

DENTITION IN MAMMALS (Part 01)

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Introduction

The arrangement of teeth in the upper and lower jaws, mainly on the premaxilla, maxilla and dentary bones, is called dentition.

Absence Of Teeth

Modern turtles and birds lack teeth. Teeth are present in all mammals though a secondary toothless condition is found in some mammals. The adult platypus (*Ornithorhynchus*) bears epidermal teeth but no true teeth are present. In platypus embryonic teeth are replaced by horny epidermal teeth in adult. In Echidna or spiny ant-eater (*Tachyglossus*) the teeth are absent in all stages of life.

In certain ant-eaters of the New World (e.g., *Myrmecophaga*, *Tamandua* and *Cyclopes*) and in adult whale-bone whale, *Balaena* (Right whale), *Caperea* (Pygmy right whale), *Eschrichtius* (Grey whale), *Balaenoptera* (Rorqual whale), *Megaptera* (Humpback whale)—teeth are absent.

Origin And Structure Of Teeth In Mammals

Teeth have evolved from denticles which are released from armour near the margins of the mouth as ossification in the integument. A typical mammalian tooth can be distinguished mainly into two regions — crown and root. The crown is the exposed part of the tooth and situated above the root and in the old age it is generally subject to wear.

The root is the hidden part in the gum which is anchored in the socket or alveolus of the jaw bone. The tooth encloses a pulp cavity that contains blood vessels, nerves, and connective tissue (Fig. 01). The junction of crown and root is called neck.

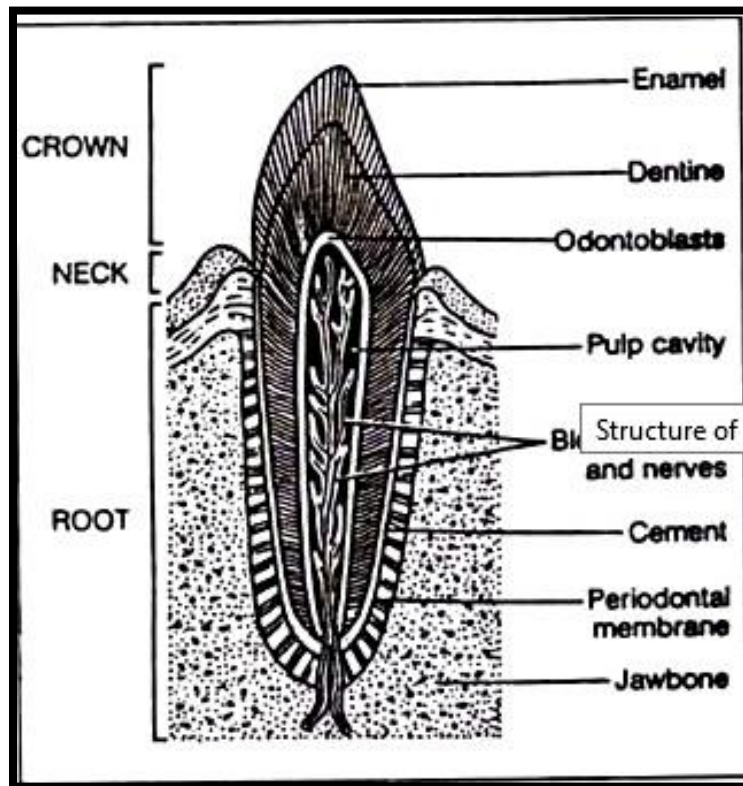


Figure : 01

There are three kinds of tissues in a typical tooth.

- ENAMEL
- DENTINE
- CEMENT

Enamel

Hardest substance in a mammal's body. almost totally made of uniformly oriented calcium phosphate crystals, only about 3% organic materials. covers crown of tooth.

Dentine

It is harder than bone but softer than enamel. The ivory is a specialised dentine and hard creamy-white substance, found in elephant, hippopotamus, walrus and narwhals tusks. The human dentine is composed of mainly calcium phosphate and fluoride 66.72%, organic matter 28.01% and calcium carbonate.

Cement

The root of tooth is covered by a thin layer of cement (cementum or Crusta petrosa) and a vascular periodontal membrane of strong connective tissue fibres (Sharpey's fibres).

Cement is a nonvascular bone and usually acellular. It is softer than dentine and is rich in collagenous fibres. It wears rapidly when exposed. The pulp cavity is lined by a layer of bone cells, called odontoblasts. Both dentine and cement are mesodermal in origin.

Types of Dentition in Mammals

A. Classification According to the Shape and Size of the Teeth:

Homodont:

Homodont or isodont type of teeth is a condition where the teeth are all alike in their shape and size, e.g., the toothed whales (Odontoceti). Pinnipeds show a tendency towards homodont condition. Fishes, amphibians, reptiles and in the extinct toothed birds, the homodont or isodont condition is observed.

Heterodont:

Heterodont condition is the usual feature in mammals, i.e. the teeth are distinguished according to their shape, size and function. The function is also different at different parts of the tooth row. Except mammals

heterodont condition is found in Port Jackson Shark (*Heterodontus*), in several reptiles, specially among mammal-like reptiles.

B. According to the Mode of Attachment of Teeth:

Thecodont type dentition is the rule among mammals. In this condition, the teeth are lodged in bony sockets or alveoli of the jaw bone and capillaries and nerves enter the pulp cavity through the open tips of the hollow roots (Fig. 02).

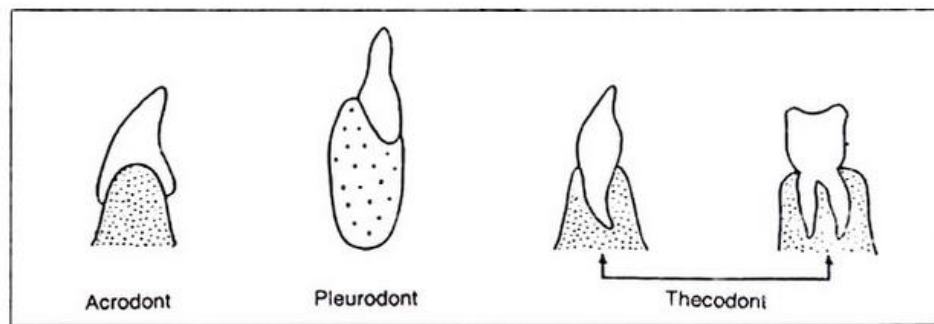


Figure 02(model of attachment of tooth)

Except mammals, thecodont type of teeth is found in crocodiles and in some fishes (Haddock, Garpike and Barracuda). Among vertebrates except thecodont, acrodont and pleurodont type of dentition is found.

Acrodont

The teeth are fused to the surface of the underlying jawbone. They have no roots and are attached to the edge of the jawbone by fibrous membrane (Fig. 02) e.g., fishes, amphibians and some reptiles.

In amphibians if teeth are present, they are acrodont and homodont except *Necturus*. All reptiles do not possess acrodont type of teeth. The acrodont- possessing reptiles are *Sphenodont*, *Calotes*, *Draco*, *Agama*, *Uromastix*, *Moloch horridus* and some snakes.

The teeth in modern amphibians are attached in the pleurodont style to the outer wall in a broad alveolar groove of the jaw bone. The teeth of modern amphibians are pleurodont and supported by pedicels of dental origin to which they are attached by zones of soft tissue.

Pleurodont:

Here the teeth are attached to the inner-side of the jawbone. The tooth touches the bone only with the outer surface of its root (Fig. 10.128). In acrodont and pleurodont types of dentition, there are no roots, and nerves and blood vessels do not enter the pulp cavity at the base, e.g., *Necturus* (Amphibia) and some reptiles.

Among reptiles the following families possess the pleurodont type teeth: Iguanidae (Iguana), Xenosauridae (Xenosaurus, Mexico), Zonuridae (Africa), Anguidae (Anguis, Ophisaurus), Lacertidae (Lacerta), Scincidae (Mabuya), Helodermatidae (Heloderma, Mexico), Varanidae (Varanus), Cerrhosauridae (Africa) and many snakes.

C. According to the Succession or Replacement of Teeth

The teeth can be divided into three categories:

- (i) Monophyodont
- (ii) Diphyodont and
- (iii) Polyphyodont.

Among mammals the first two categories are found.

(i) Monophyodont:

In some mammals, only one set of teeth develops in their life time and this condition is called Monophyodont, e.g., Marsupials retain all their milk teeth except last premolars, the toothed whales (Odontoceti), some rodents (e.g., squirrels), certain insectivores (e.g., moles). Among platypus, sirenians and toothless whales develop only one set of teeth

(monophyodont dentition). These teeth may not erupt (some whales) or, if they develop are usually shed shortly afterward.

(ii) Diphyodont:

In most mammals two sets of teeth are found. The first temporary set of teeth, called deciduous teeth, milk teeth or lacteal teeth, are lost or replaced by a second set of teeth, termed permanent teeth. In bats and guinea-pigs the milk teeth are lost even before birth. In milk teeth the molars are absent.

(iii) Polyphyodont:

In this condition, the teeth are replaced continuously throughout life, e.g., most lower vertebrates replace their teeth, generation following generation (Dogfish, snakes).

Types of teeth:

In heterodont condition the teeth can be distinguished into 4 types. They are incisors, canines, premolars and molars.

(i) Incisors:

They are situated anteriorly on the premaxilla in upper jaw and tips of dentaries in lower jaw. They are conical, single-rooted and monocuspid. They are used for cutting or cropping. Incisors may be totally absent in sloth or absent on upper jaw in sheep and ox. In rodents and lagomorphs the incisors are chisel-shaped, open rooted and continue to grow throughout life.

(ii) Canines:

Canines lie immediately behind the incisors. They are single in each half of the jaw. They are large-pointed, long-crowned with a single root. They are used for piercing and tearing the flesh of the prey (dog).

Sometimes the canines are used in holding the prey, mainly seen in carnivorous mammals.

In rodents and lagomorphs, the canine is absent, leaving a space in-between incisors and premolars, called diastema. Any gap within the dental series is called diastema. In horses, the canines are relatively small. In carnivores (dogs, tigers and lions) the canines become spear-shaped and used for piercing and tearing the flesh. They are generally used for holding and piercing in relation to both feeding and fighting.

(iii) Premolars:

Following the canines there are premolars or bicuspid teeth. These have two roots and two cusps. The premolars are used for grinding the food materials.

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Cusp patterns of cheek teeth:

The molars contain many cusps on their surface. The cusps are raised tiny structures or ridges on the occlusal surface. The cusps are called cones. Depending on the number and shape of the cusps, molars are recognised in different names.

[Among fossil mammals]

(i) Triconodont:

In this condition molars possess 3 cones or cusps arranged in anteroposterior lines. This type of molar teeth are found in the fossil Mesozoic mammals (Fig. 03 A), e.g., Triconodon.

(ii) Trituberculate:

Here the molars contain three cones or tubercles, arranged in the form of a triangle (Fig. 03 B). It is also found among fossil Mesozoic mammals, e.g., Spalacotherium.

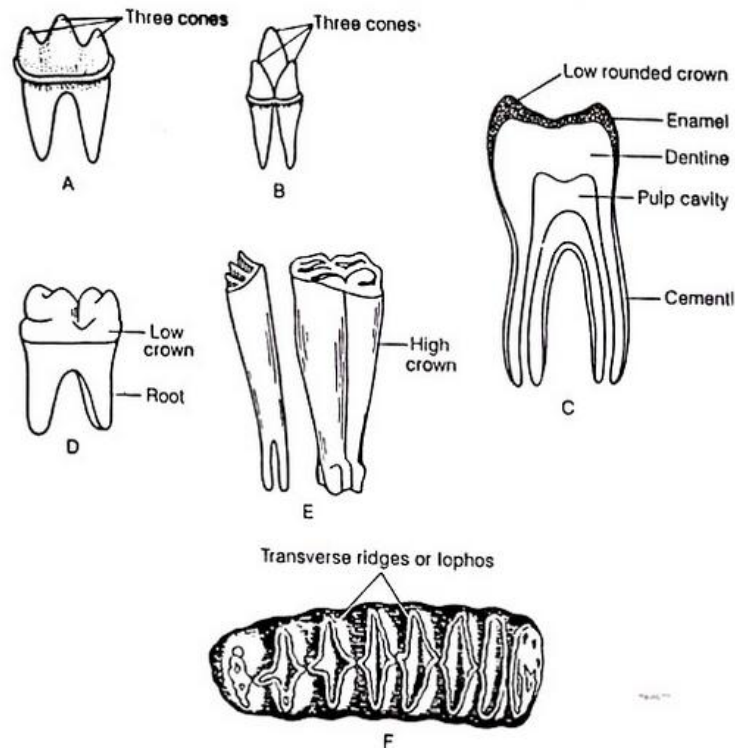


FIGURE 03

Depending upon the feeding habit and the type of food taken (trophic specialization), the premolars and molars of recent eutherians have undergone changes in their shape, and cheek teeth are recognised into the following names.

(i) Bunodont:

When the cusps in the cheek teeth remain separate and rounded, the tooth is called bunodont (mound + tooth). In man and in some omnivore mammals the cheek teeth are bunodont type and they are used in grinding the food material (Fig. 03 C).

(ii) Lophodont:

If the cusps are joined to form ridges or lophes, the tooth is called lophodont. The cheek teeth of elephant are of lophodont type. There is an intricate folding of enamel and dentine (Fig. 03 D). These type of teeth are used to grind all sorts of plants, and also grasses.

(iii) Secodont:

When the cheek teeth are with sharp cutting crowns, the teeth are called secodont. This condition of teeth is present in terrestrial carnivores. These teeth possess cutting edges and are used for cutting and shearing the flesh.

(iv) Selenodont:

Cheek teeth with crescent-shaped cusps are known as selenodont. In ruminants and horses (perissodactyla), the teeth are selenodont (crescent shaped moon + tooth) type and are used for grinding the plant matter.

(v) Brachyodont:

A tooth with a low crown and comparatively long root is called brachyodont (short + tooth) (Fig.03 D), e.g., Man.

Hypsodont:

When the crown is high and the roots are short and open (Fig. 03 E), e.g., Horse, incisor of elephants.