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Abstract: There are a number of species of marsupials that are being kept as companion animals. These are the sugar glider (*Petaurus breviceps*), the South American short-tailed opossum (*Monodelphis domestica*), the Virginia opossum (*Didelphis virginiana),* and the wallabies (Tammar, *Macropus eugenii*; Bennett's, *Macropus rufogriseus rufogriseus*). Marsupials differ from placental mammals in many anatomical and physiological ways, but can be compared to other common companion animals for purposes of medical therapy. Appropriate diet and husbandry plays a large role in disease. The most common problems presented to the practitioner include metabolic bone disease, obesity, dental disease, urogenital tract and cloacal glandular infections, cardiac disease, and trauma.

Introduction

Companion marsupials commonly seen in exotic pet practice include the sugar glider (*Petaurus breviceps*), the South American short-tailed opossum (*Monodelphis domestica*), the Virginia opossum (*Didelphis virginiana)* and the wallabies (Tammar, *Macropus eugenii*; Bennett's, *Macropus rufogriseus rufogriseus*). The brush tail possum (*Trichosurus vulpecula*) is occasionally found as a pet, although the USDA banned them from importation from New Zealand due to the high infection rate with *Mycobacterium bovis*. However, a number are still found, although called "phalangers" to escape confiscation. The practitioner is encouraged to search the literature and build a reference collection to adequately provide diet and husbandry information, medical and surgical therapy, and care.

General Characteristics of Marsupials

Marsupials get their name from the presence of the marsupial bones, or ossa marsupialia, which serve as attachment surfaces for several abdominal muscles. They rest on and articulate with, the pelvic and pubic bones. They generally are boot-shaped, flattened, and varied in size. They have been referred to as "Eupubic bones" and may be considered comparable to abdominal ribs in reptiles. Once thought to support the pouch, this has generally been found not to be true as they are present in males (no pouch) and are atrophied or absent in marsupial moles and the *Petaurus* species (the gliders).[1]

The marsupium or pouch is found in a variety of degrees of enclosure. It is well developed and forward facing in the macropods (kangaroos and wallabies), backward facing in koalas and wombats, and absent in the South American short-tailed opossum, considered to be a more primitive marsupial. It develops from annular skin creasing around each teat (primal pouch), to a common marsupial wall surrounding all teats, to finally a closed marsupium.

The shoulder girdle of newborns consists of a continuous cartilaginous arc of primal elements found otherwise only in reptiles and egg-laying mammals. This provides adequate support for forelimbs and shoulders so that the newborn can make its way to the pouch. The most important role is played by the metacoracoid. Immediately

following birth, the arc breaks up, and the shoulder girdle assumes the usual association with the sternum as in adult marsupials and placental mammals. The metacoracoid becomes the coracoid process of the shoulder blade.

Marsupial coats are generally woolly. Forelimbs are often foreshortened with hindlimbs elongated, with the best examples exhibited in the macropods. In several families, the second and third toes of the hind feet have grown out into grooming claws. The first toe is always clawless (except in the shrew opossum and marsupial mole). Olfactory, tactile senses and hearing are well-developed; vision is poorly developed. The skull has palatal windows. Unique features of the endocrine system include the facts that adrenals of females are twice the size of male adrenals on the basis of mg per kg body weight. During lactation, this discrepancy increases because of an enlargement in the "X" zone of the cortex, and an increase in a testosterone-like steroid has been detected. Cortisol is the most abundant corticosteroid. The kidneys in the desert-adapted animals have enlarged medullas and an increased ability to concentrate urine. The cloaca is a common terminal opening for rectum, urinary ducts, and genital ducts. Metabolism of marsupials in general are considered to be about two-thirds that of eutherian (placental) mammals. Heart rates are usually about half the rate of that seen in equivalent-sized eutherians.[2–4]

The urogenital tract of marsupials is significantly different from that of eutherian mammals. In all marsupials the urinary ducts pass mesially to the genital ducts, and in all eutherians they pass laterally. This results in male eutherians having the vas deferens loops around the inside of the ureter to reach the testes, and in male marsupials this loop is absent. In female eutherians, the 2 oviducts fuse together in the midline to form a single vagina and uterus. In female marsupials, this fusion cannot occur because of the presence of the ureters. The 2 lateral vaginas become united anterior to the ureters, where a median vagina is formed. At parturition, a birth canal is formed in the connective tissue between the median vagina and the urogenital sinus, through which the fetus passes. In most marsupials, this birth canal is transient and reforms at each birth. In most kangaroos and wallabies, it becomes lined with epithelium and remains patent after the first birth.[6]

Temperature regulation

Marsupials are born without the ability to regulate body temperature. During the first half of pouch life, body temperature of the young will closely approximate ambient temperature if they are removed from the pouch. At about halfway through pouch life, young marsupials begin to regulate body temperature. This timing coincides with the start of thyroid function. Species from humid tropical climates such as some of the *Phalanger* species are not capable of compensating for evaporative water loss and cannot survive dry heat. Macropods exposed to high temperatures seek the shade of trees or cool caves. Most marsupials avoid activity in the heat of the day. Cloacal temperatures are lower than actual body temperature, therefore ear (tympanic) temperatures readings are more likely accurate for core body temperature; however, ear temperature readings may be difficult to get in the very small marsupials. Studies done in the brush tail possum and rabbit that looked at chloramphenicol metabolism measured liver temperature and found that they were essentially equal and the pharmacokinetic/dynamic study showed that CHPC dosage was 50 mg/kg q12h for both.[5]

Metabolic rates of marsupials: impact on diet

Basal metabolic rates have been studied in a number of marsupial species.[4] It has been found that despite a lower metabolic rate, marsupials can increase their metabolism in times of high rates of heat loss or reproductive needs. These adaptations allow energy reserves to last longer in adverse conditions, have lower food requirements, and have more environmental tolerance. So in actuality, marsupials can do more with less. In captivity, energy requirements are less than in the wild.[4] Dietary-related disease is frequently seen and obesity is common. Appropriate diets and quantity must be stressed to the owners. Heterothermy is common in insectivorous animals, both marsupial and eutherian, because a constant supply of insects is unlikely in the wild. Because they cannot cache food like

granivores, they enter into a torpor to conserve energy. The Didelphids, Monodelphids, and Australian Petaurids and the Tarsipedidae (honey possum) can have torporous states lasting up to 11 hours. Sugar gliders have a basal metabolic rate similar to the macropods. Part of their endogenous nitrogen is retained and recycled to the digestive tract to increase protein availability. Sugar gliders have a larger cecum than most omnivores to ferment ingested gums. Herbivorous marsupials recycle urea and have resident flora to degrade and resynthesize protein. The bottom line for clinicians is that there is enough information available from captive and field studies of the major species of marsupials (metabolic rates, affects of food habits, activity levels) to develop appropriate diets. Micronutrient components still need to be studied in many; however, little should be left to guesswork, and diets should not be fed simply because the animal prefers certain food items. It is easy to over-feed captive marsupials.

Sugar Gliders (*Petaurus breviceps*)

The sugar glider (Marsupaialia, Phalangeroidea, Phalangeriae, Phalangerinae, *Petaurus breviceps*, 4 subspecies from New Guinea, 3 from Australia*: P.b.breviceps*, New South Wales, Victoria, Tasmania; *P.b. longicaudatus*, Queensland; *P.b.ariel*, Northern Territory) is native to New Guinea and Australia, with at least 7 recognized subspecies. The habitats are primarily open forests, either tropical or coastal forests, or dry inland sclerophyll tropical forest. They are nocturnal, arboreal, and nest in leaf-lined tree holes with up to 6 other adults and young. Predators include owls, feral cats, kookaburras, foxes, and goannas. The gliding membrane (patagium) extends from the fifth digit of forepaws to the ankles. Gliding distance can be up to 50 m. The tail is well-furred and weakly prehensile. The first and second digit of the hind feet are partially fused (syndactylous). The average awake body temperature is 32ºC (89.6°F). Sugar gliders are quite vocal, with a whole series of alarm yaps and screams. The natural diet in the wet season (winter) is primarily gums of eucalypts and acacias with nectar from flowers of same trees. The rest of year they are mainly insectivorous. They have specialized incisors for gouging the bark of trees. The head/body length is 120–132 mm, tail length is 150–480 mm. Average adult weights vary for the different subspecies, with the larger subspecies ranging from 115–160 g for males, 95–135 g for females. In captivity, they will breed throughout year and produce 2 litters per year on average. The pouch contains 2 teats and 2 offspring are common. Gestation is brief, about 16 days, then the fetus migrates to the pouch. The joeys begin to leave the pouch at 70 days and are independent at 17 weeks, but may remain in parental nest.

Sexual maturity is reached at 8 months to 1 year of age for females, and usually at 12–14 months of age for the males. The female has the typical marsupial bilobed uterus with lateral vaginas and central birth canal. Males have a forked penis, and mid-ventral scrotum. Males also develop a scent gland on the forehead which they may also rub on the female's chest. Males also have scent glands on the chest, and anal glands. Both sexes scent mark territory. The female just urine marks. Her scent glands are within the pouch. She will secrete and increase marking to indicate breeding readiness to the male. Life span in the wild is usually only 4–5 years, but ages of up to 9 years have been recorded. In captivity, with optimum nectar/insectivore diet and husbandry, they may live 12–14 years. The maximum recorded lifespan is 14 years. One of the main things to remember about our pet population is that the sugar glider is an extremely social animal and should not be kept as a solitary animal. Sugar gliders become almost torporous during the day (their night) and can be extremely difficult to rouse. The same thing happens if they are too cold. Home temperatures are at the low end on their comfort zone. Supplemental heating is usually necessary for a healthy glider. The housing enclosure size minimum is 2 m wide by 2 m long and at least 1.8 m high.

The natural diet of sugar gliders includes the "sugary sap or gum" of the eucalypts in which small insects are also trapped and consumed (wattle or acacia gum tree which has a carbohydrate-rich sap), insects, arachnids, small vertebrates, and the nectar from blossoms of eucalypts, banksias, acacias, and several types of native apple.

Favorite types of trees are ones that the Australian's call "bloodwood" as the sap runs red, crystallizes, mixes with the decaying pulp of the tree, and attracts more termite and ant activity. Other types of trees have a yellowish sap, which leaves "manna," a deposit of white encrusting sugars left where it has flowered from a wound produced by sap-sucking insects, birds, squirrel gliders or possums in a tree trunk or branch. The glider has been observed to eat honeydew, an excess sugar secreted by sap-sucking insects. The name "sugar" glider does not relate to "sugar as in fruits," although the glider may "like" those foods. It also does not rely on nuts, grains, or seeds despite the books published by breeders and much information on the Internet. Australians keeping gliders in captivity put up outdoor lights to catch insects and moths for their gliders as the major portion of the diet, with an artificial nectar (either Leadbeater's Mix or one designed for honey-eating possums) as the other major portion, with only occasional small pieces of fruit as treats.

Diseases of sugar gliders

A number of disease problems are being seen in pet gliders with the greatest number being attributed to malnutrition, and its consequences including encephalomalacia, osteomalacia, cardiac failure, hind quarters paresis, paralysis, weakness, ataxia, myonecrosis, and cataracts. Also seen are injuries and fractures from trauma, pneumonia (chilling, malnutrition), diarrhea (various bacterial) or enteropathy (may be diet-related), and intestinal *Capillaria* species. Poor hair coat and dermatitis have been seen. Pouch infections are not uncommon, with bacterial and/or candida as causative agents. Obesity is seen in many overfed, underexercised, and malnourished gliders. *C piliformis*, giardia and possibly cryptosporidia have been diagnosed. *Giardia* has been diagnosed as a suspected causative agent of chronic diarrhea. So far, treatment based on other carnivore species has not seemed to clear the organism. Pharmacology studies need to be performed using metronidazole, fenbendazole, and paromomycin, which have been efficacious in other species to clear the organism. A self-mutilation syndrome with CNS signs attributable to Baylisascaris, Toxoplasmosis, and, in one colony, Listeriosis, has been diagnosed. Another colony experienced what was most likely a pentastomid infestation: the adult parasite was found in the duodenum in both the adult and juvenile gliders (as young as 5 weeks after pouch emergence). Aberrant migration may be the cause of the CNS signs. Therapies and diagnostics for sugar gliders follows parameters used in other insectivores and carnivores. Clinically, the ferret dosage of medications seems to work per kilogram basis. The author has not encountered drug adverse or toxic reactions following ferret-based medication therapy. Clinicians need to continue to get diagnostic samples for blood, microbiology, cytology, parasitology, and histology samples to build more information about our captive gliders. Our experience with them as indoor pets in North America does not seem to correlate well with problems found in wild populations in Australia.

Gastrointestinal obstruction has been seen due to inappropriate food or foreign body obstructions. Urinary tract disease is being diagnosed including cystitis, nephritis, urinary obstruction with subsequent bladder rupture. Cloacal and paracloacal gland enlargement, impaction and abscessation is seen particularly in neutered marsupials. Males presented with dry or necrotic penises may be septicemic. Amputation does not impair urination. Neoplasia is seen in older gliders and primarily has been lymphatic or hepatic, although as more gliders reach geriatric age, we may encounter more types of neoplasia.

Gliders are frequently presented due to either aggression towards their owners or other gliders, or for self-mutilation. Whereas aggression may be part of normal social behavior particularly with territory marking and reproductive activity, self-mutilation is a problem of captivity. The practitioner needs to develop a history-gathering and trouble-shooting system similar to that used with feather-picking birds. Self-mutiliation is usually seen in solitary sugar gliders. Sugar gliders have been used in laboratory animal medicine as models of serotonin-deficiency depression. To clinically depress a sugar glider, the researchers found one only has to house them as single animals. Many of our pet gliders are solitary. And unfortunately, because they were removed from glider families prior to puberty, they do not know how to properly integrate into glider society. Gliders should not be housed as solitary animals.

Introduction to another glider later in life, particularly after neutering, may make stress and problems worse. Therapy needs to be aimed at maximizing the diet and habitat, and in many cases will require medical intervention. Many of the tri-cyclic antidepressants and newer serotonin-enhancer drugs may be useful. The author has used Prozac (2–5 mg/kg PO q12h; Lily, Indianapolis, IN, USA) in sugar gliders successfully to stop mutilation while correcting dietary and husbandry conditions. Dosage may be increased slowly over time. It takes 4–8 weeks before blood/brain levels are fully maximized, so clients need to be cautioned as to timeline for improvement.

Surgical techniques follow the same guidelines as with other small mammals. Orchiectomy is slightly different, because of the different marsupial anatomy. The testicles in the scrotum are attached via a short stalk to the body wall. Make an incision longitudinal and parallel to and running along the stalk, then use blunt dissection to expose the blood supply and vas deferens. Bury the sutures! Sugar gliders are very adept at suture removal unless adequate analgesic is provided, and the sutures are buried. Of a disturbing note is that the International Sugar Glider Society on its website is recommending breeders do castration by using a rubber band around the scrotal stalk. This is resulting in necrosis, self-mutilation, and septicemia. It is not recommended as a humane procedure!

South American (Brazilian) Short-tailed Opossum (*Monodelphis domestica)*

The short-tailed opossum is from eastern and central Brazil, Bolivia, and Paraguay. It has been used extensively as a laboratory animal. Males weigh 90–150 g, females between 80–100 g. Head, body length is 110–200 mm and tail length is 45–80 mm. The tail is about half as long as the head and body, but always shorter than the body alone, and sparsely haired. It is prehensile, and used by the opossum to carry bedding and other items to be dragged back into its nest. The pouch is not developed. The mammae are arranged in a circle on the abdomen and number 8–14. They usually dwell on the ground, but can climb. Nests are usually built in hollow logs. They are basically nocturnal, but as pets, do spend time interacting with owners during the day. They will use rat wheels for exercise. In South America, they live in human dwellings where they are welcome as they destroy rodents, insects, and arachnids such as scorpions. Individuals are highly intolerant of each other, though conflicts rarely result in serious injury. Breeding occurs throughout the year in tropical ranges, with young numbering 5–12. Newborn cling to the nipples of the mother, later they ride on the back and flanks. *M domestica* may have up to 4 litters annually. Gestation period is 14–15 days. Postpartum dependence lasts about 50 days. Sexual maturity is attained at 4-5 months. Breeding has occurred at up to 39 months of age in males, 28 months in females. Estrus lasts 3–12 days, but may vary up to 1 month. Diet fed in laboratory facilities: pelleted fox diet (National Complete Fox Food Pellets, Reproduction Diet, Milk Specialties Co, New Holstein, WI, USA), (Mazuri Exotic Canine Diet 5M52, Mazuri Carnivore Diet 5636, Reiserstown, MD, USA), insects, and pinkie mice. They are prone to atherosclerosis following hyperlipidemia and hypercholesterolemia. Fasting plasma cholesterol on National Fox Food (3.1 % fat dry weight): 85 ± 22 mg/100 ml. 17.7% fat diets (equivalent to 40% calories from fat) produce elevated cholesterols of 1000–1900 mg/100 ml after eating that for 8 weeks. There are high responders and some genetically lower responders (304–593 mg/100 ml). They are also used as models for UV induced sarcomas and melanomas. Blood samples may be drawn from the ventral tail artery. In the laboratory, cardiocentesis is usually done, although this is not recommended in pets as it occasionally leads to acute hemorrhage and death.[7]

The principal spontaneous disease problems of the short-tailed opossum occur in the digestive system and most diagnoses were lesions of the liver. The most common cause of death from digestive system disease was rectal prolapse. Neoplasia is found most frequently in the digestive system–in the liver–followed by the pancreas. Another frequent disease is enteritis of the small intestine with gaseous distention. The second most common system in which lesions were diagnosed was the urogenital system, and the kidney most frequently affected, with

nephritis. The most common neoplasm found is pituitary adenoma (prolactinoma), followed by uterine leiomyoma, skin lipomas, adrenal gland pheochromocytomas, and liver carcinomas. Most of these are found in opossums older than 22 months. Cardiovascular disease is fairly common, with congestive heart failure developing in males more frequently than in females. Heart disease was generally found in animals averaging 37 months of age.[8]

In general, *M domestica* is fairly hardy. In pet short-taileds, malnutrition, obesity, chilling, injury from falling or handling, and a mange mite have been seen.

Tammar or "Dama" Wallaby *(Macropus eugenii)*

Tammar wallabies originate in the southwest coastal area of Western Australia (south of Perth). The forked penis of the male is found in the ventrum of the cloaca. Testes are external. The cloacal temperature may be lower than actual body temperature; the tympanic temperature reading is probably more accurate. Cloacal temp: 35–36.0°C (95–96.9°F). Heart rate is 125–150 bpm. Gestation period is 25–28 days. Estrus cycle is 30 days. Pouch life is 250 days. Birth weight is less than 0.03 oz (1 gram). Weaning is at 10–11 months of age. Blood samples can be collected from the cephalic vein or lateral caudal vein (just dorsal to lateral of the vertebral processes on either side of the tail). Intramuscular injections can be made into the thigh or tail muscles. Subcutaneous injections should be done in the intrascapular space. Housing: Tammar wallabies must be kept above 16°C (60°F), with a large area to run without obstacles. They need to have escape routes and shade. They need a dry bedding area. They can be group-housed with several males per group. Captive diet: alfalfa hay, and 50:50 mix of horse and rabbit pellets. Timothy hay may be provided ad lib and also used as bedding. In the wild, the diet is grasses and forbs. Most commonly seen problems: injuries, "lumpy jaw" (various organisms, *Actinomyces bovis, Bacteroides* species, etc.) This is often a chronic problem with the tooth eruption process. Without sufficient roughage, the teeth which erupt posteriorly in the jaw and migrate anteriorly before being lost adjacent to the diastema, may not migrate properly. Lost premolars may leave openings for bacteria to get into the jaw. Coarse, sharp feeds such as oat awns should be avoided, since they can cause trauma to the mouth and the tissues can be invaded by the bacteria mentioned above. Provision of materials such as long dry grass or fibrous tree bark for the animals to chew on appears to reduce the incidence of the disease. Chewing on these presumably toughens the oral mucosa. It may also be important in providing the molar teeth with sufficient work to enable them to be properly shed. Body weights range from 3.55–5.30 kg.

Bennett's Wallaby (*Macropus rufogriseus rufogriseus*)

Bennett's wallaby is a subspecies of wide ranging red-necked wallaby and is found in Tasmania. It is mainly crepuscular and nocturnal. Groups may be seen at feeding areas and water holes, but it is not a cohesive social group. Adolescent males stay with mothers beyond weaning and into the following year. Daughters wean sooner than sons. Related females form "clans" with common feeding areas. Large dominant males reserve certain areas of their territory for their own use and have exclusive mating rights in those areas. Weights: Males are 15–26.8 kg, females are 11–15.5 kg. Life span is considered to be 12–15 years. Sexual maturity in females is at 14 months of age, males 19 months of age. Breeding is strictly seasonal. Bennett's wallaby gestation period is 30 days with a pouch period of 7–8 months, Birth weight is less than 0.03 oz (1 gram). Weaning is at 12–17 months. Table 1 provides a list of common infectious diseases of companion marsupials.

Table 1. Common infectious diseases of marsupials.[10]

Disease	Pathogen	Species/ susceptibility	Clinical Signs	Diagnosis	Treatment
Salmonellosis	*Salmonella* spp.	All, especially young	Diarrhea, depression, enteritis, septicemia	Fecal/oral c&s	Parenteral antibiotics, electrolytes, fluid therapy
Lumpy Jaw (Necrobacillosis, Actinomycosis)	*Bacteroides* sp, *Fusobacterium necrophorum, Actinomyces* sp, *Corynebacterium* sp	Macropods in captivity, rare in wild	Swelling of mandible or maxilla, poor prehension, cellulitis/osteitis, pus production, depression	Odor, culture, radiographs	Debridement parenteral antibiotics, local disinfection, husbandry measures to reduce crowding, cleanup environment, proper diet
Mycobacteriosis	*Mycobacterium tuberculosis, M bovis*	Probably all, esp. brushtail possum. Common in New Zealand brushtails	Weight loss, cachexia, tubercles in viscera, skin, bones	Clin signs, culture, radiology, not responsive to treatment, unknown if intradermal skin test effective in diagnosis.	Not responsive to treatment, cull. Public health significance
	M avium, M intracellularis, M scrofulaceum	Wallabies	Abscesses of skin, bone, visceral organs may be involved, purulent arthritis	Acid-fast stains, culture	None, isolate, cull. Non-responsive to treatment
Pasteurellosis	*Pasteurella multocida, P haemolytica*	All, esp. possums	Cellulitis, hemorrhagic septicemia, bronchopneumonia	Clinical signs Culture	Parenteral antibiotics, reduce stress, fighting
Pneumonia in Macropods	*P multocida*, *Klebsiella* spp, various organisms	Macropods–all species; more common in winter or in wild-caught animals; chilled	Dyspnea, coughing, frothy nasal or oral discharge, death	Clinical signs, auscultation, radiology	Parenteral antibiotics, supportive therapy

Table 1 cont'd. Common infectious diseases of marsupials.[10]

Disease	Pathogen	Species/ susceptibility	Clinical Signs	Diagnosis	Treatment
Pouch infections	*Pseudomonas aeruginosa*	Macropods	Dirty pouch, odor, brown, thick discharge	Clinical signs, culture	Disinfection, cleaning, topical and systemic antibiotics
Herpesviruses	Herpesvirus	Wallabies (Parma, Tammar), potoroos, quokka	Transient infertility, eye/nasal discharge, lingual ulcers, depression, anorexia, death	Titers, histopath, virus isolation, virology	No therapy yet. May try acyclovir?
Candidiasis	*Candida albicans*	Artificially reared pouch young. Act hungry, won't suckle.	White curdlike encrustations in mouth, lips, gums, tongue margins. Depression, painful mouth	Cytology, culture	Clean out, oral nystatin, antifungals, supportive care
Infectious dermatitis	*Pseudomonas pyocyanea*	Brushtail possums, Virginia opossum	Localized form, skin in and around pouch. Generalized form can cause dehydration toxemia, death	Culture	Antibiotics as indicated by sensitivity, clean up
	Staphylococcus species, *Actinomyces dermatonomus*	Brushtail possums, Virginia opossum	As above	As above	As sensitivity
"Crispy ear"	*Strep* species	Virginia opossum	Edges of the ears become necrotic, can become systemic	Culture	Aggressive antibiotic therapy, debride, NSAIDS, Aloe vera. Prognosis is guarded to poor
Dermatophytosis	*Trichophyton mentagraphytes*	Brushtail possum, Virginia opossum	Sparse, scaly lesions, generalized over skin	Culture	Antifungals as in other species, zoonotic public health significance

Specific problems seen with house wallabies include lumpy jaw, gastrointestinal obstruction due to ingestion of foreign material such as carpet or towels, obesity, genital-urinary tract infections, diarrhea due to improper diet, injuries from running into walls and furniture, and attacks from other pets. Clinicians need to be familiar with proper handling in the office environment. It is usually advantageous to immediately administer diazepam at 0.5–1 mg/kg IM to decrease the anxiety of the animal and potential for future muscle necrosis. Restraint is best done by first securing a firm hold on the base of the tail, then supporting the rest of the body much like one does with a fractious cat. Wallabies can do considerable damage with the nails of their hind feed. They may also bite. Vocalizations of stress and anger include a loud hissing, accompanied by thumbing and whacking the floor with feet and tail.

Virginia Opossum (*Didelphis virginiana*)

This is the only marsupial native to North America, and if hand-raised from a rescued infant (mother is usually road-kill), they make wonderful pets. They learn to come when called, and as latrine animals, will readily use newspapers in specific places to urinate and defecate. Other than nibbling some houseplants, they are generally non-destructive and docile. They also like to be held and cuddled.

As pets, the biggest challenge may be to prevent obesity by providing sufficient exercise and limiting food quantity. Diet must be carefully regulated. Metabolic bone disease is probably the second most common problem seen in pet opossums. All opossums brought in from the wild are heavily parasitized and need to be repeatedly treated with levamisole (levamisole injectable 13.65%, Agri Laboratories, Ltd, St. Joseph, MO, USA) at 6–10 mg/kg PO or SC every 3–4 weeks for several months. Repeated fecal exams should also be done, although many will not shed ova after the opossum is a few months old. Cardiac disease is a major problem after 2 years of age. Cardiomyopathies may be diagnosed using ECG, echocardiograms and radiographs. Dilatative as well as hypertrophic forms have been found. Treatment is based on feline disease parameters.[9]

Chronic urogenital tract infections are common in unspayed females. It is recommended that companion opossums be spayed. An unspayed female will be very restless, pace, and will slobber on many household objects. This behavior stops after removal of the ovaries and uterus.

New diet information

An Action-Alert was issued in March 2005 by the National Opossum Society, Inc. Available at: http// www.opossum.org. Accessed February 28, 2006, concerning different dry cat foods composition. The current recommendation is for owners to find the cat food that list the cat foods that have the following major nutrient percentages: Protein 31.5%, Fat 11%, Calcium 1.1%, Phosphorous 0.9%, and Vitamin A at 10,000 IU/kg. Avoid products that use soy as a major component. An example of an adult opossum's diet: 70% "Peter's Food" (1 part cat food, 1 part blended vegetables, ¼ part yogurt), 20% fruit variety, and 10% mixed protein (which can be canned salmon, hard-boiled eggs with shell, chicken livers cooked, yogurt). Treat foods include calcium-gut loaded crickets or other dusted adult insects. The volume will vary depending on the size and activity of the opossum, but in general consider 1–2 cups total volume for a 3-kg opossum for the evening meal, and about ½ to 1 cup of food for the morning/day meal.

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