

HISTOLOGICAL , ANATOMICAL AND EMBRYONICAL STUDY OF FUNGIFORM PAPILLAE IN TONGUE OF IRAQI SHEEP

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ABSTRACT

The purpose of this study was to determinate The location, arrangement , the total number of fungiform papillae and number of those papillae in different regions of Twenty Tongues of Iraqi sheep (males) in different ages(two, four month embryo ,five month old and two year old) .Histological sections of fungiform papillae in different region from tongues were studied.

Papillae diameters and number of taste buds was assigned for each sample. The results showed that the papillae arise during embryological stage was thickened epithelium forming protrusion on the tongue surface. No significant differences was observed in the total number of the fungiform papillae in all ages. All papillae were distributed in the rostral part of the tongue, The papillae diameter showed significant increase respect to ages in all region. The taste buds were showed significant difference in number between 4 month embryo and 5 month old, while no significant between 5 month old and 2 year old. The number of taste buds for each papillae was more in cranial and caudal part compared with the middle part. The diameter of taste buds showed difference according to ages in all regions.

INTRODUCTION

The tongue of mammals is an important tactile organ contributing significantly to food appreciation. it varies in form and size and demonstrates morphologic diversity that is greatly influenced by feeding habits. Taste organs on the mammalian tongue are complex structure called papillae, which are comprised of an epithelial covering over a core of connective tissue and taste buds discrete collection of about 40-60 cells within the papillae epithelium(1). three type of gustatory papillae: fungiform, circumvallates and foliate, are distributed on the tongue in distinctive spatial pattern. There is a characteristic number and location of taste buds within three papillae(2). The filiform and lenticulate papillae are non gustatory, mechanical papillae, important in mastication. The pattern distribution and developmental processes of the fungiform papillae indicate some similarity between the fungiform papillae and the other epithelial appendages, including the teeth, feathers and

hairs, this is because 1-prior to the morphological changes, the signaling molecules are expressed in the fungiform papillae forming area with a stereotyped pattern 2-the morphogenesis of the fungiform papillae showed specific structure in early development, such as epithelial thickening and mesenchymal condensation and 3-the fungiform papillae develop through reciprocal interactions between the epithelium and mesenchymal tissue(3). During development, papillae and taste buds acquire an extensive sensory innervation which is derived from three sensory ganglia 1-the geniculate ganglion that innervates taste buds in fungiform papillae which are located primarily on the anterior tongue via the chorda tympani nerve 2-the trigeminal ganglion that innervates anterior lingual epithelium and fungiform papillae, but not taste buds, via the lingual branch of trigeminal nerve 3- the petrosal ganglion that innervates taste buds and papillae epithelium in circumvallate and foliate papillae on the posterior tongue(4,5,6) . The function of fetal taste buds was determined by electrophysiological recording which made of activity in the chorda tympani nerve, the responses were recorded to lingual stimulations with salts, acids ,glycerol ,glycine ,sodium saccharin ,quinine HCl and amniotic fluid(7). It is generally accepted that the sensory organs lose their efficiency, and do not function properly in older animals(8). The partial loss in the taste sensitivity of the mammals is attributed to genetic factors(9), disease(10) and age(11). Taste reception depends on the interaction between ions and molecules and the receptor cell contained in the gustatory papillae(12). It has been reported that the stimulation threshold for taste reception is higher in older individuals than those of younger ones(13). There are some studies indicating that the intensity of taste reception is proportional to the number of gustatory papillae(14). The variation observed among the individuals in taste reception is due to the number of taste buds and to their arrangement on the tongue and the taste quality decreases with decreasing number of taste buds. The purpose of this study was to examine whether the number, size of fungiform papillae and their taste buds alter during development (pre and post natal).

MATERIALS AND METHODS

Twenty tongues of male sheep in different ages (2, 4 month embryo, 5 month old and 2 year old (five tongues /age)) were collected from AL-Basrah slaughter and used in this experiment. They were transported to the laboratory & Hist. Department. Vet. Med. The ages of sheep were determined on the basis of (Crown-Rump-Length) and the eruption ratio of the incisive teeth(15). After dissection the tongues were removed for histological examination, tissues were fixed in 10% neutral buffered formalin. The location, arrangement and the total

number of fungiform papillae on each tongue, and number of these papillae in different regions of tongue(rostral ,middle, caudal)were determined by stereo microscope.

Tissue samples of fungiform papillae were removed from three region, four ages, and washed in running water, dehydrated in graded ethanol and embedded in paraffin wax, sectioned at 8micron thickness. The sections were stained with hematoxylin and counter stained with eosin, Measures were made of the diameter of each papillae and taste buds at widest point using ocular micrometer the total number of taste buds in each papillae were determined. the parameters were used in this study were analyzed by(ANOVA) test .

RESULTS

Histological examination for tongue showed that ,the age of 2 month embryo showed a little fungiform papilla or their primordial are found on the dorsal part of the tongue .The histological results showed that epithelium is thickened ,some time forming protrusion on the surface of the tongue, some thickening extend slightly into the mesenchyme tissue. Also observed that the primordial of fungiform papilla were distributed irregularly on the apex, but These primordial were covering with squamous non keratinized epithelium cells consisting of 3-4 layers, the superficial layer contain flat cells and have strongly flattened nuclei, while deep layer cells were high and have oval nuclei. the fungiform papilla has irregular structure in this period. In generally fungiform papilla were rounded in shape and have connective tissue(.fig.1-A,B,C).

**Table .1- Average total number of fungiform papillae of tongue for 3 ages of
The sheep**

Total number Of Fungiform Papillae	4month embryo	5 months old	2 years old
	400.81±6.01a	427.43±13.40 a	421.39±17.10 a

Values are mean±SD,(n=10)p<0.01) significant between the values

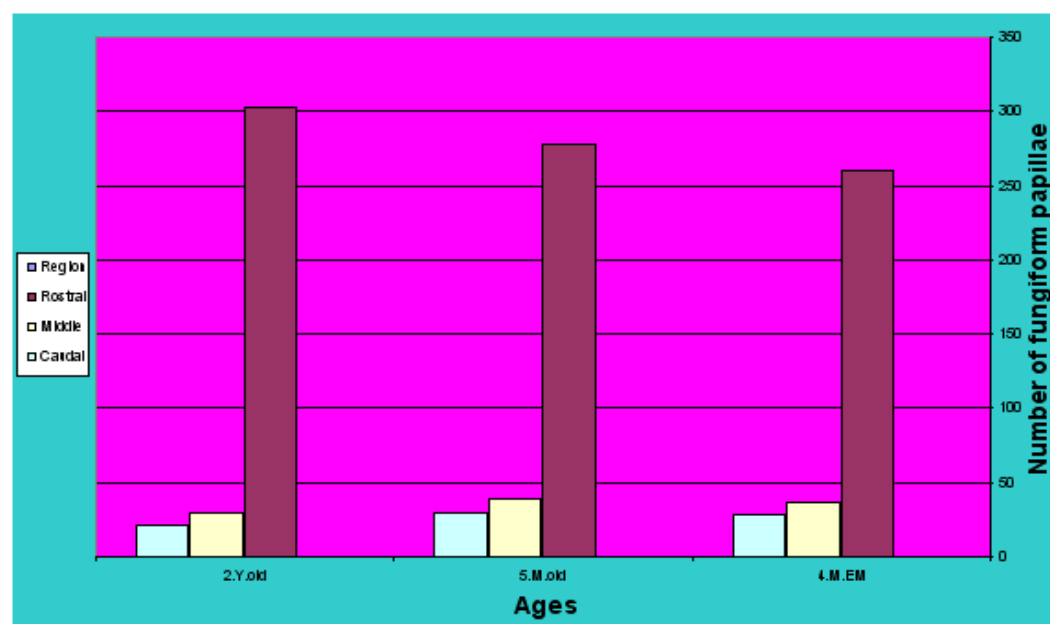


Fig.1- Number of fungiform papillae for 3 ages in rostral, middle and caudal part of tongue

Table.2- Diameter of fungiform papillae for 3 ages(μ) of sheep

Diameter of fungiform Papilla	Region	4 month embryo	5 month old	2 year old
	Rostral	209.24 $\pm$ 11.00a	303.09 $\pm$ 10.40b	334.20 $\pm$ 7.35c
	Middle	280.55 $\pm$ 9.11a	407.14 $\pm$ 20.15b	488.15 $\pm$ 15.02c
	Caudal	372.32 $\pm$ 13.25a	539.21 $\pm$ 17.10b	709.48 $\pm$ 20.61c

Values are mean $\pm$ SD,(n=10)p<0.01) significant between the values(different horizontal letteres)

Number of tast buds per mm ²	Region	4month embryo	5 month old	2 year old
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	Rostral	1.21±0.01a	2.37±0.10b	2.36±0.02 b
	Middle	1.01±0.01 a	1.50±0.02 b	1.46±0.03 b
	Caudal	1.24±0.20 a	2.24±0.21 b	2.45±0.10 b

Table.3- Number of tast buds per papuilla in 3 ages

Values are mean±SD,(n=10)p<0.01) significant between the values(different horizontal letteres)

Table.4- Diameter of taste buds in 3 ages(μ)

	Region	4 month embryo	5 month old	2 year old
Number of tast buds per papuilla	Rostral	16.18±0.01a	23.46±0.10b	33.29±0.02c
	Middle	23.33±0.01a	33.870±0.02b	41.12±0.03c
	Caudal	21.33±0.20a	30.92±0.21b	39.46±0.10c

Values are mean±SD,(n=10)p<0.01) significant between the values(different horizontal letteres)

The results of the counting of the fungiform papilla showed that No significant difference($p>0.01$) was observed in the total number of the fungiform papilla during 4 month embryo, 5 month and two year old (Tab.1),while the fungiform papilla are generally distributed in the rostral part of the tongue in all age(Fig.2),also was observed that the diameter of the fungiform papilla recorded significant difference ($p<0.01$) in three ages in all regions (Tab.2). The number of taste buds per papillae showed significant difference between 4 month embryo and 5 month ($p<0.01$), while there are no significant difference between the 5 month old and 2 year old.

The results showed that The number of taste buds per papillae in the cranial and caudal part of the tongue were more than in the middle part in all three ages(Tab.3)(fig4-A,B,C). the diameter of taste buds showed significant difference respect to ages in all regions($p<0.01$) (Tab.4),(fig.2-D).

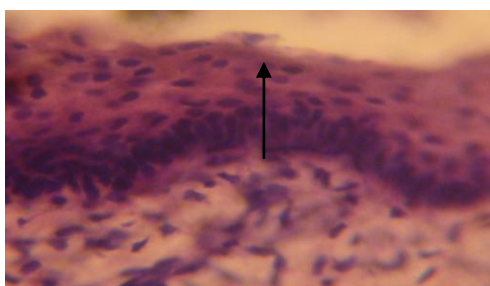


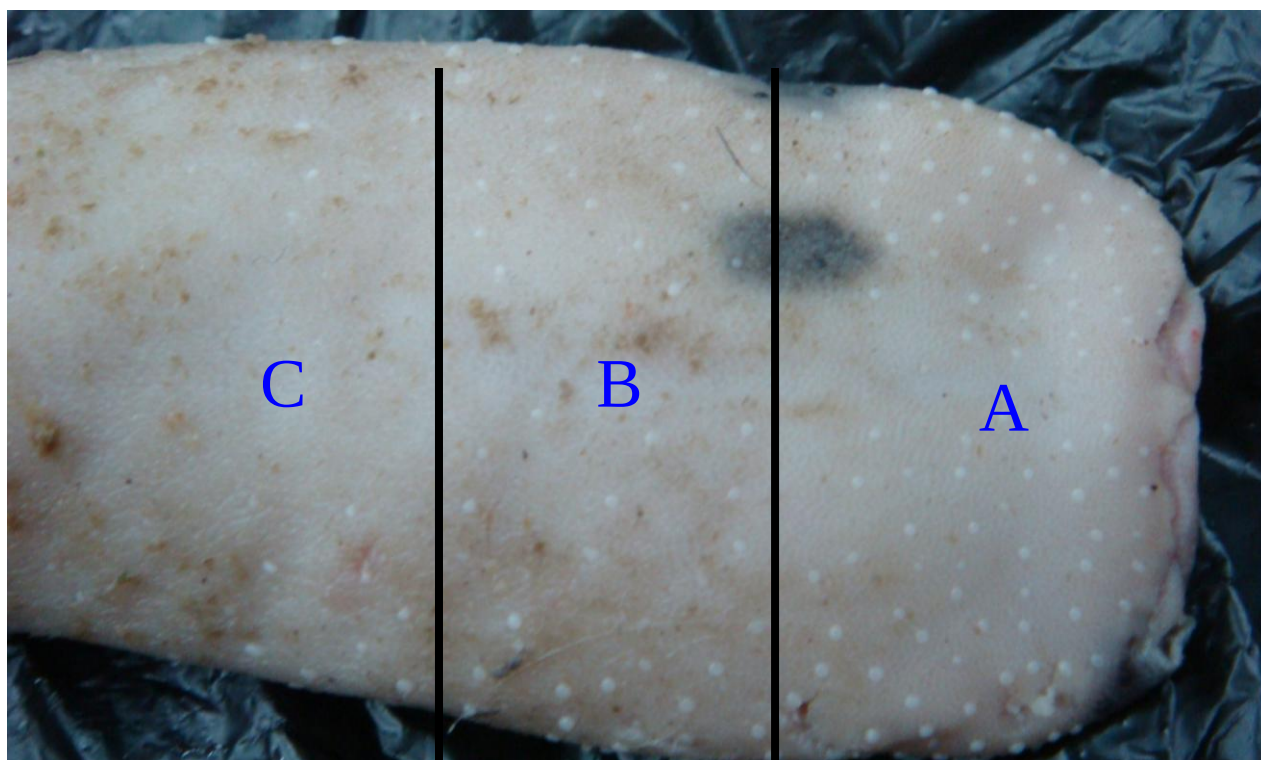
Fig.2-

A-Longitudinal section of tongue (2month embryo)show primordial of fungiform papillae(→).(400 x) (H&E) .

B- Anatomical Tongue(2month embryo)show fungiform papilla primordia

C-Longitudinal section of fungiform papillae show the diameter(→←)(250 x) (H&E).

D.Longitudinal section of fungiform papillae show the diameter of taste buds(→←)(400x) (H&E) .



show :

Fig:3.

Anatomical picture

- A- Rostral part of tongue
- B- Middle part of tongue
- C- Caudal part of tongue

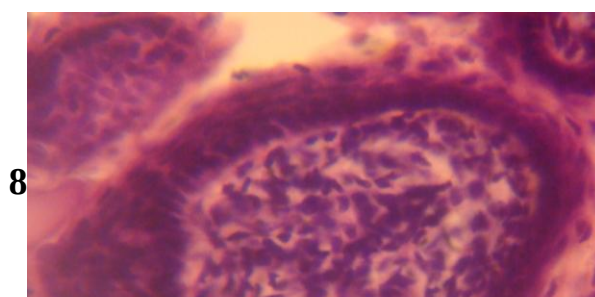


Fig :4.

A-cross section of fungiform papillae with one taste bud (400X)
(H&E).

B-cross section of fungiform papillae with no extense of taste bud
(400X) (H&E).

C-cross section of fungiform papillae with two taste bud (400X) (H&E).

DISCUSSION

The first symptom of the formation of the primordial fungiform papillae in the form of thickening in the epithelium of the tongue, this is similar to that reported in rabbit(16)who reported that no primordia of fungiform papillae are observed in day 15 of pre natal life in the rabbit.The shape of adult fungiform papillae in this study is similar to that in the Black Rhinoceros

(*Diceros Bicornis*) (17a).In bovine the fungiform papillae have clear groove surrounding their base, and separating them from the rest of lingual surface(18). the fungiform papillae in the camel was covered with thick stratified squamous keratinized epithelium, which is not observed in sheep(19).

while the fungiform papillae in adult monkey were mushroom- shape, while Dome like fungiform papillae in rabbit(12). The differences in the shapes of the fungiform papillae is related to food, feeding and mastication pattern. The total number of fungiform papillae stayed constant for 120 day embryo, 50 month and 2 year, similar observation were reported previously by(20).in cats, and(21) in monkey and (22)in Suffolk sheep. It was also similar to that observed in rat aged 8 hour to 466 days(23)..this study observed that the number of fungiform papillae were generally distributed in the rostral part of the tongue in all ages. This was agreement with that reported in Indian Tiger as was observed in Lion (24). It's also similar to that in the barbary sheep(17a),and in *Black Rhinoceros*(25). The diameter of fungiform papillae was increased from pre natal to post natal and old sheep, this result was agreement to that reported in akkaraman sheep by(26)and in Suffolk sheep by(22).(6) reported that the increase in the number of taste buds per papillae was due to increase coincide in time with an apparent increase in number of chorda tympani nerv fibers, so that there is period of hyper innervations of fungiform papillae in perinatal animal that induce the formation of increased number of taste buds.

Our results don't show any significant difference between number of taste buds per papillae in 5 month and 2 year age, this result was agreement with that reported by(26) in Akkaram sheep, but these result are accordance with the result reported in monkey(12) .(27) has studied fungiform papillae in human tongues from individual aged 2 day to ninety year, showing no significant difference are found in mean number of taste buds as function of age. The extense of non taste bud fungiform papillae was observed in the Egyptian camel and goat, it could be suggested that these papillae have mechanical function (28).

The variation in the number of taste buds might indicate gustatory function in some animals but not in other(3) .the morphological characteristic of the Tongue of the Bactrian camel might have evolved to assist the camel in prehension and manipulating of the inorganic

stiff plants that grow in its environment and there fore might related to the feed and feeding habits of the animals((19).

دراسة نسيجية وتشريحية وجينية للحليمات الفطرية في لسان الأغنام العراقية

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الخلاصة

هدفت الدراسة الحالية لبيان العدد الكلي وموقع وتنظيم الحليمات الفطرية وعددها في مواقع مختلفة في عشرون لساناً من الأغنام العراقية وبأعمار مختلفة (2، 4، 5 شهر جنيني و 5 شهر، 2 سنة) بعد الولادة. درست المقاطع النسيجية للحليمات الفطرية من مناطق مختلفة من اللسان ، وأيضاً درست أقطارها وعدد البراعم الذوقية لكل عينة، وأوضحت النتائج ان الحليمات تنشأ خلال المرحلة الجنينية كطلائية ثخينة غير متقرنة مكونة بروزاً على سطح اللسان ولم يلاحظ أي اختلاف معنوي في العدد الكلي للحليمات الفطرية في مختلف الأعمار. بينت الدراسة ان الحليمات تنتشر بكثرة في الجزء الأمامي من اللسان. أظهرت نتائج التحليل الإحصائي ان أقطار الحليمات لا تختلف معنوياً تبعاً للأعمار في كل أجزاء اللسان، بينما أوضحت وجود اختلاف معنوي $P < 0.05$ في عدد البراعم الذوقية بين عمر (4 شهر) جنيني و (5 شهر بعد الولادة، ولم يظهر أي اختلاف معنوي بين (5 شهر) بعد الولادة وعمر (2 سنة) بعد الولادة. وأوضحت النتائج أيضاً ان عدد البراعم الذوقية لكل حليلة يكون أكثر في الجزء الأمامي والخلفي عند مقارنتها مع الجزء الوسطي من اللسان. وأخيراً أظهرت النتائج وجود اختلاف معنوي في أقطار البراعم الذوقية تبعاً للأعمار في كل مناطق اللسان.

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