

17C-2 Structure and Function in the Frog

The frog is a common laboratory animal. Frogs are inexpensive and easy to obtain, but more importantly, their anatomy and physiology partially resemble those of mammals and man.

External Structures of the Frog

The most conspicuous feature of the frog's head is its large bulging eyes. A colored **iris** surrounds the dark **pupil**, the opening for light. The iris can enlarge or reduce the size of the pupil in response to varying amounts of light. At the bottom of the eye is the transparent folded **nictitating*** (NIK tih TAY ting) **membrane**. This "third eyelid" moves across the frog's eye, keeping it moist and protected.

The two small nostrils on the frog's snout open into its mouth. These structures allow the animal to breathe with just the top of its head above the water. A circular membranous structure situated behind each eye is the **tympanic** (tim PAN ik) **membrane**. This membrane serves as an eardrum, transmitting sound vibrations to the ear cavity underneath.

Mouth of the Frog

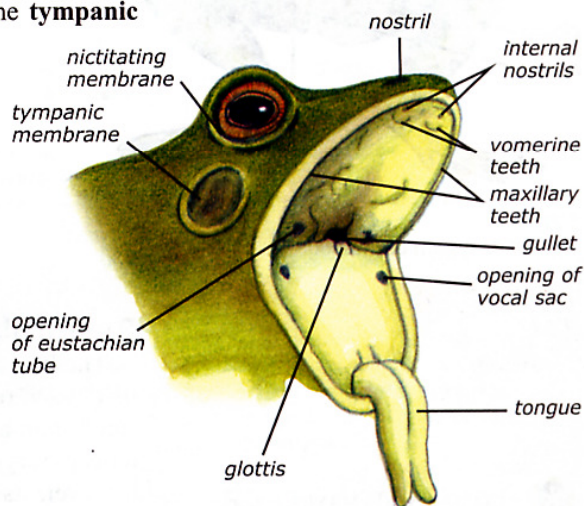
The frog has a large mouth designed to capture the insects it eats. A large sticky tongue is attached at the front of the floor of the mouth. When an insect comes within range, the frog flips out its tongue, snagging the prey. The frog then flips the tongue and insect back into its mouth. Frogs "blink" when they swallow. This is not because the food tastes bad; the eyes are actually being pressed toward the mouth cavity to help crush the food and force it down the gullet.

The inside of the frog's mouth contains several openings. At the front of the roof of the mouth are the internal nostril openings. The openings of the **eustachian** (yoo STAY shun) **tubes** uniting the ear cavity with the mouth are at the back corners of the mouth. The passage to the digestive tract is the **gullet** at the extreme back of the mouth.

Immediately in front of the gullet is a small swelling parted by a slender opening. This is the **glottis*** leading to the lungs. Male frogs have a pair of openings in the back of the lower jaw leading to the **vocal sacs** in the floor of the mouth. The frog passes air through these openings into the sacs when it "croaks," increasing the volume of the sound.

17C-2 Objectives

- Trace the path of food as it passes through the frog's digestive tract
- Name and describe the four possible means of respiration for the frog
- Describe frog reproduction, including all relevant structures



17C.8
Structures of the frog's head



nictitating: nicti- (L. NICTARE, to wink)

glottis: (Gk. GLOTTA, tongue)

The frog possesses two sets of inconspicuous teeth: a ridge of tiny maxillary* (MAK suh LEHR ee) teeth in the upper jaw and two sets of vomerine (VOH muh RINE) teeth between the internal nostril openings in the roof of the mouth. These two sets of teeth assist the frog in grasping its prey, not in chewing. There are no teeth in the lower jaw.

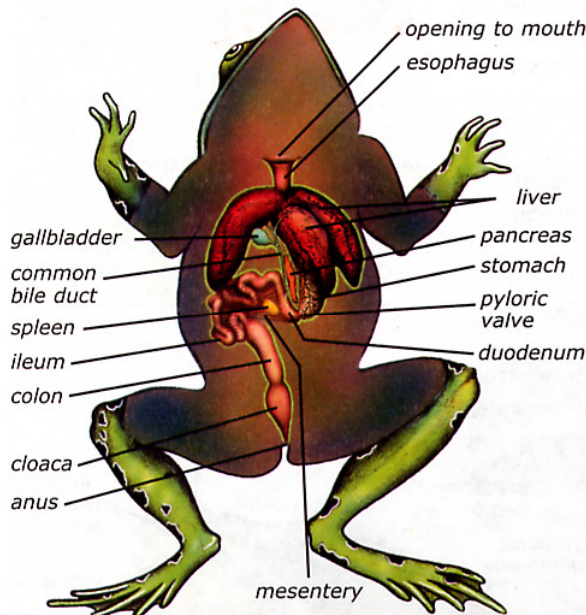
Digestion in the Frog

Although tadpoles are herbivores, feeding on plants, algae, or plankton, the adult frog is a carnivore, ingesting insects, spiders, slugs, worms, or any other moving object it can fit into its mouth. Some larger frogs have been known to eat rats. The food, once ingested, passes through a short esophagus to the stomach, an enlarged portion of the digestive tract that serves as a storage sac and site of preliminary digestion. The stomach narrows at the region called the pylorus* (pye LOR us), where the muscular pyloric valve controls the further passage of the food into the small intestine.

The stomach joins the small intestine, a thin tube consisting of the enlarged duodenum (DOO uh DEE num) joined to the stomach and the coiled ileum (IL ee um). Here, the dissolved food is absorbed into the bloodstream. The small intestine empties into the short, stubby colon, or large intestine. From here all indigestible material is passed through the short, tubular cloaca* (kloh AY kuh) and expelled from the body. The cloaca is a common passageway for both liquid and solid wastes, as well as eggs and sperm during reproduction.

Two glands outside the digestive tract contribute to the digestive process. The liver is the large maroon-colored, three-lobed organ that dominates the body cavity. It produces bile, a substance that assists digestion. The bile collects in the small saclike gallbladder and flows to the upper portion of the small intestine through the common bile duct. The liver also performs a variety of other functions, including the storage of digested food.

The pancreas, another digestive gland, is a small strip of tissue near the stomach. Pancreatic secretions also pass into the small intestine through the common bile duct. All the digestive organs are enclosed in transparent membranes called **mesenteries*** (MES un TEHR eez) that bind the organs to the dorsal body wall. Blood vessels flow through the mesenteries to the internal organs.



17C.9
Digestive system of the frog

Respiration in the Frog

The frog obtains oxygen by using its skin, mouth lining, and lungs. When its oxygen requirements are low (for example, during hibernation), the frog can obtain all the oxygen it needs through its skin. The frog may also use its capillary-rich mouth lining to supplement its respiration. When active, however, its increased oxygen needs must be supplied by its pair of small lungs.

The lungs join to a single tube called the **trachea**, which opens into the mouth cavity through the slitlike glottis. The frog lacks the ribs and muscles needed to inhale and exhale as humans do. To breathe, the frog draws air into the mouth through the nostrils by lowering the floor of its mouth. Then with nostrils closed and glottis open, the frog swallows the air, forcing it into the lungs. Contraction of the body wall expels the air.



maxillary: (L. MAXILLA, upper jaw)

pylorus: pyl- (a gate) + -orus (Gk. OUROS, watcher)

cloaca: (L. CLOACA, canal)

mesentery: mes- (middle) + -entery (Gk. ENTERON, intestines)