

*An explanation of the physiological effects of biting and eating and how that compromises a horse's ability to breathe.*

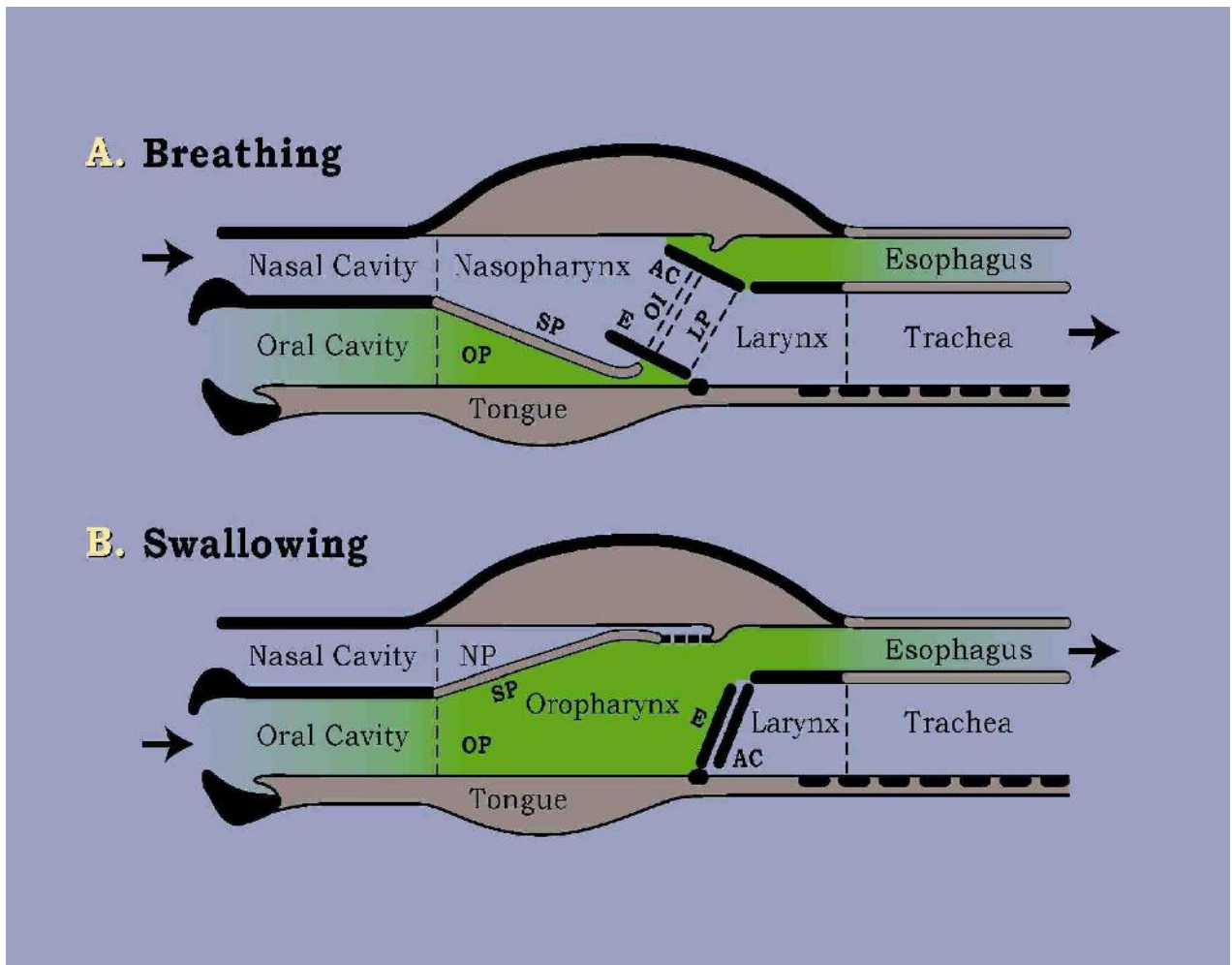
No mother would allow her child to run around the yard while eating an apple. Instinctively, she recognizes that the child should either eat or run, not both at the same time. A horse is no different. It cannot breathe deeply with something in its mouth, whether that something is food or a foreign body like a bit. In the wild, a running horse has a closed mouth, sealed lips, a relaxed and immobile tongue and jaw, and an empty and relatively dry oral cavity. A bit breaks the lip seal, opens the mouth, causes movement of tongue and jaw, triggers salivation and interferes with a horse's ability to breathe. Quite apart from the pain it causes and the fear it elicits, the presence of a bit is incompatible with exercise. A cantering horse takes one stride for every breath. If respiration is cramped, so is locomotion. A bitted horse is a handicapped athlete.

The throat (pharynx or 'ravine') will always be a region of deep physiological complexity. Blame the lung fish or blame evolution for having invented the alimentary canal before the respiratory canal. Today, the throat in all mammals divides into two channels, gullet and windpipe. In order to serve each channel correctly, the throat itself has to be capable of assuming both functions, respiratory function one moment and digestive the next. In the grazing horse, the throat even has to be capable of permitting both functions to be carried on simultaneously.

Think of the digestive and the respiratory conduits as two canals running coast to coast. The respiratory canal is wide and deep and runs from San Francisco (the nostrils) to New York (the lungs). It must remain open at all times (a horse dies within minutes if it cannot breathe). The alimentary canal is narrower and less deep and runs from Los Angeles (the mouth) to Boston (the stomach). It too must remain open for eight hours a day while a horse is grazing. An engineering problem arises because the two canals cross in Chicago (the throat). If it was just a question of crossing, the engineering solution would be relatively simple (many a canal crosses a road or river carried on a bridge). But the biological solution requires something far more difficult. At 'Chicago' the two canals have to use the same conduit, the throat ... air one minute, food or liquid the next and even air and food simultaneously.

When a horse is grazing, yet still must breathe, the simultaneous problem is solved by the first part of the windpipe (the valve called the voice box or larynx) protruding a little above the floor of the throat. So semi-liquid chewed grass, the consistency of a puree of spinach, can slide into the gullet by means of a canal on either side of the voice box. The flow is maintained by means of a peristaltic-like movement without requiring the horse to stop breathing in order to swallow. And the volume and speed of flow is such that it does not spill over into the open windpipe.

This mechanism, however, does not suffice when a horse is eating more fibrous food (hay) or drinking. At such times, a horse has to swallow and, for a brief moment, must stop breathing. But if the voice box valve remained open at this moment the horse would die from the inhalation of food or from drowning. The problem is solved by two coordinated mechanisms. First, the soft palate acts like a switch-plate in the throat, directing either air into the windpipe or a bolus (food or liquid) into the gullet. Secondly, a set of carefully coordinated and automatic reflexes control movement of the soft palate and the laryngeal valve.



The soft palate is anchored in front to the hard palate but is potentially mobile at its tail end. When the soft palate flap is in the down position, air can pass freely from nose to lungs and back again. In the up position, food or liquid is directed in to the gullet. The larynx is a valve that also acts like a switch plate. When the valve is open, the horse can breathe and the entrance to the gullet is closed.

When the valve is closed, the lungs are protected from inundation by food or liquid and the entrance to the gullet is open.

In the wild, the above engineering is assisted by the force of gravity. The horse eats and drinks with its head at ground level. So gravity also prevents food from 'going the wrong way.' The domesticated and stabled horse may take hay at ground level but tends to chew and swallow with its head erect. The problem is exacerbated when the horse is shipped by road. Now the horse is eating hay while exercising, i.e. while constantly balancing himself in a moving vehicle and standing in a wind tunnel. He may also have been sedated for the journey, in which case, his reflexes may not be acting efficiently. Under these conditions, there is a high risk of food being inhaled. This, I believe, is the cause of 'shipping fever', i.e. the pneumonia that so frequently follows long journeys. Basically, this is an inhalation pneumonia that leads to bacterial infection of the lungs and frequently results in death.