THE TRACHEALIS MUSCLE OF MAN AND ANIMALS.

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THE trachealis muscle, which completes the trachea behind, varies somewhat in its arrangement in different animals. In man, the continuous layer of non-striped muscle, which forms this muscle, is described in Quain's Anatomy as passing "not only between the ends of the cartilages, but also opposite the intervals; those opposite the ends are attached to the ends of the latter, and encroach also for a short distance on their inner surface." "Outside the transverse fibres are a few fasciculi, having a longitudinal direction." A careful examination of a number of transverse sections of the trachea shows that the attachment of the muscle encroaches for some distance upon the inner surface of the rings, where it is firmly attached to the perichondrium. The longitudinally arranged fibres are seen in several bundles outside the transversely disposed fibres. In a section which has been stained with picrocarmine, the different arrangement of the fibres is easily made out, for all the connective tissue becomes of a bright red, while the non-striped muscle is reddish brown. The acini of many of the mucous glands lie outside the trachealis muscle, so that their ducts have to pierce it to open into the trachea.

In the *cat*, the trachealis muscle consists of fibres arranged transversely. They are attached to the *external* surfaces of the cartilages at a considerable distance from their free posterior extremities, so that they can thus exert considerable action. They also exist between the cartilages, and are attached to the upper and lower margins of adjoining cartilages. The fibres are very firmly adherent to the perichondrium. There are septa of connective tissue, which envelope bundles of the transversely directed fibres, so that on making a vertical section of a trachea posteriorly in the region where the trachealis muscle is attached to the cartilage, the muscle is seen cut transversely in small blocks, each surrounded by its own perimysium. In the cat

when the trachea is separate from its anatomical connections, a vertical section shows that the thin edges of the cartilages overlap, and the muscle has such wide attachments that the free ends of the rings also overlap, and the mucous membrane is thrown into longitudinal folds, projecting into the trachea. In such a section one almost invariably meets with a section of a small microscopic nerve ganglion. These ganglia are extremely numerous in the course of the branches of the recurrent laryngeal nerve, where they are distributed to the trachealis muscle. Indeed, there is a very distinct plexus, containing heaps of ganglionic cells at the nodes, not only in the cat, but in many other animals.[1] This plexus, in all probability, is comparable to the nerve-plexuses that occur in the walls of the intestine. The mucous glands of the trachea of the cat are very numerous, and, as is usually the case, they are more numerous between two cartilages than immediately between the body of the cartilage-hoop and the mucous membrane. The acini of these glands contain cells which are usually far more "granular" in their characters than the corresponding glands of the dog.

In the *dog*, the trachealis muscle presents much the same arrangement as in the cat, its attachment being also to the *external* surface of the cartilages, and also extending a considerable distance forwards on the cartilage. The muscle does not seem relatively to be so thick as in the cat. The mucous glands are quite different in their characters from those that exist in the cat. They usually have clearer epithelium, more like true mucous glands, and they are not so numerous as in the cat's trachea. The ends of the cartilages overlap when the trachea is removed from its connections. A very few longitudinally disposed fibres exist outside the transverse ones. Neither in the dog or cat do any gland acini occur outside the tracheal muscle, but there are numerous nerves and nerve ganglia.

In the *rabbit*, the muscle is also attached *externally*, and the same arrangement exists in the *rat*, and in both cases the fibres are directed transversely; while in both the attachment includes about one-fifth or thereby of the total circumference. The cartilages overlap at their free ends, so that there are three

[1] William Stirling, *Text-Book of Histology*, p. 59; Kandarazki, *Achiv. f. Anat. u. Physiologie*, 1881, p. i.

or four longitudinal folds of mucous membrane projecting into the trachea to be seen in a transverse section. In a trachea of a rat, slit open vertically in front and spread out, the arrangement of the fibres is easily seen. The fibres form a complete layer, and are attached to the upper and lower borders of the cartilages as well as to their posterior surface. The ganglionic nerve plexus is particularly abundant in the trachealis muscle of the rat.

In the *pig*, an entirely different arrangement prevails. The trachealis muscle is attached to the *internal* surfaces of the cartilages at a considerable distance—about one sixth of the circumference—forwards from the free tips of the cartilage. The result is that in a section of the trachea of the pig, when it is severed from its connections, the trachealis muscle, with the mucous membrane covering it, runs across the lumen of the trachea, and divides into an anterior larger part and a posterior smaller one, which latter is bounded laterally chiefly by the projecting free ends of the cartilages which meet behind. This is an exaggerated condition of what obtains in man. In the *sheep* also many of the acini of the mucous glands lie outside the trachealis muscle, so that it is perforated by their ducts. In E. Verson's article on the larynx and trachea,[1] the transverse muscular layer of the trachea is represented as being inserted in the case of the sheep into the "external surfaces" of the cartilages. This is certainly a misprint for internal. In the *ox* also the muscle is attached to the perichondrium covering the inner surfaces of the cartilages, and the cartilages with their slightly everted tips[2] meet behind.

[1] *Stricker's Histology* (New Sydenham Soc. Trans.), vol. iii. 46.

[2] *Todd's Cyclopædia*, article "Respiration."