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# Supernumerary teeth in the deer mouse Peromyscus leucopus (Rodentia: Cricetidae)

**Type**

Short note

**Keywords**

pathology, hyperdontia, Premolar, Odontogenic, Peromyscus, odontoma

**Abstract**

Cases of supernumerary teeth and odontogenic masses in Rodentia are well documented in the literature, but statistically are still relatively uncommon findings. Odontogenic lesions present rarely in rodent families Cricetidae and Muridae, though extra teeth have been documented in Saccostomus, Mesembriomys, Zapus, Baiomys, Peromyscus, Mus, Orzomys, Microtus, and Necromys. The authors here report a possible example of atavistic diastemal teeth in a specimen of Peromyscus (Rodentia: Cricetidae) preserved in the teaching museum collections of Northern Illinois University NIU. To explore frequency of dental anomalies in Peromyscus, we examined a large population of 396 P. leucopus and 51 P. maniculatus housed in the collections of the Chicago Field Museum of Natural History and University of Alberta Museum of Zoology. Only one additional case was found, highlighting the probable rarity of such pathologies in this genus.

**Explanation letter**

corrected typo at line 5 "four premolars"

# Supernumerary teeth in the deer mouse *Peromyscus leucopus* (Rodentia: Cricetidae)

Cases of supernumerary teeth and odontogenic masses are well documented in Rodentia and other mammal groups, but statistically are still relatively uncommon findings. Odontogenic lesions present rarely in rodent families Cricetidae and Muridae, though extra teeth have been documented in *Saccostomus*, *Mesembriomys*, *Zapus*, *Baiomys*, *Peromyscus*, *Mus*, *Orzomys*, *Microtus* and *Necromys*. The authors here report a possible example of atavistic diastemal teeth in a specimen of *Peromyscus* (Rodentia: Cricetidae) preserved in the teaching museum collections of Northern Illinois University NIU. To explore frequency of dental anomalies in *Peromyscus*, we examined a large population of 396 *P. leucopus* and an additional 51 *P. maniculatus* housed in the collections of the Chicago Field Museum of Natural History and University of Alberta Museum of Zoology. Only one additional case was found, highlighting the probable rarity of such pathologies in this genus.

In mammals the normal dental complement of incisors, canines, premolars, and molars is species-specific and taxonomically diagnostic. The primitive dental condition for eutherian mammals is three incisors, one canine, four premolars, and three molars per quadrant (Viriot et al., 2002; Peterková et al., 2014). In most eutherian mammals, a fourth premolar develops as a deciduous tooth but is not replaced in the adult dentition (Viriot et al., 2002). Secondary loss of teeth during evolution, such as reduction in molar count or absence of premolars, is expressed during tooth development through genetically controlled cellular apoptosis of tooth germs or by fusion of dental elements. Most members of Rodentia are monophyodont, lacking a deciduous tooth stage, and erupt a permanent adult dentition shortly after birth. Normal adult tooth formula in *Peromyscus* is one incisor and three molars per quadrant (Kurta 1995; Viriot et al., 2002). Premolar and canine teeth are completely absent in myomorph rodents such as *Peromyscus*, instead forming an edentulous diastema between the incisors and first molars in upper and lower jaws.

Supernumerary teeth, or hyperdontia, are extra teeth that develop in addition to the normal dental complement (Garvey et al., 1999). Such a condition is rarely documented within the family Cricetidae. In a comparative study of dental anomalies in deer mice *(Peromyscus)*, Furtek and Bradley (1976) examined a large sample of 1,018 skulls but found no cases of extra teeth. Hooper (1957) is the first to report extra molars in a species of *Peromyscus*. Zielinksi (1978) reports a case of a maxillary tooth labial to $M^1$ in a wild-caught *P. leucopus*. Two examples of extra molar teeth in *P. maniculatus* were found in a sample of 2,800 *Peromyscus* skulls examined by Sheppe (1963).

Pathologically, odontomic masses and supernumerary teeth both originate from the same developmental pathways and are sometimes difficult to distinguish (Pippi, 2014). In rodents, odontomas occur most frequently in association with the upper incisor teeth, sometimes forming large masses that intrude into the nasal cavity. Odontomas can occur as compound, organized structures resembling a functional tooth, or as composite, irregular masses (Garvey et al., 2009; Pippi, 2014). Most types of odontomas reported in human clinical cases are interosseus, developing from within bone with or without eruption. At least in human cases, extraosseus or peripheral odontomas are rarer and are often shed as they lack developed roots and ligaments (Hanemann et al., 2013). Odontomas have been reported from laboratory strains of rats (*Rattus*) and mice (*Mus*) (Smulow et al., 1983; Dayan et al., 1994; Slootweg et al., 1996; Jang et al., 2002), often associated with abnormal tooth eruption, malocclusion, trauma, infection, or exposure to toxic or carcinogenic substances. Finkel et al. (1979) reports a case of un-erupted odontomas of the incisors occurring in a laboratory colony of *Peromyscus*.

Accessory dental structures and/or pathologies are reported here in a specimen of *Peromyscus leucopus* from the museum teaching collections of Northern Illinois University (NIU). We examined an additional dataset of 384 *P. leucopus* from Field Museum of Natural History (FMNH) collections, and 51 *P. maniculatus* and 12 *P. leucopus* from the University of Alberta Museum of Zoology (UAMZ), to test occurrence rate of dental abnormalities in museum collections of *Peromyscus*. Specimens were examined under a dissecting microscope at high power and photographed on a Leica MZ7.5 stereo microscope equipped with a Leica MC170 HD color digital camera. Photographs were scaled to 10.0 mm with resolutions of 1200-1500 dpi. Standard measurements were taken with digital calipers. Greatest occipital-nasal length (ONL) was taken for each specimen as a standard measurement, and length of each pathology measured to the nearest 0.01 mm with digital calipers (Table 1). We attempted to take radiographs, but equipment available was inadequate for the size scale of specimens and resolution was poor.

NIU1217 (*P. leucopus*) (Table 1; Fig. 1) is of adult age class as indicated by complete eruption of third molars. This individual has three anomalous odontogenic structures in the left mandibular diastema. They are peg-like and appear to lack defined roots or enamel. In addition, two bony tubercular growths of possible pathologic origin are seen on the ventrolateral aspect of the right mandible, slightly anterior and inferior to $M_1$. We found a single additional specimen, FMNH6918, to have two inferiorly projecting growths from the ventral squamosal root of the zygomatic arch (Table 1; Fig. 2). This mass appears to be of odontogenic origin, partially erupted within a region of abnormal bone growth. The etiology of the growths documented in NIU and FMNH specimens is unclear without further histological examination. Frequency of such anomalies in *Peromyscus* collections is calculated as 0.2-0.5%.

The diastemal anomalies seen in NIU1217 are unassociated with the incisive region, or with any type of physical trauma or toxicity, but similar to extraossesus odontomas in lacking roots or ligamentous connections. However, their serial regularity would seem to preclude them as odontogenic masses. The mass seen in FMNH6918, in contrast, is more consistent with a compound, partially erupted odontogenic growth. In all cases documented in *Peromyscus*, supernumerary teeth always occur in association with the maxillary or mandibular molar row itself, usually either immediately distal to the third molar or mesial to the first. In NIU1217, the lack of association with the molar row makes them atypical of supernumerary molars. Premolars are lost in adult mice (*Mus*), but two buds (premolars $P_3$ and $P_4$) normally develop in the embryonic mandible mesial to $M_1$. The anterior $P_3$ bud disappears while the posterior $P_4$ is incorporated into the adult $M_1$. Seven tooth buds develop in the maxilla (Viriot et al., 2002; Klein et al., 2006; Peterková et al., 2006; Peterková et al., 2014). If an atavistic expression of premolar development, this would to the best of our knowledge be the first recorded case of accessory premolars in an adult *Peromyscus*.

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Declarations of interest: none

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**Table 1** – Specimens examined.

| ID | Species | Sex | Age-class | ONL (mm) | Figure | Length (mm) |
|---|---|---|---|---|---|---|
| NIU1217 | *P. leucopus* | F | Adult | 26.35 | 1. | (*a*) 2.75<br>(*b-d*) ~0.62 |
| FMNH6218 | *P. leucopus* | M | Adult | 25.95 | 2. | (*a*) ~0.64 |

Figure 1
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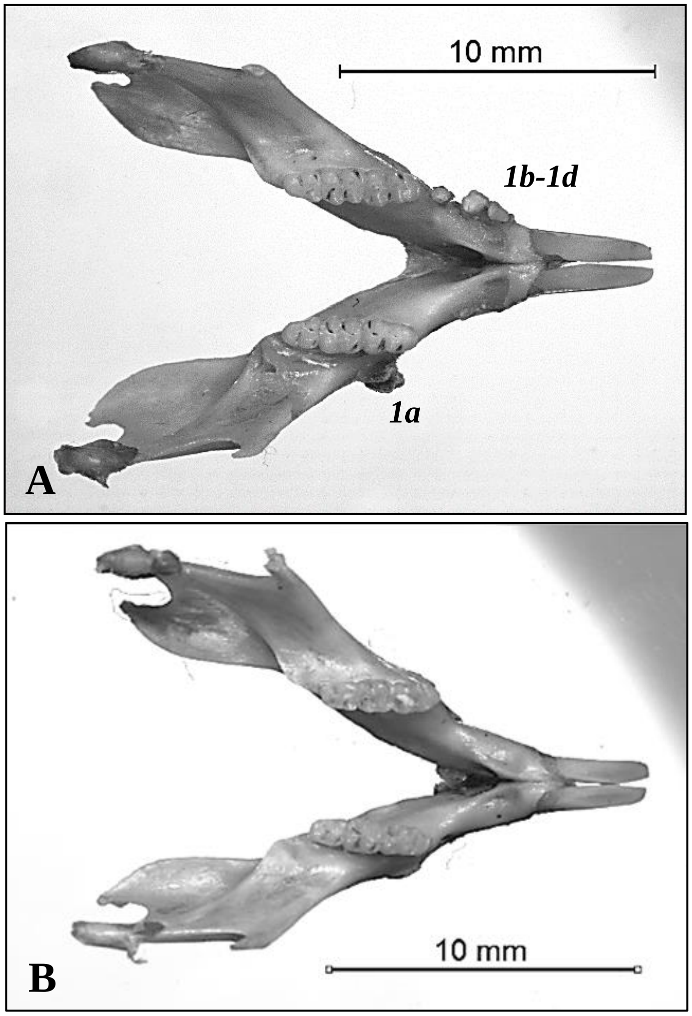


**Figure 1 -** (A) Occlusal view of mandibular pathologies (1a) and (1b-1d) - NIU1217 (B) wildtype NIU1233

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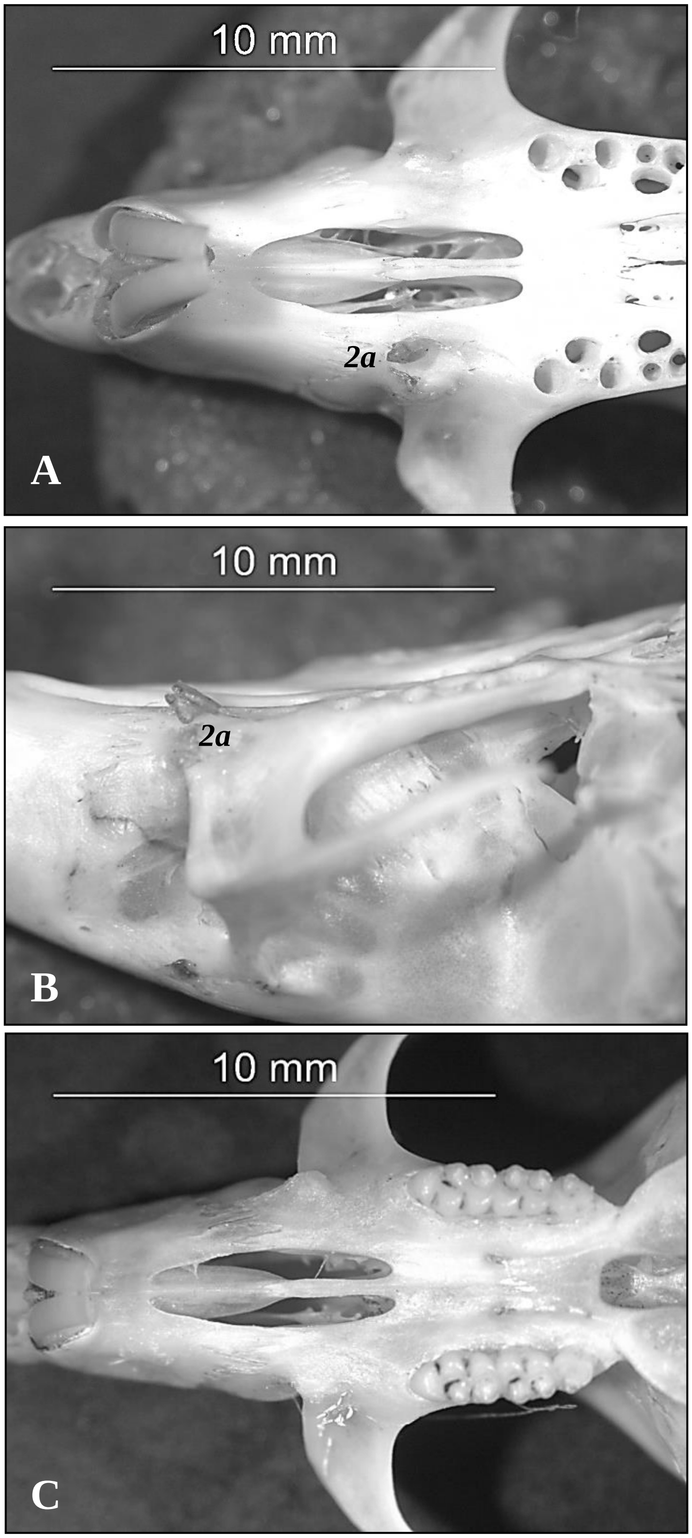


**Figure 2** - (A; B) Occlusal and lateral view of maxillary pathology (2a) - FMNH6918 (C) wildtype - FMNH201226

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## Figures

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