

Does Caballine Fold Define Caballines?

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript

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ABSTRACT

A sample of 35 upper cheek series belonging to *Garrano* (n=30) and *Galego* (n=5) specimens were studied in order to describe pli caballin (caballine fold). Occlusal aspects presented much cement and they were moderately complex, and pli was absent in more than half of studied M¹ and M² (56.5% and 57.9% respectively). Moreover, most, but not all premolars presented pli (80.8%, 77.8% and 67.9% for pM¹, pM², pM³ respectively). So, the presence of pli caballin is not an absolute descriptor of *Equus caballus* for isolated cheek tooth. The results of this research suggest that it is absolutely needed to study complete teeth series in order to describe dental singularities in equine breeds.

Keywords: *Cheek teeth; caballine fold; dental morphology; "Garrano" horse; "Losino" horse; odontological anomalies.*

1. INTRODUCTION

There is a lot of researches upon dental series in mammals [1] and they have been studied extensively aimed at both biological (variability,

inheritance, evolutionary significance, etc.) and practical (medical and veterinary) purposes [2]. The most of those researches have been made on carnivore and primate species (naturally, including human species) [3,2,4], while

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investigations of domestic ungulate breeds are much less numerous [3,4], if veterinary clinical examinations are not counted.

The adult mouth of the horse, *Equus caballus*, contains normally 24 cheek teeth, that is, four rows of 6 teeth (3 premolars and 3 molars) per side, which are accommodated in the maxilla and mandibula [3]. These cheek teeth act as grinders, using a rotary, crushing, and side-to-side movement [3]. This main rotary movement is combined with a slight rostro-caudal (back to front) movement of the temporo-mandibular joint [3].

Cheek teeth are hypsodont, e.g. they have long crowns embedded in the alveoli of the bone [3]. At eruption, hypsodont teeth have no true roots, these begin to develop about a year or so later [3]. The continuous wear on the surface of hypsodont teeth leads to the presence of alternate layers of the three calcified dental tissues (enamel, dentine, and cementum) on the occlusal surface [3]. The presence of infolding of the peripheral enamel and also of the two blind enamel cups (*infundibula*) in the upper cheek teeth increases both the length and irregularity of the exposed enamel ridges on the occlusal surface [3]. The different calcified tissues wear at different rates and therefore, a permanently irregular occlusal surface is created [3]. In addition to the above irregularity, the cheek teeth also have a series of transverse ridges on their occlusal surfaces [3].

Because the softer dentine and cement on the occlusal surface wears more quickly than the surrounding enamel, the dentinal and cemental surfaces become depressed [3]. The depth of these depressions is related to the surface area of the dentine and cementum, with larger exposed areas more deeply recessed [3]. In contrast, smaller exposed areas, being better protected by the surrounding enamel, have less wear [3]. Therefore, the orientation and invaginations of the enamel folds play an important role in dividing the occlusal surface of dentine and cementum into smaller areas [3].

In the upper pM and M there are some parts are of particular use for distinguish asses and horses: The pli caballin (or caballine fold), the buccal region and the protocone [4]. It is said that a well developed caballine fold is typical of horses and is generally absent or reduced in asses [4]. Curiously, this feature has not been

traditionally considered in veterinary anatomy publications (e.g. [5-8]).

The objective of this study was to describe the presence/absence of pli caballin on upper cheek teeth in two primitive semi-wild horse populations, *Garrano* and *Galego*, from N Portugal and NW Spain respectively [9]. This is the very first time that descriptive dental examinations were performed in extant equine breeds, e.g. *Garrano* (from Portugal) and *Galego* (from Spain). Such breeds are ideal for this kind of studies as it also they present little phenotypic variation (when sampling is in pure-bred individuals) as well as they are live under natural conditions all year round (although they can not be viewed as true feral horses), with a minimum amount of human management [10].

2. MATERIALS AND METHODS

We studied visually 35 cheek teeth series including premolar (pM¹ to pM³) and molar (M¹ to M², as some M³ lacked in younger individuals) teeth. They belonged to right upper cheek teeth from *Garrano* (n=30) and *Galego* (n=5) skulls, which are currently on deposit at *Associação de Criadores de Equinos de Raça Garrana* (ACERG) in Vieira do Minho (Portugal) and *Unidade de Recursos Genéticos, Reprodução e Melhoramento Animal* (INRB) in Tui (Spain) respectively. Only permanent dentitions with moderate wear were studied (deciduous pM and too much worn pM and M were not studied). Although dental abnormalities are common in horses [2], no apparent clinical signs of dental disease were observed. No information of death cause, sex and body condition score was possible. Samples from both breeds were clustered together as they can be considered as genetically and phenotypically identical (their differentiation is a mere administrative question) [10].

3. RESULTS

Occlusal aspects presented much cement and they were moderately complex (Fig. 1). The striking detected feature of the analyzed sampling was the absence of pli in more than half of studied M¹ and M² (56.5% and 57.9% respectively). Moreover, most, but not all premolars presented pli (80.8%, 77.8% and 67.9% for pM¹, pM², pM³) respectively (Fig. 2). So a disto-mesial descending frequency order appears for presence of pli caballin.

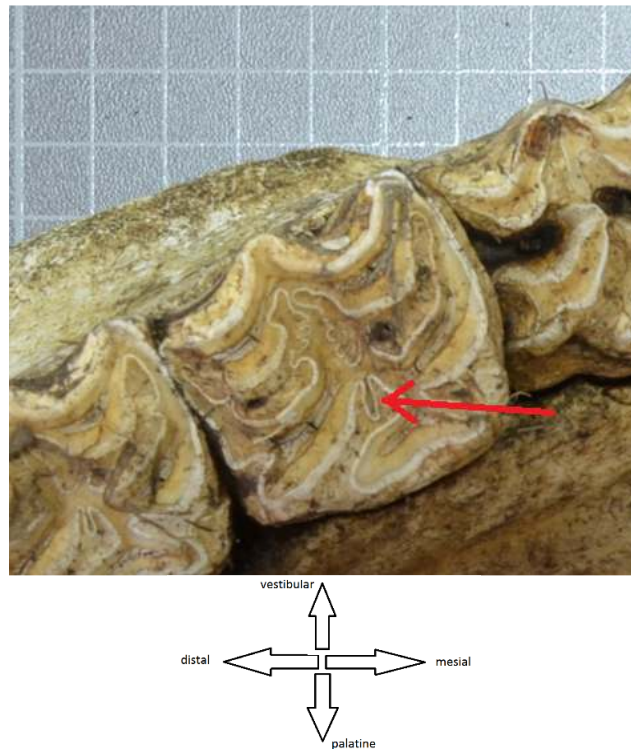


Fig. 1. Occlusal view of a right upper cheek teeth. Arrow signals pli caballin.

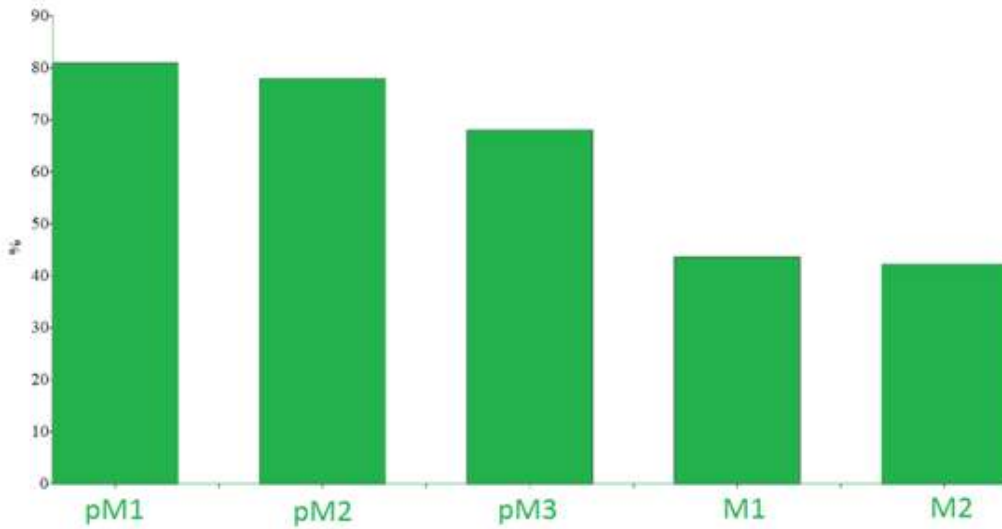


Fig. 2. Frequencies of pli caballin in upper cheek teeth (M³ excluded) for 35 cheek teeth series of right upper cheek teeth from Garrano (n=30) and Galego (n=5) skulls.

4. DISCUSSION AND CONCLUSION

Probably, the presence of pli caballin is less frequent in native horses (especially primitive breeds) as a result of inbreeding, as frequency of occurrence of dental anomalies is shown to increase in isolated groups (this phenomenon

has been described, for example, in Iceland and feral horses [6]. Anyway, the presence of pli caballin is not an absolute descriptor of *Equus caballus* species for any cheek tooth and its absence cannot exclude attribution to this species (at least studying isolated teeth). The results of this research suggest that it is

absolutely necessary in detail complete study of teeth series in order to describe dental singularities in equine breeds.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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