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Short communication

Finding of polydactyly in a free-ranging guanaco (*Lama guanicoe*)

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Abstract

Polydactylism, a genetic defect characterized by partial or complete duplication of the digit, has been described in a wide range of vertebrates. Among ungulates, polydactyly appears to be relatively common in domestic camelids, with reports in dromedary camels (*Camelus dromedarius*), llama (*Lama glama*) and alpaca (*Vicugna pacos*). However, in wild South American camelids polydactyly has been reported only in a vicuña kept in a zoo (*Vicugna vicugna*), but not in wild populations. Here a finding of polydactyly in a free-ranging guanaco is described. We propose the hypothesis that this malformation has an atavistic–genetic origin.

Keywords: Guanaco; Polydactyly; Congenital defects; South American camelids

1. Introduction

Polydactylism, a genetic defect characterized by partial or complete duplication of the digit, has been described in a wide range of vertebrates, including domestic mammals and birds, laboratory animals and humans (Al-Ani et al., 1998; Clark et al., 2000; Bahr et al., 2003; Fayeye et al., 2006; Sakai, 2006). Supernumerary digits in domestic animals have been classified as teratologic, developmental (atavistic), or bilaterally symmetric inherited (Stanek and Hantak, 1986). In wild ungulates, polydactyly is less common than domestic ungulates (Chapman, 2006). Among ungulates, polydactyly appears to be relatively common in domestic camelids, with reports in dromedary camels (*Camelus dromedarius*), llama (*Lama glama*) and alpaca (*Vicugna pacos*) (Fowler, 1989; Johnson and Gentz, 1990; Bani-Ismail et al., 1999). However, in wild South American camelids polydactyly has been reported only in a vicuña kept in a zoo (*Vicugna vicugna*, Strauss, 2002), but not in wild populations. Here a case of polydactyly in a free-ranging guanaco is described.

2. Materials and methods

Around 1000 and 700 guanacos were harvested from Tierra del Fuego during the autumn of 2003 under a population management and sustainable use program headed by Chilean

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government in southern Chile. From external examinations, a young male, aged at less than 4 years based on bone size and incomplete ossification of the epiphysis of the metatarsal bone (see Raedeke, 1979, p. 90), was found with an extra finger on the medial part of both extremities of the hind legs. The sample was collected and X-ray analysis was taken to make further descriptions of the finding.

3. Results and discussion

The extra digits were shorter than normal, but were morphologically normal, each with a slipper and hoof. There was no evidence of locomotory difficulties.

X-ray analysis revealed that this auxiliary digit corresponds to metatarsal II (Fig. 1). The metatarsal II were smaller in size than III and IV and continued distally with digital bones, proximal sesamoid and three phalanges (P1, P2 and P3). Moreover, proximal, middle and ungual phalanxes from extra fingers were smaller in size than normal digits III and IV on each foot. The metatarsal II did not articulate with any bone proximally, lying medial to tarsometarsal articulation. The left digit also had a luxation of the metatarsal-phalange articulation with a medial displacement of the proximal phalange.

This is the first report of polydactyly in a free-ranging guanaco. In artiodactylia (except most suides) metatarsal III and IV are merged, and are sometimes also merged with the reduced metatarsals. Metatarsal II in the ungulates is diminished or absent (Kowalski, 1981; König and Liebich, 2007). In all members of new and old world camelids the only remaining metatarsal rays are fused the metatarsal III and IV, except distally, where they diverge to form independent articulations for digits III and IV (Smuts and Bezuidenhout, 1987; Fowler, 1989; König et al., 2003). Previously, a case of this type of malformation was found in an archaeological site (Rusconi, 1930) being a common defect in domestic camelids, at least at Chilean high plateau (authors observations), but curiously, no incidence reports exist about polydactyly in llamas or alpacas. The finding support the hypothesis that these malformations have an atavistic–genetic origin (Cantu and Ruiz, 1985) since some older ancestors of contemporary Camelidae showed partial and non-fused metatarsals (Janis et al., 2002). The causal factors for polydactylism in guanacos are unknown, but may be linked to low genetic diversity of guanaco population in Tierra del Fuego originated by a historic founder effect (Sarno et al., 2001) and the more-recent reduction of population size from humane persecution in the area (Raedeke, 1979). Polydactyly in guanaco and South American camelids may share a pattern of inheritance similar to that reported in other species. Genetic studies of polydactylism in man, cats and dogs have established the trait is likely controlled by an autosomal dominant gene with incomplete penetrance (Liepold and Macdonald, 1971; Crowe, 1985; Clark et al., 2000). Trials conduced in bovines suggest that the mode of inheritance of polydactylism is polygenic, requiring a dominant gene at one locus and two recessive genes at another locus (Johnson et al., 1981). This hypothesis remains to be tested in camelids with pedigree trials

Fig. 1. Radiography of the hind feet of a young (<4-year-old) guanaco with polydactyly. (a) Frontal view of the left foot and (b) frontal view of the right foot.

and genome screening, which will be more feasible with the release of a radiation hybrid map and whole genome sequence of the alpaca scheduled for 2008.

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