh. The pellet size should be appropriate for the animals' mouth size. Choke can develop rapidly and ultimately be fatal if the pellets are too large.
- Clean water should be provided as well as a balanced salt mix or block commonly used for domestic hoof stock.
- If deer are raised on pasture or given forage that is deficient in copper, they may be supplemented with 100 mg/adult animal/day of copper sulfate or 0.09 mg/kg/day of copper gluconate.
- Vitamin E (200 IU/kg of dry matter fed/day) supplementation is recommended to prevent capture myopathy.

BLOOD COLLECTION

- Blood may be collected from the jugular, cephalic, lateral and medial saphenous veins (proximal to hock joint).
- The animal may need to be sedated or anesthetized depending on its demeanor.
- The veins are easy to observe with minimal pressure, but the use of topically applied isopropyl alcohol or shaving may be required.

CATHETERIZATION

- Catheterization may be accomplished at the same sites as blood collection with 16-22 gauge catheters, depending on

Blood collection from the jugular vein in the deepened jugular furrows located laterally to the trachea.



Casie Phillips

Blood collection may be obtained from the lateral saphenous vein (arrow).



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The cervical area is suited to intramuscular injections and TB testing sites.



Casie Phillips

Shown is the placement of a dilute lidocaine/marcaine mixture surrounding a skin laceration, which will reduce the pain for several hours after the reversal of the general anesthetic.



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the size of the animal and circumstance.

- If the animal is hospitalized and a catheter is required for any length of time, placing a jugular catheter used for large animals with appropriate extension sets would be best.
- Fluids and medications may be administered in the same sites recommended for domestic mammals.

RESTRAINT / GENERAL CHEMICAL IMMOBILIZATION

- Deer do not like to be manually restrained.
- They have a high flight drive when frightened, which prevents performing physical examinations and procedures that are routine in other species.
- Trying to overpower even a small deer will typically result in severe injury to both the deer and the handler.
- If a pet deer has been conditioned and responds to positive reinforcement with food or grooming, it is possible to administer injections, perform venipuncture and treat superficial wounds without physically confining the animal.
- The use of nets and bags are not recommended because deer typically respond by thrashing violently.
- Most pet deer owners do not have chutes; therefore, chemical immobilization is employed.
- Anesthesia on exotic ruminants carries increased risk of morbidity and mortality.
- It is highly advisable to gain experience by working with or observing experienced veterinarians, zoo staff or wildlife agents if possible. Familiarity with the most common anesthetics and remote delivery systems (pressurized gas-powered rifles, pistols, blow pipes and darts) is imperative.

Deer

- Before initiating any procedure, the veterinarian should discuss the risks of anesthesia and consider having signed release documentation by the owner.
- The owner should be advised to administer vitamin E orally (200 IU/kg of dry matter fed/day) 1 week prior to any elective procedure. Vitamin E aids in the prevention of capture myopathy.
- Proper monitoring (i.e., temperature, pulse, respiration, blood pressure, pulse oximetry) is the key to prevention of complications.
- Capture myopathy and hyperthermia are two of the most common complications observed in pet deer. They are usually observed together and result from overexertion or chasing/intense muscular exertion (restraint), anesthetic use, elevated environmental temperature (greater than 80ºF [26.7°C]) and humidity, fear and hypovitaminosis E.
- For a complete information about chemical immobilization with the use of darts, including chemical restraint agents and dosages, see Exotic DVM Volume 12.2.

MOST COMMON DISORDERS

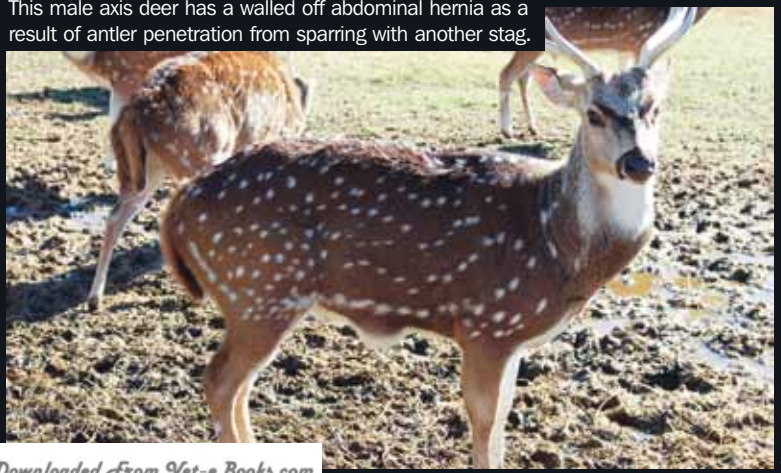
- Capture myopathy
- Neonatal diarrhea
- Limb and antler fractures
- Trauma to the jaw
- Dental abscesses
- Lumpy jaw
- Bloat
- Rumen acidosis
- Gastrointestinal foreign bodies
- Malnutrition

"Lumpy jaw" in a stag



Casie Phillips

This male axis deer has a walled off abdominal hernia as a result of antler penetration from sparring with another stag.



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Male Reeve's muntjac deer



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Female Reeve's muntjac deer



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Deer

- Overgrown hooves
- Copper deficiency
- Hematomas, abscesses or hernias associated with trauma caused by antlers
- Head and neck trauma

COMMON INFECTIOUS DISEASES

- Bacterial diseases: brucellosis, yersiniosis, pasteurellosis, leptospirosis, *Clostridial* spp. colibacillosis, campylobacteriois, mycobacteriosis, paratuberculosis (Johne's disease), listeriosis, salmonellosis, *Fusobacterium necrophorum*
- Prion: chronic wasting disease
- Parasites: lungworm, liver flukes, gastrointestinal nematodiasis, nasal bots, babesiosis
- Viral diseases: rabies, bovine viral diarrhea, malignant catarrhal fever, epizootic hemorrhagic disease, deer herpesvirus, foot and mouth disease

GUIDELINES FOR VACCINATION PROGRAMS

- May use vaccines approved for domestic animals (although considered extra-label).
- Use only inactivated viral vaccines or bacterins to avoid potential virulence in an exotic species.
- Only healthy animals should be vaccinated.
- When using remote delivery systems, such as darts, the veterinarian should keep in mind that the full dose may not have been delivered due to operator or equipment failure (failure to impact, hitting a bone, rapid rebound of the dart).
- For rabies, use only killed vaccine (Imrab 3®) - same

dose and frequency as sheep.

- For tetanus, use dose and frequency as for sheep and goats.
- *Clostridium perfringens* (types B, C, and D) - commonly included with tetanus vaccine. Other *Clostridium* spp. are found in polyvalent bacterins (e.g., Covexin 8®) and are used in endemic regions.
- Some veterinarians vaccinate against bovine viral diarrhea and shipping fever depending on risk: doses are extrapolated from bovine recommendations.
- Currently there are no efficacious vaccines against malignant catarrhal fever, epizootic hemorrhagic disease or bluetongue.

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Male white-tailed deer



USDA - Scott Bauer

Female white-tailed deer



Ken Thomas

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Male fallow deer



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Female fallow deer



Adrian Pingstone

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28. Chronic Wasting Disease Alliance, www.cwd-info.org
29. Agricultural Extension Service (check telephone directory for listing)*
30. State Game and Fish Department*
31. State Veterinarian*
32. State Veterinary Diagnostic Laboratory*

*Check online for specific state

Genet
Pet Care



Adrienne Saunders

A pointed snout and large rounded ears are typical of a large-spotted genet (*Genetta tigrina*).

VITAL STATISTICS

Life span	12-20 years in captivity
Adult size	
Length	Head and body: 16.5-23.0 in (42-58 cm) Tail: 15-21 in (39-53 cm)
Weight	2.2-6.6 lb (1-3 kg)

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Genet (*Genetta* spp.)

Dawn Zimmerman, DVM, MS

SUBSPECIES

- Family Viverridae, Subfamily Viverrinae, Genus *Genetta*, 3 subgenera, up to 17 recognized species.
- The common, small-spotted or European genet (*G. genetta*) and the large-spotted, blotched, caped or South African genet (*G. tigrina*) are the most common species.

ORIGIN / FREE-RANGING HABITAT

- *Genetta* is an Old World genus, inhabiting most of Africa and western Europe.
- Genets inhabit forests, savannahs and grasslands with a maximum average home range of 3 square miles (7.8 km^2).

PHYSICAL CHARACTERISTICS

- Genets are long-bodied, short-legged carnivores with pointed snouts and large rounded ears.
- They have a dense hair coat of variable coloration (gray to yellow with rows of brown or black spots) and a very long banded tail. Melanistic individuals are not uncommon.
- Genets have a prominent dorsal crest of hair that they can erect when frightened.
- They have 2 pair of mammae and 40 teeth (I 3/3, C 1/1, PM 4/4, M 2/2).
- They have 5 digits on both front and hind feet with well-furred soles and partially retractable claws.
- Generally, vital statistics, including hematology and serum chemistry values, fall within normal mammalian limits.

Genets

SEXING AND REPRODUCTION

- Genets have easily recognizable mammalian sex organs; males have a baculum.
- Sexual maturity occurs at 2 years of age.
- Breeding is year round and gestation ranges from 56-77 days, depending on species.
- Two litters are produced per year in captivity, generally April-May and July-August.
- Litter size is 1-5 young, but usually 2-3.

BEHAVIOR

- Genets are primarily nocturnal and spend days in hollow trees, on large branches, in rock crevices or in burrows.
- They are both terrestrial and arboreal, being very agile climbers.
- They are usually solitary but may travel in pairs; females are thought to be territorial while males are not.
- Genets are excellent stealth hunters with acute vision, hearing and olfaction. They scent mark when frightened and to mark territory.
- Behavioral problems in captivity may be observed if genets are confined to small cages and are manifested by pacing, self-mutilation, regurgitation and excessive scent marking.
- Genets tend to bond to only one person, and as such are not considered good social or education animals.
- Genets may be litter-box trained.

CAPTIVE HOUSING

- Genets should be housed singly or in a single hetero-sexual pair, as aggression is observed in larger groups.
- Minimum cage size is 40 ft^2 (3.7 m^2) of floor space for 1

Shown is a large-spotted genet with a long lean body, spotted hair coat and long banded tail.



Angela Price

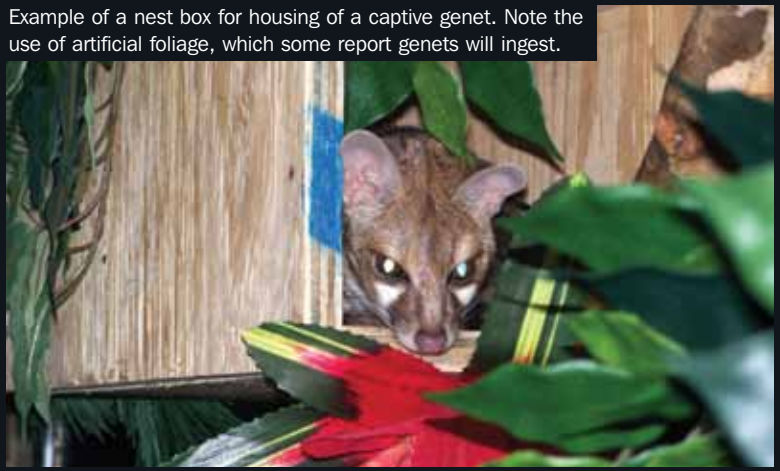
Shown is a small-spotted genet *(Genetta genetta)*.



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Example of a nest box for housing of a captive genet. Note the use of artificial foliage, which some report genets will ingest.



Angela Price



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Genets

animal and 64 ft^2 (6 m^2) for 2 animals, with a minimum height of 7 ft (2.1 m).

- Enclosures should include a nest box, such as an open-topped box lined with straw, in a sheltered corner or a recess, such as a pipe or hollow log.
- One box or recess per adult is required, but each should be large enough for 2 adults to enter.
- Elevated sleeping platforms and climbing branches should be provided.
- It is important to note that genets are able to enter or exit any area they can get their head through. In addition, genets are agile climbers, and escape-proof cages must have non-climbable walls or a ceiling.
- Spot cleaning is recommended; complete cage disinfection daily may cause undue stress, as genets will scent mark their area daily. The substrate of the enclosure should be cleaned but not the "furniture" (e.g., rocks, trees).
- Genets housed in the home have similar requirements to that of the domestic cat.
- The use of artificial (silk) leaves and foliage should be avoided to prevent ingestion.
- Examples of environmental enrichment used to encourage hunting behavior and stimulate senses include:
  - live crickets placed in a hamster ball or paper bag
  - live cave roaches, hissing roaches or mealworms placed within the enclosure
  - banana pieces spread on branches
  - various scents or spices (e.g., cinnamon, allspice) sprinkled on substrate, rocks and logs
  - chicks or mice as supplement to diet
  - bells, mirrors and various other bird toys.

Genets

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Temperature should be between 68-78°F (20-25°C).
- If housed outdoors, shelter and shade must be provided for summer months, and heated quarters provided when temperatures are low.
- Humidity recommendations depend on the species. A wide humidity range is tolerated, desert species prefer ~30% humidity, while aquatic species prefer ~60%.

DIET

- Genets are classified as carnivores but are actually more omnivorous in the wild. The diet varies according to availability and typically includes rodents, birds/eggs, reptiles, amphibians, insects and fruits.
- In captivity, diets should consist of ground meat supplemented with vitamins and minerals (e.g., Nebraska canine diet), fruits (bananas, apples, grapes), vegetables and occasional whole animals (mice), eggs and insects.
- Commercially available feline diets may be used as the diet base, as it is assumed that the nutritional requirements of genets are similar to those of domestic cats.

RESTRAINT / ANESTHESIA

- Genets are nearly impossible to manually restrain. If it is necessary to use physical restraint over chemical restraint, leather gloves are recommended.
- For anesthesia, chamber induction with isoflurane is ideal.
- Alternatively, a combination of ketamine (7 mg/kg) and xylazine (10 mg/kg) IM appears to be safe and effective for immobilization.
- Other anesthetic combinations may be just as effective:

Crickets placed around the enclosure and within a plastic ball, an example of environmental enrichment for a captive genet.



Adrienne Saunders

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Small-spotted genet (*Genetta genetta*)



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Small-spotted genet in a nest box.



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ketamine at 10 mg/kg with xylazine at 2 mg/kg IM.

MOST COMMON DISORDERS

- Most medical problems of domestic canids and felids apply to genets.
- Infectious diseases reported include canine distemper, feline panleukopenia and rabies. In Africa, genets are thought to be a wildlife reservoir for the rabies virus.
- Other diseases reported in wild genets include bovine tuberculosis, lymphocytic choriomeningitis associated with the ingestion of rodents and ebola hemorrhagic fever.
- Parasitic diseases in genets are similar to other domestic carnivores and include roundworms, *Physaloptera, Oxyuris, Dirofilaria repens,* tapeworms, hookworms, whipworms, fleas, ticks and mites. Control and treatment is as used for domestic dogs and cats.
- Bite wounds and lacerations are common as a result of conspecific aggression when genets are housed in groups.

VACCINES

- Genets are susceptible to feline panleukopenia and canine distemper; vaccination is warranted at 8 weeks of age (series of 3 vaccines at 3-4 week intervals, booster yearly).
- For canine distemper virus, vaccination with an avian cell modified live vaccine is recommended (Merial Purevax™ Ferret Distemper).
- In areas where rabies, canine leptospirosis and canine hepatitis are of concern, vaccination should be considered.

ZOONOTIC POTENTIAL

- There are no known reports of zoonotic disease transmission from captive genets; however, possible diseases

acquired from genets include rabies, and the animals may serve as hosts for toxoplasmosis, *Toxocara canis* larval migrans, *Trichinella, Angiostrongylus* and *leishmaniasis.*

SPECIAL CONSIDERATIONS

- Genets are subject to state legal restrictions, which may include specific housing mandates.
- They are easily startled, exhibit a strong musk odor when scent marking and are agile climbers.

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Capybara Pet Care



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Capybara (*Hydrochoerus hydrochaeris*)

André Becker Saidenberg, DVM, MS, PhD candidate

ORIGIN / FREE-RANGING HABITAT

- Capybaras are native to South America.
- Capybaras reside in areas from rainforests to flooded savannahs, where there is access to a constant source of standing water, as they are semi-aquatic in nature.

PHYSICAL CHARACTERISTICS

- Capybaras are the largest rodents.
- The coat is coarse and thin, with reddish brown coloration over the body and turning yellowish brown on the belly.
- Capybaras have no tail.
- Their back legs are taller than the front. Four digits are present on the forelegs and 3 on the rear legs, with connecting skin between them as an adaptation for swimming.
- Capybaras have an extremely efficient digestive system. The caecum is exceptionally well-developed where active fermentation occurs, producing volatile fatty acids.

SEXING AND REPRODUCTION

- There is no obvious sexual dimorphism (a pouch of cutaneous skin folds covers the genitals).
- Males have a larger sebaceous scent gland that forms a bump between the eyes and nose and is used to mark territory. It is more visible in males after the first year of age. Dominant females may also have a prominent gland.
- Males do not have a scrotum, and testicles are adhered to the abdomen.

VITAL STATISTICS

Life span	10-12 years in captivity
Adult size	
Length	3.3-5.0 ft (1.0-1.5 m)
Weight	110-198 lb (50-90 kg)

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Capybaras

- Females have spontaneous ovulation and are continuously polyestrus.
- Females reach sexual maturity at about 10-12 months and males at 15-24 months.
- Copulation occurs in the water.
- Gestation lasts 5 months with an average birth of 4 young.
- Two births per year are possible because the female is able to enter estrus and become pregnant while still nursing.
- Youngsters are nursed by all lactating females for a minimum of 5 weeks besides eating solid food on their own or by regurgitation from adults.

BEHAVIOR

- Capybaras are semi-aquatic herbivores.
- They are gregarious; family groups usually consist of 3-4 males (1 dominant male) and 6 females, but numbers may reach up to 50 members or more.
- Aggression against individuals not belonging to the family group is frequent and may have serious results.
- Grazing occurs during the early hours of the day and again in late afternoon until dusk.
- They usually swim, bathe, play and rest in the water during the warmer hours of the day.
- Capybaras regurgitate their food and masticate it before swallowing it a second time.
- They exhibit coprophagic behavior.

CAPTIVE HOUSING

- Capybaras must have access to water in a pond to avoid overheating; suggested size is 107 ft^2 (10 m^2) with 1.6 ft (0.5 m) depth. Mud is important to prevent sunburn.

Wild groups of capybaras in Brazil often become habituated to human presence.



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Young capybaras nursing from their mother.



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Capybaras usually stay in family groups of 10-30 animals, like this group at Zoo Prague.



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Capybaras are excellent swimmers and have partially webbed feet.



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Capybaras

- For a group of 5 individuals, an enclosure of at least 1076 ft^2 (100 m^2) with soft substrate or grass is necessary.
- An area with trees or a small open corral provides shade and protection from the weather.
- In colder climates, a heated indoor enclosure of 215-323 ft^2 (20-30 m^2) must be provided to maintain a minimum temperature of 54°F (12°C).
- A system to renovate the water pond is important to maintain its quality and prevent diseases, as capybaras frequently defecate in the water.
- It is extremely important to house capybaras in groups because they have a well developed social order.
- An opportunity for foraging inside and outside the water should be provided, as well as a water supply in which they can rest during the heat of the day.
- Natural branches are important for wearing down the continuously growing teeth.

DIET

- Captive adults consume 6.6-8.8 lb (3-4 kg) of food a day consisting of grasses, aquatic plants, fresh vegetables and a commercial pelleted diet rich in vitamin C for large rodents. This could be supplemented with small quantities of corn, sugar cane, pumpkin and rice.

RESTRAINT

- A separate confinement area within the enclosure is useful to prevent capybaras from seeking shelter in the water during capture attempts.
- Snares or nets might be used for capture, taking care not to cause additional stress that would lead to traumatic

injury. Following capture, juvenile animals may be transferred to a strong fabric bag; adults require a squeeze cage or injectable anesthetic agent for longer procedures.
- Covering the eyes with a piece of cloth helps reduce stress.
- Capybaras may bite.

ANESTHESIA

- Injectable anesthetics are the preferred drugs (delivered by blow gun or following physical restraint).
- A combination of alpha 2 adrenergic agonists with atropine and tiletamine hydrochloride + zolazepam (Telazol®) in varying doses provides surgical anesthesia (employ allometric scaling).[10]
- Ketamine hydrochloride combined only with xylazine was reported to cause death in individuals presenting hyperthermia.[2]

MOST COMMON DISORDERS

- Intraspecific aggression
- Infanticide among unfamiliar females
- Trauma (inappropriate restraining methods, concrete substrate leading to pododermatitis)
- Malocclusion
- Scurvy
- Bacterial infectious diseases (microflora imbalance/ opportunistic diseases: *Staphylococcus* sp., *Streptococcus* sp., *Corynebacterium* sp., *Escherichia coli*)
- Other bacterial infections (*Pasteurella* spp.)
- Fungal diseases (dermatomycoses - *Trychophyton* spp. and *Microsporum* spp.)
- Viruses (coronavirus, causing diarrhea)
- Hemoparasites (*Trypanosoma evansi*)

Capybaras must have access to water at all times.



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Foraging opportunities should be provided for capybaras.



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When not swimming, the capybaras like to just lie in the sun and rest.



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Capybaras

- Endoparasites (nematodes, trematodes, cestodes, Coccidia - the latter is of special importance in young animals, causing hepatic coccidiosis and conjunctivitis)
- Ectoparasites (*Sarcoptes scabiei*, fleas, lice, ticks - mainly *Amblyomma* spp.)

ZOONOTIC POTENTIAL

- *Leptospira* spp.
- *Brucella* spp.
- *Salmonella* spp.
- *Campylobacter jejuni*
- *Rickettsia rickettsii* (Brazilian spotted fever)

SPECIAL CONSIDERATIONS

- Capybaras excrete two different types of feces: one consists of hard oval pellets and the other is pasty and clearer in color. The second type, produced by the caecum, contains an average of 37% more protein than the first type.
- As with other rodents, especially guinea pigs, certain oral antibiotics should be avoided in order to prevent disrupting the intestinal microflora. Most practitioners employ aminoglycosides, sulphonamides, chloramphenicol and quinolones.
- Injectable enrofloxacin is usually the drug of choice for most bacterial infections, but culture and sensitivity should be performed when possible and appropriate therapy based on the results.
- *Clostridial enterotoxemia* has not been described for capybaras but is possible as with other rodents.
- It may be helpful to include probiotics (lactobacillus) during antibiotic use.

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Arthur Chapman



Associacao Bichos da Mata NGO

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Bushbaby Pet Care



Angela Price

A northern greater galago (*Otolemur garnettii*) has large eyes and ears and well-developed digits.

VITAL STATISTICS

Life span	12-18 years in captivity
Adult size varies by species	
Otolemur species:	
head/body length	9-18 in (23-46 cm)
weight	1.3-4.4 lb (0.6-2.0 kg)
Galago species:	
head/body length	3-9.5 in (7-24 cm)
weight	1.5-16 oz (44-445 g)
G. senegalensis:	
head/body length	5-8 in (13-20 cm)
weight	2.5-11 oz (70-314 g)
Rectal temperature	37.2-40.2°C
Heart rate	165-240 beats per min
Respiratory rate	20-50 breaths per min

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Bushbaby (*Galago* sp.)

Dawn Zimmerman, DVM, MS

SUBSPECIES

- Taxonomy is frequently disputed and revised (about 20-40 species recognized. All are classified as CITES Appendix II.
- Order Primates, Suborder Strepsirrhini, Family Galagidae, 3 genera (previous 4th genus Galagoides, the dwarf galagos, now placed under *Galago*):
  - *Otolemur* (greater galagos or thick-tailed bushbabies)
  - *Euoticus* (needle-clawed bushbabies)
  - *Galago* (lesser galagos or lesser bushbabies)
- One of the most common captive species is *G. senegalensis* (lesser, Somali, or Senegal bushbaby/galago), of which there are 4 subspecies.
- Other species that may be seen as pets include thick-tailed bushbabies (*O. garnettii* and *O. crassicaudatus*) and Demidoff's or dwarf bushbabies/galagos (*G. demidoff*).

ORIGIN / FREE-RANGING HABITAT

- Bushbabies inhabit most of sub-Saharan Africa; there are significant differences in distribution by species.
- They are found in a variety of habitats (dense forests, wooded savannahs, dry woodlands, scrub and thicketed grasslands), which vary widely in climate and ecology.

PHYSICAL CHARACTERISTICS

- Bushbabies are small, long-tailed primates with large eyes and very large, mobile, membranous ears.
- Their fur is dense and woolly with significant color

variation, usually silver-gray to brown but may also be white, yellow or black with orange or reddish tints.

- Their hindlimbs are longer than their forelimbs and are quite strong, making them agile leapers.
- They have well-developed digits, although their thumbs are not opposable, with nails on all digits except for P2 of the hind feet, which has a curved grooming claw, sometimes called a "toilet claw."
- Bushbabies use different types of locomotion depending on the species—some moving almost exclusively by hopping and leaping (up to 2 m vertically) while others (*G. demidoff, O. garnettii*) primarily ambulate quadrupedally.
- The anatomy and physiology of their respiratory, gastrointestinal and urogenital systems are similar to those of humans and domestic dogs.
- Their dental formula is: I 2/2, C 1/1, PM 3/3, M 3/3 = 36 teeth, with a mandibular toothcomb comprised of pectinate lower incisors and canines.

SEXING AND REPRODUCTION

- Males have a baculum, and females have 2 pairs of mammae.
- Bushbabies are generally referred to as polygynous.
- Their estrous cycle ranges from 20-44 (avg 32) days, and estrus lasts 2-7 days. Gestation is 110-146 days, depending on the species.
- Placentation is non-invasive epitheliochorial.
- Free-ranging bushbabies reproduce once to twice a year.
- Bushbabies give birth to 1-2 babies per litter.
- Birth weight is about 5-40 g (0.17-1.4 oz), depending on the species. Young are born fully furred with their eyes

Shown are the woolly haircoat and long tail of a northern greater galago.



Angela Price

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The well-developed digits on the hind foot of a northern greater galago. Note the nails on all digits except for P2 which has a curved grooming "toilet claw."



Angela Price

A newborn northern greater galago is fully furred with eyes open.



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open, able to cling to branches at just 1 day of age.

- The young will ambulate out of the nest on their own and start catching insects at about 4-6 weeks of age. They are weaned at around 6-14 (average 10-11) weeks.
- Diseases reported in the infant include nutritional (iron deficiency if hand-raised with improper milk substitute), bacterial (*Salmonella, Shigella, Klebsiella, Escherichia coli*) and fungal (*Candida albicans*) diarrheas. Rickets may be observed in young bushbabies with vitamin D deficiency.

BEHAVIOR

- Although often considered gregarious, bushbabies are actually better described as non-gregarious. Typically, they are solitary for evening/nighttime activities with morning/daytime social aggregations, especially at sleeping sites.
- These social groups (numbered around 2-10 individuals, depending on the species) consist of closely related females and their offspring.
- Adult males maintain separate territories and may fight another male for control of its territory. Generally, 1 male will mate with all females in an area.
- Bushbabies may become aggressive as they reach sexual maturity; this is a significant danger due to their fierce bite and potential transmission of zoonotic diseases.
- Bushbabies are arboreal, found in thick vegetation and nesting in trees or in hollow logs during the day.
- They are nocturnal and have excellent night vision and an acute sense of hearing.
- Vocalizations include a clicking sound to call, a loud cry or bark for distant communication and territorial encounters (resembling the cry of a child and therefore the basis for

the name “bushbaby”) and a high-pitched alarm call.

- Olfactory communication includes “urine washing,” whereby males wash their hands and feet with urine so that their scent is spread around their territory.
- In captivity, the lack of an appropriate social environment coupled with a lack of environmental stimulation can lead to stereotypical and maladaptive behaviors (e.g., regurgitation/reingestion, self-mutilation, coprophagia).

CAPTIVE HOUSING

- Regulatory bodies dictate minimum space requirements for captive primates as 2.5 times the height and 5 times the width of the animal with arms extended. Other sources recommend a minimum cage size of 5 x 5 x 7 ft (1.5 x 1.5 x 2.1 m).
- Drafts and dampness should be avoided. An absorbent substrate (shavings) will absorb urine and feces.
- Two perches per animal should be provided; each should be long enough to allow the animal to recline.
- Nests should also be provided for each animal (adults rarely share nests).
- “Furniture” (e.g., climbing ropes, chains, branches) should be added to encourage play and exploration.
- Bushbabies will adapt quickly to a reverse day-night cycle; a red fluorescent or red flood light can be used during the day, and a bright white light used as a total light source during the night hours, without altering activity patterns.
- The bushbaby’s digital dexterity should be a consideration regarding cage design as should their curious nature regarding materials used for and within the cage (wood will be chewed on, and lead toxicity is possible if cage

Branches may be used to encourage the arboreal nature of a captive bushbaby.



Adrienne Saunders

A variety of enrichment items may be used to stimulate visual, auditory and tactile senses in a captive bushbaby.



Angela Price

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Feathers may be used as a novel enrichment item for a captive bushbaby.



Adrienne Saunders

Brown greater galago in Chipata, Zambia



Hans Hillewaert

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bars, furniture and toys are painted with lead paint).

- Dietary variation may be used to encourage natural foraging behavior, accomplished by increasing the number of feedings and variety or by complex food presentation.
- Sensory stimulation may be provided through a variety of forms: music, adding "furniture" (ropes, tree branches) and a rotation of play objects (jungle gyms), hanging up hamster balls, paper bags, cups with live crickets, "feather dowel" (drill holes into wooden dowel, add feathers), browse, scents (e.g., vanilla, orange, coconut) sprayed on cage "furniture" and bells, mirrors and bird toys.
- Male bushbabies should not be housed together, as it will usually result in aggression.
- Environmental temperatures should be maintained between 65-80°F (18-26°C), usually at 75°F (24°C).
- Relative humidity should be maintained between 55-70%.
- Outside cages require shelter and shade.

DIET

- Bushbabies are omnivorous, and diet varies according to species and season.
- Some (smaller species) are highly insectivorous while others predominantly consume leaves, fruit, tree gums and nectar. *Euoticus* species feed primarily on tree gums.
- Other diet items include small mammals and birds, frogs, seeds, flowers, eggs and nuts.
- In captivity, bushbabies may be maintained primarily on a commercially prepared primate diet, such as Lab Diet 5045 HiProtein Primate biscuits or another monkey pellet. Diet is supplemented with mealworms, crickets, waxworms, pinkie mice, fruit and vegetables (green peas,

corn, green beans, celery, spinach leaves). Additional waxworms and occasional bits of cooked egg may be used to increase weight.

- Finicky animals may be fed soaked biscuits or canned primate diet, although less than ideal for dental health.
- Although there is not a known predilection for diabetes in these species, it is observed in captivity and therefore sugary fruits and simple starches should be limited.

RESTRAINT

- Physical restraint is possible using leather gloves or a towel, keeping a firm grasp behind the head with one hand and using the other to restrain the rear limbs.
- Initial capture may be accomplished by simply grabbing with gloves or netting.

ANESTHESIA

- Mask or chamber induction with isoflurane is ideal.
- Alternative anesthesia used is ketamine (8-10 mg/kg IM, up to 20 mg/kg for more invasive procedures).

MOST COMMON DISORDERS

- Infectious diseases of the gastrointestinal tract (usually infectious enteritis caused by *Salmonella, Shigella, Klebsiella* and *Escherichia coli*) and respiratory system.
- Renal disease in aged individuals is not uncommon and is often a result of chronic interstitial nephritis caused by infection or chronic nutritional imbalances.
- Deficient caloric intake frequently occurs when owners allow the animal to eat what it prefers (e.g., fruits and vegetables) and is the most common nutritional imbalance observed, followed by deficiencies of vitamin C (scurvy),

Manual restraint with leather gloves is demonstrated on a bushbaby.



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Senegal bushbaby (*Galago senegalensis*)



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Brown greater galago



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Bushbabies

vitamin D (rickets) and calcium (chronically resulting in nutritional secondary hyperparathyroidism).

- The most common parasitic disease is nematodiasis (*Strongyloides*, pinworms, whipworms, hookworms), but also observed are cestodes, protozoa (*Entamoeba, Balantidium*) and ectoparasites (lice, fleas and mites, including ear mites caused by *Notoedres galagoensis*).
- Dermatophytosis has been reported.
- Periodontal disease and gingivitis are not unusual, especially if fed soft diets (primarily fruits). Malar abscesses (maxillary tooth root abscesses) are frequently observed.
- Gastrointestinal foreign body obstruction has also been a problem in captive nonhuman primates.

VACCINES

- Routine tetanus toxoid administration is recommended.
- Rabies vaccination should be a consideration.

ZOONOTIC POTENTIAL

- Bacterial zoonoses include Mycobacterium (tuberculosis, for which they should be screened yearly), *Salmonella, Shigella, Campylobacter, Klebsiella* and *Yersinia.*
- There are many potential viral zoonoses, but none reportedly transmitted from these species.
- Various parasites found in nonhuman primates are considered zoonotic, particularly protozoa (*Giardia, Entamoeba histolytica*), strongyloides, *Hymenolepsis nana* and ectoparasites (fleas, lice, mites).
- Fungal zoonoses include dermatophytes (Microsporum, *Trichophyton mentagrophytes*), *Candida albicans* and *Dermatophilus congolensis.*

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A juvenile (approx. 4 months of age) Grant's bushbaby (*Galago granti*)



South African galago (*Galago moholi*)



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Corn Snake Pet Care



Common corn snake (*Pantherophis guttata guttata*)

VITAL STATISTICS

Life span	10 years (avg)
Body length	4-6 feet (120-190 cm)

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Corn Snake (*Pantherophis guttata*)*

*formerly *Elaphe guttata*

Nathalie Wissink-Argilaga,
Lic Vet, GPCert (ExAP), MRCVS

COMMON SUBSPECIES / SIMILAR SPECIES

- Common corn snake or red rat snake (*P. g. guttata*)
- Two snakes that were previously assigned to subspecies categories were recently designated as full species: the Great Plains rat snake or Southwestern rat snake (*P. emoryi*, formerly *P. g. emoryi*) and the Slowinski corn snake (*P. slowinskii*, formerly *P. g. slowinskii*). Their husbandry requirements are similar to the common corn snake.

ORIGIN / FREE-RANGING HABITAT

- Southeastern United States
- Primarily ground-dwellers but some are semi-arboreal
- Pine forests, rocky outcrops/hills and around farms

PHYSICAL CHARACTERISTICS

- The common corn snake is distinguished by brownish orange skin with orange/red saddles; the saddles have black borders and usually a black and white underbelly.
- After many generations of selective breeding, domesticated corn snakes are found in a wide variety of different colors and patterns: color morphs, such as Miami Phase, Okeetee Corns and Candycane; pattern morphs like Aztec, Zigzag, Milksnake Phase and Motley; and compound morphs like Snow, Blizzard, Ghost and Phantom.
- There is also a wide variety of hybrids.

Corn Snakes

BEHAVIOR

- Corn snakes are a good beginner snake because they are non-venomous, generally calm and docile, easy to handle and care for and thrive in captivity.
- They are most active at dawn, dusk and during the night.
- They are solitary animals so they are best housed alone.

CAPTIVE HOUSING

- A corn snake should be housed in at least a 20-gallon tank with a secure top, as they are known to be escape artists.
- Aspen or cypress shavings are often used as substrate to allow the snake to burrow. Other suitable substrates are newspaper, reptile carpet or paper towels.
- Hiding places are necessary, as corn snakes become stressed if they cannot hide.
- Branches should be available for climbing and resting.
- A temperature gradient from 70-85°F (21-29°C) should be maintained.
- Heat may be provided by special reptile heating pads or incandescent light bulbs in reflector hoods and placed to avoid direct contact with the snake. One end of the enclosure maintained at a higher temperature for basking.
- Normal household humidity (30-50%) is usually fine, but it may need to be higher if your snake has trouble shedding.

WATER

- Corn snakes need a bowl of fresh water that is large enough for them to submerge their whole body in.
- Ensure that the bowl is not too deep for juvenile animals—approximately 1 inch (2.54 cm) of water.
- Because corn snakes often defecate in their water bowls,

Great Plains rat snake (*Pantherophis emoryi*)



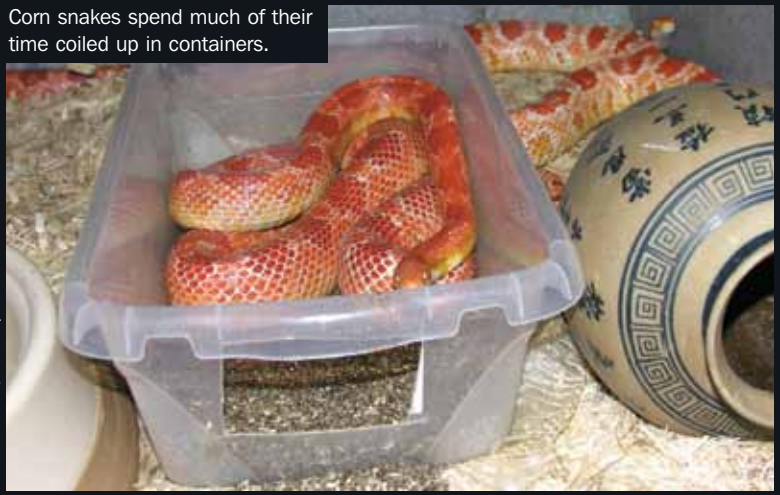
Erik McCormick

Slowinski's corn snake (*Pantherophis slowinskii*) was originally considered an intergrade subspecies of the corn snake and Great Plains rat snake, but it has been elevated to species status.



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Corn snakes spend much of their time coiled up in containers.



Carole Saucier, www.reptilecare.com

Corn snakes may soak frequently in water.



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regular changing, cleaning and disinfection are necessary.

DIET

- In the wild, hatchlings feed largely on small lizards and tree frogs, while adults feed on small rodents and birds, killing their prey by constriction.
- In captivity, hatchlings can easily be started on pinkie mice (1-2 days old), quickly moving up the prey scale to fuzzies, crews and small adult mice. A live rodent should not be left unattended with any snake.
- Juveniles are fed every 5-7 days; adults every 7-10 days.
- Corn snakes need water every day but most people probably will not see the snake drink.

RESTRAINT

- Minimal restraint is recommended as corn snakes are normally very docile. The body must be fully supported.
- Corn snakes will not wrap snugly around the handler's arm, but they tend to pick a direction and go, so the head can be gently guided in another direction.

ANESTHESIA

- The use of premedication eases induction and may provide some analgesia: butorphanol (1-2 mg/kg IM), low dose ketamine (5-20 mg/kg IM), tiletamine/zolazepam (3 mg/kg IM).
- Intravenous induction (with/without premedication) using propofol (5-10 mg/kg IV).
- Gaseous induction with isoflurane (5%) via mask, induction chamber or by intubating the sedated patient and performing intermittent positive pressure ventilation (IPPV).

Corn Snakes

- Maintenance is achieved with isoflurane and oxygen via an uncuffed endotracheal tube connected to a non-rebreathing circuit, IPPV at 4-8 breaths/min and pressure of 16-10 cm H_2O.
- It is very important to maintain body temperature.
- For recovery, IPPV may be provided with room air rather than 100% oxygen to encourage spontaneous respiration. Decreasing the IPPV frequency will hasten recovery.

MOST COMMON DISORDERS

- Dysecdysis (retained skin shed, retained eye spectacles)
- Respiratory infections
- Stomatitis
- Cloacal prolapse
- Constipation and loss of appetite
- Dystocia/retained eggs
- External (mites and ticks) and intestinal parasites
- Cryptosporidiosis
- Bite wounds from prey
- Skin problems
- Inclusion body disease
- Spinal fractures/trauma and burns

ZOONOTIC POTENTIAL

- *Salmonella*, as with all reptiles
- *E. coli* and other enteric pathogens
- Pentastomiasis

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A female snow color morph corn snake



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Blood Python Pet Care



Male *Python curtus curtus*

VITAL STATISTICS

Life span	25+ years
Adult size	
Females:	4-6 feet (1.2-1.8 m) avg
Males:	3-5 feet (0.9-1.5 m) avg

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Blood Python (*Python curtus*)

Giuseppe Visigalli, DVM

SUBSPECIES

- Blood python or Sumatran blood python (*P. c. curtis*)
- Malaysan blood python or red blood python (*P. c. brongersmai*)
- Borneo blood python or short-tailed blood python (*P. c. breitensteini*)

ORIGIN / FREE-RANGING HABITAT

- Malaysia, Sumatra, Borneo, coastal Thailand and Cambodia
- Palm plantations, tropical forests and marshes

PHYSICAL CHARACTERISTICS

- Blood pythons are squat, heavy-bodied serpents with varied markings.
- Coloration may vary from yellow, tan and brown to a bright red, cherry red or oxblood with lighter tan, gold, orange and black blotched markings.
- The head is typically gray, although specimens may exhibit black, light gray or even red heads.
- Blood pythons are well known for their changing head colors (e.g., black-headed snake in the evening and very pale head in the morning).
- Some blood pythons exhibit broken dorsal striping.
- Color mutations include striped, T+ albino, T- albino, ivory (white body with gray and black dorsal speckling) and hypomelanistic

Blood Pythons

SEXING AND REPRODUCTION

- Sexual determination by probe depth is 9 subcaudal scales for males and 3-4 for females.
- Sexual maturity is 18 months to 4 years.
- Breeding size occurs at lengths of 3-5 feet (0.9-1.5 m).
- Wild-caught females may not breed at all in captivity.
- Breeding season in captivity typically ranges from November to March. All feeding should be stopped at this time. Animals should be well established and in excellent condition before breeding is attempted.
- Breeding may be induced by reducing daytime photoperiod to 8-10 hours and dropping nighttime temperatures to around 75°F (24°C). The female should be introduced into the male's cage. Misting the animals with water may also induce breeding activity.
- Females shed 14-20+ days after ovulation; eggs are typically laid within 30 days of post-ovulation shed.
- Clutch size varies from 8-20 eggs.
- At an optimal incubation temperature of 88-90°F (31-32 C°), these eggs take an average of 60 days to hatch.

BEHAVIOR

- Nocturnal
- Timid; may be temperamental, especially young snakes
- Wild-caught pythons tend to be nervous, irritable and even aggressive
- Captive-bred specimens often mature into docile, placid animals
- Blood pythons are suitable for intermediate keepers.
- They are non-venomous.

Python curtus brongersmai



Python curtus breitensteini



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Blood Pythons

CAPTIVE HOUSING

- Minimum cage size (enclosure perimeter) for one adult python is the length of snake x 2.5.
- Enclosure may be simple or elaborate plastic sweater boxes (e.g., Rubbermaid®), melamine racks, Freedom Breeder® cages, or any of the commercially available plastic-type reptile cages. Glass aquariums and tanks are adequate; however, screen tops on such enclosures can make it difficult to maintain humidity levels.
- Feces/urates/uneaten prey items must be removed from the enclosure as soon as possible.
- Depending on cage conditions, all substrate and cage furniture should be removed and the enclosure completely disinfected using a 5% bleach solution approximately every 30 days. The enclosure must be rinsed thoroughly and allowed to dry before cage furniture and snake are replaced.
- Newspaper is the easiest and least expensive substrate material for cleaning and disinfecting. Cypress mulch holds humidity but excess humidity should be avoided. Do not use substrate containing cedar.
- Blood pythons are sensitive snakes that appreciate and utilize a hide spot, so at least two should be provided. Clay flowerpots, plastic flowerpot trays and commercially available hide boxes all work well.
- Because blood pythons are nocturnal, supplemental lighting is not necessary. However, if it is used it should run on a 12/12 cycle. Continuous bright, overhead lighting is stressful.

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Basking spot should be 88-89°F (31°C); ambient (background) temperature range is 78-82°F (25-27°C); minimum ambient temperature is 75°F (24°C).
- If the ambient temperature is strictly maintained around 80-84°F (26-28°C), a juvenile blood python can live in a simple Rubbermaid®/melamine rack setup without a basking spot or supplemental heat; it needs a basic hide box, water bowl and substrate.
- Under-cage heating pads, ceramic heat emitters, basking bulbs (both regular daytime and red “night” bulbs) are possible heating accessories.
- Thermostats, rheostats and/or timers must be used to control the heat source.
- Hot rocks should not be used in order to avoid serious burn.
- Heat emitters and bulbs, especially if combined with a screen top, will dry the air in the enclosure quickly, so additional humidity is needed.
- To provide a snake with a humidity level of 50-60%:
  - Use cypress mulch or a similar mold-resistant substrate that can be misted. It is advantageous if the substrate changes color when it is wet, thereby providing visual cue for the next dampening. Using cypress mulch requires disciplined maintenance, as a dirty and humid enclosure will quickly lead to unhealthy conditions.
  - A “humidity box” may be constructed for the snake by packing a plastic container with damp sphagnum moss (think well-wrung-out wash cloth to gauge moisture) with a hole cut in the top or side. Screen top on the enclosure needs keeping moisture from escaping. It is





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important to maintain a proper, reliable ambient temperature, as warm air holds more moisture than cool air.

WATER

- Fresh, clean water must always be available, as blood pythons have a tendency to drink copiously.
- A water dish should be large enough for the python to crawl into and soak. Ensure that the bowl is not too deep for juvenile animals—approximately 1 inch (2.54 cm) of water will suffice.
- Because snakes often defecate in their water bowls, regular changing, cleaning and disinfection are necessary.

DIET

- Primary diet is live rodents (young gerbils, mice) and birds (chickens). A live rodent should not be left unattended with any snake.
- Blood pythons are generally easy to convert to frozen/thawed or pre-killed rodents.
- Blood pythons should be fed with an appropriately-sized rodent weekly (prey = 2.5 x snake head size or 10-15% snake weight).
- Very young prey or defrosted prey need vitamin-calcium integration every 2-3 meals.
- Blood pythons can eat rats starting off with rat “crawlers” for younger snakes (every 5 days) and moving up in size as the animal grows.
- Sub-adult and adult pythons are prone to obesity due to a strong feeding response coupled with a slow metabolism,

so a 10-14 day feeding schedule is strongly recommended.
- In order to avoid regurgitation, it is recommended for the owner to not handle the snake for at least a day after feeding.

MOST COMMON DISORDERS

- Intestinal parasites
- Loss of appetite
- Respiratory disease
- Mouth rot
- External parasites (mites and ticks)
- Dysecdysis (retained skin shed, retained eye spectacles)
- Obstipation/constipation
- Bite wounds from prey
- Inclusion body disease
- Spinal fractures/trauma/thermal burns

ZOONOTIC POTENTIAL

- *Salmonella*, as with all reptiles

SPECIAL CONSIDERATIONS

- Clinical visits should be scheduled every 4-6 months and include a fecal exam for parasites.
- Microchip application for identification is advised.

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Boa Constrictor
Pet Care



Common boa *(B. c. imperator)*

VITAL STATISTICS

Life span	20-30 years in captivity
Adult size	
Females:	7-10 ft (2-3 m) avg
Males:	6-8 ft (1.8-2.4 m) avg
Adult we	~60 lb (27 kg)

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Boa Constrictor (*Boa constrictor*)

David Hannon, DVM, Dipl ABVP (Avian)

SUBSPECIES

There are 10 recognized subspecies; the first 6 are recognized by all herpetologists, while the last 4 are not.

- Common or Mexican boa (*B. c. imperator*)
- Red-tailed boa (*B. c. constrictor*)
- Argentine boa (*B. c. occidentalis*)
- Short-tailed or Amaral's boa (*B. c. amarali*)
- Clouded or Dominican boa (*B. c. nebulosus*)
- San Lucia boa (*B. c. orophias*)
- Northwest Peruvian or Orton's boa (*B. c. ortonii*)
- Peruvian black-tailed boa (*B. c. longicauda*)
- Ecuadoran black-bellied boa (*B. c. melanogaster*)
- Saboga Island or Pearl Island boa (*B. c. sabogae*)

ORIGIN / FREE-RANGING HABITAT

Central and South America, from northern Mexico to northern Argentina, and some islands in the Caribbean

Boa constrictors have been found from tropical rainforests to semi-arid plains in their native environment.

They are excellent swimmers and are often found inhabiting foliage along waterways.

Boas are semi-arboreal, although as they get older and larger, they will spend more time on the ground.

PHYSICAL CHARACTERISTICS

Boa constrictors have a base color of grey, cream or brown, with brown to red saddles along the dorsum. As

they progress caudally, the saddles occur closer together and have a more intense color.
- The number of saddles varies with subspecies, with *B. c. constrictor* having less than 20 saddles between the head and vent, while *B. c. imperator* has 21 or more and *B. c. occidentalis* has 29-30 interconnected dorsal saddles.
- Many color mutations and pattern variations have been developed in captive-bred boas.
- Boa constrictors have 2 functional lungs.

SEXING AND REPRODUCTION

- Male boas are typically smaller than females and have larger spurs and broader, thicker tails than females.
- In juveniles, the hemipenes may be everted, but in older animals cloacal probing is a much more reliable method of sexing. Adult females will typically probe to a depth of 2-4 subcaudal scales, while adult males will probe to a depth of 10-12 scales.
- Boas reach sexual maturity at 3-5 years of age.
- Boa constrictors mate in the wild between April and August. Females will normally display a mid-body swelling approximately two-thirds down the body length 2-3 weeks prior to ovulation. Following copulation, a postovulatory shed occurs 2-3 weeks after ovulation. Gestation generally lasts 100-120 days after the postovulatory shed.
- Boa constrictors are ovoviviparous and can give birth to a litter of up to 65 neonates, although 25 is average.

BEHAVIOR

- Boa constrictors are primarily nocturnal and crepuscular.
- Being a tropical species, boas do not hibernate.

Red-tailed boa *(B. c. constrictor)*



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Juvenile boa constrictor



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Northwest Peruvian boa *(B. c. ortonii)*



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Shown is a juvenile female boa constrictor in a shed cycle; the blue opaque eyes indicate the shed cycle.



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Boa Constrictors

- Although captive-bred individuals are generally docile if handled regularly, boas may strike if startled or threatened.
- Boa constrictors are best housed individually unless being paired for breeding. Females of similar size may be able to cohabitate, but males may fight.
- Boa constrictors are not generally considered “beginner’s snakes” due to their large adult size and potential for aggression, but they can be rewarding pets.
- Columbian boas are considered to have the most docile temperaments, while Mexican, Central American, and insular subspecies are more likely to become aggressive.
- Captive-bred boas tend to be much more docile than wild-caught ones.

CAPTIVE HOUSING

- Enclosures must be very secure. Full grown boas can be very powerful and an enclosure must prevent escape.
- A baby boa constrictor requires an enclosure that is at least 24 in (61 cm) long and 15 in (38 cm) tall (but it will quickly outgrow it).
- Adults need an enclosure at least 6 ft (1.8 m) long and 24+ in (61+ cm) wide and tall. Smaller subspecies may be adequately housed in a 4-ft (1.2 m) enclosure.
- Suitable substrates include newspaper or butcher paper, artificial turf, aspen shavings (avoid cedar and other shavings with aromatic oils), mulches and potting soil.
- Boas should not be offered food on a granular substrate due to the potential for substrate ingestion.
- One or more hiding areas should be provided.
- Because boas are semi-arboreal, providing a stick or log to climb on, particularly as a basking site, is recommended.

Boa Constrictors

ENVIRONMENTAL TEMPERATURE / HUMIDITY

- Enclosures should be maintained at 82-90°F (28-32°C) during the day and 78-85°F (26-30°C) at night. Focal basking sites can reach 95°F (35°C).
- Boas have no lighting requirements, but if lamps are used as a heat source, they should be turned off at night.
- A thermal emitter and/or a conductive heat source (e.g., heat tape, heating pad) may be used to maintain enclosure temperature at night.
- An ambient humidity of 50% should be maintained and can be increased to 70% during shed. Prolonged exposure to higher humidity may result in dermatitis.

WATER

- Fresh, clean water must always be available.
- A water dish should be large enough for the snake to crawl into and soak.
- Because snakes often defecate in their water bowls, regular changing, cleaning and disinfection are necessary.

DIET

- In the wild, boas eat a wide variety of whole prey, including rodents, birds, bats, lizards and amphibians.
- In captivity, mice and rats appear to provide adequate nutrition. Prey items should be no larger in diameter than the snake's maximum girth.
- Larger boas may be fed larger prey items, such as guinea pigs, rabbits and chickens.
- Killed frozen/thawed prey items are preferred over live prey to limit parasite transmission and prey trauma.
- Clean water should be available at all times. The bowl

A boa constrictor in a vivarium with a large water bowl.



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Boa constrictor imperator eating



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should be large enough to hold the snake's entire body.

RESTRAINT

- When handling a boa, the snake should be grasped with one hand just behind the head and the other hand is used to support the rest of the body.
- Larger snakes may need to be restrained by more than one person. Assistance should be sought when handling a snake that is longer than the height of the handler.

ANESTHESIA

- Propofol (3-5 mg/kg) IV may be used for anesthesia induction and short procedures. It may be accompanied by endotracheal intubation and isoflurane or sevoflurane.
- Some boas may be induced with isoflurane or sevoflurane via face mask or induction chamber.
- Premedication with a sedative, such as butorphanol (0.4-2.0 mg/kg IM), buprenorphine (0.02-0.2 mg/kg IM) or ketamine (5-20 mg/kg IM), may reduce struggling and breath-holding.
- Docile individuals may be able to be intubated while awake and induced via endotracheal tube, which allows for positive pressure ventilation if the snake holds its breath.
- Larger or aggressive snakes or ones that have poor venous access may be anesthetized with an IM injection of tiletamine HCl and zolazepam HCl (Telazol,® 2-6 mg/kg) or ketamine (10-60 mg/kg). The addition of a benzodiazepine or alpha2-agonist may smooth ketamine induction. However, IM anesthesia can result in prolonged recovery time.

Boa Constrictors

MOST COMMON DISORDERS

- Inclusion body disease
- Respiratory tract disease
- Stomatitis
- Vomiting/regurgitation
- Constipation
- External parasitism (snake mites, *Ophionyssus natricis*)
- Intestinal parasitism

ZOONOTIC POTENTIAL

- Boas fed poultry may harbor and shed *Salmonella*.
- Cryptosporidium, pentastomes and other species of internal and external parasites have been documented.

SPECIAL CONSIDERATIONS

- There is significant potential for human injury. Although no human deaths have been attributed to boa constrictors, there have been reported fatal incidents involving children caused by other species of constrictor that were of similar size and body type as boas. Boas have also been implicated in the deaths of other household pets.
- Boa owners must provide adequately-sized housing.
- Responsible ownership of a boas involves providing very secure housing to prevent escape and a commitment to avoid release of unwanted boas into the wild.

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A boa constrictor in a Belize jungle



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Horned Frog Pet Care



Ornate horned frog
(C. ornata)

Bruce Maclean

VITAL STATISTICS

Life span		4-8 years (avg)
Adult size	Females:	up to 6 in (15 cm)
	Males:	up to 4 in (10 cm)
Adult weight		200-300 g (7.0-10.5 oz)

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Horned Frog (*Ceratophrys* sp.)*

*Also known as pac man frog

Bruce Maclean, BSc (VetSci), BVM&S, MRCVS

SUBSPECIES

- Several *Ceratophrys* species within the family Ceratophyrinae are kept as pets, and some hybrids have been produced in the hobby.
- Common pet species include:
  - Ornate (Bell's or Argentine) horned frog (*C. ornata*)
  - Chaco (Cranwells) horned frog (*C. cranwelli*)
  - Surinam horned frog (*C. cornuta*)
  - Fantasy frog (cross between *C. cranwelli* & *C. cornuta*)

ORIGIN / FREE-RANGING HABITAT

- Origin is South America
- Horned frogs live in ground litter and debris, ranging from rainforests to drier areas.
- Their climate is generally sub-tropical to mild temperate, with or without a distinct rainy season.

PHYSICAL CHARACTERISTICS

- Horned frogs are very short and squat (sometimes the body width is greater than the length).
- They have extraordinarily large mouths.
- Their legs are relatively short and stubby.
- They are named for the fleshy "horn" over each eye, although its size is variable with the species and individual. This is not usually very marked in the most common pet species.

Horned Frogs

- The natural color is a green and brown pattern; captive animals have been bred for brighter colors, hypomelanism or even albinism.

SEXING

- Sexing may be difficult: males may show darker throats and nuptial pads on digit I on the forelimbs.
- Males are also the only ones to vocalize significantly.

BEHAVIOR

- Horned frogs are ambush predators; they sit and wait for passing prey.
- They may be diurnal or crepuscular, depending on local conditions.
- They brumate, up to months, depending on conditions in the wild.
- They can and will bite.

CAPTIVE HOUSING

- Relatively small enclosures are acceptable (commensurate with providing an adequate range of microhabitats); recommended minimum size for adults is 30 in (75 cm) long x 12 in (30 cm) wide.
- Horned frogs are best housed singly; even quite similar-sized individuals may be taken as prey.
- Ease of cleaning the enclosure should always be a priority.
- Horned frogs are natural burrowers, so several centimeters of substrate (sphagnum moss/leaf litter/coconut husk fiber/soil) are recommended, although more hygienic options of unbleached paper towels or nontoxic foam rubber are acceptable if sufficient hiding places are provided.

Cranwells horned frog *(C. cranwelli)* in an enclosure with hiding area



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Horned frogs use their colors and patterns to blend in with their environment to aid in catching prey and hiding from predators.



Adrian Pingstone

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Ornate horned frog *(C. ornata)*



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Ulcerative skin lesion from trauma



Bruce Maclean

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Horned Frogs

- Lighting should generally be subdued.
- Full-spectrum lighting is not generally considered necessary for these frogs, but it should be available, with the proviso that it is relatively low intensity and they can escape from it completely if they choose.
- Normal amphibian water quality considerations apply; dechlorinated water/rain water/bottled spring water should be used.
- Adequate hiding places (distributed throughout the thermal gradient/mosaic) are necessary.
- Live plants help microhabitat formation, but the frogs may dig in under the plant, so any plants should be hardy as well as nontoxic.
- A shallow water bath should be available; deep bowls should be avoided as a drowning risk.

ENVIRONMENTAL TEMPERATURE

- A gradient is necessary. The recommended temperature range is 73-86°F (23-30°C) with a drop of a few degrees at night; they are generally quite hardy at lower temperatures.

DIET

- Free-ranging horned frogs eat almost anything that will fit in their mouths.
- In captivity, a variety of invertebrates and small rodents is recommended.
- Rodents should be limited in quantity due to concerns over nutritional issues for amphibians (excesses of vitamin A, other vitamins, fat).
- Note that in the wild these frogs do not feed for several months a year; overfeeding is very common in captivity.

Horned Frogs

- Feeding should be to effect (judged on body condition), but adults should generally be fed no more than weekly to every 2 weeks.

RESTRAINT

- Washed, powder-free gloves should be used; evidence suggests vinyl gloves are least likely to cause reactions, especially in tadpoles.

ANESTHESIA

- Typical amphibian anesthesia with buffered MS-222 (tricaine methanesulfonate) is recommended: 0.5-1.0 g/L (5-10 ppm) may be used for induction.
- Care should be exercised to avoid drowning during induction.
- Another anesthetic to consider is propofol (10-30 mg/kg intracoelomic).

MOST COMMON DISORDERS

- Metabolic bone disease/nutritional hyperparathyroidism complex
- Impactions with substrate, due to their indiscriminate feeding lunges
- Nutritional issues associated with excessive feeding, especially of rodents
- Ulcers associated with trauma or pressure sores
- Atypical mycobacterial infections

ZOONOTIC POTENTIAL

- Like most amphibians, horned frogs can harbor or suffer from various pathogens (notably atypical mycobacteria and bacterial species, also some fungi), which are

Atypical mycobacteriosis resulting in a swollen thigh.



Bruce Maclean

Eye lesion of unknown etiology



Bruce Maclean

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Radiograph shows a large bony deformity in the right thigh, which appeared to be a healing fracture/callus.

Bruce Maclean

recorded as zoonotic, although specific reports associated with these frogs are rare.

SPECIAL CONSIDERATIONS

- There is significant potential for human injury. Although no human deaths have been attributed to boa constrictors, there have been reported fatal incidents involving children caused by other species of constrictor that were of similar size and body type as boas. Boas have also been implicated in the deaths of other household pets.
- Boa owners must provide adequately-sized housing.
- Responsible ownership of a boas involves providing very secure housing to prevent escape and a commitment to avoid release of unwanted boas into the wild.

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Alligator Snapping Turtle Pet Care



Alligator snapping turtle (*Macroclemys temminckii*) has a jagged appearance, with 3 pronounced ridges.

VITAL STATISTICS

Life span	20-70 years in captivity
Adult size	
Carapace length	16-26 in (40-66 cm)
Weight	150-175 lb (68-79 kg)

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Alligator Snapping Turtle (*Macroclemys temminckii*)

David Hannon, DVM, Dipl ABVP (Avian)

ORIGIN / FREE-RANGING HABITAT

- Southeastern United States, primarily in the Mississippi River Valley, extending west to eastern Texas, Oklahoma and southeastern Kansas, north to Illinois, and east to western Georgia and the Florida panhandle.
- Alligator snapping turtles are found only in river systems that empty into the Gulf of Mexico.
- Introduced populations have been found in California, Arizona, Michigan, Indiana, Virginia, Maryland and Puerto Rico.
- *Macroclemys* are predominantly aquatic chelonians that inhabit deep water. They are most commonly found in deep slow-moving rivers with steep banks but can also be found in lakes, canals, swamps and bayous.
- Hatchling and juvenile turtles tend to inhabit small streams.

PHYSICAL CHARACTERISTICS

- Alligator snapping turtles are the largest freshwater turtles in North America.
- *Macroclemys* range in color from gray to brown to black to olive green and are often covered in algae.
- Compared to the common snapping turtle (*Chelydra* spp.), which has a rounded and smooth carapace, the alligator snapper's shell has a more jagged appearance, with 3 pronounced ridges running in a cranial to caudal direction across the dorsal carapace.
- The plastron is also comparatively small.

Alligator Snapping Turtles

- *Macroclemys* has a broader and more pointed head then *Chelydra* spp., usually with sharp points projecting from the rostral aspect of the maxillary and mandibular beak.
- Snapping turtles are unable to retract fully into their shells.
- The rostral aspect of the tongue is pink and vermiform and acts like a lure to attract prey to the turtle's mouth.
- The eye is surrounded by a ring of fleshy eyelash-like protuberances.
- The tail is long and prehensile and is used to anchor the turtle to underwater rocks or logs while waiting for prey.

SEXING AND REPRODUCTION

- Alligator snappers are not sexually mature until they reach 11-13 years of age and a body weight of 30 lb (14 kg).
- Males tend to have longer and thicker tails than females.
- Breeding occurs in early spring in Florida and late spring in the Mississippi Valley.
- The female will lay a clutch of 8-52 spherical eggs 1.25-2.0 in (3-5 cm) in diameter in sandy soil approximately 160 ft (50 m) from the shore. Incubation takes 100-140 days.
- Hatchlings emerge in the early fall.

BEHAVIOR

- Alligator snapping turtles only leave the water to lay eggs.
- They tend to be very sedentary, preferring to wait for prey opportunistically.
- In the wild they will remain solitary unless breeding.
- When threatened, they will face the threat with the neck retracted and the mouth open and will bite if approached.
- Alligator snapping turtles do not hibernate.

The common snapping turtle (*Chelydra serpentina*) has a relatively smooth carapace as compared to the alligator snapping turtle.



Alligator snapping turtles have a red fleshy worm-like lure in their mouth to attract prey.



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Alligator snapping turtles require large tanks for housing.



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Alligator Snapping Turtles

CAPTIVE HOUSING

- Alligator snapping turtles need an aquatic environment.
- They do not need basking sites.
- Hatchlings can be housed together, but adult turtles should be maintained in separate enclosures.
- Turtles housed in mixed multispecies exhibits will often prey upon their cagemates.
- Hatchlings may be housed in a 20- to 50-gallon tank, depending on number.
- Juveniles (6-12 in [15-30 cm] carapace length) may be housed in 100-gallon aquariums or smaller stock tanks.
- Adults need an 800-gallon or larger tank or pond.
- A powerful filtration system is needed to keep the water clean.
- Submerged rocks or logs should be provided for the turtle to hold on to with its tail while under water. It is ideal to place them at a depth that allows the turtle to reach the surface with its nose to breathe without having to let go.
- A floating piece of wood or other material for hiding under will provide the turtle with an added sense of security.

ENVIRONMENTAL TEMPERATURE

- Water temperature should be maintained at 70-80°F (23-25°C).
- Alligator snappers need a photoperiod of 8-12 hours. Because the turtle spends most of its time submerged, basking and UV lights are unnecessary.

DIET

- Alligator snappers typically passively hunt during the day and actively forage at night.

Alligator Snapping Turtles

- Hunting involves remaining still and using the vermiform appendage on its tongue to attract prey.
- In the wild, these turtles eat fish, frogs, snails, crayfish, insects, snakes, worms, clams, ducklings, aquatic plants, carrion, small alligators, nutria and other turtles.
- They have also been documented eating floating fruit, grass, nuts and flowers that have fallen into the water.
- In captivity, these turtles can be fed fish (guppies, minnows, goldfish, or larger—alive or dead), crayfish, cooked chicken or beef, beef liver or heart, mice, rats, chicks and commercial turtle food.
- They should also be offered vegetable matter, such as water hyacinth, water lettuce, carrots, apples, grapes, cherries and bananas.

RESTRAINT

- Smaller specimens may be grasped on either side of the shell. The alligator snapper's neck is too short to get around to the hand in that position, although they may be able to scratch the hands with their rear claws.
- Larger specimens should be grasped by the carapace, with one hand on the cranial aspect right behind the head, and the other on the caudal aspect just above the tail.

ANESTHESIA

- If a peripheral vein is accessible, propofol (3-5 mg/kg) may be administered IV for anesthesia induction or short anesthetic procedures.
- IM administration of ketamine (20-40 mg/kg) and midazolam (2 mg/kg); or ketamine (4-10 mg/kg), butorphanol (1-2 mg/kg) and medetomidine (40-150 μg/kg) should

A hatchling alligator snapping turtle



Alligator snapping turtle will face a threat with the neck retracted and the mouth open.



Chris Howey

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Leucistic alligator snapping turtle





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provide ample sedation to facilitate handling and endotracheal intubation.

- Following induction and intubation, anesthesia may be maintained with isoflurane or sevoflurane with intermittent positive pressure ventilation.
- Aquatic turtles have a propensity to hold their breath, and they are very resistant to the effects of hypoxia. For this reason, anesthesia mask or chamber induction is not recommended.

MOST COMMON DISORDERS

- Trauma
- Dehydration and cachexia in individuals confiscated from poachers
- Leeches
- Intestinal parasites (nematodes, acanthocephalans, flukes)
- *Haemogregarina parasitemia*
- Herpesvirus
- Toxin exposure (mercury, organochlorine pesticides)
- There are unconfirmed suspicions that *Macroclemys* may be susceptible to *Mycoplasma* and iridovirus

ZOONOTIC POTENTIAL

- Although there have been no published reports of *Salmonella* spp. isolated from alligator snapping turtles, all aquatic turtles should be considered potential vectors for this pathogen.

SPECIAL CONSIDERATIONS

- This species is listed as a CITES Appendix III species by the International Union for Conservation of Nature (IUCN). It is not currently listed as endangered or threatened by the US

Fish and Wildlife Service (USFW).

- Because of their aggressive nature and large adult size, this species should only be kept by experienced herpeto-culturists or in zoological collections.
- Alligator snapping turtles have very powerful jaws and sharp beaks, and they can be quick to inflict a nasty bite or even sever a finger.

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Mud Turtle Pet Care



Chris Leone, www.gardenstatetortoise.com

Eastern mud turtle (*Kinosternon subrubrum*)

VITAL STATISTICS

Life span	10-15 years (avg)
Adult size	8-12 cm (3-5 inches) (avg) in length; maximum size is 22 cm (9 inches)

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Mud Turtle (*Kinosternon* sp.)

Jennifer Mosier, DVM

COMMON SUBSPECIES

- Eastern mud turtle or common mud turtle (*K. subrubrum*)
- Striped mud turtle (*K. baurii*)
- Yellow mud turtle (*K. flavescens*)
- Sonoran mud turtle (*K. sonoriense*)
- *Pelusios* sp. (side-necked African mud turtles), found in sub-Saharan regions of Africa, have similar husbandry requirements.

FREE-RANGING HABITAT

- Mud turtles are found from southern Canada to central South America in areas of slow-moving or still, shallow bodies of warm water with moderate to heavy vegetation and soft bottoms.

PHYSICAL CHARACTERISTICS

- Mud turtles are generally dark in color and have a relatively flattened carapace. Different subspecies have subtle differences in shading as well as various shades of yellow or orange on the sides of the neck.
- All subspecies have two plastral hinges.
- Turtles in the Kinosterninae family have 10-11 scutes on their plastron compared to the 7-8 in Staurotypinae.
- Males tend to be larger than females of the same age and have thicker tails and larger heads.

Mud Turtles

BEHAVIOR

- Mud turtles are nocturnal and generally shy.
- They prefer to walk on the bottom of ponds and streams.
- Mud turtles can be very aggressive toward other individuals and need to be housed only with similar-sized members of the same species.
- They can release foul-smelling secretions when threatened.

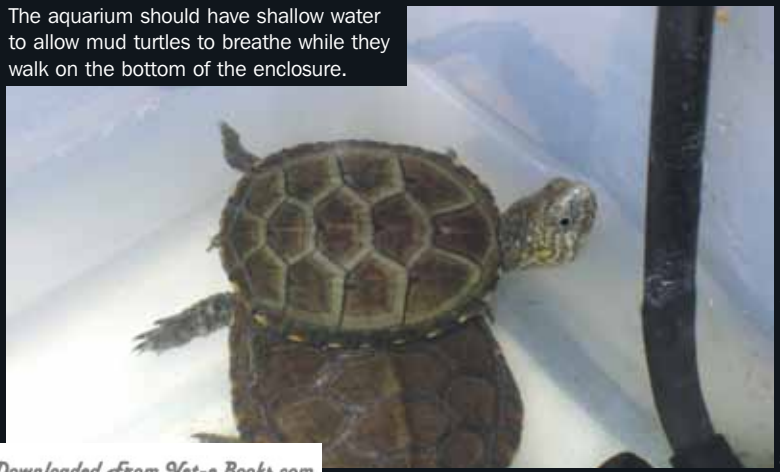
CAPTIVE HOUSING

- Outdoor housing with shade and haul-out areas is preferred.
- Aquariums may be used for indoor housing; a 20 gallon is fine for a hatchling, but adults need a larger enclosure.
- The aquarium should have shallow water with a depth as deep as the widest part of the turtle (2-4 inches [5-10 cm] for hatchlings and 8-12 inches [20-30 cm] for adults).
- A dry area, such as a pile of rocks, at one end of the enclosure should be provided for a basking spot.
- A heat lamp may be beneficial; it can be positioned over the dry area to provide a basking spot of 90°F (32°C).
- Water temperature should be 75-78°F (24-25°C). Abrupt changes in temperature may be harmful.
- Optimal water quality is essential for health. Both mechanical and biologic filtration are needed, with canister filters preferred.
- Frequent water changes are required.
- UVB full-spectrum lighting is believed to be important if there is no access to sunlight.
- A hiding place (e.g., half of clay flowerpot) under the surface of the water is essential.
- Aquatic plants will help mud turtles feel more secure.

Striped mud turtle (*Kinosternon baurii*)



The aquarium should have shallow water to allow mud turtles to breathe while they walk on the bottom of the enclosure.



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Free-ranging mud turtles spend much of their time walking on the bottom of ponds and streams.



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Shells can provide a hiding place for hatchlings.



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Mud Turtles

DIET

- Mud turtles are opportunistic carnivores or omnivores.
- The young are generally carnivores, with larger amounts of vegetation added to the diet with age.
- Adults should be fed 2-3 times per week; hatchlings are fed daily.
- Variety of diet is essential to maintaining good nutrition, and a mixture of insects, worms, snails, fish and vegetation should be offered.
- Commercial turtle diets are also widely available.
- Calcium supplementation is essential. Powdered calcium can be sprinkled on all foods. If the turtle is kept indoors the calcium supplement should include vitamin D_3.

RESTRAINT

- Individuals should be held by their shell in the middle of their body.
- The head and front limbs can often be exteriorized by pressing the hind limbs into the shell; the hind limbs can be exteriorized by pressing the front legs inside.
- If the mud turtle is uncooperative, chemical restraint may be necessary for a thorough examination and diagnostics.

ANESTHESIA

- Premedication with butorphanol IM is suggested.
- Analgesia may be achieved with butorphanol, buprenorphine and/or ketoprofen, but more information is needed.
- Induction with propofol is preferred when IV access is available.
- A combination of ketamine, medetomIdine and butorphanol IM may also be used.

Mud Turtles

- Chamber or mask induction with inhalants is not recommended due to their prolonged breath holding.
- Maintenance via inhalants may be provided after endotracheal intubation with an uncuffed tube. Note the short trachea and take care to intubate the bronchus.

MOST COMMON DISORDERS

- Diarrhea (secondary to improper diet)
- Aural abscess
- Internal parasites
- Chronic eye infections (hypovitaminosis A)
- Shell rot
- Trauma

ZOONOTIC POTENTIAL

- *Salmonella*, as with all reptiles

SPECIAL CONSIDERATIONS

- A fecal analysis is recommended for all new acquisitions and every 6-12 months thereafter.
- Many subspecies are endangered or threatened in the wild.

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Aquatic plants will help mud turtles feel more secure.



Chris Leone, www.gardenstatetortoise.com

Coconut shells may also be used for hiding places.



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Koi
Pet Care



Walt Oldenburg

VITAL STATISTICS

Life span	10-20 years in captivity
Size depends on genetics, with most Japanese imports being larger. Size is also dependent on water volume and water quality.	
Adult length	up to 28 in (71 cm)
Japanese imports	36+ in (0.9 m)
Chagoi	48+ in (1.2 m)
Adult weight	6.6-17.6 lb (3-8 kg)
Japanese imports	11-22+ lb (5-10+ kg)
Chagoi	44+ lb (20 kg)

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Koi
(*Cyprinus carpio*)*

*Also known as brocaded carp, Nishikigoi, koi carp

Helen E. Roberts, DVM

ORIGIN / FREE-RANGING HABITAT

Originally from central Europe and Asia.

Wild common carp are distributed worldwide in freshwaters.

PHYSICAL CHARACTERISTICS

Koi have a fusiform body shape and a paired set of oral barbels (distinguishing them from goldfish and goldfish-koi hybrids).

Scales

- Scale patterns vary from scales over the entire body, “matsuba” and “asagi” (scales arranged in a net pattern) or “doitsu” (scaleless, large scales only along the lateral line and dorsum, or large scales in a line along the base of the dorsal fin).
- “Ginrin” koi exist in any color variety and have scales that sparkle like diamonds.

Colors

- Koi varieties are named by their color pattern. The most common varieties are Kohaku (white fish with red), Sanke (white with red and black), and Showa (black with white and red). A poster showing 47 of the most common varieties can be found at www.akca.org.

Finnage

- Fins include a dorsal fin, paired pectoral fins and pelvic fins, and a single ventrally located anal fin. Most koi

have short fins and a tail proportional to their body size. Long finned and butterfly koi varieties are gaining in popularity. However, in a pond without adequate room or in crowded conditions, the long flowing fins are prone to traumatic injuries and tend to develop ragged margins.

SEXING AND REPRODUCTION

- Adult females have a rounder body shape and are less streamlined in appearance when compared to adult males.
- Spawning occurs most often in the spring when water temperatures approach 68°F (20°C).
- Spawning is less likely to occur in indoor ponds (where environmental cues for spawning do not typically occur) or when fish are under stress (e.g., overcrowded conditions, poor water quality and during disease outbreaks).
- During spawning, several males will pursue females, "bumping" them onto existing vegetation or artificial spawning media (mats or pads) to stimulate egg release. The males will then fertilize the released eggs.
- Koi will eat the eggs, so many farmers and hobbyists remove the pads or mats if they desire a hatch.

BEHAVIOR

- Koi are very food-oriented and will quickly recognize their owners as a source of food and follow them around the pond with their mouth open!
- Koi may be trained to come to a bell or a feeding station or may be trained to hand feed and perform a few tricks.
- Chagoi tend to be the most "friendly" of all the varieties.
- Novel skittish behavior or "hiding" behavior by the fish is a sign a predator may have visited the pond.

A Kohaku variety tosai (tosai = koi less than 1 year of age)



Helen E. Roberts

A valuable Sanke variety koi



Helen E. Roberts

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Koi can be captured using a net and carefully manipulated into a bowl. It is best not to lift the koi out of water using only a net as this can cause injury to the spine.



Helen E. Roberts

A koi receiving an IM injection near the base of the caudal aspect of the dorsal fin. Alternatively, the IM injection can be done in the epaxial musculature of a koi.



Helen E. Roberts

CAPTIVE HOUSING

- Due to their large size as adults, koi are best kept in ponds instead of aquaria.
- A recommended volume for 1 full-grown, adult koi is 500-1000 US gallons (2.27-4.5 kL). Small koi may be raised in smaller volume ponds or aquaria initially.
- Most owners keep koi in overcrowded situations, which predisposes them to stress, poor water quality and disease outbreaks.
- Life support equipment needs to be of sufficient size and durability to provide adequate water flow, biological filtration, waste solids removal and ease of maintenance.
- In addition, most experts recommend bottom drains for koi ponds for increased waste removal and water flow.
- Supplemental aeration is also beneficial.
- Some koi are very curious and like to explore novel items placed in the pond, such as humans, floating balls, the bubble stream from air stones, water stream (if dechlorinated) from a garden hose, underwater cameras and aquatic plants.

ENVIRONMENTAL TEMPERATURE

- The optimum temperature for koi is 68-75°F (18-24°C They can survive in temperatures 32-95°F (0-32°C).
- Koi housed in outdoor ponds are very susceptible to disease out-breaks in the spring as water temperatures gradually increase. For this reason, owners in cool climates often winter their koi indoors.
- Rapid temperature changes may be stressful; however, raising water temperatures may be beneficial in some disease outbreak situations.

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Koi

DIET

- Koi may be fed a commercial pelleted feed. It is recommended to purchase only what can be fed within 3 months and to rotate brands.
- Although wild carp are traditionally bottom feeders, most koi will accept, and prefer, a floating feed.
- A pelleted diet may be supplemented with fresh greens, orange sections, watermelon slices and romaine lettuce.
- Koi may be trained to hand feed with freeze-dried krill, “Manda fu,” or other palatable food.

SEDATION / ANESTHESIA

- Tricaine methanesulfonate (MS-222): 50-100 ppm (mg/L) (Finquel® - Argent Chemical Laboratories or Tricaine-S® - Western Chemical Inc)
- Metomidate 0.25-1.0 ppm (mg/L) (Aquacalm,® Western Chemical Inc)
- “Clove oil,” a mixture of isoeugenol, methyleugenol and eugenol, has been used. Isoeugenol and methyleugenol have been determined to be carcinogens by the National Toxicology Program, so the use of “clove oil” is not advised.
- Debilitated or stressed fish often require a lower dosage of anesthetic.

MOST COMMON DISORDERS

- Poor water quality is the cause of most stress/disease in koi eventually leading to poor health. Health problems are compounded by overfeeding, overstocking and a failure to appropriately provide an adequate life support system.
- Secondary bacterial diseases (external include “fin rot” and “tail rot” and cutaneous ulcers)

Hand feeding a butterfly koi



Helen E. Roberts

A traumatic injury that was sutured



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Gonadal neoplasia in a koi



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A severe ulcer in a koi



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Koi

- Septicemia, characterized by hemorrhages and fraying of the fins and tail, cutaneous hemorrhage and ulcers, coelomic distension/ascites, scale protrusion, anorexia and lethargy
- Cutaneous ulcers (usually secondary to poor water quality, external parasites and/or koi herpesvirus [KHV])
- Koi herpesvirus causes massive mortalities.
- External parasitic diseases
- Traumatic injuries and cutaneous masses
- Coelomic (gonadal) neoplasia
- Failure to quarantine is the most common cause of infectious disease outbreaks.

VACCINES

- Vaccines are not typically used in private practice for koi.

ZOONOTIC POTENTIAL

- There are no zoonotic pathogens specific to koi. All fish are potential carriers of *Mycobacterium* sp.
- Koi with clinical disease caused by *Aeromonas* sp. (common) and *Streptococcus iniae* (uncommon) may be considered a potential source for zoonotic disease.
- Bacterial pathogens may gain entry through existing open wounds on the skin or punctures obtained during handling.

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Seahorse Pet Care



Bruce Maclean

Dwarf seahorse

VITAL STATISTICS

Life span		20-70 years in captivity
Adult size		*Varies with the species*
	Length	0.8-12.0 in (2-30 cm)
	Weight	16-26 in (40-66 cm)

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Seahorse (*Macroclemys temminckii*)

Bruce Maclean, BSc (VetSci), BVM&S, MRCVS

COMMON SPECIES / ORIGIN

- Dwarf seahorse (*H. zosterae*) - Gulf coast of Florida
- Big belly seahorse (*H. abdominalis*) - Australasian waters
- Zebra snout seahorse (*H. barbouri*) - Southeast Asia waters
- Short-snouted seahorse (*H. breviceps*) - Australasian waters; (*H. hippocampus* [European/North African] may also be referred to as the short-snouted seahorse)
- Brazilian or long snout seahorse (*H. reidi*) - North and South American waters (Atlantic coast)
- Yellow or spotted seahorse (*H. kuda*) - Southeast Pacific region (often used as a "default" identification)
- Narrow-bellied seahorse (*H. angustus*) - Australasian waters
- Tiger tail seahorse (*H. comes*) - Southeast Asia
- Lined seahorse (*H. erectus*) - North and South American coastal waters
- Species identification may be difficult (based on various subtle morphological features, such as number of tail rings, fin rays, pattern of coronet); mislabelling by suppliers certainly occurs.
- There is also some overlap of usage of common names, or different usage in different countries.

FREE-RANGING HABITAT

- Seahorses are generally found hitched onto coral reefs or beds of sea grass or other vegetation.
- They are considered a relatively shallow water fish (most approximately 6.5-164 ft [2-50 m] in depth).

Seahorses

PHYSICAL CHARACTERISTICS

- Seahorses have several unique anatomical features, although the body plan is essentially similar to other fish. These features can make common diagnostic or therapeutic procedures more difficult or impractical.
- They lack scales, instead having dermal bony plates (which can make injections difficult).
- They swim upright.
- The mouth is small, located at the end of a long snout.
- Gills appear rounded and are inaccessible due to the small opening; this makes gill biopsies impractical, although branchial washing may be performed.
- The eyes can move independently.
- The tail is long and muscular (used for gripping or "hitching").
- Seahorses have some color change ability (variable with species).
- Their swim bladder is single chambered with no connection to the gut (physoclistous).

SEXING

- Seahorses are sexually dimorphic; the brood pouch is usually visible in males.

BEHAVIOR

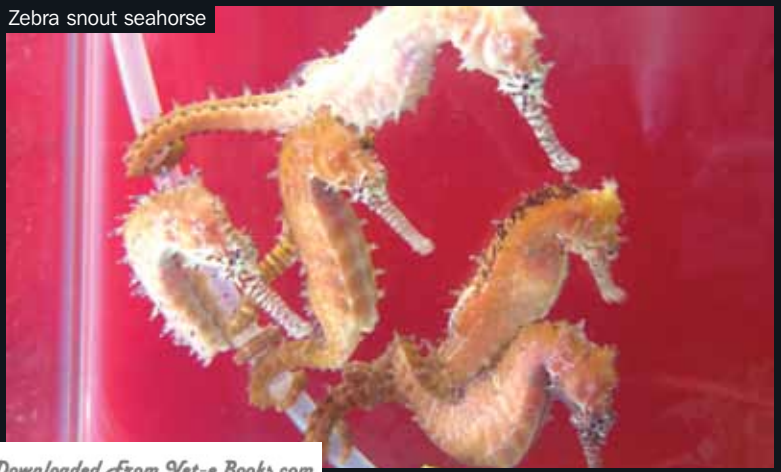
- Seahorses are fairly sedentary most of time (except for the daily greeting of its mate and the courtship dance).
- They are ambush or local hunting predators.
- Along with other syngnathids, seahorses are unique in the animal kingdom in that the male undergoes pregnancy. The female deposits eggs in the male's brood pouch with

Big belly seahorses



Bruce Maclean

Zebra snout seahorse



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Brazilian or long snout seahorse



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the ovipositor, which the male then fertilizes and incubates.
- Incubation is typically 2-4 weeks.
- The young are independent when born.

CAPTIVE HOUSING

- Tanks should generally be deep rather than long; a minimum of 3 times the uncurled length of the seahorse is recommended.
- Recommended water parameters are:
  - pH 8.0-8.3
  - Specific gravity 1.018-1.024
  - Ammonia 0
  - Nitrite 0
- Generally, live rocks are best avoided, due to the potential for harboring pests and predators.
- Aeration should be reasonable, but significant water currents should be avoided as much as possible.
- Artificial lighting is not generally considered necessary for the seahorses but will enhance viewing pleasure.
- Tank companions are generally best avoided, with the possible exception of very inoffensive fish, such as blennies or gobies as “clean up” fish. Seahorses do not generally compete well with other fish.
- Gastropods may also be used for clean-up purposes.
- Adequate hitching sites are essential.
- Seahorses naturally hunt in nooks and crannies—a reasonable variety should be provided.

ENVIRONMENTAL TEMPERATURE

- Depends on species; may be broadly:
  - Warm tropical = 73-77°F (23-25°C): *H. barbouri,*

H. kuda, H. reidi, H. zosterae, H. erectus, H. breviceps, H. comes

- Temperate = 64-68°F (18-20°C): *H. abdominalis, H. breviceps*

DIET

- Any small invertebrates may be offered.
- Seahorses will learn a regular feeding regime.
- Typically frozen or live mysids and/or brine shrimp are fed in captivity; a variety should be provided where possible and enrichment strategies used.

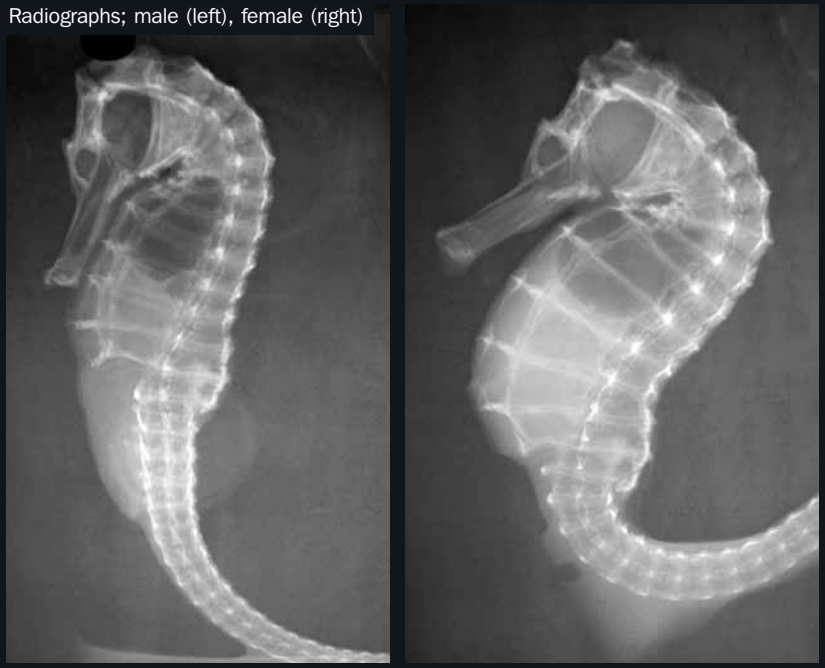
RESTRAINT / ANESTHESIA

- As with all fish, handling with rinsed powder-free gloves (possibly vinyl preferred) is recommended.
- Standard fish anesthesia with buffered MS-222 (tricaine methanesulphonate) is appropriate; 0.05-0.1 g/L (50-100 ppm) may be used for induction.

MOST COMMON DISORDERS

- Gas problems: may be gas in brood pouch, gas bubbles on tail or gas bladder overinflation. Acetazolamide may help, particularly with brood pouch or gas bladder issues.
- Mycobacteriosis; presentation may often be relatively acute, although chronic wasting is also possible (typically sporadic cases).
- Vibriosis is common in stress situations.
- Most parasites of marine fish can also affect seahorses.
- Systemic bacterial, fungal (phaeophyomycosis) and viral diseases

Radiographs; male (left), female (right)



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Two seahorses hitching to one another



Tail rot



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VACCINES

- No vaccines are available or routinely used in pet seahorses, although some public aquaria have reportedly used vibrio bacterins.

ZOONOTIC POTENTIAL

- Seahorses commonly suffer from mycobacteriosis and other bacteria, which may be possible zoonotic risks.

SPECIAL CONSIDERATIONS

- Because they are relatively delicate, they are not considered a beginner's pet; they are often very difficult to rear successfully.

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Axolotl
Pet Care



Stan Shebs

Axolotl *(Ambystoma mexicanum)*

VITAL STATISTICS

Life span	10-15 years (avg)
Adult size	9-12 in (23-30 cm)
Adult weight	4.2-7.0 oz (120-200 g)

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Axolotl (*Ambystoma mexicanum*)

Stephen A. Smith, DVM, PhD

SPECIES

- *Ambystoma mexicanum* is an amphibian, one of the Mexican neotenic mole salamanders that belongs to the tiger salamander group.
- They are often confused with larval forms of the closely-related tiger salamander (*Ambystoma tigrinum*).

ORIGIN / FREE-RANGING HABITAT

- Axolotls are native to freshwater subterranean lakes and canals (Lake Xochimilco and Lake Chalco) near Mexico City in central Mexico.
- Wild axolotls are near extinction due to habitat destruction, water pollution, extirpation by non-native species and urbanization.
- Free-ranging individuals are extremely rare and are listed as an endangered species under Appendix 2 of CITES.

PHYSICAL CHARACTERISTICS

- Larval axolotls fail to undergo complete metamorphosis and, as a result, retain gills and an aquatic life style as sexually mature adults.
- Axolotls have broad heads with lidless eyes and underdeveloped limbs with long, thin toes.
- Three large, feathery gills (rami) are located externally on both sides of the head.
- The tail is laterally compressed and has a dorsal swimming fin along the entire length of the tail.

Axolotls

- Captive-bred animals come in a variety of color phases, including the natural olive green to brown, black, leucistic and albino.

SEXING

- Axolotls reach sexual maturity at 18-24 months of age.
- Adults are sexually dimorphic, with females having a heavier build and shorter and broader heads than males. Males also have several enlarged glands around the cloaca.
- After breeding, females may lay up to 300 eggs over several days. Eggs, which hatch in 2 to 3 weeks, should be removed as the adults will eat newly hatched larvae.

BEHAVIOR

- Though generally not overly aggressive toward tank mates, feeding activity may result in the lost of toes or gill tips.
- They are responsive to humans and readily adapt to being fed by hand.
- Axolotls are generally more active at night.

CAPTIVE HOUSING

- Axolotls may be maintained in large aquaria (10 gallon [38 L] or larger) or plastic tubs with shallow water.
- The water needs to be changed on a regular basis if a continuous filtration is not incorporated into the system.
- Although axolotls will sometimes use a dry area to crawl out of the water, they spend the majority of their time on the bottom of a tank.
- Lighting must be indirect so as not to increase the water temperature.

Axolotls are often confused with larval forms of the tiger salamander *(Ambystoma tigrinum)*, shown.



An adult albino axolotl displaying red eyes and feathery red gills.



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A female axolotl is shown. Axolotls are extensively used in research laboratories, in no small part due to the fact that they have astonishing regenerative potential.



Stan Shebs

Axolotls

- Small pebbles should be avoided as substrate to avoid being ingested.
- Only individuals of the same size should be housed together to avoid cannibalism.
- Clay pots or sections of PVC pipe may be used as hiding places.

ENVIRONMENTAL TEMPERATURE

- Axolotls prefer temperatures around 62.6-64.4°F (17-18°C) but can usually tolerate temperatures ranging from 57-68°F (14-20°C).
- The water should be on the soft side with a pH of 6.9-7.6.
- Chlorine and chloramines should be removed from the water as these may cause skin and gill problems.

DIET

- As carnivores, they may consume small prey items in the wild, such as fish, aquatic insects and worms.
- In captivity, they can be fed a variety of commercial fish pellets, crickets, shrimp, bloodworms, earthworms, mealworms and waxworms.

RESTRAINT

- If necessary, axolotls may be handled gently but firmly with powder-free gloves, as they may easily slip out of the holder's grasp.
- If using a net, a fine mesh is recommended to avoid abrasion to the gills and skin.

MOST COMMON DISORDERS

- Poor water quality due to poor filtration or inadequate water changes is the major problem of captive axolotls.

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Axolotls

- Elevated levels of ammonia from the buildup of nitrogenous wastes in the water may cause gill and skin damage.
- Secondary fungal infections, such as *Saprolegnia* spp., and bacterial infections, such as *Aeromonas* sp. and *Pseudomonas* sp., may be problems when water temperatures are suboptimal or the animals are stressed. A few recommended antibacterial treatments may be found in Armstrong and Malacinski.[1]

ZOONOTIC POTENTIAL

- Salmonellosis has been reported in axolotls, but other bacteria, such as *Mycobacterium* sp., should also be considered zoonotic.

SPECIAL CONSIDERATIONS

- Though suitable as aquarium animals, excessive handling by hand or net may cause damage to the gills and limbs of axolotls.

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Note the 3 separate feathery gills (rami) on each side of the adult axolotl's head.



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Mudpuppy Pet Care



Common mudpuppy (*Necturus maculosus*)

VITAL STATISTICS

Life span	11-15 years (avg)
Adult size	11-16 in (28-40 cm)

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Mudpuppy (Proteidae)

Stephen A. Smith, DVM, PhD

COMMON SUBSPECIES

Mudpuppies, or "waterdogs," belong to the amphibian family Proteidae, which consists of 2 genera: *Necturus* spp. (5 distinct species) and *Proteus* sp. (1 species).

- Common mudpuppy (*Necturus maculosus*)
- Alabama waterdog (*Necturus alabamensis*)
- Gulf Coast waterdog (*Necturus beyeri*)
- Neuse River waterdog (*Necturus lewisi*)
- Dwarf waterdog (*Necturus punctatus*)
- Olm (*Proteus anguinus*)

ORIGIN / FREE-RANGING HABITAT

Necturus spp. are indigenous to central North America, while the *Proteus* sp. is native to southern Europe.

Necturus spp. are found in freshwater habitats (shallow, slow-moving streams, rivers, ponds and lakes).

The common mudpuppy is found in rivers in the northeastern United States and parts of Canada.

Proteus anguinus, a blind aquatic salamander, is found in caves of the northern Adriatic Sea region.

PHYSICAL CHARACTERISTICS

Mudpuppies are neotenous, retaining many of the larval characteristics, such as external gills, in the adult stage.

They have a salamander shape with a broad, flattened head, short legs each with four digits, and a wide flat tail.

They are brown to bluish-grey in color with a grey underside.

Mudpuppies

SEXING AND REPRODUCTION

- The vent of the male has a transverse groove with 2 prominent papillae directed backwards at the rear of the vent.
- Mudpuppies mate in the fall and early winter, and females deposit eggs in the late spring or early summer.
- Clutches of 30-100 eggs are attached to substrate (rocks, logs, aquaria glass).
- Larvae hatch in 1-2 months and mature in 5 years.

CAPTIVE HOUSING

- Mudpuppies are bottom-dwelling animals and can be maintained in aquaria or shallow tanks.
- The water needs to be changed on a regular basis, or a continuous filtration system needs to be integrated into the aquaria or tank.
- Minimal lighting is required as mudpuppies are nocturnal.
- Caves and hiding places are recommended.
- Mudpuppies prefer room temperature or cooler temperatures, so heaters are not needed for this species.
- As with other aquatic organisms, chlorine, chloramines and other environmental contaminants should be removed from the water, as these may cause skin and gill problems.

DIET

- Mudpuppies are carnivores and feed on small fishes, crayfish, aquatic insects, insect larvae and mollusks.
- In captivity, they readily consume earthworms, bloodworms, mealworms, crickets and frozen shrimp.

RESTRAINT

- Mudpuppies should be handled gently but firmly with powder-free gloves, as they are slippery to hold.

Olm (*Proteus anguinus*)



The dorsal view of a mudpuppy shows large caudal fin and relatively large limbs.



A close up of the mudpuppy's head shows its flattened head, small eyes and very large plume-like gills.



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Dr. Karen E. Petersen, Dept. of Biology, University of Washington

Mudpuppy hatchlings





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Mudpuppies

- If a net is used for restraint, a fine mesh net is recommended to avoid abrasion to the gills and skin.
- Excessive handling by hand or net may cause damage to the gills and skin.

MOST COMMON DISORDERS

- Water quality disorders resulting from poor filtration or inadequate water changes are the major problems.
- Elevated levels of nitrogenous wastes in the water, such as ammonia or nitrites, may cause gill and skin damage.
- Fungal and bacterial infections may be secondary problems when water qualities or temperatures are suboptimal.

ZOONOTIC POTENTIAL

- Although there is nothing reported in the literature, zoonotic bacteria, such as *Mycobacterium* sp., should be considered.

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Pet Chickens Care*



Christoph Neumüller - Creative Commons-Share Alike License

VITAL STATISTICS

Life span	10-11 years	Heart rate	220-360 beats per min
Average weight	283-510 g (10-18 oz)	Rectal temperature	41.2°C (106.1°F)
Range of weights	50-2000 g, depending on breed	Sexual maturity	4.5-5 months (begin laying; sexually mature by 1 year)
Respiratory rate	12-37 breaths per min		

*Adapted in part from Johnson-Delaney C: Exotic Companion Medicine Handbook. Zoological Education Network, 2000.

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Pet Chickens

Cathy A. Johnson-Delaney, DVM, Dipl ABVP-Avian and **Steven Benscheidt,** DVM

BREEDS / PHYSICAL ATTRIBUTES

- Various chicken breeds have developed from domestication of the red junglefowl (*Gallus gallus, forma domesticus*) for different purposes: egg laying (leghorns), meat (Cornish) or meat and eggs (Plymouth rocks, Rhode Island reds and New Hampshire), as well as for exhibition.

LAWS AND PERMITS

- Maintaining, breeding, treating or commercially dealing with chickens may be regulated by laws that govern the protection of animals, property rights, exchange of goods, liability, epornitics, food for human consumption, hunting and transport of animals.
- Voluntary federal and state programs, such as the National Poultry Improvement Plan (NPIP), provide testing for specific diseases to facilitate transport of fowl.
- Local laws and city codes must be consulted for specific management guidelines (e.g., possibly limiting the number of roosters on a given amount of land).
- The recommendations in this section apply to individual chickens or small flocks that are maintained as pets or for egg laying.
- Numerous online resources are available for management of small flocks (e.g., www.ces.ncsu.edu/depts/poulsci/tech_manuals/small_flock_resources.html).

Pet Chickens

BEHAVIOR

- Chickens seem to be the fowl to which owners most easily bond and for which they are willing to seek veterinary attention when needed.
- They are usually gentle but during the breeding season can be aggressive, especially males.
- Chickens are easier to carry than other fowl, have less messy stool and produce fresh eggs for consumption.

CAPTIVE HOUSING FOR ADULTS

- Chickens are usually housed in groups outdoors where they can eat grass and peck for bugs.
- Studies of chickens kept in cages clearly show that without appropriate foraging material, feather pecking and other behavioral problems are common.
- Chicken coops provide shelter and safety for sleeping and laying eggs.
- Coops should be made of strong materials, be easy to clean and be dry and well ventilated.
- A shaded portion is essential, especially in summer, and supplemental heat may be necessary in winter climates.
- To prevent access by predators, wire sides or sheet metal should be extended underground, and the top should be covered with wire mesh.
- Indoor/outdoor aviaries should be as large as possible (with extra height for roosting).
- Roosts should be placed so that the tail or wing of a roosting bird does not touch the sides of the aviary.
- Natural turf surfaces are best, with an area designated for dust/sand baths.
- Appropriate indoor substrates include shavings, sawdust,

Leghorn



Rhode Island red



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Chickens are usually housed in groups outdoors where they can forage.



Karin Kanton, DVM

Coops provide shelter and safety for chickens.



Karin Kanton, DVM

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straw or recycled paper pellets to a depth of 6-8 inches (15-20 cm).

- The substrate should be changed routinely to prevent ammonia buildup.
- Clean nesting material, such as wood shavings, should be provided in the nests at all times.
- Many pet chickens reside in the home, with an area in a kitchen or laundry room sectioned off by gates.
- The substrate often consists of layers of newspaper with straw or hay, although towels, blankets or other types of cloth bedding may be provided in a small box for a roost.
- Pet chickens with access to carpet and upholstery fabric may entangle their nails, leading to injury, or may ingest these materials, leading to impactions or other gastrointestinal disorders.
- Pet chickens may peck and ingest other household items, such as rubber bands, small trinkets, jewelry, grouting, window/door insulation materials and even foam shoe insoles, which can also lead to gastrointestinal problems.
- Although many pet chickens appear to get along well with other household pets, such as dogs, cats or ferrets, they should not be left unattended.
- Sleeping boxes or pen areas should be well-secured at night or when owners are not home so that these other pets do not have access to the chickens.
- Pet chickens should be offered some daily access to the outdoors and dust/sand areas for grooming.

CAPTIVE HOUSING FOR CHICKS

- Until baby chickens are 10 weeks old they may need supplemental heat in a draft-free area.

Pet Chickens

- For 1-week-old chicks, the room temperature should be 90°F (32°C) with a gradual dropping of 5°F (3°C) per week until the temperature is 70°F (21°C).
- At 4 weeks of age the floor space should be one-half square foot per chick, gradually enlarging to 5 ft^2 (0.5 m^2) per chick at 21 weeks of age.
- One waterer should be provided for every 25-50 chicks.
- The water and food containers should be placed outside the edge of the hover brooders.

DIET FOR ADULTS

- Many disorders of captive poultry are directly or indirectly related to malnutrition.
- As with other birds, a seed diet is not a complete diet, nor is chicken scratch or cracked corn.
- Commercial formulated diets are available for domestic fowl and include chick starter, layer, broiler and adult maintenance, with considerable variation in the levels of calcium, protein and energy among the rations.
- It is best to feed commercial diets without coccidiostats, antiflagellates or antimicrobials.
- Extra-label use of medicated feed for production purposes is not allowed.
- The availability of fresh green plants to the diet provides the birds with nutritional diversity.
- Owners should refrain from offering their chickens table scraps, bakery goods and human foods in general.
- As an occasional treat, commercial mealworms or earthworms are relished.
- Because obesity is a major problem in pet chickens, portions of commercial poultry food should be measured.

Baby chicks may need supplemental heat until they are 10 weeks old.



Karin Kanton, DVM

As chicks mature the room temperature can be gradually reduced.



Karin Kanton, DVM

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Juvenile chickens are able to forage on their own.



Mother hen with her chicks



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Pet Chickens

- Birds that are not allowed to freely roam should have access to grit. The grit container should be emptied and refilled regularly with various sizes of grit because birds select only stones that are suitable for their body mass.
- Pellets or complete rations have an adequate supply of calcium and should not be supplemented with lime or crushed shell.
- Fresh, clean water must be available at all times.

DIET FOR CHICKS

- For the first 6 weeks of age, a 20% protein starter mash should be offered, which can be gradually changed to a 16% protein formula after 8 weeks of age.
- Feed should be provided to newly hatched chicks on a large, flat plate on which they can move around and practice picking.
- By 5-7 days of age, food can be offered in larger containers.
- Shallow bowls should be used for water, as small chicks may drown in large water containers.
- Reducing drinker depth by placing stones or glass marbles in the container will reduce losses.

SEXING AND REPRODUCTION

- Most chicken breeds show a marked sexual dimorphism.
- The size (height and width), body mass (weight), color of the plumage, shape of certain feathers, presence of spurs and the length and color of the tail feathers assist in gender determination between adults.
- Highly skilled individuals can determine gender by examining the cloaca in 1-day-old chicks or in adults.

Pet Chickens

- Behavioral clues, like dominance and certain mating rituals, may suggest a gender but are not always indicative.
- Endoscopic examination of the gonads provides definitive determination of gender in species with similar morphologic characteristics.
- The laying pattern is nondeterminant (the hen continues to lay if eggs are removed).
- The clutch size is 5-8 chicks, and the incubation period is 19-22 days

RESTRAINT

- The face and eyes of handlers should be protected from possible injury from spurs (cocks) or beaks.
- A hooked long stick can be used to gently catch chickens in an aviary.
- The legs of chickens should be restrained first and then the abdomen supported from below.
- A large bird can be restrained by placing it under one arm and pressing it gently against one's body.
- Birds can be calmed by placing a loose-fitting lightweight cotton sock over the head to reduce vision.
- Some chickens may go into a "hypnotic" state for noninvasive procedures by having their head placed under a wing and rocking them side to side.
- Chickens that are housed exclusively outdoors may become overheated during the trip to the veterinary clinic and subsequent examination.
- The examination room should be as cool as possible. If the chicken appears agitated and begins panting, the examination should be suspended until the panting stops.
- Midazolam (0.5 mg/kg IM) may alleviate anxiety and

Sexual dimorphism is evident in most breeds of chickens.



A chicken was presented with an overgrown beak, presumably due to malnutrition (it had been fed cat food). The beak was successfully trimmed with a Dremel tool, the diet was changed to commercial poultry feed and the overgrowth did not recur.



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Hematologic Reference Ranges for Domestic Fowl

Basophils	0-8%
Eosinophils	0-16%
Erythrocytes (RBC)	1.25-4.50 x10^6/mm^3
Hematocrit (PCV)	23-55 ml%
Hemoglobin	7.0-18.6 g/dl
Lymphocytes	29-84%
MCH	25-48 $\mu\mu$g
MCHC	20-34%
MCV	100-139 μ^3
Monocytes	0.05-7.00%
Neutrophils	15.1-50.0%
Platelets	13-70 x10^3/mm^3
Sedimentation rate	0.5-6.5 mm/hour
WBC	9-32 x10^3/mm^3

Biochemistry Reference Ranges for Domestic Fowl

Albumin	1.3-2.8 g%
Calcium	13.2-23.7 mg%
Cholesterol	86-211 mg%
Glucose	227-300 mg%
Creatine	0.9-1.8 mg%
Globulin	1.5-4.1 g%
Phosphorus	6.2-7.9 mg%
Potassium	3.0-7.3 mEq/L
Sodium	131-171 mEq/L
Total protein	3.3-5.5 g%
Uric acid	2.5-8.1 mg%

struggling, thereby decreasing the potential for overheating.

- The calming effect may greatly facilitate a thorough examination.

ANESTHETIC PROTOCOLS

- As with other birds, anesthetic protocols should include a balanced approach: anti-anxiety/sedation, analgesia and then anesthesia or loss of consciousness.
- The use of midazolam (0.25-0.5 mg/kg IM) coupled with the analgesic butorphanol (0.2-0.5 mg/kg IM) may be adequate for diagnostic procedures, such as radiography and ultrasonography.
- Anesthesia may then be induced with isoflurane via face mask and maintained via intubation.
- Chickens should have a pre-anesthetic blood pressure (systolic) value obtained using the wing and should be monitored during anesthesia with ECG and blood pressure measurements.
- Respiratory apnea to inhalant anesthetics is less likely if sufficient pre-anesthetic sedation and analgesia have been provided.
- Local anesthetic injection or infiltration using lidocaine 2% will not only provide local analgesia, but in combination with the pre-anesthetic medications, allow for lower concentrations of inhalant anesthetic gases to be used.

VACCINATION PROGRAM

- The goal in small chicken collections should be disease prevention by avoiding entry of disease organisms onto the premises.
- Vaccines for fowl are readily available for commercial use

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but not for smaller collections.

- Diseases commonly considered for vaccination, if endemic or if virulent strains are of concern in the area, include Marek's disease, infectious laryngotracheitis, pox, Newcastle's disease and infectious bursal disease.
- Chickens sold by feed stores or large suppliers may have already been vaccinated.

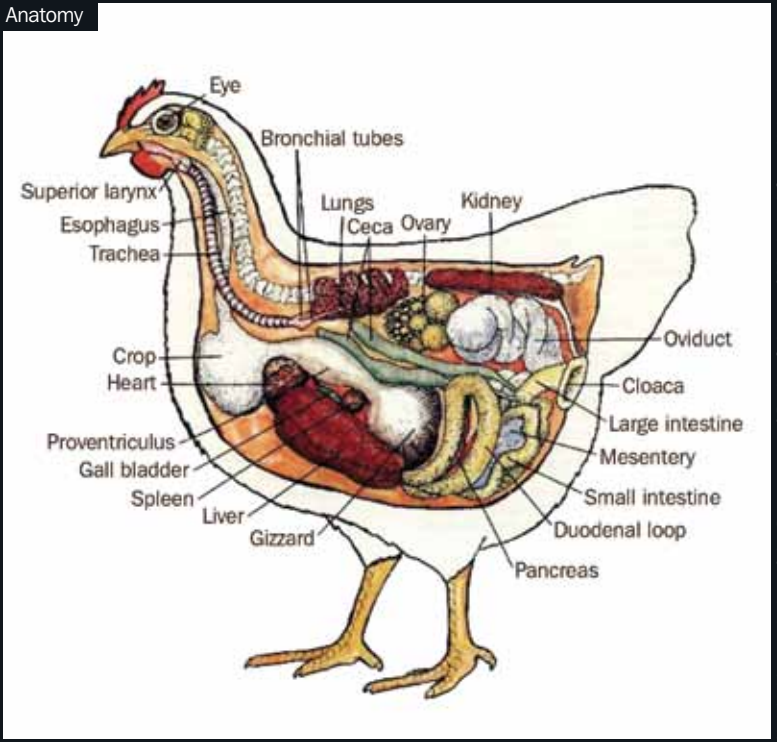
HEALTH CERTIFICATES

- The Veterinary Services Area Office for the specific state must be contacted for instructions on testing animals being transported to another country.
- Health certificates usually require testing for mycoplasma, salmonella (specifically the poultry-specific Salmonella pullorum) and influenza species.

GROOMING

- Most chickens take baths in dust or sand rather than water.
- The use of these abrasive materials on the plumage may function to lightly abrade and polish the edges of the feathers and may help reduce the number of external parasites as long as the sand itself is not contaminated.
- Insect powders should be used only if they are nontoxic and only if the birds in fact have parasites.
- Beak trimming is not recommended in chickens raised for hobby or for pets.
- When performed improperly, this procedure may interfere with the bird's ability to eat, may result in infection and even affect the bird's social ranking in the flock.
- Owners of pet roosters may have the veterinarian blunt the

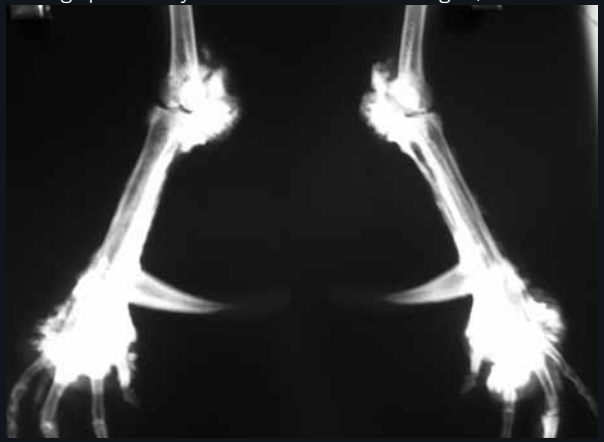
Anatomy



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Radiograph of a 9-year-old rooster with severe gout/arthritis.



Cathy A. Johnson-Delaney, DVM, Dipl ABVP-Avian

Ultrasound from an eggbound hen with oviductal adrenocarcinoma.



Cathy A. Johnson-Delaney, DVM, Dipl ABVP-Avian

tips of the spurs, which can be performed with a Dremel sanding tool.

- The veterinarian should wear appropriate mask and face protection to prevent inhalation of dust. The procedure should be monitored for potential bleeding, as with all birds.
- Trimming of the flight feathers can be performed, as with psittacines, to prevent birds from escaping from open aviaries or to reduce the mobility of an aggressive cock during the breeding period.
- A sufficient amount of wing feathers should remain to prevent damage to the keel if the bird should try to fly and instead crash.

BLOOD COLLECTION SITES

- Jugular vein
- Wing (brachial) vein
- Tarsal/metatarsal vein

MOST COMMON DISORDERS

- Pet chickens are susceptible to a wide variety of viral, bacterial, mycoplasmal, parasitic, chlamydial, rickettsial and fungal agents.
- Cannibalism may be expressed as vent picking, feather pulling, toe picking, head picking and egg eating. Overcrowding, incorrect feeding, an inappropriate daylight cycle, high light intensity, poor housing conditions (e.g., high proportion of toxic gases in the air), genetic predisposition and other factors may all promote cannibalism.
- Common internal parasites may include coccidia, roundworms and capillaria.

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Pet Chickens

- External parasites commonly found on chickens are lice, fleas, flies, mosquitoes, midges and ticks.
- Aging chickens develop atherosclerosis, cardiomyopathy, arthritis, gout, obesity and renal disease.
- Reproductive system diseases include chronic infections and neoplasia.

PRIMARY ZOONOTIC POTENTIALS

- Colibacillosis (*Escherichia coli*) - ingestion
- Erysipelas (*Erysipelothrix insidiosa*) - contact
- Tuberculosis (*Mycobacterium avium*) - ingestion, inhalation
- Salmonellosis (*Salmonella pullorum*) - ingestion
- Chlamydiosis (*Chlamydophila psittaci*) - inhalation, aerosol

COMMON DIAGNOSTIC TESTS

- CBC, serum chemistries
- Culture, sensitivity (state diagnostic lab)
- Fecal parasite examination (flotation, direct smear, centrifugation)
- Fecal Gram's stain
- Necropsy (state diagnostic lab)

THERAPEUTIC CONSIDERATIONS

- Therapeutics appropriate for chickens are listed in the literature and must be approved for use in "food" animals whether the animals are actually consumed or not.
- Off-label usage for food animals is more strict than for traditional companion animals: 1) there must be a proper veterinarian/client relationship; 2) the veterinarian must supply a scientifically based withdrawal time; 3) there must be a medical rationale for the drug noted in the record;

An ECG was performed on this rooster with congestive heart failure.



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Angela Lennox

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SELECTED ONLINE RESOURCES

- Cooperative Extension Service (check local telephone directory)
- The Game Bird Gazette (hobbyist magazine) www.gamebird.com
- Journal of the American Association of Avian Pathologists (Avian Diseases) www.aaap.info
- Journal of the Wildlife Diseases Association www.wildlife.org
- Journal of the Poultry Science Association www.poultryscience.org
- Avian Pathology www.tandf.co.uk/journals/titles/03079457.asp
- National Poultry Improvement Plan www.aphis.usda.gov/vis/npip
- www.farad.org
- FDA Center for Veterinary Medicine Extra-Label Use of Medicated Feeds www.fda.gov/cvm/CVM_Updates/CPGExtraLabelUse.htm
- http://madcitychickens.com
- www.chickendiapers.com
- www.backyardchickens.com
- www.mypetchicken.com
- www.henspa.com
- www.wikihow.com/Keep-Chickens-in-a-City
- www.the-scientist.com/news/display/53190
- www.msstate.edu/dept/poultry/pub1276.htm
- http://extension.missouri.edu/explore/agguides/poultry
- http://poultryextension.psu.edu/Management.html
- www.ext.vt.edu/pubs/poultry/factsheets/designs.html
- www.mcmurrayhatchery.com

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and 4) if scientific information on the human food safety aspect of the drug is not available, the veterinarian must take appropriate measures to ensure the animal and its food products do not enter the human food supply.

- If eggs from a bird being treated are consumed, the owner should be advised in writing of the withdrawal times for any and all medications used during the veterinary examination and therapy.
- Fluoroquinolone products may no longer be sold, distributed or administered to chickens whether they are pets or livestock.
- Other extra-label prohibitions include: diethylstilbestrol (DES), chloramphenicol, nitroimidazoles (including dimetridazole, metronidazole and ipronidazole), clenbuterol, dipyrone, glycopeptides (e.g., vancomycin), nitrofurans (including nitrofurazone, furazolidone, topical use prohibited as well), and gentian violet.
- One may access the Food and Animal Residue Avoidance Databank for prohibited drugs at www.FARAD.org.

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Ornamental Goose Pet Care



Piotr Kuczynski

Greylag goose *(Anser anser)*

VITAL STATISTICS

Life span	10-26 years in captivity
Adult size	Variable depending on species/subspecies: 1.1-6.5 kg (2.4-14.0 lb Canada geese: 3.2-6.5 kg (7-14 lb)

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Ornamental Goose (*Anser* sp., *Chen* sp., *Branta* sp.)

Michelle L. Campbell-Ward, BSc, BVSc (Hons I), DZooMed (Mammalian), MRCVS

COMMON SPECIES

Most common types kept can be divided broadly into three groups:

- **Grey geese (*Anser* sp.)** include greylag (*A. anser*), bean (*A. fabalis*), pink-footed (*A. brachyrhynchus*), greater white-fronted (*A. albifrons*) and bar-headed (*A. indicus*)
- **White geese (*Chen* sp.)** include snow (*C. caerulescens*), Ross (*C. rossii*) and emperor (*C. canagicus*)
- **Black geese (*Branta* sp.)** include Canada (*B. canadensis*), Brent (*B. bernicla*), barnacle (*B. leucopsis*), red-breasted (*B. ruficollis*) and nene or Hawaiian (*B. sandvicensis*)

BEHAVIOR

- Some species/individuals may be aggressive.
- Generally monomorphic, except for size and vocalization
- Monogamous
- Most species are sexually mature at 2 years of age.

CAPTIVE HOUSING

- Large predator-proof enclosure with a pond (min. 300 m^2 [360 $yards^2$] for 1 pair; up to 10 pairs per hectare)
- Geese should be housed in pairs or groups.
- Access to fresh water, preferably flowing, is necessary.
- Pond size: min. 20% water to land

Ornamental Geese

- Pond should have slope or ramp (<30°) for entry and exit.
- Plants are necessary for shelter, protection and shade.
- An artificial shelter should be erected if plant cover is minimal and/or the climate is harsh.
- Materials for nest-building (e.g., leaf litter, peat, fresh straw, piles of rocks/logs, old car tires) should be provided.
- Access to a large area of short grass for grazing, ideally on free-draining soil, is recommended.
- Clean, dry bedding should be provided.
- Geese may be kept with ornamental ducks.
- Overhead netting to limit wild bird access is desirable.
- Geese are tolerant of a range of temperature and humidity, provided that enclosure permits shelter from extremes.

DIET

- Grazers; strictly herbivorous
- Short herbs, grasses and clovers; may dig for roots/tubers
- Generally large areas of short grass sward are needed.
- If the grass area is not sufficient (e.g., high stocking densities and/or in winter) supplementation may be provided with dark leafy greens, pellets (waterfowl or poultry layer) and wheat.
- One feeder per pair is necessary to ensure all in group can feed freely, and a number of feeding stations and/or scattered food will promote normal foraging behavior.
- Grit should be available.
- Feeding excess food should be avoided; uneaten food promotes wild rodents, food spoilage (e.g., fungal growth) and eutrophication of water sources.
- Fresh sward should be used (not from the previous year) for goslings to avoid gizzard worms and gapeworms.

Bar-headed goose *(Anser indicus)*



Canada goose *(Branta canadensis)*



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Red-breasted goose (*Branta ruficollis*)



Canada geese mating ritual



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Ornamental Geese

RESTRAINT

- Geese can be aggressive and will bite.
- Limit access to water; drive into a corner.
- Geese may be restrained by placing one hand loosely around the neck while using the other hand to hold the wings in over the back and then sliding one hand under the body to restrain the feet.
- Alternatively, the goose may be lifted onto a forearm, tucking the neck under the arm so the head is pointing behind the handler (as demonstrated on a swan to the right).
- To aid restraint and to permanently limit flying ability where open enclosures are used, pinioning (amputation of the terminal phalanx of one wing) may be carried out on conscious goslings at 1-7 days of age. In older birds, anesthesia is required.



ANESTHESIA

- Pre-anesthetic fasting is not required.
- Options for pre-medication (not always required): butorphanol 0.5-1.0 mg/kg IM/IV or midazolam 0.1-1 mg/kg IM/IV
- Inhalational (via mask and/or endotracheal tube): isoflurane (5% induction; 2-3% maintenance) or sevoflurane (8% induction; 4-5% maintenance)
- Injectable option 1: medetomidine 0.15 mg/kg IV + ketamine 3 mg/kg (reversed with atipamezole 0.75 mg/kg IM)
- Injectable option 2: alfaxalone 5-10 mg/kg IV or IM
- Injectable option 3: alfaxalone/alfadalone 7 mg/kg IV
- Injectable option 4: propofol 10-15 mg/kg IV followed by

intubation and maintenance on isoflurane or sevoflurane
- Assisted ventilation may be required (manual/mechanical)

MOST COMMON DISORDERS

- Pododermatitis (bumblefoot)
- Alimentary tract impactions (if feeding on lush, long grass)
- Amyloidosis
- Botulism
- Algal and mycotoxicosis
- Yolk coelomitis
- Dystocia (egg binding)
- Cloacal organ prolapse
- Viral diseases, e.g., goose viral hepatitis, hemorrhagic nephritis and enteritis of geese
- Bacterial diseases, e.g., *Mycobacterium avium,* pseudotuberculosis, mycoplasmosis, salmonellosis, colibacillosis, chlamydiosis, *Pasteurella multocida* (avian cholera)
- Fungal diseases, e.g., aspergillosis, candidiasis
- Parasitic diseases, e.g., gizzard worm, schistosomiasis, coccidiosis, gapeworms, air sac mites
- Neonatal disorders, e.g., yolk sac infection/retention, enteritis, leg/wing deformities

VACCINES

- None essential, but vaccination for the following may be considered if significant risk factors are relevant:
  - Goose viral hepatitis 1
  - Hemorrhagic nephritis and enteritis of geese
  - Newcastle disease
  - Avian influenza
  - West Nile virus

Emperor goose (*Chen canagicus*) on its nest



Tim Bowman, USFWS

Canada goose and goslings



Donna Dewhurst

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Anser canagicus in a park

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Lesser white-fronted goose (*Anser erythropus*)



BS Thurner Hof: Creative Commons Attribution-Share Alike 3.0 Unported license

Bean goose (*Anser fabalis*)



Adrian Pingstone

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Ornamental Geese

ZOONOTIC POTENTIAL

- Avian influenza
- Avian tuberculosis
- Campylobacteriosis
- Chlamydiosis
- Erysipelas
- *Escherichia coli* infection
- Newcastle disease
- Salmonellosis

SPECIAL CONSIDERATIONS

- Regular annual endoparasite prophylaxis is recommended (e.g., with ivermectin, levamisole or a benzimidazole).
- New stock should be isolated for up to 1 month before introduction to existing group.

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Peafowl Pet Care



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Blue peacock (*Pavo cristatus*)

VITAL STATISTICS

Life span	20-25 years in captivity
Adult length	
Peacocks	5.9-7.3 ft (180-220 cm) *full breeding plumage* 3.5 ft (107 cm) *not breeding*
Peahens	2.8-3.1 ft (86-95 cm)
Adult weight	
Peacocks	8.8-13.2 lb (4-6 kg)
Peahens	6-8.8 lb (2.8-4 kg)

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Peafowl (Phasianidae)

David Hannon, DVM, Dipl ABVP (Avian)

SPECIES AND SUBSPECIES

- Peafowl are in the pheasant family; 3 recognized species:
  - Blue, Indian or common peafowl (*Pavo cristatus*)
  - Green or scaled peafowl (*Pavo muticus*)
    There are 3 subspecies of green peafowl:
    - Javanese green peafowl (*P. m. muticus*)
    - Indo-Chinese green peafowl (*P. m. imperator*)
    - Western Burmese green peafowl (*P. m. spicifer*)
  - Congo peafowl (*Afropavo congensis*)
- Many color mutations have derived from captive breeding.

ORIGIN / FREE-RANGING HABITAT

- Blue peafowl are native to India, Sri Lanka, Pakistan and Nepal. Green peafowl are native to the Asian subcontinent, ranging from Bangladesh to Vietnam and south to Malaysia.
- Javanese green peafowl are found in southern Thailand and Malaysia and also on the Indonesian island Java.
- Congo peafowl are native to central Africa, ranging primarily within the Democratic Republic of Congo.
- Peafowl may be found primarily in scrub areas and dense forests, but occasionally in more open country.
- They prefer to be near fresh water, often along riverbanks.

PHYSICAL CHARACTERISTICS

Blue peacocks/peahens

- Blue peacocks have a glossy blue head, neck and breast. Their backs are golden-green, and their wings are buff

white irregularly barred or mottled with black and a fan-shaped crest on the top of the head with blue-green tips.

- Blue peahens are more drab than males, with brown to bronze-green coloration of the head and back. Their neck is bronze-green cranially, fading to a buff and black mottled pattern. Their crown has green to brown tips.
- The peacock's most distinctive feature is its tail or train, which can be 4.6-5.3 ft (1.4-1.4 m) long. The display feathers are actually elongated covert feathers, which are made up of metallic barbs that are coppery bronze/gold/dark green and are supported by the shorter retrices.
- Most feathers have an "eye" or ocellus, with a blue center surrounded by rings of brilliant blue or green and copper.
- Males will molt and regrow their tail coverts in the fall.
- Chicks are brown with a buff breast. First year males show a blue neck and breast and full plumage at 3 years of age.

Green peacocks/peahens

- Green peacocks differ from blue peacocks in that their neck and cranial breast are green; their crown is more of a tuft than a fan. Green peahens have brighter plumage than blue peahens.

Congo peacocks/peahens

- Congo peacocks are primarily dark brown to black with a blue to violet breast. The throat area and cranial neck are devoid of feathers and are bright red in color. The crest is made up of many white and black hair-like feathers.
- Congos lack the long train their Asian counterparts have.

SEXING AND REPRODUCTION

- Adult peafowl are sexually dimorphic, although outside of the breeding season when the males are not in full

Green peacock (*Pavo muticus*)



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Green peahen (*Pavo muticus*)



Mark Pellegrini - Creative Commons Attribution-Share Alike license

Baby peafowl (*Pavo cristatus*)



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Peafowl

plumage, male and female green peafowl may look similar.

- Dimorphism occurs a few weeks after hatching.
- Peafowl are sexually mature at 3 years of age, although a yearling peahen may lay a fertile clutch if housed with a mature male.
- One male may breed with multiple females.
- Although they roost in trees, blue and green peafowl make their nests on the ground. Congo peafowl nest in trees.
- Peahens typically start laying eggs in April and will lay eggs every other day until a full clutch of 4-10 eggs is laid and will continue to lay if the eggs are removed from the nest.
- Incubation times vary from 27-30 days.
- Like other Galliformes, hatchling peachicks are precocial. They may be housed in brooders until 2-3 months of age.

BEHAVIOR

- Peafowl are diurnal and spend most of their time foraging for food on the ground and in shallow water. At night they will roost in trees, sometimes as high as 49 ft (15 m).
- They rarely fly but will if startled.
- The most impressive aspect of the blue and green peacocks is their ability to lift their tail feathers into a large arc 5.9-6.9 ft (1.8-2.1 m) wide to attract females. Males with the longest trains and largest ocelli are chosen for mates more often and sire larger clutches.
- Peafowl have a very loud high-pitched cry that is often voiced during mating season or as an alarm call.

CAPTIVE HOUSING

- Adult peacocks require large enclosures to accommodate their tails.

Peafowl

- Flight pens for breeder birds should be constructed at least 6 ft (1.9 m) tall and 10 ft (3 m) wide, with the length determined by the number of birds in the cage (80-100 ft^2 [7.4-9.2 m^2] per bird).
- It should be topped with wire or netting to prevent escape.
- A covered shelter may be placed at one end and should be at least 8 ft wide x 8 ft long x 6 ft tall (2.4 x 2.4 x 1.8 m).
- Multiple perches should be available for roosting and should be placed 4-5 feet (1.2-1.5 m) off the floor to prevent damage to the peacock's tail.
- Peafowl thrive in a free-range environment but are more susceptible to predation, escape or injury.
- Newly acquired peafowl should be penned for 4-5 months to acclimate them before they are allowed to roam freely.
- Peafowl should not be housed with other fowl. They are often aggressive toward other species.
- Supplemental heat may be necessary in colder weather.
- Nests may be built on the ground or in low structures, such as tires or buckets.

DIET

- Peafowl are omnivorous. Their natural diet includes plant parts (flowers, buds, seeds, leaves and berries), insects and other arthropods, reptiles, amphibians and crustaceans.
- In captivity, peafowl may be fed a game bird crumble or pellet suitable for pheasants. The diet may be supplemented with dry dog /cat food to increase dietary protein. Cracked corn may be offered in the winter to increase body fat.
- Breeders may be fed a game bird layer diet during breeding season.
- In captivity, peafowl may be offered supplemental fruits,

Blue peacock (*Pavo cristatus*)



Ltshears

Blue peahen (*Pavo cristatus*)



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Congo peacock (*Afropavo congensis*)



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Congo peahen (*Afropavo congensis*)



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vegetables, seeds, arthropods and grit, but free-range birds will supplement their diet with food in their environment.

- Chicks should be fed 30% game bird starter diet for the first month.
- Peafowl drink a large quantity of water and should have access to fresh clean water at all times.

RESTRAINT

- Birds should be grasped by the shoulders over the wings, not by the head, neck or legs.
- Peafowl may have formidable spurs and inflict injuries.
- Individuals may be transported in boxes or animal crates.
- Sufficient room and care should be given to prevent damage to the male's train.

ANESTHESIA

- Isoflurane/sevoflurane provide rapid induction via face mask and are generally safe, even in compromised individuals.
- Birds may be maintained at 2-3% isoflurane or 4-5% sevoflurane. Recovery is relatively rapid.
- If the bird is anxious, distressed or in pain, it may be given midazolam (0.25-0.5 mg/kg IM) and butorphanol (2-4 mg/kg IM) prior to handling or anesthesia induction.
- Alternately, injectable anesthesia with ketamine (20-25 mg/kg IM) and xylazine (1-2 mg/kg IM) may be used for short procedures.
- Close monitoring of core body temperature, heart rate and blood pressure should be provided for all anesthetized birds as well as intermittent positive pressure ventilation.

MOST COMMON DISORDERS

- External parasites (mites, lice, ticks, chiggers)

Peafowl

- Helminths (*Oxyspirura, Syngamus, Ascaridia, Capillaria* and *Cheilospirua* spp. and cestodes). Free-range peafowl or birds housed on dirt floors should be dewormed biannually.
- Protozoal infections (coccidiosis, histomoniasis, trichomoniasis, leucocytozoonosis and *Haemoproteus* infection)
- Viruses that have been documented in peafowl include Newcastle disease, fowl pox and hemorrhagic enteritis.
- Bacterial pathogens (*Salmonella pullorum, S. gallinarum, S. arizonae,* paratyphoid, *Mycobacterium avium, Bordetella avium, Haemophilus paragallinarum, Pasteurella multocida*)
- Other pathogens (*Mycoplasma gallisepticum, M. synoviae, M. meleagridis, Chlamydophila psittaci, Candida albicans*)
- Nutritional diseases (perosis, rickets, curled toe paralysis, crazy chick disease, white muscle disease, nutritional roup)
- Noninfectious conditions (trauma, impaction, foreign body ingestion and reproductive disorders)

ZOONOTIC POTENTIAL

- Peafowl may harbor *Chlamydophila, Salmonella* and *Mycobacterium* spp.

VACCINES

- Poultry vaccines may be used off-label to prevent Newcastle disease, fowl pox, hemorrhagic enteritis and pasteurellosis.

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Blue peacock lifting and fanning its tail feathers



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Blue peacock lifting and fanning its tail feathers



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Eclectus Parrot
Pet Care



Female and male red-sided eclectus

VITAL STATISTICS

Life span	20-30 years (max)
Adult length	12-14 inches (30-36 cm)
Adult weight	380-450 g

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Eclectus Parrot (*Eclectus roratus*)

Rose Ann Fiskett, VMD, Dipl ABVP-Avian Practice

COMMON SUBSPECIES

- Grand (*E. r. roratus*)
- Red-sided (*E. r. polychloros*)
- Vos (*E. r. vosmaeri*)
- Solomon Island (*E. r. solomonensis*)
- There are 10 eclectus subspecies.
- Eclectus subspecies look very similar and are often crossbred.
- The Eclectus Group organization has identification tables and photos on their web site (www.eclectusgroup.org) to help identify the subspecies.

ORIGIN

- Eclectus parrots originate from Australia, New Guinea and other South Pacific islands.

PHYSICAL CHARACTERISTICS

- The feather barbs are not as tight in eclectus as in other species, giving the feathers a more “hair-like” appearance.
- They do not produce dust as some other species of parrots and may be a better choice for people with allergies.

BEHAVIOR

- Eclectus parrots are affectionate, sociable and easily tamed.
- They need lots of attention from their human caretakers.
- Eclectus are generally calm in captivity, especially in the

presence of strangers.
- Unless socialized early, they may become alarmed by new situations or locations.
- To a greater degree than other companion birds, they may be frightened by anything new or unusual.
- While not a very vocal species, they do have a loud call that may make them objectionable in apartment dwellings.
- Both genders have mimicking ability, although the male may be a better talker.
- In captivity, females tend to be much more aggressive than males. In fact, females may traumatize or even kill their mates in breeding facilities.
- Hand-raised females may even become aggressive toward humans shortly after weaning.
- Male eclectus parrots are extremely docile, especially when hand-raised, and make desirable companions.
- Feather destructive behavior is common.
- "Toe tapping" has been described in eclectus as a regular and rhythmic extension and flexion of particularly P2 and P3 when the bird is perched at a complete rest. Some birds may, in addition, show a similar rhythmic "wing flipping/twitching." This "syndrome" is not seen to progress to more severe clinical signs and may actually be part of their normal behavior patterns.

CAPTIVE HOUSING

- Because eclectus are social, most birds appreciate interaction with their human companions on a daily basis.
- In the home, their enclosure should be placed near calm family activity. The minimum cage size for a pet bird should be 3 x 4 x 2.5 ft (1 x 1.2 x 0.8 m).

"DRUMMING" BY FREE-RANGING ECLECTUS

Cathy Johnson-Delaney, DVM, Dipl ABVP-Avian Practice



The Public Broadcasting System (PBS) has presented a Nature series program called "Parrots in the Land of Oz,"* which devotes a good portion to free-ranging Australian eclectus parrots. The producers were interested because the breeding/social patterns were so different from those observed in other parrots in Australia. The female eclectus essentially sets up a nest site(s) (tree with hole) and stays close to the favored sites. Males, usually in small groups of 2 or more, fly around, covering a lot of territory and visiting a lot of different females. They "tap/drum" to signal males and females. The females do not do this. The program showed a male "drumming," which is what we have always considered an irregular behavior. In captivity, keeping males solitary or even paired with one female is completely contrary to their normal adult behavior, and just preventing the males from free flight is likely very stressful.

I found the program very enlightening. Since that time, I have shared this with my eclectus clients. We've made some major changes in habitat, flight, even pairing. It has made a difference!

*The "Parrots in the Land of Oz" DVD is available from PBS, www.shopthirteen.org or 888-625-5360 for $19.99.

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A nest box situated in the upper part of the cage is necessary for breeding eclectus.



Juan Caparrós



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Eclectus Parrots

- Bar spacing should be 0.75 in (2 cm) or less.
- Perches can be wood, rope or PVC pipe (which needs to be roughened and scored for grip).
- For aviary housing, a 9 x 3 x 6 ft (3 x 1 x 2 m) area may support an inside aviary with adjoining outside flight.
- A communal aviary requires 27 ft^2 (2.5 m^2) per pair.
- Full spectrum lighting is highly recommended for all birds housed indoors; avoid the use of fluorescent bulbs.
- It is valuable to offer variable-sized perches made of clean, nontoxic pesticide-free tree branches in the enclosure
- Toys must be free of toxic metals, hooks, sharp objects or small, easily consumed components.
- Eclectus are believed to be sensitive to colors so any new toy or cage furniture should be first introduced to the bird from a distance.
- Foraging toys are especially important to potentially reduce the tendency toward feather destructive behaviors.
- Eclectus do well at average household temperatures. They should be offered occasional opportunities for protected outdoor exposure to fresh air and sunlight. They can adapt to gradual changes in environmental temperature.

DIET

- The free-ranging diet consists of fruit, nuts, seeds, flowers and nectar obtained from high in the tree canopy.
- In captivity, eclectus parrots should be fed a fresh, high quality, toxin-free formulated diet.
- It is especially important to avoid food with artificial colors or food additives because they seem to have skin hyper-sensitivity disorders related to their diet.

Eclectus Parrots

- Supplementation should be limited to small amounts of chopped vegetables or fruit, although eclectus are believed to have a high requirement for vitamin A, so they should be supplemented with sources of vitamin A precursors (e.g., red palm fruit oil).
- Clean, fresh, uncontaminated water must be available at all times.

SEXING AND REPRODUCTION

- Eclectus have the most pronounced sexual dimorphism of any psittacine: the males are predominantly green with a candy corn-colored beak, and the females are predominately red with a black beak.
- An appropriate nest box is 12 x 12 x 32 inches (30 x 30 x 81 cm) with a 4-inch (10 cm) diameter hole for access.
- In captivity the hen can be aggressive to fledged young.
- Several breeding cycles are possible per year, as many birds are continuously breeding.
- Sexual maturity is at 3-5 years.
- These birds will lay infertile eggs or not feed the chicks, so breeding should be limited to 2 clutches per year.
- It may be necessary to remove either the male or the nest box.
- The clutch size is usually 2 eggs, incubation lasts 28-30 days and fledgling 70-80 days.
- The offspring are easy to hand-feed.

RESTRAINT

- Gentle restraint using standard techniques with towels can be used.
- Eclectus are intelligent and can be trained to accept most

Male red-sided eclectus (front)



Female red-sided eclectus



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A male juvenile eclectus parrot has brown coloration in its beak.



A large aviary provides free-flight space with covered protection for feeding.



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simple medical and grooming procedures using current behavior modification and positive reinforcement techniques.

BLOOD COLLECTION SITES

- Jugular vein (preferred)
- Medial metatarsal vein located along the medial aspect of the leg just distal to the hock and on the dorso medial aspect of the foot
- Cutaneous ulnar vein located on the ventral aspect of the wing at the elbow

INJECTION SITES

- Intramuscular: pectorals
- Intravenous: cutaneous ulnar vein, jugular, medial metatarsal
- Intraosseous: distal ulna preferred. Can use tibia in an emergency. Provide analgesia.
- Subcutaneous fluids: intrascapular region, inguinal web area of legs

ANESTHESIA

- A pre-anesthetic physical examination with baseline blood work is recommended.
- It is advised to minimize stress and provide a supplemental external heat source and pre-anesthetics such as midazolam (1-2 mg/kg IM) or butorphenol (1-3 mg/kg IM).
- Gas anesthesia with isoflurane or sevoflurane is safest; endotracheal intubation and careful monitoring using a Doppler or indirect blood pressure are strongly recommended.

Eclectus Parrots

MOST COMMON DISORDERS

- Feather destructive behavior
- Polyomavirus infections (in both juveniles and adults)
- Hypovitaminosis A
- Circovirus (psittacine beak and feather disease [PBFD] virus) infections
- Sarcocystis
- Aspergillosis
- Annular toe deformities (neonates)
- Scissors beak
- Papillomas
- Gout
- Heavy metal toxicosis
- Lipomas (in older birds)

ZOONOTIC POTENTIAL

- Chlamydiosis
- Bacterial infections
- *Encephalitozoon hellem* (potential issue for immunocompromised humans)
- Viral infections (avian influenza and Newcastle disease virus)

VACCINES

- Eclectus parrots are susceptible to polyomavirus infections and death, even as adult birds. They are also susceptible to herpesvirus (Pacheco's disease). Vaccines to protect against both viral diseases are produced by Biomune, but only the polyomavirus vaccine (PSITTIMUNE® APV) is USDA-registered and recommended for routine use.
- Serological studies have demonstrated that neonatal,

Feather picking is a common disorder in eclectus parrots.



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Feather loss is especially pronounced around the face and tail, and the plumage takes on a moth-eaten appearance as shown in these 2 PBFD cases.





Marc H. Kramer

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juvenile and adult eclectus are susceptible to eastern equine encephalitis (EEE) and should be vaccinated yearly if there is risk of infection.

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Toco Toucan
Pet Care



Mairee Vincent, Leeds Castle Zoo, United Kingdom

Adult female and male toco toucans

VITAL STATISTICS

Life span		10-20 years in captivity
Adult size		
	Length	22-26 in (55-65 cm) including the 8 in (20 cm) bill
	Weight	27.6-30 oz (500-860 g)

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Toco Toucan (*Ramphastos toco*)

André Becker Saidenberg, DVM, MS, PhD candidate

SUBSPECIES

- *R. toco toco* - Northeast of Brazil and Guyanas, coastally South to Pará, from western Amazon to Manaus and Southeast of Peru
- *R. toco albogularis* - Bolivia and Central Brazil, South to Argentina and Southeast Brazil

ORIGIN / FREE-RANGING HABITAT

- Toco toucans are native to South America.
- Dry semi-open areas (woodland, savannah and other open habitats with scattered trees and forest edges)
- It is still commonly found throughout most of its range and classified as of “least concern” by the IUCN (International Union for Conservation of Nature) Red List

PHYSICAL CHARACTERISTICS

- Toco toucans have a black body with white on the throat and upper breast; orange periorbital area and bill; black oval blotch near the tip of bill and a narrow black line at the base.
- Juveniles are easily recognizable with the incomplete black color on the bill.
- The bill is extremely sensitive and fragile.
- The bill is used to regulate heat distribution by modifying blood flow, working as a transient thermal radiator.
- Toco toucans also have a long keratinous tongue with lateral horn fringes; they lack an ingluvies.

Toco Toucans

SEXING AND REPRODUCTION

- Males tend to be larger and heavier than females and have a slightly longer beak (males = longer than 6.3 in [16 cm] and females = shorter than 6.1 in [15.5 cm]).
- Toucans need choices for mate selection.
- Sexual maturity is achieved at 3-4 years of age.
- Breeding season is April to September.
- Captive breeding is usually difficult.
- Palm logs or plywood boxes should be provided for nesting.
- Incubation lasts 16-18 days, 2-4 eggs are laid, and chicks fledge at 42-47 days.
- In captivity, killing or mutilation of chicks by the parents is common if not fed with appropriate sources of protein.

BEHAVIOR

- Tocos are territorial; they should not be housed with any other birds. They may be aggressive and prey upon others.
- Flight cages should be screened visually from other toucans as they aggressively protect their territory, engaging in beak jousting even through a wire mesh.
- Tocos are very active throughout the day, needing considerable space and daily activities to keep them busy.
- During sleep they rest the bill on the back and cover it with the tail.
- Toco toucans bite hard if upset.
- Tame birds that do not receive sufficient attention may become aggressive towards the owner.

CAPTIVE HOUSING

- Toucans are best housed alone or in compatible pairs to avoid aggression.

Toco toucan chicks



Mairee Vincent, Leeds Castle Zoo, United Kingdom

Juvenile toco toucan



Mairee Vincent, Leeds Castle Zoo, United Kingdom

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Toco Toucans

- Large, macaw-sized, horizontally-oriented enclosures are needed in addition to outside playground space with several perches.
- Outdoor flights should be at least 8 ft x 12 ft x 6 ft (2.5 m x 3.6 m x 1.8 m).
- Perches may be made of natural bark-covered wood.
- Feeders and water pans should be elevated above ground to prevent contact with feces and organic material.
- The floor of the enclosure should be well drained and easy to clean in order to avoid potential pathogenic microorganism buildup and contact with parasite eggs.
- The water dish for drinking/bathing should be at least 8 in x 10 in (20 cm x 25 cm).
- Nontoxic tree limbs, ornamental grasses or bamboo to defoliate and destroy may be provided for activity.
- A PVC pipe may be filled with substrate materials (e.g., mulch, wood chips) or chopsticks with fruits in the tube (when the chopsticks come out the fruit is dropped down).
- Hanging toys approved for psittacines made of safe material (plastic chains, balls) may be used.
- Plastic bottles with large holes filled with pellets may be suspended.
- Care should be taken to prevent the birds from swallowing small domestic objects.

ENVIRONMENTAL TEMPERATURE

- Daytime temperatures should mimic their natural environment, ~68°F (20°C), although they can endure colder temperatures overnight as long as they have access to an indoor shelter with a heat source.
- Birds must have access to shelter protected from wind, rain

and excessive heat (above 90°F [32°C]) as well as easy access to the water bowl or misting during the summer.

DIET

- Toucans require a pelleted diet low in iron content specific for Ramphastidae. In addition, fruits may be offered, with the exception of high-acid fruits, such as oranges, grapefruits, pineapples and tomatoes, which increase iron intake.
- Dietary items may be provided in a variety of ways, such as offering large chunks instead of chopped.
- Commercially available crickets are important during the breeding season.
- Drinking water may be available alone or as prepared green tea, which provides antioxidants and helps chelate iron excess (1 month with green tea followed by 1 month with pure water).

RESTRAINT

- Toucans may be restrained by holding the bill closed with one hand (taking care to avoid obstructing the nostrils at the base of the beak) and using a towel loosely wrapped around the body to control the wings and feet.

ANESTHESIA

- Inhalant anesthesia with isoflurane is recommended (induction should not exceed 3% and maintenance 1.5-2%).
- For short procedures, injectable anesthetics (ketamine 20 mg/kg + diazepam 1 mg/kg IV) may be given at a slow rate.

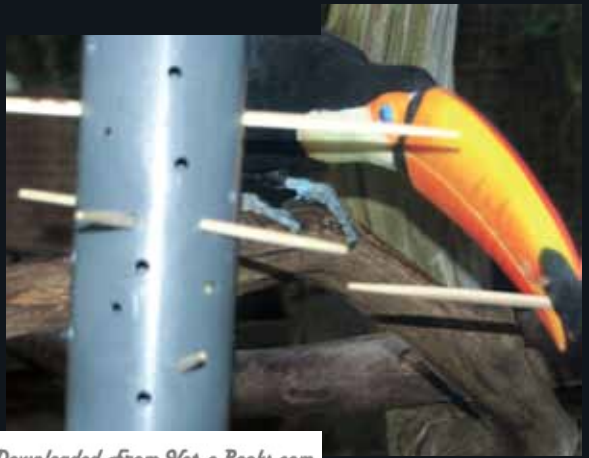
MOST COMMON DISORDERS

- Self-inflicted beak fractures are common due to intraspecific aggression through wire mesh or with birds recently

Tocos aggressively protect their territory with beak jousting.



Mairee Vincent, Leeds Castle Zoo, United Kingdom



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introduced to an aviary. Acrylic repair is needed to prevent contamination and help keratin layer formation.

- Avian pseudotuberculosis (*Yersinia pseudotuberculosis*)
- Bacterial infectious diseases due to low immunity (e.g., overgrowth of microflora, *Escherichia coli, Klebsiella* spp.)
- Other reported bacterial pathogens include *Aeromonas sp., Mycobacterium spp., Bacteroides spp.* and *Clostridium colinum.*
- Mycotic diseases (*Candida* sp., *Aspergillus* sp., *Penicillium* sp.)
- Viral diseases (Newcastle, herpesvirus serologically distinct from psittacine isolates). Lesions resembling proventricular dilatation disease and polyomavirus have been reported.
- Iron storage disease (hemochromatosis)
- Parasites (*Capillaria, Plasmodium, Giardia, Eimeria, Sarcocystis* spp.)
- Idiopathic diabetes mellitus

ZOONOTIC POTENTIAL

- *Mycobaterium* spp.
- *Salmonella* spp.
- *Chlamydophila psittaci*

SPECIAL CONSIDERATIONS

- Wing clipping only if absolutely necessary. Abundant perches need to be provided to allow mobility if clipped.
- In warmer climates, *Capillaria* sp. infections might cause high mortality rates combined with concurrent diseases or poor husbandry that undermine the immune system.
- Resistance to anthelmintics is common, and repeated administration or drug combinations might be necessary to

eliminate the parasite. Preventive husbandry measures to break the life cycle and recontamination are essential.

- Treatment for *Capillaria* sp.[4]
  1. Albendazole + ivermectin (15-20 mg/kg + 0.4 mg/kg PO) once, repeat if necessary
  2. Oxfendazole + ivermectin (15-25 mg/kg + 0.4 mg/kg PO) once, repeat after 15 days if necessary
  3. Fenbendazole (50 mg/kg PO q24h) over 5 days
  4. Mebendazole (25 mg/kg PO q12h) over 5 days
  5. Pyrantel pamoate (70 mg/kg PO) once, repeat if necessary
  6. Moxidectin (0.2 mg/kg IM) once, repeat if necessary
  7. Ivermectin (0.2-0.4 mg/kg SC or PO) once, repeat if necessary

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