

## 2.4

# Smooth Muscle

Smooth muscle is found lining the hollow organs of the digestive system, airways of the lungs, tubes of the urinary system and blood vessels to name just a few examples. Although smooth muscle contraction is much slower than skeletal muscle, smooth muscle can generate more force per unit area and can shorten up to 80% of its length (skeletal muscles can only shorten 30%), and smooth muscle is also very fatigue resistant, contracting for many hours when needed. Consider the issues that would arise if a sphincter muscle fatigued! Fortunately, most sphincter muscles are composed of smooth muscles. The ability to not fatigue will be discussed later on in this section. The ability to shorten at a much greater distance is due to the difference in structure of the myofilaments. Smooth muscle myofilaments are about 10,000 times longer than their diameter, and although not uniformly aligned (no striations), are still found in sarcomeric arrangements.

Smooth muscle can be broadly categorized into two groups: **single unit** and **multiunit**. Single unit smooth muscles are linked together via gap junctions that allow them to contract as a "single" unit. Contractions of this sort often spread as waves, starting at one end and spreading to the other end. This type of contraction in the digestive system is called **peristalsis**. Organs that contain single unit smooth muscle can use "pacemaker potentials" or cells that automatically depolarize to start the contraction. As a result, single unit smooth muscles can work independent of the nervous system or it can be modified by it.

Multiunit smooth muscles are not electrically coupled together so that stimulation of one muscle does not result in stimulation of others. Multiunit smooth muscle depend solely on nervous or endocrine input. Examples that you may be familiar with include the iris of the eye and arrector pili muscles in the skin

Now that we have given a broad categorization to smooth muscle, please realize that single unit and multiunit are only book ends and that most smooth muscles are comprised of various combinations of single and multiunit components.

Smooth Muscle Contraction



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