

# Small Mammal Dentistry

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Many veterinary technicians are unfamiliar with the oral conditions of small mammals and the treatment options. By the time their owners notice a problem, these small patients may already be debilitated. Technicians and pet owners need to be knowledgeable about the particular needs of small mammals in order for these animals to have healthy mouths.

## Oral Anatomy

### Rabbits

The dental formula for rabbits is  $2(I2/1, C0/0, P3/2, M3/3) = 28$ .<sup>1</sup> Rabbit teeth grow continuously and have no true anatomic roots.<sup>2</sup> Rabbits have two incisors in each upper quadrant: a rostral and a caudal tooth (the caudal teeth are often called *peg teeth*). The lower incisors occlude between the upper posterior incisors and the peg teeth in a scissor-like fashion to bite off grasses and hay. Rabbits do not have canine teeth; between the incisors and premolars is a long gap called a *diastema*, which is occupied by cheek tissue when the mouth is closed.<sup>3</sup> The mandible is slightly narrower than the maxilla, which, coupled with reduced chewing motion, can cause sharp spurs to form on the lingual aspects of the mandibular cheek teeth and on the buccal aspects of the maxillary cheek teeth. If the teeth are not properly worn, which can be due to an inappropriate diet, trauma, or genetic defects, they elongate and cause malocclusion.

### Caviomorph Rodents

Caviomorph rodents include guinea pigs, chinchillas, and degus. Their dental formula is  $2(I1/1, C0/0, P1/1, M3/3) = 20$ .<sup>1</sup> All teeth of caviomorphs grow continuously and have open root apices.<sup>4</sup> Each quadrant has only one incisor and no canine teeth. A diastema is present between the incisors and cheek teeth. The incisors of chinchillas and degus, but not guinea pigs, are normally yellowish orange. The angulation of the mandibular cheek teeth can cause tongue entrapment in guinea pigs with malocclusions.

### Murine Rodents

Murine rodents include hamsters, rats, mice, and gerbils. Their dental formula is  $2(I1/1, C0/0, P0/0, M3/3) = 16$ .<sup>1</sup> Murine rodents have continuously growing incisors, but unlike caviomorphs, their molars have true closed roots and do not grow continuously. The mandibular incisors are much longer than the maxillary incisors, and the incisor enamel is orange.<sup>5</sup> A diastema is present, separating the incisors and the cheek teeth. Hamsters have a large cheek pouch, which normally fills the diastema.

### Ferrets

The dental formula for ferrets is  $2(I3/3, C1/1, P3/3, M1/2) = 34$ .<sup>6</sup> Ferret teeth closely resemble feline teeth in form and function, but ferrets have an additional mandibular premolar and molar.

### Hedgehogs

The dental formula for hedgehogs is  $2(I2-3/2, C1/1, P3-4/2-3, M3/3) = 34$  to 40.<sup>7</sup>

Hedgehogs are insectivores with a long, narrow snout and a primitive tooth structure. The incisors are used to grasp prey, and the canine teeth may resemble incisors or first premolars. All teeth have true anatomic roots and do not grow continuously.<sup>8</sup>

### Sugar Gliders

The dental formula for sugar gliders is  $2(I3/2, C1/0, P3/3, M4/4) = 40$ .<sup>9</sup> Sugar gliders are small marsupials with teeth designed for stripping bark from trees. The mandibular incisors are longer than the maxillary incisors.<sup>10</sup> The molars are much larger and wider than the premolars. All the teeth have true anatomic roots and do not grow continuously.

## Clinical Signs of Dental Disease

Because small mammal pets may not be handled much by their owners, these pets can become seriously debilitated before owners notice a problem. The most common clinical signs of dental disease that these pets present with are described below; these signs may also indicate other medical problems.<sup>11</sup>

### Anorexia

The pet may be too painful to eat, as in the case of a tooth root abscess, a fractured tooth, or periodontal disease. In other cases, the pet may be physically unable to eat, such as when overgrown teeth prevent prehension and mastication of food.

### Hiding, Hunching, and Teeth Grinding

Hiding, hunching, and teeth grinding can be signs of pain in many small mammals, but the pain is not necessarily specific to the oral cavity.

### Hypersalivation

Seen most often in rabbits and chinchillas, hypersalivation (commonly called slobbers) can lead to wetness under the chin and dewlap area, which can lead to dermatitis. Hypersalivation is



**Figure 1.** Visualizing rabbit cheek teeth with the patient under general anesthesia.

often associated with malocclusion in which the pet cannot close its mouth.

### **Halitosis**

Pet owners may mistake halitosis for a generalized malodor. Halitosis is most commonly associated with periodontal disease.

### **Epiphora**

Epiphora can be due to conditions such as an abscess of the maxillary tooth root, an eye infection or irritation, an allergy, or a blocked tear duct.

## **Oral Examination**

### **Limitations**

It is difficult to perform a complete oral examination of small mammal patients while they are awake because of their small, narrow oral cavities and the long diastema of rabbits and rodents. The exception to this is ferrets, which can usually be examined in much the same way as cats. The incisors of small mammals can often be visualized while they are awake; however, accurate detection of problems involving the cheek teeth requires sedation or general anesthesia to allow placement of tools such as cheek retractors and mouth gags, which are necessary for proper visualization (**FIGURE 1**).

### **Equipment**

An otoscope, a laparoscope, or a small vaginal speculum is useful for looking at the cheek teeth of unanesthetized rabbits and rodents and for detecting obvious problems. However, this method does not provide the type of visualization that can be achieved in an anesthetized patient.

### **Assessment**

The face and head should be assessed for asymmetry, swellings, discharge from the eyes or nose, drooling, saliva staining, or



**Figure 2.** Tongue entrapment (*arrows*) in a guinea pig.

inability to close the mouth. All rabbits and rodents should be examined for incisor overgrowth and abnormal incisor wear. Rabbits and caviomorph rodents should be checked for irregular wear of the cheek teeth, including sharp points or hooks, and for entrapment of the tongue beneath the mandibular cheek teeth (especially in guinea pigs; **FIGURE 2**). Other problems include impaction of food between teeth, soft tissue lacerations or ulcerations, cheek pouch impaction or eversion (only in hamsters), stomatitis, periodontal disease, tartar accumulation, and fractured teeth. The gingiva, oral mucosa, and sublingual area should be checked for swellings or oral masses.

## **Anesthesia**

Anesthesia techniques for small mammals are outside the scope of this article. If you need more information, many excellent books, articles (e.g., “Dentistry in Pet Rodents” [*Compendium* January 2006], “Dentistry in Pet Rabbits” [*Compendium* September 2005]), and other resources have been devoted to this subject.

## **Dental Radiography**

Dental radiography of small mammal patients is best performed with a dental x-ray unit. However, a standard x-ray unit capable of low kilovolt peak settings can be used to obtain extraoral skull radiographs of large rodents and rabbits. Sedation or general anesthesia is necessary to ensure that the patient does not move during exposure.

### **Rabbits, Rodents, and Other Small Mammals**

Extraoral skull radiographs are usually obtained for rabbits, rodents, and other small mammals because the small size of their oral cavities makes it difficult to insert film and obtain a diagnostic image. Manual dental film size #4 can capture the entire skull of most species, or several exposures using size #2 film can be compiled. The standard views obtained are described below.



**Figure 3.** Lateral extraoral radiograph of rabbit with malocclusion and root elongation (arrows).

The **lateral view** is the most useful<sup>12</sup> for assessing occlusion, crown or root overgrowth, and bony changes to the ventral cortex of the mandible. The disadvantage of this radiographic view is that the left and right quadrants of the mouth are superimposed. The patient is placed in lateral recumbency with the x-ray film beneath the skull. In lateral radiographs of rabbits and caviomorphs, normal incisors appear chisel-shaped and cheek teeth have an even, zigzag pattern, whereas waves or steps are signs of malocclusion (**FIGURE 3**).

The two **lateral oblique views** are obtained with the patient in lateral recumbency and the skull rotated approximately 45° right to left and left to right, revealing details of the teeth, root apices, and surrounding bone without superimposition of structures from the opposite side of the mouth.

For the **dorsoventral view**, the patient is placed in sternal recumbency with the x-ray film placed beneath the chin and skull. The dorsoventral view reveals asymmetry of the skull and irregular bony contours.

### Guinea Pigs

The **rostrocaudal skull view** is an additional view that is useful for detecting malocclusions in guinea pigs. The patient is placed in dorsal recumbency with its nose pointing up at the x-ray tube head. The x-ray film is placed beneath the skull. An oblique radiolucent line can be seen between the upper and lower cheek teeth on either side of the mouth in guinea pigs with normal occlusion.<sup>13</sup>

### Ferrets

Positioning ferrets for dental radiography is much the same as for cats. Extraoral skull radiographs are not recommended because intraoral radiographs are much more diagnostic. A bisecting angle technique using size #0, #1, and #2 dental x-ray film can be used to obtain intraoral images of the teeth.



**Figure 4.** A rabbit with an abscessed molar.

## Dental Problems and Treatments

### Malocclusion

The most common dental problem in rabbits and rodents is incisor overgrowth,<sup>14</sup> which is almost always secondary to cheek tooth overgrowth. Malocclusion can be due to (1) tooth fracture resulting in loss of normal wear on the opposing tooth, (2) unequal jaw lengths, or (3) inadequate consumption of roughage for wearing the teeth. Malocclusion and/or periodontal disease can cause altered curvature of the teeth, which may widen the spaces between teeth, leading to impaction of food, periodontal pockets, and periodontal abscesses (**FIGURE 4**). Inadequate wearing of teeth can lead to sharp spikes on the teeth, resulting in soft tissue lacerations. Elongation of the mandibular roots can cause a palpable “lumpy jaw,”<sup>15</sup> while long maxillary cheek tooth roots can cause eye prolapse in severe cases. Root elongation of the maxillary incisors can obstruct the tear ducts, causing ocular discharge.

Odontoplasty (also known as *crown height reduction*, *occlusal leveling*, or *occlusal equilibration*) is the most common treatment for malocclusion, often needing to be repeated every 6 to 8 weeks.<sup>1</sup> Once a tooth's curvature has been altered, the curvature rarely returns to normal, even after numerous odontoplasty procedures. Extraction of the affected teeth along with their opposing teeth is another option for resolving the problem. However, if any amount of germinal tooth tissue is left behind, the tooth may grow back. Dietary change, such as substituting hay for pellets, can be successful in cases of malocclusion when tooth curvature has not been altered, although getting rabbits to accept a new food is often difficult.

### Periodontal Disease and Tooth Root Abscess

Plaque-related periodontal disease is rare in rabbits<sup>16</sup> and caviomorphs. More commonly, food or bedding becomes impacted between teeth, and subsequent infection causes loose teeth or periapical abscesses. Other causes of periapical abscess include tooth pulp exposure or penetrating wounds. Treatment involves





**Figure 5.** A hedgehog with severe periodontal disease. Note the tartar and tooth loss.



**Figure 6.** A ferret with a fractured upper-right canine tooth.

tooth extraction, curettage of infected material, flushing the area with saline or povidone-iodine solution, and administration of systemic antibiotics. Placement of perioceutics or antibiotic-impregnated beads should be considered. Extraoral abscess marsupialization is necessary when complete curettage of the abscess is unachievable intraorally. Even with treatment, including extraction, abscess recurrence is common because it is difficult to completely eradicate the infection.

In ferrets, murine rodents, hedgehogs, and sugar gliders, plaque-induced periodontal disease is more common (**FIGURE 5**). Comprehensive oral health assessment and treatment (COHAT) and extraction of teeth with advanced attachment loss are necessary, along with administration of an antibiotic and pain medication.

### **Dental Caries and Tooth Resorption**

Dental caries can occur in rodents fed a diet high in sugar. Tooth resorption can also occur, possibly secondary to periodontal



**Figure 7.** Odontoplasty of incisors in a guinea pig.

inflammation. In either case, extraction should be considered if tooth damage is extensive. However, if a carious lesion is present on a continuously growing tooth that appears otherwise healthy and is erupting, odontoplasty and pulp capping is an option.

### **Tooth Fracture**

Tooth fracture, especially of the maxillary canine teeth, is very common in ferrets (**FIGURE 6**).<sup>17</sup> If a fracture has exposed the tooth pulp, extraction or root canal therapy is necessary.

### **Other Problems**

Guinea pigs cannot synthesize their own vitamin C. Therefore, if they do not receive vitamin C supplementation, they develop scurvy, which results in gingival bleeding and loose teeth, sometimes leading to malocclusion.

The cheek pouches of hamsters can become impacted if sticky, dry, or sharp materials are ingested. Clinical signs of impaction include lethargy, inappetence, and permanent swelling (fullness) of the cheek. With the patient under sedation, the impacted pouch must be emptied and rinsed clean with saline. Long-term impaction can lead to stomatitis, for which antibiotics may be necessary.

Everted cheek pouches appear as moist, pink, fleshy masses protruding from the mouth. The cheek pouches should be replaced and sutured to the cheek to prevent re-eversion. The causes of cheek pouch eversion are unknown.

### **Dental Equipment**

For trimming incisors, the use of nail clippers or tooth trimmers is no longer acceptable<sup>18</sup> because they can cause diagonal tooth fractures. Instead, a #330, #701, or coarse diamond cone bur on a high-speed handpiece with the water turned off can be used to reduce incisor height, sometimes even in awake patients. Inserting half of a tongue depressor or cotton-tipped applicators behind the incisors can protect the tongue and soft tissues from injury (**FIGURE 7**). For odontoplasty of the cheek teeth, the patient must



**Figure 8.** Odontoplasty of overgrown cheek teeth in a guinea pig.

be anesthetized and cheek dilators and a mouth gag placed to allow access to the caudal oral cavity (**FIGURE 8**). A slow-speed handpiece and bur, such as an HP5 or HP558, should be used to shorten overgrown teeth or sharp spurs. If no burs are available, the cheek teeth can be floated using small mammal premolar and molar rasps; however, this technique is not recommended because of increased risk of damaging soft tissues. Cotton-tipped applicators or suction can be used to remove blood, debris, and fluid from the mouth.

To extract continuously growing teeth, a set of rodent incisor and molar/premolar luxators and extraction forceps are required. Extraction sites need to be closed with a fine, absorbable suture.

Other tools include magnifying loupes and 18-, 20-, and 22-gauge needles, which can function as luxators when very small teeth are extracted (**FIGURE 9**).

For ferrets, the same dental equipment (e.g., curettes, scalers, periosteal elevators, luxators) that is used in cats can be used. A standard ultrasonic dental scaler is ideal for removing plaque and calculus. The oral cavity can be packed with gauze or suctioned to prevent aspiration of water and debris.

### **Husbandry to Promote Dental Health** *Rabbits and Caviomorph Rodents*

The continuously growing teeth of rabbits and caviomorph rodents are designed to be worn by an abrasive diet of grasses and vegetation. Tooth overgrowth can result from not consuming enough roughage to wear the teeth or from stress-related behavioral problems, such as cage chewing. To prevent diet-related malocclusions, most of the diets of rabbits and caviomorph rodents should be roughage, such as timothy hay, fresh grass, and fibrous vegetables, with only a small amount of commercial pellets. Chewing aids such as wooden blocks are not of much use in these species because these aids do not help wear the cheek teeth. Stress may be alleviated by providing a larger cage, removing or adding cage mates, or adding environmental enrichment such as toys and mazes.



**Figure 9.** Small mammal dental instruments. (1) Cheek pouch dilators, (2) mouth gag, (3) burs, (4) extraction forceps, (5, 7) incisor luxators, (6, 8) molar/premolar luxators, (9, 10) molar/premolar rasps.

Debilitated or painful patients may need nutritional support. Rabbits are of particular concern because anorexia in this species can result in gastrointestinal stasis—a slowing or stopping of normal intestinal peristalsis—leading to death, if untreated. A variety of soft foods can be offered or force-fed. For example, powdered recovery foods for herbivores can be mixed with water and fed from a syringe (50 mL/kg/d).<sup>11</sup> Yogurt, hay, and vegetables can be pureed with water in a blender. Catheter-tipped syringes (35 mL) can be used to force-feed rabbits, abscess-flushing syringes with trimmed tips can be used to force-feed chinchillas and guinea pigs, and 1- to 3-mL syringes work well for force-feeding degus.

Oral medications may be mixed with fruit juice in the dosing syringe to improve palatability. If the patient has had extraoral surgery such as abscess lancing, bedding and debris may stick to the site. Owners should be advised to keep the area clean. Sterile saline can be used to flush abscesses at home, but caution must be exercised because abscesses may communicate with the oral cavity, so the patient must be allowed time to swallow the saline.

### **Murine Rodents**

Murine rodents possess continuously growing incisors that allow them to nest in and tunnel through hard obstacles; these rodents do not have continuously growing cheek teeth. In the wild, these rodents' diet of seeds, roots, and tubers is not particularly abrasive. Providing chewing aids (e.g., wooden blocks, cardboard without print, undyed tissues) can help wear rodent incisors and allow rodents to exhibit normal chewing and nesting behavior. Feeding a diet high in refined carbohydrates can cause dental caries in rodents, so frequent use of commercial honey treats should be avoided. Hamsters should not be given sticky or sharp materials, which can lead to cheek pouch impaction.

Anorectic patients should be offered nutritional support. Edible rodent blocks, vegetables, or fruit can be ground and mixed with

## Glossary

**Antibiotic-impregnated beads**—polymerized polymethacrylate beads that are inserted at the site of infection to deliver a high concentration of antibiotic

**Bur**—a cutting tool similar to a drill bit that is used on a dental handpiece to cut and carve teeth, bone, and, in some cases, soft tissue

**Caviomorph**—member of the parvorder Caviomorpha of the order Rodentia, including the families Chinchillidae and Caviidae

**Cheek pouch impaction**—occurs when a hamster is unable to empty one or both cheek pouches

**Cheek teeth**—the premolars and molars

**Curettage**—the use of a curette to remove tissue, tartar, or other material by scraping

**Dental caries**—the breakdown of enamel and dentin due to acid by-products of bacteria that consume sugars

**Diastema**—a space or gap between teeth

**Epiphora**—watery eyes due to excessive tear production or an obstruction of the lacrimal duct

**Gingiva**—the immobile, keratinized epithelial tissue directly surrounding the teeth

**Halitosis**—a foul odor from the mouth, often due to periodontal disease

**Insectivore**—a carnivore that primarily eats insects

**Lingual**—toward the tongue

**Malocclusion**—a condition of the jaw or individual teeth resulting in misaligned teeth

**Mandible**—the pair of bones that form the lower jaw

**Marsupial**—a type of mammal whose young are born prematurely and are carried by the mother in a pouch until development is complete

**Maxilla**—the pair of bones that form the upper jaw

**Murine**—a family within the order Rodentia that includes rats, mice, hamsters, and gerbils

**Oral mucosa**—the nonkeratinized epithelial tissue that lines the oral cavity, except around the teeth

**Periapical**—surrounding a tooth root's apex

**Perioceutic**—a locally applied antimicrobial agent used to treat periodontal disease

**Periodontal disease**—infection and inflammation of the tissues surrounding and supporting the teeth

**Periosteal elevators**—thin-bladed instruments used to remove tissue from underlying bone

**Plaque**—a biofilm that covers the teeth and is composed of food particles, bacteria, and epithelial cells

**Pulp capping**—applying calcium hydroxide or another appropriate medicament to a damaged tooth to protect the pulp, prevent infection, and promote the formation of reparative dentin; applying dental sealants such as unfilled resins is not sufficient for pulp capping; direct pulp capping is performed when the pulp is exposed; indirect pulp capping is performed if the damage approaches the pulp but does not expose it

**Root apex (apices)**—the end of a tooth root containing the apical foramen, through which pass the tooth's nerves and blood supply

**Root canal therapy**—treating a dead or damaged tooth by removing the pulp, replacing it with an inert material, and sealing the tooth

**Scurvy**—a disease resulting from a lack of vitamin C, causing bleeding gums, loose teeth, and weakness

**Stomatitis**—inflammation of the mucous membranes of the mouth

**Sublingual**—beneath the tongue

water to be fed by syringe. Cooled oatmeal or boiled carrots can be hand fed to rodents that resist syringe feeding. These measures are only meant for short-term feeding.

### Other Small Mammals

Pet hedgehogs should be fed either a hedgehog-specific commercial diet or a high-protein cat food.<sup>19</sup> Crickets, mealworms, cooked lean meats, fruits, and vegetables can be added as occasional treats. Canned cat food can be syringe fed to debilitated and anorectic patients that allow handling. Medications can be mixed with canned cat food or chicken broth in a syringe. If a patient resists handling, canned cat food, hardboiled eggs, cottage cheese, or pinkie mice can be offered.

Sugar gliders are generally fed commercial pellets, pinkie mice, mealworms, eggs, cooked chicken, fruits, and vegetables. They are nocturnal, so restraint and syringe feeding of debilitated patients may be more successful in the morning, when they are more inactive. Subcutaneous fluids may be needed to remedy dehydration, but some sugar gliders will accept water mixed

with fruit juice, yogurt, or jarred baby food by mouth from a syringe.

### Ferrets

At least 30% of a ferret's diet should be protein from animal sources.<sup>20</sup> There are many commercial diets for ferrets. Small amounts of fruits, vegetables, and grains can be offered, but refined carbohydrates such as white bread, pasta, or sugary treats should be avoided.

To help prevent periodontal disease, ferrets can be taught to accept daily toothbrushing with a cat toothbrush and toothpaste. Tooth fractures are very common in ferrets because of their chewing tendencies; therefore, owners should check their pets' teeth regularly for signs of fracture.

Anorectic ferrets should be syringe fed a canned high-protein diet until they eat on their own. Canned cat foods work well for this. Most ferrets will tolerate feedings of 5 to 10 mL four times daily.<sup>21</sup> Medications should be dispensed in liquid form, if possible, because it can be very difficult for ferret owners to administer pills or capsules.



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