

**Morphological and Histological Description of
the Tongue in the Frog *Rana ridibunda***

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Abstract

The structure of the lingual epithelium of the frog *Rana ridibunda* contains two types of papillae which are believed to function in gustation and in the secretion of salivary fluid. Filiform papillae are compactly distributed over nearly the entire dorsal surface of the tongue, and fungiform papillae are scattered among the filiform papillae. Each type of papillae are covered with pseudo stratified columnar epithelial tissue with goblet cells and a few ciliated cells.

The ventral surface of the tongue is lined by a simple epithelium with the presence of goblet cells and no papillary surface. The connective tissue of the lamina propria contained large number of glandular structure, deeply there are bundles of skeletal muscle fibers and the cartilaginous or bone skeleton are absent in the tongue.

The purpose of this study was to clarify the morphological and histological structure of the lingual epithelium of *Rana ridibunda*.

Keywords: lingual surface, lingual papillae, *Rana ridibunda*.

الوصف المظهري والنسجي للسان في الضفدع الشجري *Rana ridibunda*

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الخلاصة

تحتوي ظهارة اللسان في الضفدع الشجري جنس *Rana ridibunda* نوعين من الحليمات والتي يعتقد ان لها دوراً مهماً في الهضم وافراز سائل اللعاب.

تنتشر الحليمات الخيطية بشكل كامل على السطح الظهري للسان وتتبعثر بينها الحليمات الفطرية . يغطي كلا النوعين من الحليمات بنسيج ظهاري عمودي مطبق كاذب حاوي على خلايا كأسية والقليل من الخلايا المهدبة في حين يغطي السطح البطني بنسيج ظهاري بسيط حاوي على نسبة كبيرة من الخلايا الكأسية وفاقداً للحليمات اللسانية.

يحتوي النسيج الضام للصفحة الاصلية على عدد كبير من التراكيب الغدية وتمتد عميقاً منها حزم من الالياف العضلية الهيكلية ولم يلاحظ وجود اي تراكيب غضروفية او عظمية في اللسان.

ان الغرض من الدراسة الحالية هو توضيح التركيب المظهري والنسجي لظهارة اللسان في الضفدع من جنس *Rana ridibunda*.

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Introduction

A true tongue, which has voluntary muscle and is movable found in amphibian animals (1). The feeding mechanism is clearly an important factor that determines the success of adaptation of vertebrates to their environment and of their persistence through procreation (2).

There have been many studies on the lingual taste organs or the sensory papillae of anurans (3,4,5). However, of these reports, only a few described the lingual epithelium other than the sensory organs (3,6). In particular, histological aspects of the lingual dorsal epithelium of anurans have almost completely ignored.

The amphibian tongue contains two types of papillae which are believed to function in gustation and in the secretion of salivary fluid. Filiform and fungiform papillae are distributed on the dorsal surface of the anuran tongue (7).

Many studies showed that the tongue of *Rana* composed of filiform and fungiform papillae, these papillae are variable relative proportion in different species (8,9).

The dorsal surface of the tongue of the bull frog, *Rana catesbeiana*, has simple columnar epithelium with a few ciliated cells and goblet cells and the entire surface is covered with numerous filiform papillae and a few fungiform papillae (10).

The purpose of the present study was to clarify the gross and histological structure of the lingual epithelium of *Rana ridibunda* in Iraq and to compare the results to those for *Rana*.

Materials and methods

Tongue from five male and five female adult frogs, *Rana ridibunda* were used in the present study. These frogs were collected from the area around the city of Baghdad.

Samples were fixed in the 10% formaldehyde for 48 hours or Bouin's fluid for 24 hours at room temperature and later submitted to the dehydration process in a series of ethanol at increasing concentration (70-100%) and embedded in paraffin wax (11).

Histological slides of thickness of about 6 μ m were stained routinely with hematoxylin-eosin in order to determine the type of the lingual epithelium.

The selected sections were examined with light microscope (Kruss-Germany) and photographed with digital camera (Sony 14.1MP).

Results

The tongue of *Rana ridibunda* is flat and round in shape with bilateral anterior process. The posterior part of the tongue is fixed to the mandibular mucosa and when the tongue sticks out from the opened mouth, the anterior process reverses and comes out (Fig.1).

The dorsal mucosa of the tongue was seen to be composed of filiform and fungiform papillae. The filiform papillae were somewhat smaller than the fungiform papillae, however, the number was larger than that of fungiform papillae (Fig.2). Some of fungiform papillae were branched (Fig.3).

The shape and size of filiform papillae are almost constant. The height of papillae is 2.32 μ , the diameter of the median shaft is 1.2 μ , while the height of fungiform papillae is 3.25 μ , the diameter of the head is about 2.2 μ and the neck portion is about 1.22 μ .

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Each papillae are composed of epithelium and connective tissue of lamina propria, and covered with pseudo stratified columnar epithelial tissue. It was observed that the epithelium of the papillae was composed of several kinds of cells: columnar cells, mucous cells (goblet cells), basal cells and a very small number of ciliated cells were distinguishable, the taste buds could not see within this epithelium (Fig.4,5).

The large portion of the epithelium was composed of columnar and mucous cells, each cell rested on the basal lamina and apical portion of many of these cells reached the free surface and the nuclei were located basally. A high proportion of mucous cells were located between the columnar cells and were seen particularly in the upper area of the filiform papillae, a large part of the cytoplasm of mucous cells was filled with mucus while the flattened nuclei were located in the basal part (Fig.6).

Ciliated cells were scattered among the columnar cells and occupied about 5% of the filiform papillae epithelium, the ciliated cells had cilia on their free exterior surface while the nucleus was located basally.

The ventral surface of the tongue is lined by simple epithelium with the presence of the goblet cells and no papillary surface (Fig.7). Just beneath the lingual papillae, large number of glandular structure are distributed within the lamina propria, the connective tissue penetrated deeply into the area that surrounds the glandular structure and the center of each papillae (Fig.8)

The bulk of the tongue consists of bundles of striated skeletal muscle *species (Fig.8).

There were no histological differences between males and females with regard to the present results.



Figure 1: Morphology of the tongue of the frog *Rana ridibunda*

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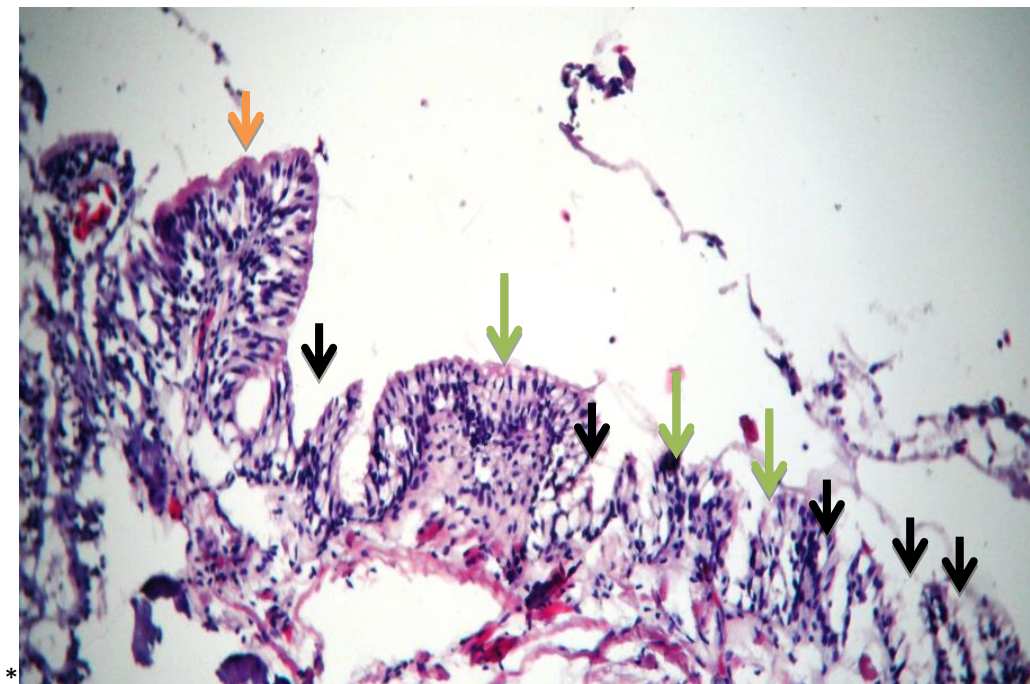


Figure 2: Dorsal surface of the tongue showing filiform ,fungiform papilla,
Some of the fungiform papillae are branched

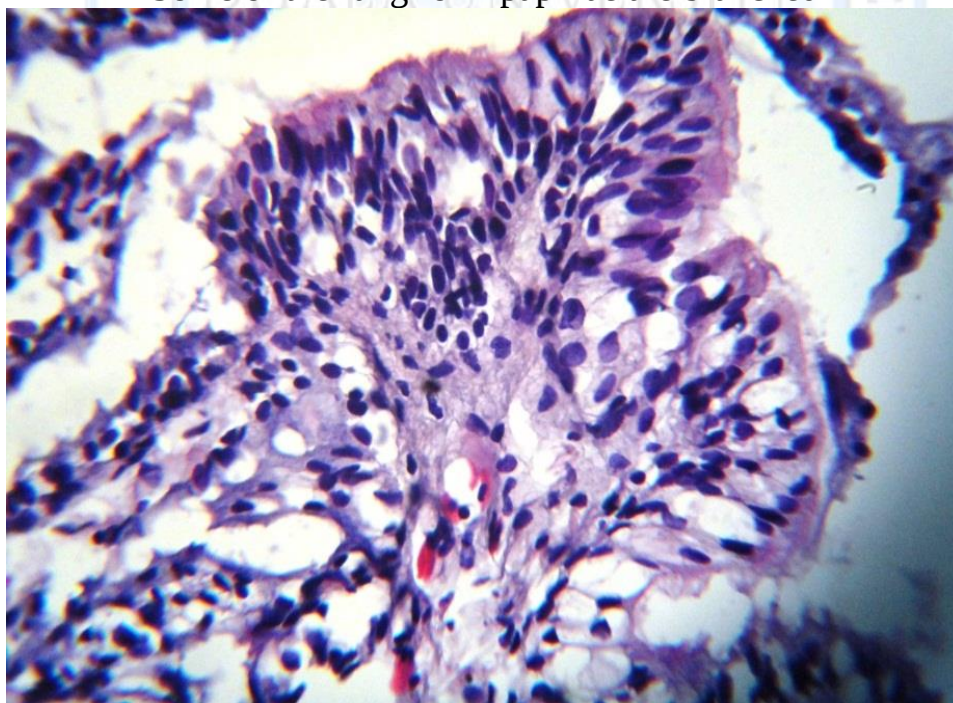


Figure 3: Dorsal surface of the tongue showing branched fungiform papillae.

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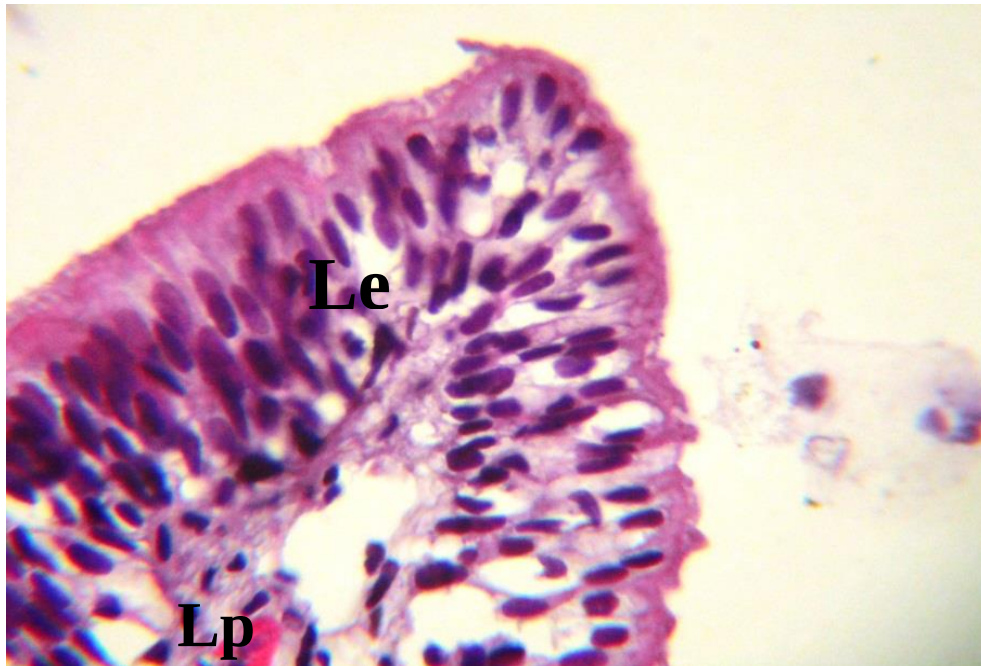


Figure 4: The filiform papillae lined with pseudo stratified columnar epithelium (Le), the connective tissue of lamina propria(Lp) penetrated the center of the papilla

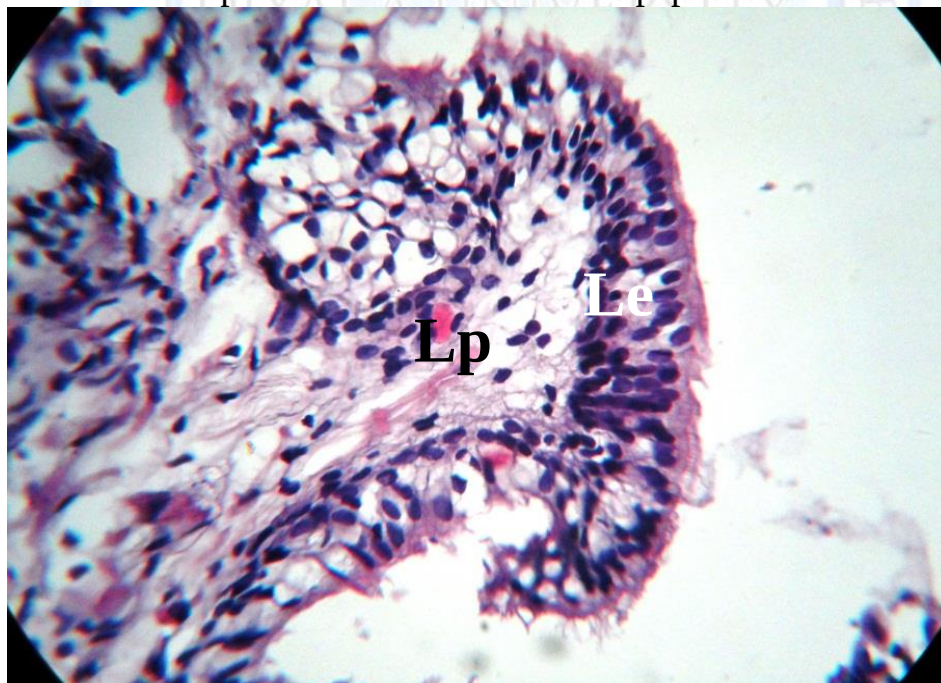


Figure 5: The fungiform papillae lined with pseudo stratified columnar Epithelium (Le) and the connective tissue of the lamina propria (Lp) penetrated the center of the papilla.

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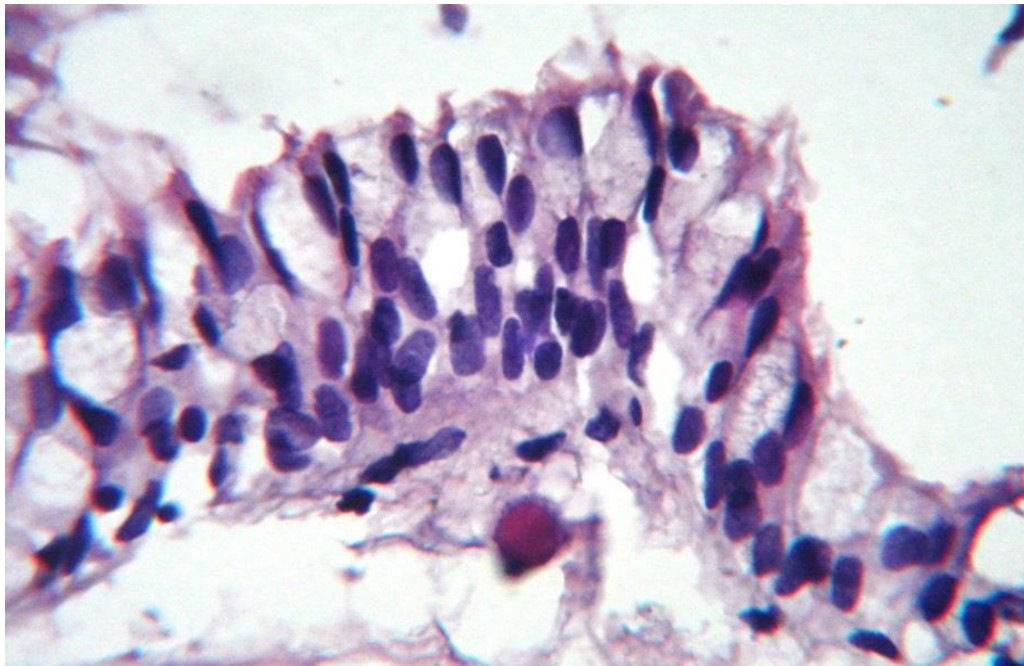


Figure 6: The lining epithelium of the lingual papillae showing that the Large part of the epithelium consist of columnar cells (), and Mucous cells ().

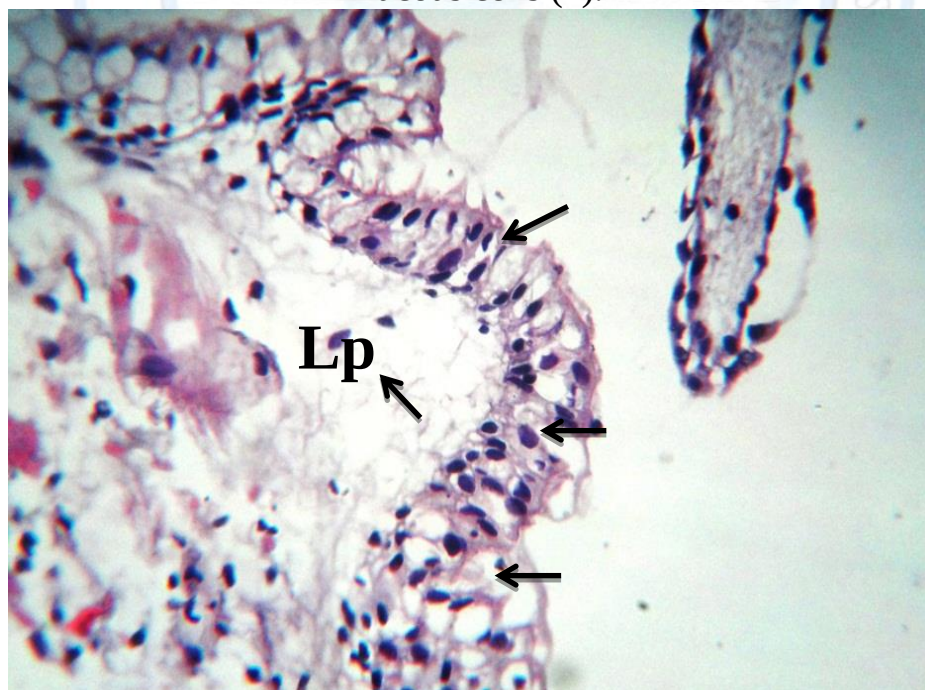


Figure 7: The ventral surface of the tongue showing the lining epithelium With goblet cells(), lamina propria(Lp).

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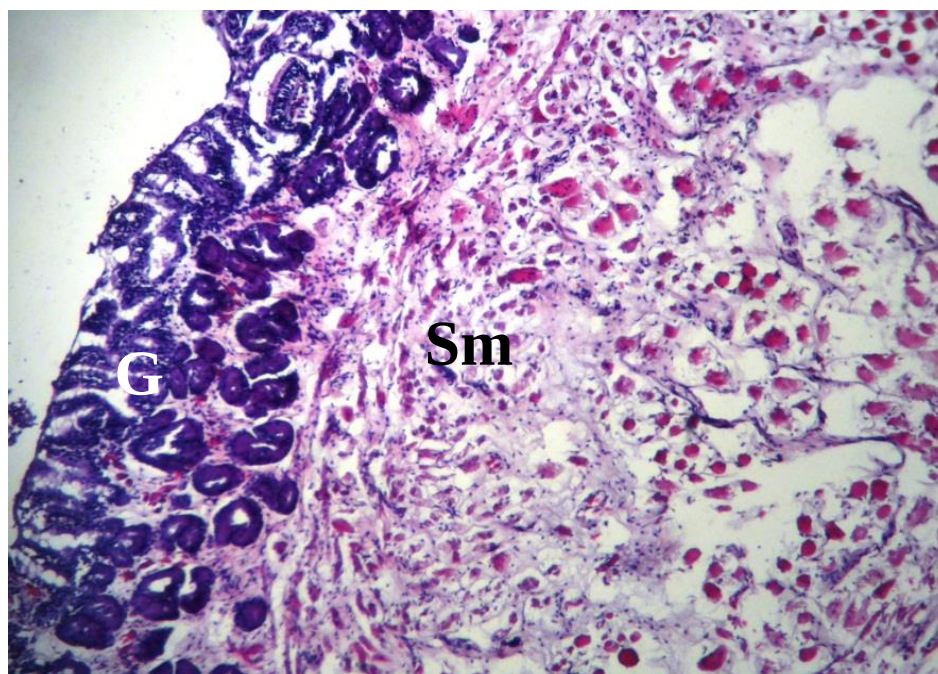


Figure 8: Section in the tongue showing the large number of the glandular Structure (G) and bundles of striated muscles (Sm)

Discussion

Anuran tongue play an important functional role in the uptake of food, in the sense of taste (12), and in the secretion of mucus (3). In mammals, tongues function mainly as the organ used for uptake of food and for the senses of taste, and are not so important for secretion of mucus. Salivary glands are the main mammalian organs which serve this function. Furthermore, in a few species of reptiles (13), mucous glands are located in restricted area of the tongue, and the taste organs are located on various areas of the oral mucosa ,Thus , it seems that there may be variations in the function and structure of the tongue based on the evolution of animals(14).

The tongue of *R. ridibunada* contains two types of papillae which are filiform and fungiform papillae, the filiform papillae are compactly distributed over nearly the entire dorsal surface , while the fungiform are scattered among the filiform papillae and some of fungiform papillae are branched , similar papillae have been observed in *R. concrivora* (7),*R. catesbeiana* (6,10) and *R. rugosa* (9) but significantly different from those of *Bufo japonicas* (4).

In mammals, almost all of the lingual epithelium is composed of stratified squamous epithelium, and various degrees of keratinization of the epithelium have been observed in some areas (13) .By contrast , no keratinization of any sort could be recognized in the lingual epithelium of the frogs. Instead, the epithelium was composed of several kinds of cells: electron dense granular cells, mucous cells, ciliated cells and other cells(1,4).

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The present study showed that the epithelium of two types of papillae are pseudo stratified columnar epithelium, these epithelium is composed of several types of cells: columnar cells, mucous cells, basal cells and a small numbers of ciliated cells, these observation imply that the lingual dorsal epithelium of *Rana* may be composed of cells that are morphologically rather similar to the epithelial cells in the trachea of mammals (7,15).

The present study also indicated that a large part of the epithelium consists of mucous cells. This suggests that the epithelium of frog tongue may be more important in the secretion of mucus (4). Each papillae are composed of epithelium and connective tissue of lamina propria, furthermore, the glandular structures which are analogous to the lingual glands of mammals, were observed under light microscope in the lamina propria beneath the filiform papillae. These results demonstrated that the lingual dorsal mucosa of the frog is the main organ for the secretion of mucus (8).

From the results of the present study and previous observations, we are able to recognize that the lingual epithelium of frog is devoid of keratinization and contained a large amount of mucous cells which probably plays the production of salivary fluid which suggest that the tongue of frog could help both to catch food and to moisten it.

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