Smooth Muscle

Macroscopic Structure

- Found in walls of **hollow** organs (not heart)
- Spindle shaped cells of variable size, each with **one** centrally located nucleus
- 10x **narrower** and thousands of times **shorter** than skeletal muscle fibers
- Have essentially the same contractile mechanisms as skeletal muscles
- Lack connective tissue sheaths, but have **endomysium** (fine connective tissue secreted by smooth muscles and contain blood vessels and nerves)

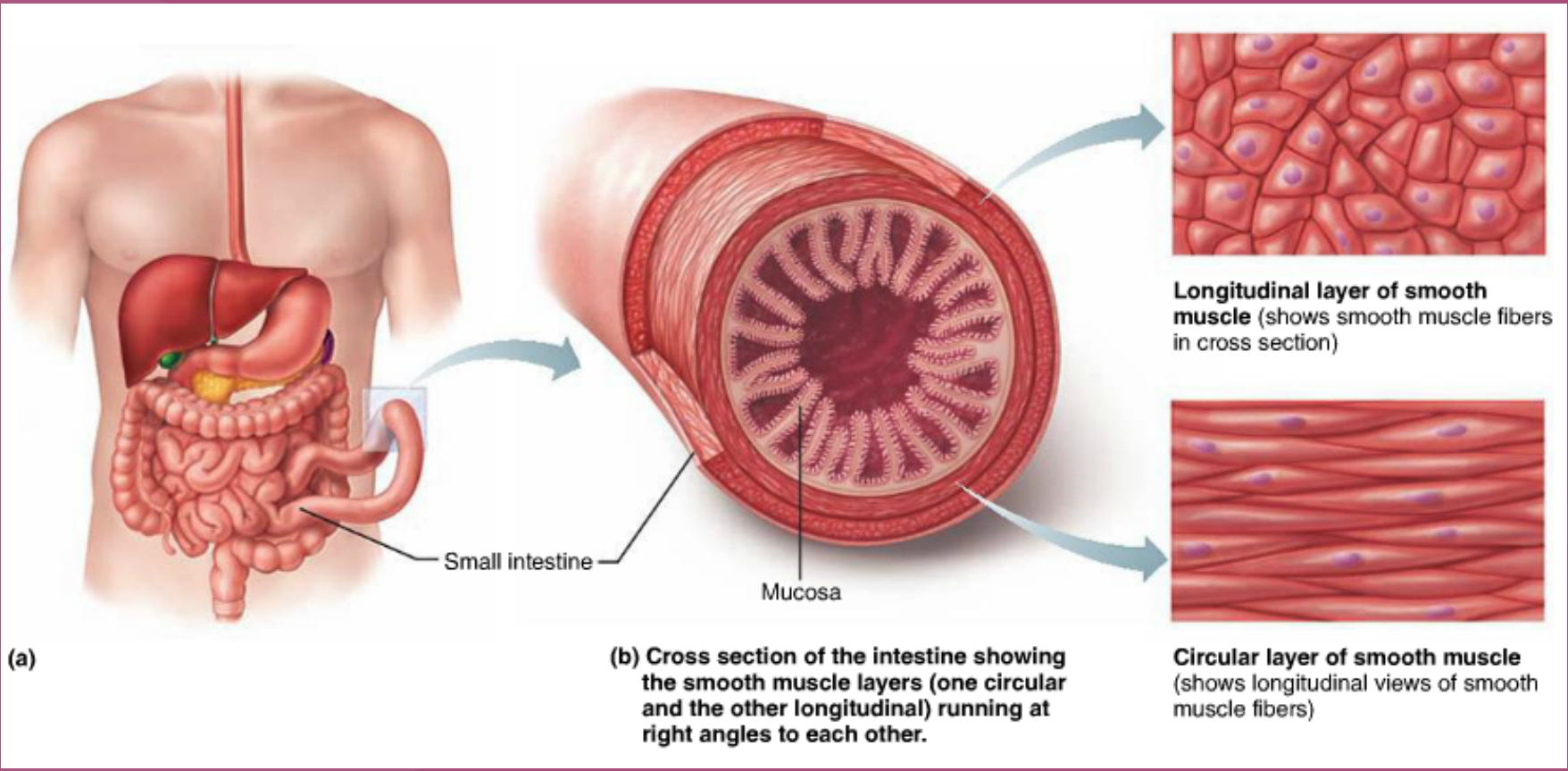
Microscopic Structure

- No **striations**, no **sarcomeres**
- Thick filaments are fewer but have myosin heads along their entire length
- No troponin complex in thin filaments
- Thick and thin filaments arranged **diagonally**
- Intermediate filament-dense body network
    - lattice-like arrangement of non-contractile filaments that resist tension
    - **dense bodies**: tethered to sarcolemma and act as anchoring points for thin filaments corresponding to

Microscopic Structure cont...

Two Layers:

- **Longitudinal Layer:** muscle fibers run parallel to the long axis of the organ.
  - fiber contract→ organ dilates and shortens
- **Circular Layer:** fibers run around the circumference of the organ
  - contraction constricts the lumen of the organ and elongates



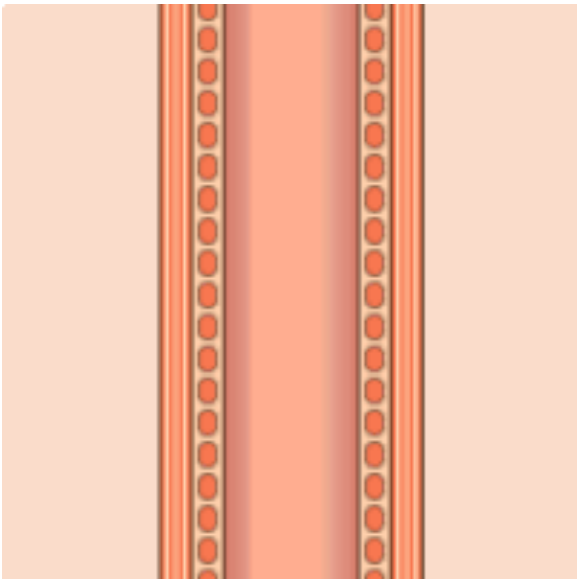
(a)

(b) Cross section of the intestine showing the smooth muscle layers (one circular and the other longitudinal) running at right angles to each other.

Peristalsis

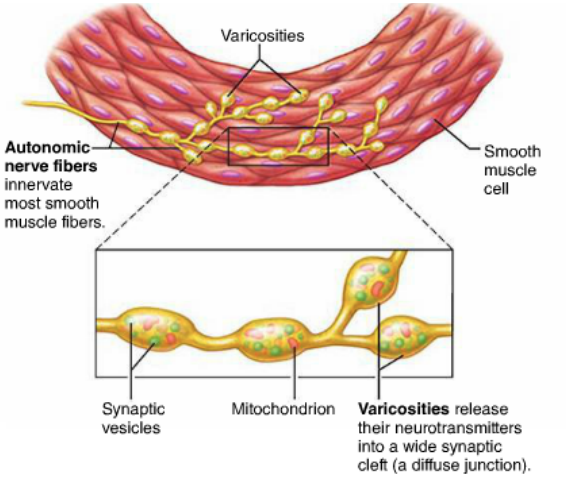
Progressive, wavelike contractions that mixes substances in the lumen and squeezes them through the organ's internal pathway

- rectum, urinary bladder, and uterus
  - expel contents
- accounts also for the constricted breathing and stomach cramps



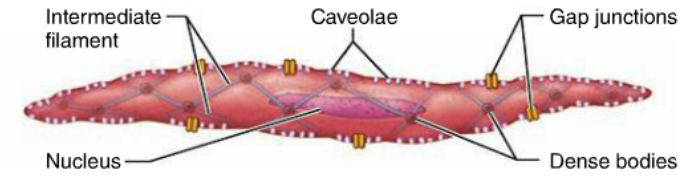
Varicosities

- Smooth muscles lack the structured neuromuscular junctions of skeletal muscles
- Knob like swellings of certain autonomic (involuntary) axons containing mitochondria and synaptic vesicles
    - release neurotransmitter into a wide synaptic cleft called **diffuse junctions**

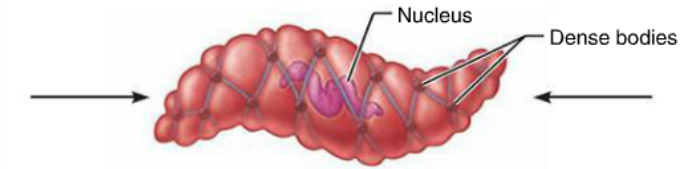


Smooth Muscle is Special because…

- Smooth muscle tone
- Slow, prolonged contractile activity
- Low energy requirements
- Response to stretch



(a) Relaxed smooth muscle fiber (note that gap junctions connect adjacent fibers)



(b) Contracted smooth muscle fiber