
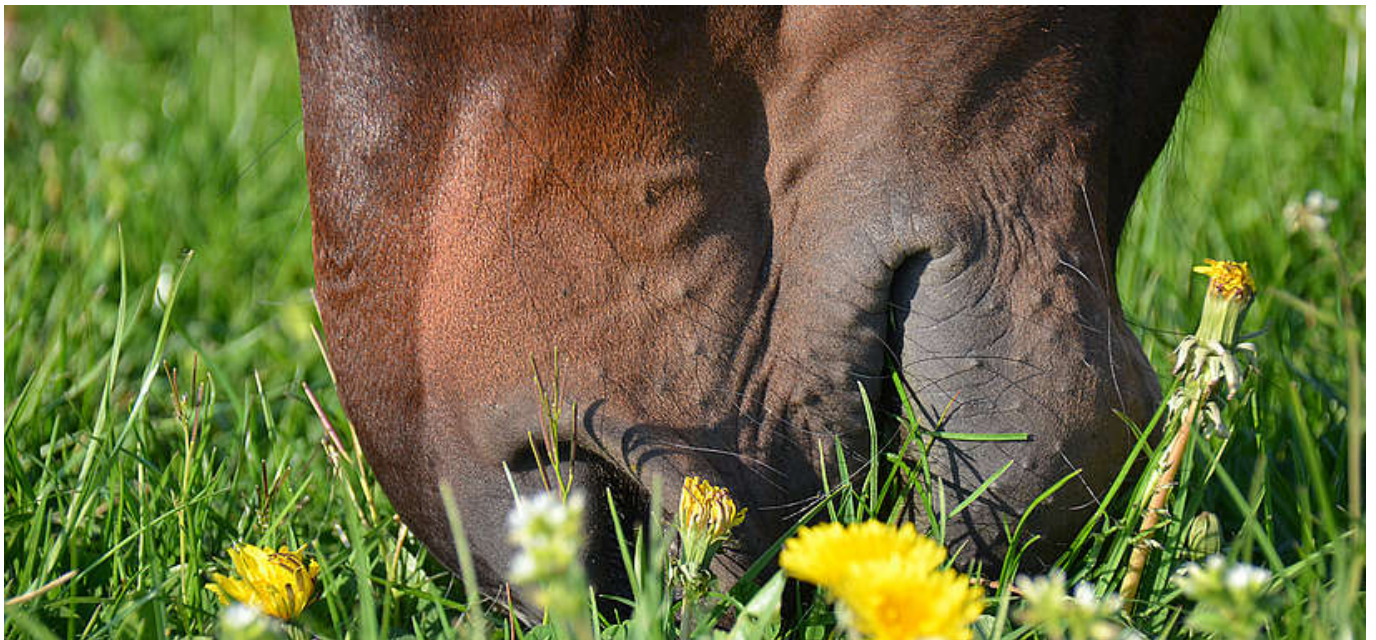


The horse's mouth : an anatomy suited to a herbivorous diet

The mouth is the first compartment of the horse's digestive system. It ensures four important functions : prehension of food, chewing, insalivation, and swallowing. It is in the mouth that food is prepared for its long journey down the rest of the digestive tract. As for Man, a horse's dentition evolves with age, but also with the type of feed he is provided with. Let us take a closer look at the anatomical particularities of the horse's mouth with regard to its herbivorous diet.

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Technical level : 



Des lèvres sensibles et mobiles pour le tri et la préhension des aliments



The horse selects and grasps his food thanks to mobile sensitive lips equipped with long tactile hairs © N. Genoux

The horse is a selective grazer. His mobile sensitive lips enable him to minutely select his food, and to grasp it.

Because of where the eyes are located, the horse cannot see what is at the end of his nose. The lips are equipped, like the eyes and nostrils, with long tactile hairs or whiskers known as vibrissae, which are essential to aid in depth perception, and generally help in gathering information about his surroundings.



Since 2019, shaving off a horse's whiskers for esthetics has been forbidden by the French equestrian federation. Depriving the horse of these sensorial organs is considered as an act which goes against his well-being.

Two powerful jaws for chewing



The lower jaw makes circular movements beneath the upper jaw to crush food © N. Genoux

The horse is a monogastric herbivore, who unlike ruminants, cannot chew his food a second time.

To be properly assimilated by the organism, food should be properly crushed before entering the digestive tract. For this reason, the horse possesses two powerful jaws suited to his herbivorous diet. The lower mobile jaw (called the mandibular jaw) performs circular movements against the fixed upper jaw (called maxillary jaw) to ensure efficient grinding of food, a bit like a grindstone. Upper and lower jaws are linked by the temporo-mandibular joint (TMJ), and powerful mastication muscles (see diagram below).

Thus the horse is equipped to chew fibrous matter like cellulose, which is quite difficult to breakdown. As an example, a kilogram of hay is ingested in about 40 minutes and requires between 3000 and 3500 chews.

Teeth suited to grazing short grass



Sharp incisor teeth to cut the grass short © A. Laurieux

In his natural habitat, a horse spends 15 hours a day grazing, preferably short young grass, which is richer, and chewing each mouthful at length. Well suited to this type of diet, the horse's dentition is composed of sharp incisors to cut the grass, and well developed (pre)molars to grind the larger food elements into

smaller particles.

The length of the particles found in the feces is a reflection of the length of particles found in the stomach after mastication. Therefore, healthy teeth are needed to promote efficient mastication, ensuring the reduction of particles of fiber which can then be better broken down by the digestive enzymes and bacteria

Dental composition

As a general rule horses have :

- 12 incisors (4 central, 4 intermediate and 4 corner teeth)
- 12 premolars
- and 12 molars

This corresponds to 3 incisors (1 central, 1 intermediate, and one corner tooth), 3 premolars, and 3 molars on either side of both lower and upper jaw (see the figure below). This means that the number of teeth on each side of a jaw should be multiplied by 4 to obtain the total number of teeth. The interdental space between the incisors and the premolars is known as the « bars ». This is where the bit is placed in the horse's mouth.

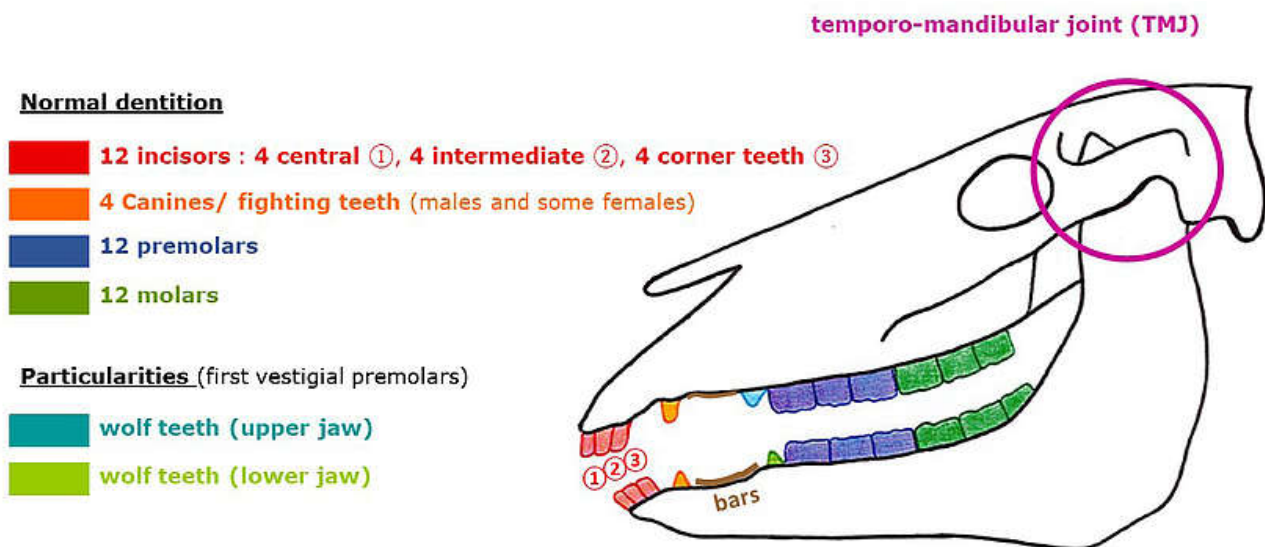


Figure representing a horse's dentition © N. Genoux

Stallions and geldings, and occasionally mares, have 4 canines (also known as « fighting teeth »). Usually these are not present in mares. By counting the number of teeth on each side of both lower and upper jaw, there are therefore two types of dentition :

- 3/3 I - 0/0 C - 3/3 PM - 3/3 M in the majority of mares
- 3/3 I - 1/1 C - 3/3 PM - 3/3 M for males (stallions and geldings) and in some mares

With I = incisors| C = canines| PM = premolars| M = molars

Mares therefore usually have 36 teeth, compared to 40 for males.



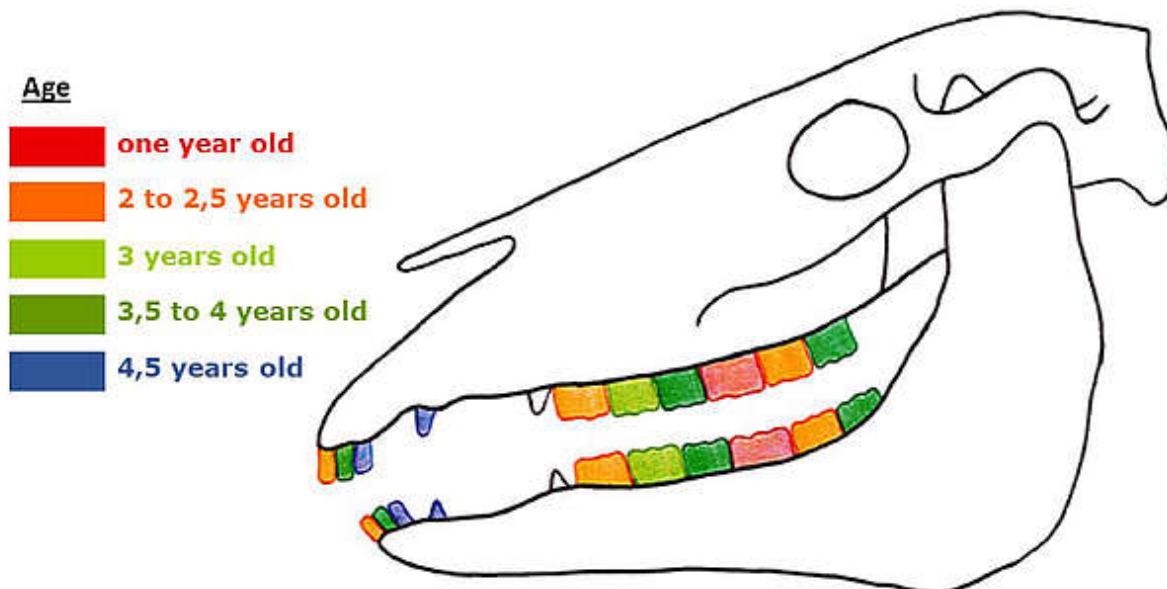
Particularity : Between the age of 6 months and a year old, a small teeth can appear in front of the first premolars : they are known as « wolf teeth » and are usually present on the upper jaw, more seldom on the lower jaw. These premolars are vestigial and have no specific use, but they may be bothersome or painful when in contact with the bit. It is advisable to have them removed by an equine dentist once the horse has been bitted, and is working in a bit.

Loss of the deciduous teeth in young horses



Growth of the definitive corner incisor on the lower jaw following the loss of the milk tooth in a young horse between 4 and 5 years old © N. Genoux

In the newborn foal, the teeth grow gradually right from the first week after birth. As for Man, the first set of teeth is deciduous, and develops during the first 8 months after birth. During the foal's growth, between the ages of 1 and 5 years old, the milk teeth (also known as deciduous teeth or baby teeth) will gradually fall out to be replaced by the permanent teeth. The figure below shows the time scale for the growth of the permanent teeth.



Time scale for the loss of milk teeth/ eruption of permanent teeth © N. Genoux

Potentially painful, sometimes a source of deformation or random regrowth, the loss of deciduous teeth can cause discomfort or pain in the young horse, particularly when feeding, or being worked. Sometimes a baby tooth will persist even after the growth of permanent teeth. When this happens, an equine dentist needs to be called out to remove the remaining baby tooth.



A source of tiredness, and discomfort... loss of the milk teeth is an important step to be taken into account in young horses, as it is often a source of defenses seen when working the horse (head shaking, horse leaning on the bit...). Other problems can follow on in a chain reaction which are more serious than simple dental problems (deterioration of locomotion, osteopathic problems...). A dental check up visit before breaking-in the horse (at 18 months old for racehorses, at around 3 for the other disciplines) then every 6 months up to the age of 5-6 years old is the recommended protocol.

Teeth which erupt continuously to compensate for them wearing down

Horses have hypsodont teeth : this means that even if the permanent tooth is formed once and for all in young animals, it will continue to erupt by 2 to 3 mm per year throughout the horse's lifetime to compensate for the wearing down due to constant grinding of food. Therefore, removing a tooth in a young horse is more difficult than in an older animal. Due to this continuous eruption, the way the teeth change shape can indicate a horse's age, more specifically by observing the lower incisors. This estimation of age becomes less and less accurate as the horse gets older.



Horses who crib bite will present abnormal wear of the incisors.

Wear of the teeth in the older horse

With age the **older horse's** dentition will deteriorate. Teeth become blunt, cheek teeth become smoother, the enamel crown on the molars disappears, spaces form between the molars, loss of teeth... all these problems can be detrimental to proper chewing of food, thus to correct assimilation by the organism, and ultimately to the general health of the animal. The older animal's feed must then be adapted to suit his particular needs.

The tongue, a powerful muscle fulfilling several functions

Powerful muscle and taste organ, the tongue allows the horse to select and move the food from the front of the mouth towards the cheek teeth, and ensures even mastication. It also plays a role in salivation and swallowing of food.

Considerable secretion of saliva from the salivary glands

The horse possesses 3 pairs of salivary glands in his mouth :

- One pair of parotid glands (the largest) located behind the jaw, under the temporo-mandibular joint.
- A pair of mandibular glands located on the inner surface of the lower jaw
- A pair of sublingual glands found under the tongue.

There are also numerous minute salivary glands located all around the horse's mouth. Their role is to secrete saliva, which is triggered by the action of chewing. Saliva is composed of :

- 99,9 % water
- Ions (Cl⁺, K⁺, Na⁺, Ca²⁺...)
- And contains α -amylase, a digestive enzyme which serves to break down starch, a macromolecule present in cereals and in other concentrated horse feeds.



Unlike Man or pigs who are omnivorous and have a high concentration of



α -amylase in their saliva (77 U/mL for human saliva, and 98 U/mL in pig saliva), the concentration of α -amylase in horse saliva is much lower (0,44 U/mL). This just goes to show that the horse is a herbivore, much better equipped to digest the (hemi) cellulose fiber found in hay than to digest the starch contained in concentrated horse feeds !

The amount of saliva secreted depends on the dry matter content of the feed and on the chewing time necessary, therefore on the type of ration the horse is provided with : hard feed for example requires much less chewing and salivation than hay. If you observe your horse carefully, you will notice that he tends to chew each mouthful of hay for much longer than hard feeds, and he will salivate more when being worked when he has eaten hay not long before the session.

What exactly is saliva for ? Insalivation of the alimentary bolus helps swallowing and starts the digestion of starch. Saliva also has a high buffering role, as it neutralizes gastric acid linked to the continuous production of hydrochloric acid (HCl) in the horse's stomach. The daily production of saliva is quite considerable in horses. It is estimated that a 500kg horse produces between 15 and 40 liters of saliva per day. This is why he requires constant access to fresh clean water.

A highly developed soft palate for swallowing

A sort of valve, prolonged to the rear, the soft palate opens when the horse swallows to allow the alimentary bolus through from the mouth to the oesophagus. It is highly developed in the horse, and prevents the horse from breathing through his mouth, and prohibits any reflux of feed to the mouth once it has been swallowed. A horse cannot therefore vomit. When the horse swallows food the wrong way, the food goes back towards the nasal cavities, this is sometimes observed when there is an oesophageal obstruction.

To remember



From lips, to jaws and teeth, the anatomy of the horse's mouth is suited to grazing grass short.

A horse's dentition evolves as he ages : deciduous teeth, loss of milk teeth and eruption of permanent teeth.

The permanent teeth erupt constantly to compensate for the wearing down of the teeth due to chewing.

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