

## Gross Equine Dentition and Their Supporting Structures

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Equid teeth are classed as hypsodont (high crowned) teeth, which have prolonged eruption throughout most of the horse's life. The teeth lie within the alveolus which is composed of three distinct layers of alveolar bone. The inner most alveolar bone that is very compact is called the cribriform plate and is seen as a thin radiodense line on radiography, and is radiographically termed the lamina dura denta. However, this line is not always radiologically distinct in equids due to normal, irregularities of the periphery of some cheek teeth. The cribriform plate is covered by periodontal ligament and the larger Sharpey's fibres of the periodontal ligament are embedded in this aspect of the alveolus. The middle and outer layers of the alveolus consist of spongy (cancellous) and cortical bone, respectively.<sup>1</sup> The prolonged eruption of hypsodont teeth is believed to be due to continued deposition and traction by the periodontal ligament.<sup>2</sup> The rate of eruption should equal the rate of occlusal wear which is normally about 2-3mm a year.

At the commencement of dental eruption there are no true roots (i.e. enamel-free apical areas) and therefore such young teeth can be divided into coronal (crown) and apical regions. The crown is divided into the clinical crown that has erupted and reserve (unerupted) crown. The reserve crown has further been classified into gingival crown (with more active cementum deposition) and alveolar crown.<sup>3</sup> Gingival crown development is also often incomplete at the time of eruption.<sup>2</sup> True roots are formed gradually, starting about one year after eruption.<sup>4</sup>

Equids have 24 deciduous teeth and 36-44 permanent teeth as represented by the dental formulae:<sup>5</sup>

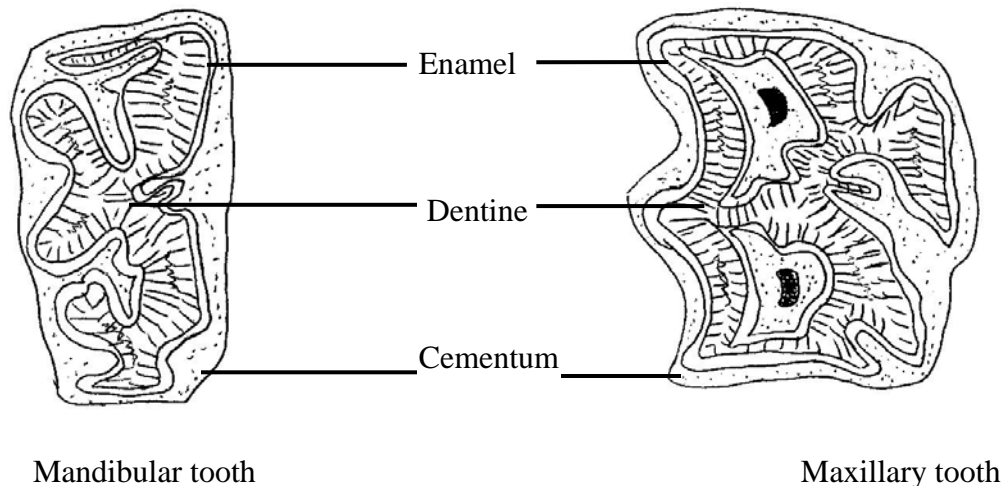
Deciduous	I <sub>D</sub> 3/3, C <sub>D</sub> 0/0, P <sub>D</sub> 3/3
Permanent	I 3/3, C 0-1/0-1, P 3-4/3, M 3/3

The variation in number of adult teeth is due to the variability of the presence of first premolars (wolf teeth) in males and females, and variability of canines in females. The canine teeth are simple brachydont teeth with no coronal cement covering, and no enamel infolding. They do not have prolonged eruption and most of the tooth remains as unerupted crown. The mandibular canines are more rostrally placed than the maxillary canines. Consequently, there is no occlusal contact between canines, which is thought to predispose to calculus deposition on these teeth.

The 'Modified Triadan' system has been widely accepted as a numeric system for identifying equid teeth.<sup>6</sup> In this system the jaw is divided into four quadrants starting with the right maxilla that is numbered as quadrant number one, and continuing clockwise

such that the left maxilla is quadrant number two, the left mandible is numbered three and the right mandible is numbered four. The deciduous teeth are referred to as quadrants five to eight in the same order. The individual teeth are numbered from one (central incisor) to eleven (third molar) with the tooth number preceded by the quadrant number.

In equids, all three calcified tissues (enamel, dentine and cementum) are exposed on the occlusal surface. The length of (protruding) enamel folds on the occlusal surface is enhanced by the presence of one infundibulum in each incisor, two infundibula in each maxillary cheek tooth and by the presence of increased enamel infoldings in the mandibular cheek teeth.<sup>7</sup> These calcified tissues differ in hardness and durability and therefore wear at different rates, enamel being the hardest and cementum the least hard of the three.<sup>5</sup> The areas of dentine and cementum wear down more rapidly resulting in occlusal surface depressions; however, the sizes of these depressions are limited by the adjacent enamel infoldings and infundibulae. This results in an irregular occlusal surface, which aids grinding of hard silicate matter and coarse fibres<sup>5</sup>. This self-sharpening mechanism was an evolutionary change to compensate for the many hours of mastication required by the equid (average 16 hours a day).



### Cheek Teeth

Equids have been shown to have a 23% wider space between the maxillary cheek teeth than the mandibular cheek teeth (anisognathia).<sup>8</sup> The maxillary teeth are also approximately 50% wider in a medio-lateral direction compared to mandibular teeth. These anatomical features result in only about one third of the maxillary teeth occlusal surfaces being in contact with about one half of the mandibular teeth occlusal surfaces in the resting occlusal position. At eruption, some authors state that the occlusal surfaces are parallel to each other but due to anisognathia and the medially directed 'power' stroke of mastication, the occlusal surfaces develop angles of approximately 10-20° from the palatal/lingual aspect dorsally to the buccal aspect ventrally.<sup>9</sup>

The occlusal surfaces of the cheek teeth also have 11-13 raised transverse ridges that correspond with depressions in the opposing areas of maxillary and mandibular teeth. These ridges increase the occlusal surface area for grinding of coarse fibre and are the result of enamel infoldings causing different wear patterns. These ridges are more predominant in young horses and have been termed “exaggerated” or “accentuated” transverse ridges (ETRs or ATRs) by some operators who do not understand that they are the result of millions of years of evolution to enhance mastication, and by others, who because of pseudo-scientific theories of improving rostro-caudal mandibular movement often reduce or even remove them. Reduction of these normal transverse ridges during routine rasping should be avoided as it will reduce the dental life of the horse. In cases where there are individual, truly exaggerated ridges, reduction should be performed judiciously. The maxillary cheek teeth also have longitudinal lateral ridges, the purpose of which has not been elucidated, but which are the sites of most enamel overgrowths on maxillary cheek teeth.

The maxillary cheek teeth have a square shape on transverse section, which is in contrast to the more rectangular shaped mandibular cheek teeth. Both the upper 06's and 11's are more triangular in shape.<sup>10</sup> The maxillary cheek teeth of equids have a shorter erupted crown, compared with the mandibular cheek teeth, and once fully developed have two small lateral and one large medial root. The mandibular cheek teeth have longer roots but only two – a rostral and caudal root (except 11's that have three roots).<sup>10</sup>

The maxillary arcade tends to be slightly convex in shape on the buccal aspect and mandibular arcade less so on the lingual aspect.<sup>11</sup> The maxillary and mandibular 06s, that are sometimes shorter than the other cheek teeth, and their occlusal aspects are orientated caudally on longitudinal section, and those of the 10's and 11's are orientated rostrally. This causes compression of the cheek teeth and enables the occlusal surface of each cheek teeth row to work as a single functional unit and importantly, also inhibits the formation of spaces (diastema) between cheek teeth.<sup>10-12</sup> The occlusal surfaces of caudal cheek teeth are not level in a rostro-caudal direction, as the jaw curves caudo-dorsally. This curve is known as the ‘curve of Spee’ and should not be confused with overgrowths of the mandibular 11's. Some normal horses may have a similar dorsal curvature of the rostral mandibular cheek teeth occlusal surface.

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