

# Pet rodents: What every vet should know

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The order Rodentia contains more species than any other mammalian order. Wild rodents are found naturally on all continents except Antarctica and have evolved to survive in an astonishing variety of ecosystems. Whilst members of this group share some common features, significant variations in biology and physiology exist from species to species.

The keeping of rodents as pets has been a popular pastime for many years. The most readily available species are small, clean, quiet, amenable to handling, inexpensive and relatively easy to breed. Collectively these animals are frequently referred to as 'small furrries' or 'pocket pets', but these terms can be misleading as they tend to imply a simplicity which is undeserved. Client expectations are on the increase and, regardless of size or purchase value, all pets including rodents deserve a high standard of veterinary care which is tailored to their needs.

This article will review basic rodent biology and husbandry and aims to highlight some of the differences that exist between six of the most popular pet rodents (mice, rats, Mongolian gerbils, Syrian hamsters, guinea pigs and chinchillas) in relation to their disease susceptibility.

## Rodent biology and husbandry: general

### *Housing and equipment*

Pet rodents should be housed in an escape-proof enclosure made of non-toxic materials with sufficient space for exercise. Plastic-floored, wire-mesh cages or glass 'gerbilariums' may be appropriate for the smaller species. Hutches with runs are more suitable for the larger species, e.g., guinea pigs. A high level of hygiene must be maintained with the cleaning of cages required two to three times a week. Gerbils produce scant urine and, therefore, their enclosures require less frequent cleaning. Hamsters, on the other hand, hoard food and hide areas should be checked regularly for spoiling food.

Careful thought should be given to enriching the environment with toys such as balls, cardboard boxes, tunnel constructs, mazes, ladders and exercise wheels. Hide areas and/or nest boxes are vital (at least one per individual). Permitting climbing by providing multiple-level shelving (e.g., for chinchillas) and/or burrowing with deep bedding material (e.g., for gerbils and hamsters) allows the pet to express natural behaviours. High levels of humidity must be avoided, particularly with gerbils and chinchillas. Temperatures below 10°C may promote hibernation in Syrian hamsters, whilst temperatures above 28°C can cause heat stress in chinchillas and guinea pigs.

A variety of bedding materials can be used including:

recycled paper products; shredded paper; saw dust; and, pine shavings. Hay must be available at all times for guinea pigs and chinchillas.

Chinchillas must be given access to a dust/sand bath for 15-20 minutes, three to four times a week for maintenance of coat health. Gerbils may also benefit from such a bath. Over-bathing should be avoided, however, as it can result in irritative conjunctivitis.

### *Sexing*

Sex determination of many rodents can be difficult, especially when they are young. In general, the anogenital distance is greater in male rodents compared with females. In sexually mature males the testes may be palpable. The inguinal canals, however, remain open throughout life and so testes may be in an intra-abdominal location at the time of examination. Females often have a well developed genital papilla which can be mistaken for a prepuce.

### *Social needs*

Most rodents are social animals and should be kept in pairs or groups. Syrian hamsters are the exception and, for them, individual housing is more appropriate.

It is important to remember that rodents are prey species. They have an innate fear of predators and are skilled at masking signs of disease. Seriously ill rodents may only show subtle clinical signs and the stress of transport and handling can exacerbate underlying disease. The veterinary surgeon must be very observant to avoid missing vital clues which may point to the aetiology of a medical or surgical problem.

### *Preventive health care*

Vaccinations and routine antiparasitic treatment are not currently recommended for pet rodents. Regular veterinary examinations (every six to 12 months) are, however, suggested and provide an opportunity to detect early disease and to discuss husbandry issues. The provision of an appropriate diet (see below) and an enriched, hygienic environment are the most important measures to prevent disease in these species. Neutering of either sex may be considered for population control or behavioural modification.

## Mouselike rodents: Biology, diet, behaviour and selected diseases

### *Taxonomy*

Mice, rats, gerbils and hamsters belong to the family

Muridae, within the suborder Sciurognathi. They are often referred to as 'mouse-like' rodents and are grouped together on the basis of their dentition and the structure of their masticatory muscles.

Their dental formula is: 1/1 0/0 0/0 3/3. They have open-rooted, continuously growing incisors which can result in overgrowth if malocclusion (congenital or acquired) is present. Their adult molar teeth do not grow following eruption. Cheek tooth malocclusion is therefore uncommon in these species.

### Reproduction

Mouse-like rodents typically have large litters of altricial young after a short gestation period (i.e., they are relatively undeveloped at birth).

### Behaviour and suitability as pets

Rats make excellent pets as they rarely bite and are amenable to training. They are, however, nocturnal. Mice are smaller and more active but can be flighty and are not so easy to train.

Syrian hamsters are solitary, nocturnal rodents which may hibernate at low temperatures. They may bite if not familiar with handling or if startled. Gerbils tend to be more docile, do not hibernate and are diurnal.

All species in this group are short-lived, with life expectancies less than four years.

### Diet

Commercial rodent pellets/blocks (with 4-5% fat and a minimum of 16% protein) are preferred to seed mixes as the primary constituent of the diet of mouse-like rodents as they prevent selective feeding and ensure adequate intake of micronutrients. There are numerous brands available and most appear to be highly palatable to all species within this group. A higher protein content may be required for breeding animals. The pellets can be supplemented with small amounts of fresh fruit and vegetables daily. Honey-covered grain bars sold by many pet stores will be readily eaten but should be reserved as very occasional treats or training tools only. Many species are coprophagic. Nutritional problems include osteoporosis in hamsters and obesity in gerbils and rats.

Fresh water should be available at all times.

### Five must-know conditions of mice

- Skin disease is the most common reason for presentation and may include barbering by a dominant individual, trauma due to poorly constructed abrasive cage furniture, contact hypersensitivities or parasites e.g., fur mites.
- The majority of spontaneous neoplasms in mice are mammary adenocarcinomas and fibrosarcomas. These tumours carry a poor prognosis as the rate of recurrence following surgical excision is high.
- Sendai virus and *Mycoplasma pulmonis* are the two most common causes of respiratory disease in mice. Treatment is largely supportive and includes: antibiotics; mucolytics; nebulisation; and, reduction of environmental respiratory irritants.



Figure 1: Mammary fibroadenomas of rats are benign and can occur anywhere along the extensive mammary chain. These masses become very large and ulcerated. Surgical excision may be curative.

- Endoparasites, e.g., pinworms, are common but are generally non-pathogenic and do not require treatment unless clinical signs of enteritis are apparent.
- Urethral obstruction in male mice may occur due to bacterial infection of the preputial and bulbourethral glands or, less commonly, urolithiasis. The presenting complaint is usually self-mutilation of the penis.

### Five must-know conditions of rats

- Chronic infectious respiratory disease is the most common health problem in pet rats. The primary causative agents are: *Mycoplasma pulmonis*; *Streptococcus pneumoniae*; and, *Corynebacterium kutscheri*. Treatment is largely supportive with antibiotics, mucolytics, nebulisation and reduction of environmental respiratory irritants.
- Mammary tumours are very common and are usually benign fibroadenomas. They may occur anywhere, from the neck to the inguinal region (Figure 1).
- Healthy yet elderly male rats develop brown, glandular, sebaceous secretions at the base of the hair shaft which may be mistaken for ectoparasite infestation.
- Chromodacryorrhoea is the term used to describe red ocular discharge due to porphyrins secreted from the Harderian gland. Owners often mistake it as haemorrhage. It occurs as a non-specific response to stress and disease and a thorough investigation to identify the underlying problem is recommended.
- Chronic progressive nephropathy may be seen in aged rats with polydipsia and proteinuria. The disease is predisposed to by overfeeding of high protein diets. Supportive treatment includes fluid therapy, anabolic steroids and reducing dietary protein.

### Five must-know conditions of gerbils

- Nasal dermatitis, also known as 'facial eczema' or 'sore nose', is a common condition in the gerbil. It is thought to occur due to excessive Harderian gland secretions (similar to chromodacryorrhoea in rats) that irritate the skin and promote a secondary bacterial dermatitis. Stress, often associated with high humidity or overcrowding, is believed to be the primary predisposing factor.



Figure 2: Administering oral medication to a gerbil with vestibular disease.

- Infection or neoplasia (e.g., adenocarcinoma) of the ventral abdominal gland is common in older gerbils. The former may be successfully treated with antibiotics but the latter requires surgical excision. Histopathology and bacterial culture of resected tissue are recommended to confirm the diagnosis and prognosis.
- Behavioural problems, e.g., stereotypies, can occur if gerbils are not given suitable substrates that promote normal burrowing activity.
- Diarrhoea is a common presenting sign. The differential diagnosis includes: Tyzzer's disease (*Clostridium piliforme*); protozoal enteritis (*Giardia* spp., *Trichomonas* spp., *Entamoeba muris* and coccidia); and, helminthiasis (various species). Tyzzer's disease frequently presents as peracute death and the diagnosis is made on postmortem examination. The other causes may be diagnosed on faecal parasitology and treated accordingly.
- *Torticollis* is common in older gerbils and may be due to bacterial otitis media/interna or aural cholesteatoma, papilloma or polyp formation. Treatment may include surgery and/or antibiotics (Figure 2), but is not always successful.

#### Five must-know conditions of Syrian hamsters

- The cheek pouches (which function normally for temporary food storage) may become impacted. This condition presents as persistent facial swellings (unilateral or bilateral). The pouches should be emptied and flushed under general anaesthesia. A thorough oral examination is recommended to rule out underlying causes.
- 'Wet-tail' is the non-specific term that is used to describe diarrhoea in hamsters. The differential diagnosis includes: proliferative ileitis (due to *Lawsonia intracellularis*); enterotoxaemia (e.g., overgrowth of *Clostridium difficile* following inappropriate antibiotic administration); and, Tyzzer's disease (*Clostridium piliforme*). Treatment must be aggressive, including fluid therapy, nutritional support and antibiotics.
- *Hyperadrenocorticism* is reported in hamsters. The



Figure 3: Newborn Guinea pigs are highly precocious, i.e., born in a relatively developed state.

clinical signs include bilaterally symmetrical alopecia, hyperpigmentation and thinning of the skin, polydipsia, polyuria and polyphagia. Effective treatment protocols have not been developed.

- Exophthalmos can occur in hamsters secondary to ocular infection/trauma or following restraint. The prognosis is good if immediate treatment can be provided: cleanse and lubricate the proptosed eye then replace and perform tarsorrhaphy (a partial or complete suture of the eyelid margins performed to shorten the palpebral fissure) if necessary. Enucleation may be required for severe or recurrent problems.
- Cutaneous neoplasia is common and includes melanoma, melanocytoma, epitheliotropic lymphoma and transmissible lymphoma (due to hamster papovavirus). Diagnosis is by biopsy and treatment for each of these conditions is often unrewarding.

### Hystricognath rodents: Biology, diet, behaviour and selected diseases

#### Taxonomy

Guinea pigs and chinchillas belong to the rodent suborder Hystricognathi. This group have a dental formula of: 1/1 0/0 1/1 3/3. All the teeth are open-rooted and grow continuously. Hence, overgrowth due to malocclusion often affects the cheek teeth.

#### Reproduction

Guinea pigs and chinchillas have relatively long gestation periods, small litters and their young are surprisingly precocious (Figure 3).

#### Behaviour and suitability as pets

Guinea pigs are highly vocal, social and non-aggressive animals. They generally make good pets and tolerate frequent, gentle handling. Chinchillas are nocturnal and prefer a quiet environment during the day. They are generally non-aggressive but can be more difficult to handle than guinea pigs.

Life expectancy is four to eight years for guinea pigs and 10-15 years for chinchillas.



Figure 4: Chinchillas should be offered a diet of *ad libitum* hay with a small daily portion of mixed green vegetables and concentrate pellets.

#### Diet

The primary component of the diet of chinchillas and guinea pigs should be good quality hay provided *ad libitum*. Hay is essential to promote normal dental wear and gastrointestinal motility. A restricted amount of commercial concentrate pellets may be given. Mixed rations (i.e., ‘muesli mixes’) should be avoided as they promote selective feeding and may result in micronutrient deficiencies. The diet can be supplemented with a daily portion of mixed leafy vegetables (dark green varieties are preferable) (Figure 4). Nuts, fruit and sweet items should be given only as occasional treats, if at all.

Guinea pigs have an absolute requirement for vitamin C as they lack the enzyme required to convert glucose to ascorbic acid. Supplementation is best provided in the drinking water (200-400mg/litre; changed daily). Most commercial guinea pig pellets contain vitamin C (unlike rabbit pellets), but the concentration diminishes with shelf life of the product. Owners should therefore avoid buying large quantities of food in bulk.

Fresh water should be available at all times.

#### Five must-know conditions of guinea pigs

- Cystic ovarian disease is extremely common in female guinea pigs over the age of two years. Affected animals may be asymptomatic; however, when the cysts (usually bilateral) become large and/or numerous abdominal distension, anorexia and depression can result. Ovariohysterectomy is curative (Figure 5).
- Ectoparasitic skin disease is seen frequently and may be due to mites, lice or fleas. *Trixacarus caviae* infestation is the most common and results in alopecia, intense pruritis, excoriations, crusting and secondary bacterial dermatitis (Figure 6). It will often become apparent at times of stress or immunosuppression, so a thorough health and husbandry evaluation is warranted. Diagnosis

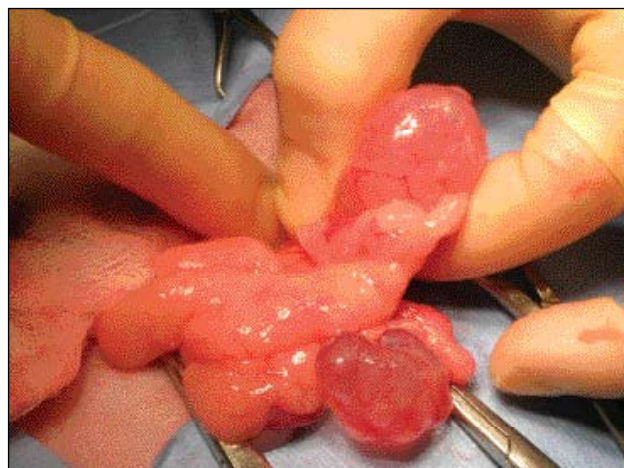


Figure 5: Bilateral cystic ovarian disease in a guinea pig – diagnosed during exploratory laparotomy.

is confirmed by microscopic inspection of skin scrapes and/or plucked hair. Ivermectin is a well-tolerated ectoparasiticide in this species. In-contact animals should be treated and the environment cleaned to prevent reinfestation.

- Hypovitaminosis C (‘scurvy’) readily develops in guinea pigs if dietary vitamin C is not provided. Clinical signs include a shuffling gait, swollen joints, petechiation of mucous membranes, lameness, rough hair coat, anorexia, diarrhoea, tooth grinding and delayed wound healing. The disease can be fatal. The diagnosis is usually made on the basis of the history and clinical signs. Radiography can be useful to assess bone/joint disease. Treatment is 100mg/kg/day vitamin C orally.
- Pregnancy toxæmia is a misleading name for this life-threatening condition as non-pregnant animals, including males, can also be affected. Obesity and fasting are the two most important predisposing factors. Clinical signs reflect a ketoacidotic state and include: anorexia; dyspnoea; recumbency; seizures; coma; and, death. Diagnosis is made on the basis of the history, clinical signs and urinalysis (aciduria and ketonuria). The prognosis is guarded and treatment is largely supportive.
- Urolithiasis is relatively common in guinea pigs, although the underlying causes are still largely unknown. Females appear to be more susceptible than males. Clinical signs include: anorexia; dysuria; haematuria; and, a hunched posture. Diagnosis is made on the basis of radiography and treatment is usually surgical. Fluid therapy and antibiotics are often indicated. It is not possible to acidify the urine of guinea pigs.

#### Five must-know conditions of chinchillas

- Acquired dental disease is the most common condition diagnosed in pet chinchillas. The disease occurs due to a lack of wear on the teeth that results when food requires little mastication. Lesions are often subtle but may cause painful ulceration of the oral mucosa. Evaluation is best performed by a thorough oral examination under anaesthesia combined with skull radiography. Clinical signs include: hypersalivation; altered food preference;



Figure 6: Dermatitis along the dorsum of a guinea pig suffering from *Trixacarus caviae* infestation. The mites were identified on microscopy of skin scrapes.

anorexia; tooth grinding; and, ocular discharge.

Treatment includes regular removal of dental spikes and correction of tooth crown height with a low speed burr under sedation or general anaesthesia (Figure 7). Dietary correction must be attempted as an adjunct to treatment.

- ‘Fur slip’, a sudden loss of a patch of fur, is a predator avoidance mechanism in this species and can occur in pets secondary to rough handling or fighting. It can be differentiated from dermatopathies as the underlying skin is clean and smooth. Treatment is not required. Hair regrowth may take many months.
- Heatstroke can occur in chinchillas if the environmental temperature rises to greater than 28°C in the presence of high ambient humidity. This can occur if the enclosure is located next to a radiator or a sunny window. Clinical signs include: hyperthermia (rectal temperature >39.4°C); recumbency; and, tachypnoea. Treatment includes brief, tepid (not cold) water baths and fluid therapy (preferably intravenous).
- Fur-ring is a condition seen in breeding and non-breeding male chinchillas in which fur accumulates under the prepuce and around the penis. Pain, paraphimosis and urinary obstruction may result. The penis must be lubricated until the fur-ring can be removed under sedation or anaesthesia. Owners should be encouraged to check their male chinchilla’s prepuce regularly for this problem.
- Gastrointestinal ileus may occur in chinchillas as a result of inadequate dietary fibre, gastrointestinal obstruction, anorexia, stress and/or pain. Reduced faecal output (size and number of pellets) is the key clinical sign. Radiography will reveal gaseous distension of parts of the gastrointestinal tract. Most cases will respond to prompt medical therapy (fluid therapy, non-steroidal anti-inflammatory analgesia with or without opioid analgesia, nutritional therapy and prokinetics such as metoclopramide and cisapride). Obstructions require surgical investigation once the patient is stabilised.

### Antibiotics to avoid in rodents

It is well known that some rodent species react adversely to particular antibiotics. The drugs in question usually cause intestinal dybiosis resulting in fatal clostridial



Figure 7: Chinchillas with acquired dental disease must undergo dental evaluation under anaesthesia on a regular basis. A low speed burr is used to remove spikes and to correct the crown height of affected teeth.

enterotoxaemia but direct toxicities are also reported.

Antibiotics to avoid by species are listed below.

- Chinchillas: penicillins (including ampicillin and amoxicillin); cephalosporins; clindamycin; lincomycin; erythromycin; chloramphenicol (high dose); and, aminoglycosides (high dose).
- Guinea pigs: penicillins (including ampicillin and amoxicillin); cefazolin; clindamycin; erythromycin; lincomycin; dihydrostreptomycin; streptomycin; bacitracin; chlortetracycline; oxytetracycline; tylosin; chloramphenicol (high dose); and, aminoglycosides (high dose).
- Hamsters: penicillins (including ampicillin and amoxicillin); cephalosporins; clindamycin; erythromycin; lincomycin; vancomycin; dihydrostreptomycin; streptomycin; bacitracin; oral gentamicin; and, tylosin.
- Gerbils: dihydrostreptomycin and streptomycin.
- Mice: dihydrostreptomycin; streptomycin; and, procaine preparations.

A basic formulary is provided in Table 1.

### Summary

Rodents comprise some of the most popular small mammal pets. On the basis of their biology they can be divided into the ‘mouse-like’ rodents and the hystricognath group. Each species has distinct husbandry requirements and disease susceptibilities. A generic and logical approach to clinical problems, combined with an understanding of some basic species-specific features, allows the veterinary surgeon to provide quality care to this diverse group of fascinating animals, and at the same time provide sound husbandry and preventative health advice to their owners.

### Further reading

- Meredith, A. and Redrobe, S. (2002). *BSAVA Manual of Exotic Pets*, 4<sup>th</sup> edition. British Small Animal Veterinary Association, Gloucester.
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- O’Malley, B. (2005). *Clinical Anatomy and Physiology of Exotic Species*. Elsevier Saunders, Edinburgh.
- Quesenberry, K. E. and Carpenter, J. W. (2004). *Ferrets, Rabbits and Rodents: Clinical Medicine and Surgery*, 2<sup>nd</sup> edition. Saunders, St Louis.

Table 1: Basic formulary for rodents

Drug	Class	Dose (mice and rats)	Dose (gerbils and hamsters)	Dose (chinchillas and Guinea pigs)
Buprenorphine	Analgesic	0.05-0.5mg/kg sc, im, ip, iv q6-12h	0.01-0.1mg/kg sc, im, ip, iv q8h	0.05mg/kg sc q8-12h
Butorphanol	Analgesic	1-2mg/kg sc q4h	1-5mg/kg sc, im, ip q4h	0.4-2.0mg/kg sc q2-4h
Carprofen	Analgesic	5mg/kg po, sc q24h	5mg/kg sc q24h	2mg/kg po, sc q12h or 4mg/kg po, sc q24h
Meloxicam	Analgesic	1-2mg/kg po, sc q24h	0.6mg/kg po, sc q24h	0.3-0.6mg/kg po, sc q24h
Ampicillin	Antibiotic	20-50mg/kg po, sc, im q12h	Hamsters: DO NOT USE Gerbils: 20-100 mg/kg sc q8h	DO NOT USE
Cephalexin	Antibiotic	60mg/kg po Rats: 15mg/kg sc Mice: 30mg/kg sc	DO NOT USE	DO NOT USE
Doxycycline	Antibiotic	5mg/kg po q12 h or 70-100mg/kg long-acting injection sc im q7d	2.5mg/kg po q12h	2.5mg/kg po q12h
Enrofloxacin	Antibiotic	5-10mg/kg po, sc, im q12h OR 0.1mg/ml drinking water	5-10mg/kg po, sc, im q12h	5-15mg/kg po, sc, im q12h
Gentamicin	Antibiotic	5-10mg/kg sc, im divided q8-24h	5-8mg/kg sc, im divided q8-24h	5-8mg/kg sc, im divided q8-24h
Metronidazole	Antibiotic; antiprotozoal	10-20mg/kg po q12h	20mg/kg po q12h	Chinchillas (use with caution): 10-20mg/kg po q12h Guinea pigs: 20mg/kg po q12h
Oxytetracycline	Antibiotic	10-30mg/kg po q8h OR 60mg/kg long-acting injection sc, im q72h OR 0.4mg/ml drinking water	Hamsters: 16mg/kg sc q24h OR 0.25-1.0mg/ml in drinking water Gerbils: 10mg/kg po q8h OR 20mg/kg sc q24h OR 0.8mg/ml drinking water	Chinchillas: 50mg/kg po q12h OR 1mg/ml drinking water Guinea pigs: DO NOT USE
Penicillin	Antibiotic	22,000IU/kg sc, im q24h	DO NOT USE	DO NOT USE
Tetracycline	Antibiotic	10-20mg/kg po q8-12h OR 2-5mg/ml drinking water	10-20mg/kg po q8-12h	Chinchillas: 10-20mg/kg po q8-12h OR 0.3-2.0mg/ml in drinking water Guinea pigs: DO NOT USE
Trimethoprim sulphamethoxazole	Antibiotic; anticoccidial	30mg/kg po, sc q12h	30mg/kg po, sc q12h	30mg/kg po, sc q12h
Tylosin	Antibiotic	10mg/kg po, sc q12h	Hamsters: DO NOT USE Gerbils: 10mg/kg po, sc, im q24h OR 0.5mg/ml drinking water	Chinchillas: 10mg/kg po, sc q12h Guinea pigs: DO NOT USE
Fenbendazole	For GI nematodes	20mg/kg po q24h x 5d	20mg/kg po q24h x 5d	20mg/kg po q24h x 5d
Fipronil	Anti-flea treatment	7.5mg/kg topically q30-60d	Hamsters: 7.5mg/kg topically q30-60 days Gerbils: no information available at time of publication	No information available at time of publication
Ivermectin	Ecto- and endoparasiticide	0.2-0.4mg/kg sc, topical q7-14d Dilute in propylene glycol for topical use	0.2-0.4mg/kg sc, topical q10-14d Dilute in propylene glycol for topical use	0.2-0.4mg/kg sc, topical q10-14d Dilute in propylene glycol for topical use
Praziquantel	For cestodes	6-10mg/kg po, sc q10d x 2-3 treatments	6-10mg/kg po, sc q10d x 2-3 treatments	6-10mg/kg po, sc q10d x 2-3 treatments
Dexamethasone	Corticosteroid: SELDOM INDICATED IN RODENTS	0.5-2mg/kg sc, im, iv	0.5-2.0mg/kg sc, im, iv	0.5-2.0mg/kg sc, im, iv
Furosemide	Diuretic	2-10mg/kg po, sc, im q6-12h	2-10mg/kg po, sc, im q6-12h	2-5mg/kg po, sc, im q6-12h
Metoclopramide	Prokinetic	0.2-1.0mg/kg po, sc, im q12h	0.2-1.0mg/kg po, sc, im q12h	0.2-1.0mg/kg po, sc, im q8-12h
Cisapride	Prokinetic	0.1-0.5mg/kg po q12h	0.1-0.5mg/kg po q12h	0.5mg/kg po q8-12h
Lactated Ringer's Solution	Fluid therapy	10-25ml/kg sc, ip, iv (slow bolus)	10-25ml/kg sc, ip, iv (slow bolus)	10-25ml/kg sc, ip, iv (slow bolus)