Scientific Works. Series C. Veterinary Medicine. Vol. LXVII (1), 2021
ISSN 2065-1295; ISSN 2343-9394 (CD-ROM); ISSN 2067-3663 (Online); ISSN-L 2065-1295

RESEARCH ON THE BUNODONT AND SECODONT TYPES OF TEETH IN DOMESTIC MAMMALS

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Abstract

The teeth are made of hard materials, they represent the most resistant organs to destruction, often being collected from archaeological sites. They play a major role in establishing the species origin of fossils or corpses. A single tooth sometimes provides clues as to where it came from, and provides information about the animal's age, diet, and behaviour. The study was performed on the skulls of pigs, canines and cats, then described the anatomical characteristics of each type of tooth, insisting on teeth that have similar anatomical aspects and can cause confusion in identification. The dentition of pigs is adapted to the omnivorous regime, the molars being of the bunodont type, compared to carnivores where all teeth are of the brachiodont type. The stricter carnivorous diet of cats, compared to that of canids, translates into the specialization of dentition to a more pronounced second type, the morphological effect being the reduction of tuberculous molars. This motivated us to carry out the work, hoping that the results could be useful for the professional activities of veterinarians, but also forensic doctors.

Key words*: carnivores, dentition, omnivores, teeth.*

INTRODUCTION

Although mammal teeth are similar from the point of view of the basic structural components, there are major differences in numbering, size and shape (Barone, 1997; Coțofan et al., 2013).

The great degree of morphological variation in mammal teeth (specifically molars) makes them easy to recognise. Thus, teeth and jaws play a major role in establishing the species origin of various fossil remains or bodies. Even a small particularity of shape or structure can have a fundamental importance in clarifying taxonomical incertitude, often being possible for a single tooth to offer clues as to which mammal species it belongs to, and moreover provide information about the age, diet and behaviour of the animal in its environment.

Dentition morphology is an extremely important chapter in legal medicine, often teeth or fragments of them being the only identifiable parts of a body. (David-Be et al., 2009; Stan, 2016.) Bibliographical sources prove that dental medicine offers enough details on the morphology of deciduous and permanent dentition in humans (Ata-Ali, 2014) However, bunodont teeth are also encountered in domesticated animals, such as swine and carnivores, species where literature data is not as abundant. (Koning & Liebich, 2015; Ungar, 2010; Lucas, 2004; Stan, 2016). This fact has motivated the choice of study, in the hope that the results will be useful not only to future veterinary dental medicine specialists, but also to medical examiners and coroners, who wish to identify samples from on-going investigations.

MATERIALS AND METHODS

The study was performed on skulls prepared through maceration, belonging to the collection of the Anatomy laboratory of the Faculty of Veterinary Medicine in Bucharest.

The pieces selected had either a complete dentition or very minor gaps. 10 skulls of swine, 10 skulls of dogs and 6 skulls of cats were analysed, originating from animals of various breeds and ages. Detailed and systematic descriptions were performed of the anatomical characteristics of each type of tooth,

insisting especially on teeth which have similar anatomic aspects and can thus generate confusion upon identification (for example secodont molars in swine which have a bunodont dentition or tuberculate molars in carnivores).
The most suggestive images on the studied material were photographed, and then edited in the Adobe Photoshop C3 program. The identification, description and homologation of the formations was done in correlation with the Nomina Anatomica Veterinaria - 2017.

RESULTS AND DISCUSSIONS

The results of the study allowed the observation of some morphological details on the basis of which teeth or tooth fragments can be identified with certitude, establishing their origin with one of the studied species, and even their position in the dental arcades when this is necessary.
The dentition of the **pig** is excellently adapted to the omnivorous regime. The dental formula is as follows: I: $\frac{3}{3}$, C: $\frac{1}{1}$, P: $\frac{4}{4}$, M: $\frac{3}{3}$.
With the exception of central incisors and inferior intermediate incisors, which are hypsodont, and the canine teeth which grow continuously, all the other teeth are brachydont.
On each side and on each maxillary three incisors can be noticed: a central one, an intermediate one and a distal or corner one. They have a different aspect ranging from one maxillary to the other, but on the same arcade. Their size decreases from the central incisor to the corner one.
The inferior incisors are pointed rostrally, following the line of the mandible. (Figure 1-1). The central incisor is strong, in contact with the one on the opposite side through the mesial side (Figure 2-1). It has an elongated crown, with prolonged eruption, supported by a strong root. The crown is flattened vestibulo-lingually, smooth on the vestibular side but with a pronounced longitudinal relief (dental tubercle) on the lingual side, delimited by two ridges. The mesial edge and the distal edge are almost parallel, thick towards the neck of the tooth. The occlusal margin is perpendicular. The neck of the tooth is not as distinct from the root, it directly lengthens the crown, very thick in its vicinity, solidly implanted in the alveoli. The intermediate incisors are similar to the central incisors (Fig. 2-2). They are however a little shorter, and their crown is thicker, almost prismatic in a triangular section, a little narrowed at the occlusal extremity. This makes the ensemble of the four central teeth (central and intermediate incisors) to appear convergent, and it gives the arcade an elongated contour, almost sharp. The corner incisor is isolated, approximately in the middle of the distance between the middle incisor and the canine tooth. It is much more reduced than the other two, with a short, narrow crown and an obvious neck, as well as a less solidly implanted root (Fig. 1-3).

Figure 1. Incisors in pigs (lateral-rostral view) (original): 1-inferior central incisor; 1'-superior central incisor; 2-inferior intermediate incisor; 2'-superior intermediate incisor; 3-inferior corner incisor; 3'-superior corner incisor

The superior incisors are oriented less longitudinal than the inferior ones. They serve especially with food prehension, while the last ones aid in digging in the soil. The central incisor has a wide, relatively short crown, convex on the vestibular side and concave on the lingual side. The distal margin is shorter and more oblique than the mesial side. It curves a bit to the side of the opposite central incisor, the teeth being convergent through their occlusal extremities, delimiting a triangular interval between their proximal portions. (Figure 2-1'). The occlusal margin, very oblique, not very distinct from the distal

margin, is excavated towards the lingual side, where a large and relatively deep infundibulum is contoured. The neck of the tooth is net, and the root is strong, profoundly implanted in the socket. The intermediate incisors are similar to the central ones, but they are smaller and with a more compressed crown and a weaker marked infundibulum. The superior intermediate incisor is located at the level of the inferior corner incisor, with which it does not come into contact during occlusion. The corner incisor is also reduced and isolated, similar to the inferior counterpart (Figure 1-3'). The crown is flattened from one side to the other, and the occlusal extremity is trilobed, marked by two weakly evidenced incisures.

Figure 2. Incisors in pig (rostral view):
1-inferior central incisors; 1'-superior central incisors; 2-inferior intermediate incisor; 2'-superior intermediate incisor; 3-inferior corner incisor; 3'-superior corner incisor; 4-inferior canine tooth; 4'-superior canine tooth (original)

Canine teeth are very well developed in adults, where they mark a strong sexual dimorphism. They are better developed in males, where they rapidly emerge from the oral cavity, forming true "defences weapons" (Figure 3). In both sexes their growth is permanent and they do not have roots.

The inferior canine tooth is less thick but longer than the superior one. It can reach 20-25 cm in length at elderly males. It curves in such a way that the free part reaches the face of the superior canine tooth, between it and the corresponding corner incisor, lifting the superior lip. The body of the tooth is tri-faced. The distal side which occupies all its concavity does not have enamel. The other two, separated by a sharp mesial edge, only have a very thin layer. The free extremity is sharp and, just like the lingual margin, it is maintained sharp by its friction with the superior canine tooth. The alveolar extremity is wide and occupied by an open orifice which enters further and further into the bone with age until it reaches the level of the molars. In sows, the growth is more moderate, and the largest recorded length was of 3-4 cm. The calibre is more reduced too, the tooth is easily flattened from one side to the other.

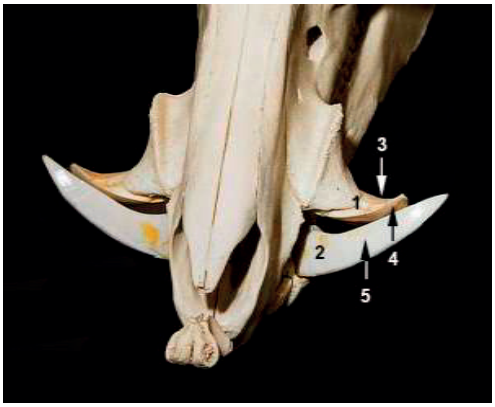

Figure 3. Canines in male pigs (rostro-dorsal view) (original):
1-superior canine; 2-inferior canine; 3-distal part of superior canine; 4-mesial part of superior canine which by friction with the inferior canine keeps it sharp; 5-mesial part of inferior canine

The superior canine tooth is thicker at the base but shorter than the inferior counterpart. The length does not exceed 12 cm in elderly males. It curves first laterally, then caudally, passing before its inferior counterpart, arising early from the oral cavity and deforming the superior lip. It has the shape of a quadrilateral pyramid, with very weakly marked angles, in an almost circular section. The distal side is concave and lacks enamel (Figure 3-3), which is very thin and often absent on the rest of the dental surface. The free extremity is blunt on the mesial side, convex and in contact with the inferior canine tooth. The alveolar extremity is open, determining a relief on the surface of the maxillary which delimits the canine fossa. Just like with the inferior counterpart, it is more reduced in sows than in male pigs and flattened from one side to the other.

On each jaw, the **premolars and molars** regularly grow in volume and complexity from the first to the last. They are all brachydont and starting from the first superior premolar and the fourth inferior premolar - purely bunodont teeth.

The inferior premolars are the simplest. They are flattened from one side to the other and almost similar to secodont teeth in carnivores. The first is separated from the others, a short distance away from the canine tooth and a reasonable distance from the second premolar (Figure 4-Pm1). It is a deciduous tooth which persists more or less in adult dentition. It falls off at a certain age and never gets replaced. The crown has little volume, being narrow and simple, with a sharp edge. It has two roots: a mesial and a distal one. The crown of the second molar is larger meso-distally and trilobed, with an intermediate lobe flanked by two reduced depressions on the vestibular side. It also has two roots. The third is similar, albeit a bit larger, the crown has ridges, better delimited on the vestibular side and two similar depressions but less profound on the lingual side. Sometimes it is three-rooted, with a bifid distal root. The fourth molar is the largest and the thickest. Being the tallest, usage quickly wipes off the details off the occlusal margin. The depressions of the lingual side and especially of the vestibular side are very profound. It has three roots.

The inferior molars continue the voluminous progression of the premolars. Their crown is low and practically cement-less, it is thick and formed of cuspids, each of them subdivided by a very complex system of ridges into primary and secondary tubercles (Figure 4-M1, M2, M3). The occlusal side is very quickly flattened by usage, though it has complicated folds of enamel which end up wiped. The first has four cuspids, which correspond to four roots: two vestibular and two lingual. The crown is twice as long as it is wide. The second molar is similar to the first but it is stronger, its lobes are better delimited and a fifth cuspid contours on the distal edge. The final molar is characteristic. It is larger in volume than the other two combined, has five cusps of which the distal one takes up almost half the tooth, and tends to divide into two portions itself: vestibular and lingual. Each cusp corresponds to a root, the distal one tending to divide into what raises their number to six.

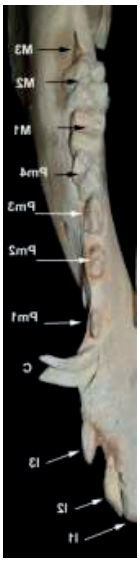

Figure 4. Inferior molars and premolars in pigs (dorsal view) (original):
I1-I3 – inferior incisors; C-canine; Pm1-Pm4 – inferior premolars; M1-M3 – inferior molars (M3 in the process of eruption)

Superior premolars are, with the exception of the first one, more complex than the inferior counterparts. The first is small, with a sharp crown and two roots. It comes in contact with the neighbouring one. The second one is also narrow, formed of two main cusps of which the mesial one is somewhat taller, and the third one is rudimentary and placed on the lingual side of the distal cusp. It is three-rooted, the two distal roots united at the base and a little divergent. The third one, more massive, has a neatly trilobed crown, the disto-lingual cusp almost as thick as the neighbouring one. The three roots are equally distinct. The fourth one has a squarer crown on a transversal section. It is formed of four massive cusps, though uncomplicated in structure, and sustained by four roots, two mesial and two distal ones. The cusps of the lingual side are not very different from one another.

The superior molars have the same organization as the inferior ones. Their crown is however thicker in a vestibulo-lingual way. The first two are also formed of four cusps and four roots. The meso-distal size is slightly

larger than the transversal size of the first one, a more neat difference in the second one which contours a supplementary distal cusp.

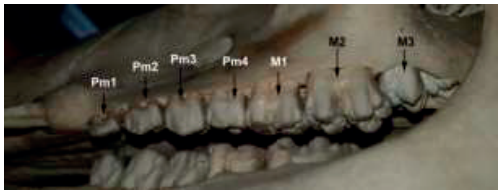

Figure 5. Superior molars and premolars in pigs (latero-ventral view) (original):
Pm1-Pm4 – superior premolars; M1-M3 – superior molars (M3 in the process of eruption)

The last one is massive, with the same conformation as its inferior counterpart, but wider and less developed backwards. The distal cusp is less strong and less bilobated (Figure 5). It does however feature 6 roots.

The molar arcades are rectilinear, with a thickness that raises progressively meso-distally. They converge slightly forward, which is better noticed at the superior maxillary. Their direction crosses the alveolar edge less. This thing becomes more visible at the mandible which appears curved towards the lingual side at the level of the molars. In occlusion, teeth easily alternate, the inferior ones a bit more rostral than the superior ones. The first inferior premolar has no contact with its superior counterpart, the last one being in contact only with the second inferior premolar.

Dentition in carnivores: The level of specialisation of carnivore dentition is somehow different, depending on the family a species belongs to. As a general rule, there are two teeth on each arcade and on each side, with a characteristic aspect (Figures 6, 7). At the entrance in the oral cavity, the canine teeth, long, powerful and sharp, and caudally, a special molar or premolar called a carnassial tooth.

The functional efficiency of the canine teeth is given by the reduction of the volume of neighbouring teeth (incisors and premolars), these being destined for catching, killing and ripping apart prey. Carnassial teeth, sharp and affronted like the blades of a scissor, serve to cut bigger pieces of meat, which are then shredded. This thing is helped by the distal teeth, also called tuberculate teeth. Unlike canine teeth which remain long and powerful at all carnivores, the carnassial teeth are those whose morphology reflects the adaptation to different alimentary regimes.

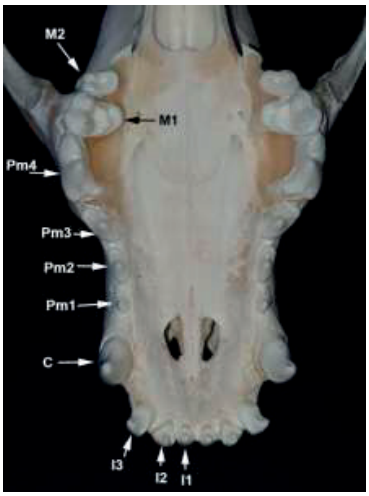

Figure 6. Superior dental arcade in dog (ventral view) (original):
I1-I3 – incisors; C-canine; Pm1-Pm4 – premolars (Pm4 – carnassial tooth); M1-M2 – molars

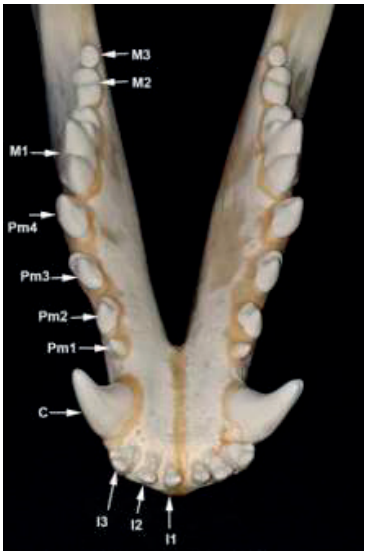

Figure 7. Inferior dental arcade in dog (dorsal view) (original):
I1-I3 – incisors; C- canine; Pm1-Pm4 – premolars; M1-M3 – molars (M1 – carnassial tooth)

Very slightly different from neighbouring teeth in *Ursidae,* where their bunodont aspect is largely correlated with the great diversity of

consumed food, in *Hienidae* and *Felidae* they exhibit an exaggerated development. At the latter, the shortage of maxillaries and by consequence of the leverages formed, gives these teeth a maximal efficacy. Canids do however have a less specialised form of these teeth. All teeth in carnivores are of the brachydont type.

The permanent dental formula of the dog is:

$$\text{I: } \frac{3}{3}, \text{ C: } \frac{1}{1}, \text{ P: } \frac{4}{4}, \text{ M: } \frac{2}{3}.$$

On each arcade, the first premolar is not replaced and, just like in swine, it persists into adulthood, which sometimes makes it considered a permanent premolar, which lost its homologous deciduous tooth.

The incisors are implanted perpendicularly on the osseous substrate; these teeth are very tiny. The crown is short, the root is long and strong.

The thick crown is flattened vestibulo-lingually near the occlusal extremity, and a bit latero-laterally near the neck of the tooth. The vestibular side is smooth, convex in all senses, narrowed towards the neck of the tooth. The lingual side is curved near the end by an obvious cingulum (Figure 10-4). It appears curved, its extremities reaching the base of the occlusal edge, where each of them will determine a small tubercle (mesial and distal) (Figure 8).

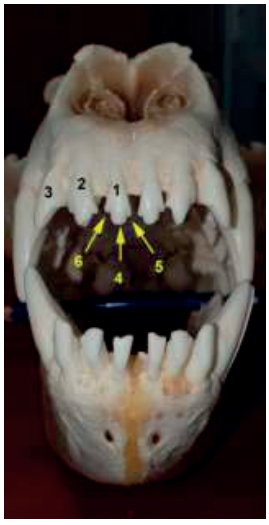

Figure 8. Incisor teeth in dogs (frontal view) (original): 1-central incisor; 2- intermediate incisor; 3-corner incisor; 4-central lobe; 5-mesial lobe (tubercle); 6-distal lobe (tubercle)

The concavity of the cingulum delimits an ample depression which will subdivide a central dental tubercle, widened and slightly relieved, but raised to the occlusal side. The contact sides, wide at the level of the neck of the tooth, rapidly narrow, in order to finish sharply at the extremities of cingulum through the two formerly mentioned tubercles. The cutting edge of the virgin tooth has the contour made up of an arcade with a sharp apex, flanked at the base by the two tubercles which mark the extremities of the cingulum, delimited by the central prominence through two reduced incisures. Thus it can be appreciated that it is trilobed, with a very prominent central lobe on the virgin tooth, contouring the so-called "club" of the tooth. This disposition will suggest the tritubercular type of the premolars and molars.

The crown is three or four times longer than the crown, very compressed from one side to the other, and finishing with an apex which closes rapidly. It is solidly implanted in the alveoli. The neck of the tooth is well marked.

The dentine is thick and fills the dental cavity very early. The enamel covers the crown totally in a thick layer. The cement is very weakly represented, absent at the level of the crown.

Usage affects initially the central lobe of the cutting margin and it shortens this margin until the level of the tubercles which flank it. Thus, the occlusal edge becomes rectilinear and thick, and the club disappears, the process being called levelling of the teeth. In the most advanced stages, the crown, very short, yellowing, separates from the neighbouring ones, reduced to a simple stump.

On each arcade, the size increases from the central incisors to the corner incisors. The difference is more poignant on the superior maxillary. The superior incisors are twice as strong as their inferior counterparts. The cingulum is better evidenced, and the central lobe is stronger and better separated from the other two. The superior corner incisor is easy to recognise: the central lobe is elongated and sharp, which gives it the aspect of a canine tooth. On the other hand, the distal lobe of the corner incisor is missing, leaving room for the inferior canine, which during occlusion comes into contact with it (Figure 9).

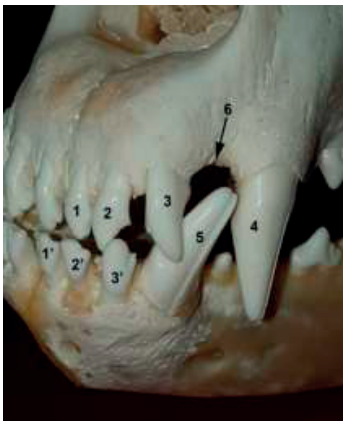

Figure 9. Incisors and canines in dogs (latero-rostral view) (original):
1, 2, 3-superior incisors; 1`, 2`, 3`-inferior incisors; 4- superior canine; 5-inferior canine; 6-diastema

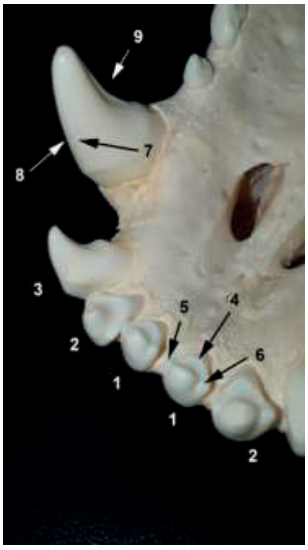

Figure 10. Superior incisors in dogs (ventral view) (original):
1-central incisors; 2-intermediate incisors; 3-corner incisors; 4-cingulum; 5-mesial tubercle; 6-distal tubercle; 7-crest; 8-mesial side of the canine; 9-distal margin of the canine

On each maxillary, the incisor arcade describes a regulated circle arc, wider in the superior side than on the mandible. The superior incisors override the inferior ones, so in the occlusion the central incisor easily masks the inferior one and the adjacent portion of the inferior intermediate incisor. The superior intermediate incisor comes to cover the occlusal margin of the two corner incisors. The superior corner incisor is located between the inferior corner incisor and the inferior canine, and a small diastema separates it from the superior canine. Dolichocephalic breeds conserve this disposition while brachycephalic breeds present an inferior prognatism, which leaves the incisors and the superior canines more or less before their counterparts, raising their efficacy.

Canines are very voluminous teeth, slightly flattened from one side to the other and slightly curved, with a distal concavity. The neck of the tooth is very weakly marked, and the root is twice as long as the crown. The latter has a vestibular side which is convex and smooth, and the lingual side is traversed by a reduced ridge limited on the mesial side by a small crest. The mesial edge is convex, the distal one is concave, and the occlusal extremity is simple and sharp (Figure 10).

The root, which is long, is the part which corresponds to the largest circumference of the section of the tooth. The vestibular side is more convex than the lingual side, which is almost flat. The apex is sharp and closes early on. The root is profoundly implanted on both maxillaries, reaching the plane of the mesial root of the second premolar (Figure 13).

Distinctive characteristics and occlusion

The superior canines are always stronger than the inferior ones. Their root is proportionally longer. Above the neck of the tooth, the superior canines have on the distal edge a prominence (cingulum) which is more obvious than in the inferior canines. During occlusion, the inferior canine is placed before the superior one, occupying a small diastema which separates the inferior canine from the pre-carnassial.

Premolars and molars on each arcade are systematised medio-distally in pre-carnassials, carnassial teeth and tubercled teeth. With the exception of the latter, they are all perfectly secodont teeth. It has been described that the first type is considered a permanent tooth without a precursor – however it should be considered a persistent deciduous tooth.

Upper pre-carnassials are the first three premolars. The first one is small, with a simple, ogival crown whose lingual side presents an obvious cingulum, which contours through its extremity a small distal lobe. The other two rise

in volume, become flattened from one side to the other, sharp and trilobed, with a prominent intermediate lobe, a short medial lobe and slightly detached and an elongated distal lobe (Figure 11). Each has two roots, the distal one twice as strong as the other one. The final pre-carnassial is the largest in size.

The upper carnassial is the final premolar. It is the most powerful tooth on the arcade. It exhibits three lobes whose disposition is highly characteristic. Two are very powerful and represent the body of the tooth. The most prominent one is the mesial one (Figure 11); a sharp crest connects it to the distal lobe, which is more reduced in size. The third (protoconus) is accessory; it is short, sustained by the cingulum on the meso-lingual side of the base of the main lobe. It presents three roots, two main ones and an accessory one, on the lingual side, each in direct continuation of a lobe.

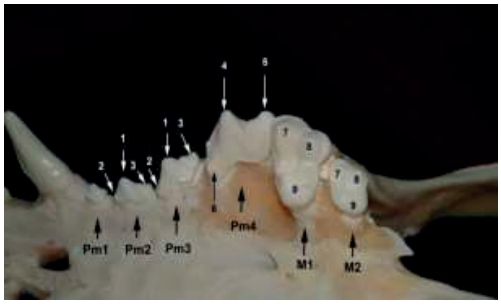

Figure 11. Superior premolars and molars in dog (ventro-medial view) (original):
Pm1-Pm4 – premolars (Pm4 – carnassial); M1-M2 – molars; 1-intermediate lobe; 2-mesial lobe; 3-distal lobe; 4-mesial lobe of the carnassial; 5-distal lobe of the carnassial; 6-accessory lobe of the carnassial 7-mesial cusp 8-distal cusp; 9-cingulum (lingual lobe) whose occlusal side is subdivided in tubercles

The upper tuberculate teeth are the two molars. They are strong, with a short and wide crown, more developed transversally than mesio-distally, strongly mamelonated. Each of them has three roots, two vestibular and one lingual. The first tuberculate tooth is very thick, slightly more reduced than the carnassial. The crown is surrounded by a cingulum which includes the lingual part of the base of two cuspids, of which the mesial one is taller. This cingulum is represented on this side by an enormous rounded and short lobe, whose occlusal side is itself divided into tubercles. The last tuberculate tooth looks like the first one, but aside from the fact that it is three or four times smaller, the two vestibular cusps are less well evidenced and the lingual lobe is not as mamelonated.

The lower pre-carnassials are the four premolars. The first one looks like its upper counterpart, but it is smaller, with a cingulum and a caudal tubercle that are more reduced in (Figure 12). The following pre-carnassials, which rise progressively, are two-rooted. The crown is trilobed, just like with the upper counterparts, but the distal lobe is stronger, slightly more pulled medio-distally. The final lobe is subdivided by a small incisure, more and more obvious from the second to the fourth tooth.

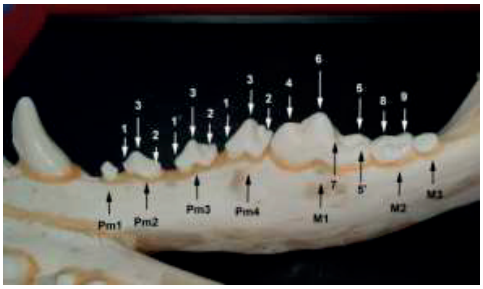

Figure 12. Inferior premolars and molars in dog (dorso-medial view) (original):
Pm1- Pm4 – premolars; M1-M3 – molars; 1-mesial lobe; 2-distal lobe; 3-intermediate lobe; 4-mesial lobe of the carnassial; 5, 5`-tubercles of the caudal lobe (distal or the heel of the carnassial); 6-intermediate lobe of the carnassial; 7-accessory lobe; 8-mesial tubercles of the first tuberculate molar 9-distal tubercle of the first tuberculate molar

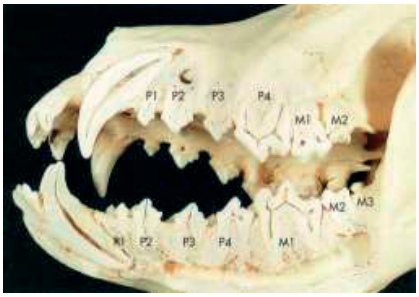

Figure 13. Section through the maxillary and mandibular teeth (lateral left view) (original)

The lower carnassial is the first molar. It is stronger than the upper one. The crown has a reduced cingulum, but it is completely trilobed.

The intermediate lobe, the strongest one, is sharp and serrated, flanked at its base by a small disto-lingual accessory tubercle. The mesial tubercle, though slightly shorter, is just as sharp; it is oriented a bit towards the lingual side; the caudal lobe (of the heel of the carnassial) is short, wide, subdivided in two secondary portions, vestibular and lingual, by a depression destined to hide a relief of the first superior tubercle. It has two roots. Very divergent, they are neatly separated, each with a salient neck.

The inferior tuberculate teeth are the final two molars. They are much smaller than the superior ones. The first one (M II) has a thick crown, slightly larger meso-distally than transversally and mamelonated on the occlusal side, the distal tubercles being the shortest. It has two roots. The final molar (M III) is very small, with a slightly mamelonated crown and a single root.

Dentition in felines: In cats, the dental formula is: I: $\frac{3}{3}$, C: $\frac{1}{1}$, P: $\frac{3}{2}$, M: $\frac{1}{1}$.

There are 30 teeth in adult dentition and 26 deciduous teeth. The reduction of the number of molars and premolars is somehow correlated to the shortening of the splachnocranium, but the conformation and the evolution of diverse types of teeth is comparable to those of canids.

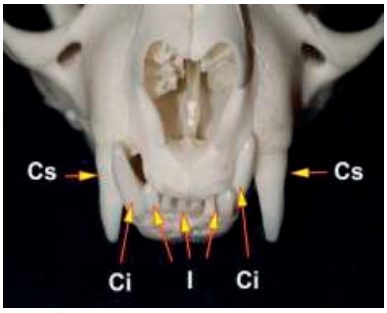

Figure 14. Incisors and canines in cats (frontal view) (original): I-incisors; Ci-inferior canines; Cs-superior canines

Incisors are very small and narrow, especially deciduous ones. They are disposed like in dogs, their size increasing from the central incisor teeth to the corner incisor teeth (Figure 14). The deciduous ones erupt near the age of three weeks and are replaced between 4 and 7 months.

Canine teeth are proportionally longer, thinner and more circular on a section, but especially sharper than in dogs. The cingulum is better marked. The vestibular side has two or three fine longitudinal ridges. The superior ones are larger than the inferior ones, and in occlusion they cover the latter partially, somewhat placed caudally to them. The deciduous ones are very thin. They erupt and are replaced at the same age as the incisors.

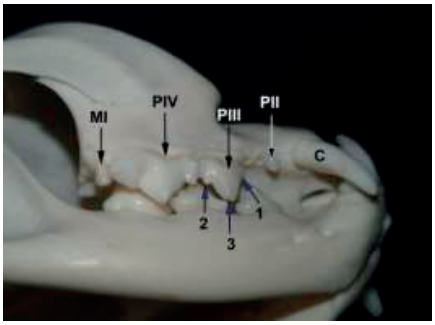

Figure 15. Premolars and molars on the left side of the cat during occlusion (latero-ventral view) (original): C-canine; PII, PIII, PIV-premolars; MI-molar (tuberculate); 1-mesial lobe; 2-distal lobe; 3-intermediate lobe

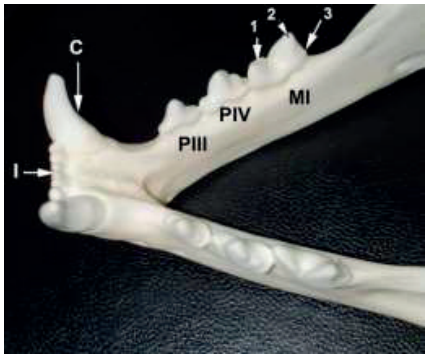

Figure 16. Inferior arcade dentition in cats (dorso-medial view) (original): I-incisors; C-canine; PIII, PIV-premolars; MI-molar; 1-mesial lobe; 2-intermediate lobe; 3-distal lobe

Premolars and molars are represented on the superior arcade by two pre-carnassials and a carnassial, as well as a tuberculate molar (Figure 15). On the lower arcade there are two pre-carnassials and a carnassial. The carnassial is thus the last upper premolar and the only lower molar. It can be noted that the first superior premolar is missing, as well as the first

two inferior premolars and the two molars on each arcade.

The first superior premolar (P II) is very small, similar to P I in dogs. The second one (P III) is clearly better represented, flattened from one side to the other and trilobed. The intermediate lobe is prominent and sharp, the mesial is less contoured, and the distal is more obvious. The carnassial (P IV) is strong and sharp. It could be compared to the one in dogs, had it not had a well contoured mesial apex, which offers it a trilobed profile. In regards to the tuberculate tooth (M I), it is very small, flattened meso-distally and practically has no contact with the inferior carnassial.

On the lower arcade, the first pre-carnassial (P III) is much more voluminous than the superior one and neatly trilobed. The second one (P IV) is just as strong as the second superior one and also trilobed. The carnassial (M I) only has a rudiment of the caudal lobe, appearing bicuspid (Figure 16). In occlusion, the final pre-carnassial and the inferior carnassial are covered laterally by their superior opposites, though they are placed slightly anteriorly.

CONCLUSIONS

The lower incisors in **swine** are easy to identify, almost rectilinear, with an elongated crown, lacing a neck and with the mesial and distal margins long and almost parallel. The corner incisor is short, with an obvious neck and reduced root. The superior central incisors are distinct through the fact that the distal edge practically continues without delimitation from the occlusal side. Both the superior central incisors and the superior intermediate incisors have a reduced infundibulum.

In **dog**, the general aspect of the crown if the incisors and the trilobed aspect of their occlusal side are distinctive characteristics. Even in the case of usage, the mesial and distal lobes disappear relatively late.

The inferior first premolar of **swine**, which can be mistaken for the superior or inferior first premolar of **dogs**, is still differentiated from the latter by the fact that in swine it has two roots (mesial and distal).In **dogs** it only has one root. Although similar to the secodont II and III premolars in dogs, the corresponding premolars in swine have two secondary depressions on the vestibular side (absent in dog). The fourth premolar in pig is tuberculate and cannot be confused for the fourth premolar of dogs.

The inferior molars are voluminous teeth in swine. They cannot be compared to the inferior tuberculate teeth of dogs, firstly because of volume, as well as due to the large number of cusps, both primary and secondary, and the greater number of roots (more than two, or one, as is the case with dogs).

The upper first premolar in pigs has two roots while it has only one in dogs. From a side view, it looks approximately sharp in dogs, while in pigs it has an elongated occlusal margin. In dogs, the three cusps of the 2-4 premolars are aligned, while in swine the distal cusp is located near the lingual side of the other two.

The multitude of cusps and the longitudinal diameter larger than the transversal, in the case of superior molars are the most obvious differences to canids.

The strictly carnivorous regime of felines compared to that of canines translates through the specialisation of dentition to a more accentuated secodont type, the morphologic effect being the accentuated reduction of the tuberculate molars.

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