

Respiratory System Anatomy, Physiology, and Disease: Guinea Pigs and Chinchillas

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- Guinea pig • Chinchilla • Respiratory diseases
- Scurvy • Dentition

In the last decade, nontraditional companion mammals have gained increasing interest and popularity both in Mexico and the United States. Rodents are now presented frequently to the exotic animal practitioner for professional medical care.

The order Rodentia comprises the most numerous species of all mammals and includes 2 suborders, one of which, the Hystricognathi, describes guinea pigs and chinchillas. The suborder name derives from the Latin word *hystrix* (porcupine), in recognition of the porcupinelike nature of these animals. Guinea pigs and chinchillas normally have life expectancies between 5 and 10 years. Improved knowledge of proper diets, husbandry, and veterinary care has led to an improved quality of life and client satisfaction.

Guinea pigs (*Cavia porcellus*), also known as cavies, are classified as members of the family Caviidae and are represented by 14 species. Chinchillas belong to the family Chinchillidae and are represented by 6 species, including long-tailed chinchillas (*Chinchilla laniger*) and short-tailed chinchillas (*Chinchilla brevicaudata*).

Both of these hystricomorph rodents come from South America. Guinea pigs inhabit rocky areas, forest edges, and also swamps in Venezuela, Colombia, Brazil, and Argentina. Chinchillas are rare in the wild and may even be extinct,¹ although other researchers report that *C laniger* may be found in arid areas of the northern Chilean Andes inhabiting rocky crevices at elevations between 3000 and 5000 m; however, the short-tailed species (*C brevicaudata*) has been reported rare or possibly extinct in the wild.²

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The word rodent derives from the Latin verb *rodere*, meaning to gnaw. Although the dental formulas of members of this animal order vary, guinea pigs and chinchillas share the following dental formula:

$$I\ 1/1, C\ 0/0, PM\ 1/1, M\ 3/3 = 20$$

Incisors grow continuously in rodents, a trait classified as *elodont*. Cheek teeth classification further identifies rodents. The teeth of guinea pigs and chinchillas have long, continuously growing crowns (*hypodont*) and no anatomic root (*aradicular*), whereas rats, mice, and hamsters have short-crowned molars with roots (*brachydont*) that stop growing once fully erupted.^{3–5} Guinea pigs and chinchillas have a *diastema*, or gap, between the incisors and the cheek teeth, a trait they share with rabbits.^{1,4,5}

Dental anatomic adaptations are important in rodent classification, as are features related to feeding habits. The teeth of guinea pigs and chinchillas teeth are adapted to a more abrasive and voluminous diet and have larger chewing surfaces necessary for an herbivorous diet, which also implies pronounced wear in time from prolonged chewing. This cheek teeth wearing is compensated for by constant growth of premolars and molars.^{3,5} Guinea pigs exhibit a maxilla wider than the mandible, with a marked occlusal angle of the cheek teeth, in comparison with other rodents.⁶

As with all rodents, the enamel on the incisors of guinea pigs and chinchillas is deposited unevenly (absent on the lingual surface, slight deposition on the mesial and distal surfaces, and full deposition on the labial surface). This feature allows the continuously growing incisor to wear through abrasion, without which the tooth would become too long and prevent feeding. It also helps to sharpen the incisors. The superficial layer of the enamel is pigmented yellow-orange in most rodents, but not in guinea pigs, whose incisors are white.^{2–4}

NUTRITION AND HUSBANDRY REQUIREMENTS OF GUINEA PIGS AND CHINCHILLAS

Nutrition

Guinea pigs

In the past, low-quality guinea pig diets with imbalanced mineral concentrations (rich in calcium and phosphorus and deficient in magnesium) were associated with metastatic calcification of soft tissues around elbows and ribs, leading to a wrist stiffness syndrome. Mineralization also involved lungs, aorta, heart, kidneys, sclera, and uterus. The incidence of this condition has been reduced in the last few years because guinea pigs are now generally fed high-quality diets manufactured and balanced according to their specific nutritional requirements.⁷

Guinea pigs, like other mammals (nonhuman primates, humans, and some bat species), require a dietary source of vitamin C (ascorbic acid) because they lack *L-gulonolactone oxidase*, a hepatic enzyme that converts glucose into ascorbic acid.^{2,8}

Vitamin C deficiency may be an underlying factor for any illness in the guinea pig: it produces scurvy, the main clinical signs of which can range from the acute form, with painful joints, generalized immobility, and anorexia, to the chronic form of the disease, characterized by weakness, diarrhea, anorexia, petechia of the mucous membranes, and recurrent chronic diseases including pneumonia and other infections (Fig. 1).^{1,7,9,10}

Scurvy in guinea pigs is prevented by the use of proper species-specific commercial diets in which a stable form of vitamin C (as *L-ascorbyl 1–2-polyphosphate*) is added to the formulation. However, oxidation may deplete the levels of vitamin C in these diets even 90 days after production, and some investigators recommend that supplemental

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