Contraction of the smooth muscles in the small intestine

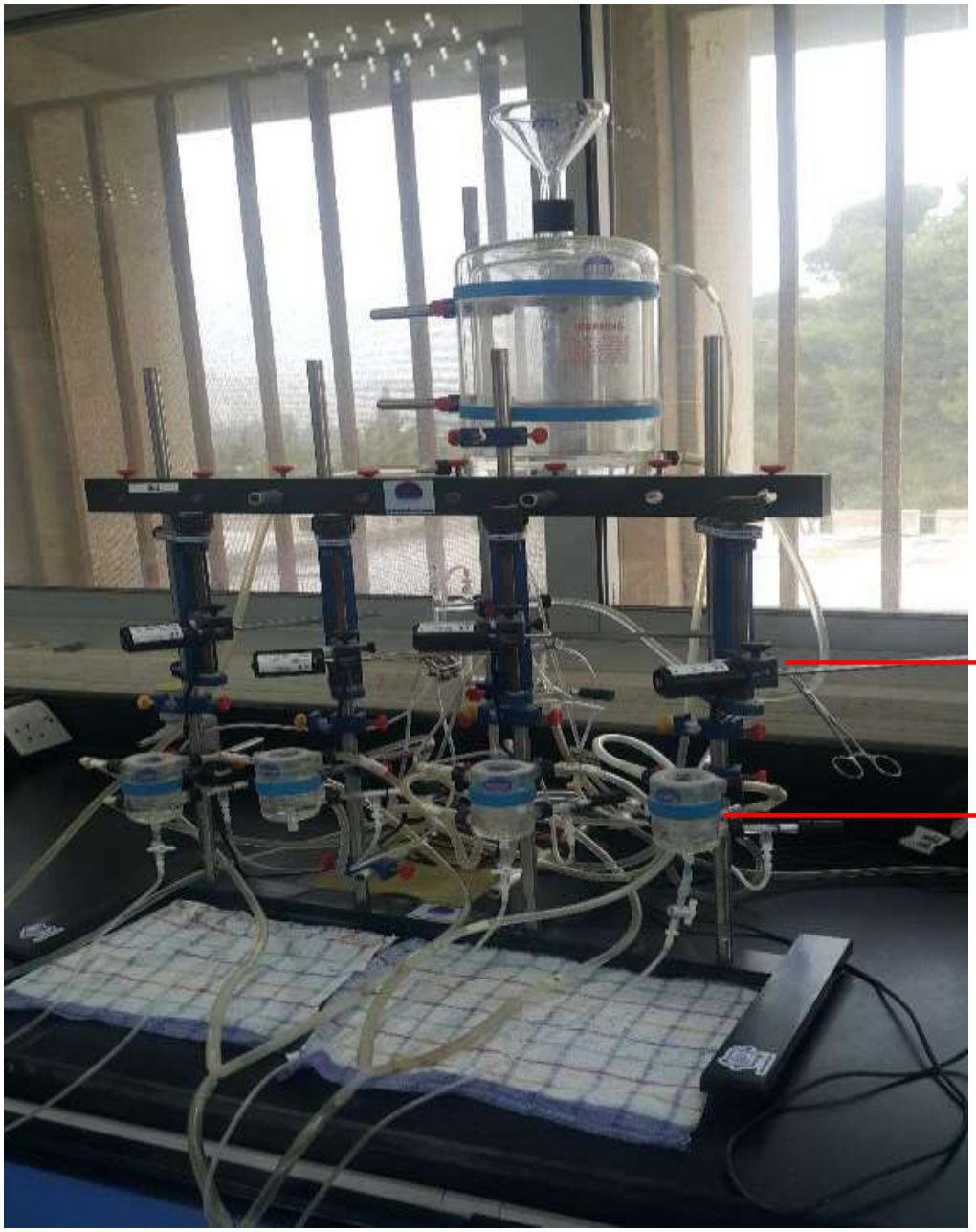
Dr. Tamara Alqudah

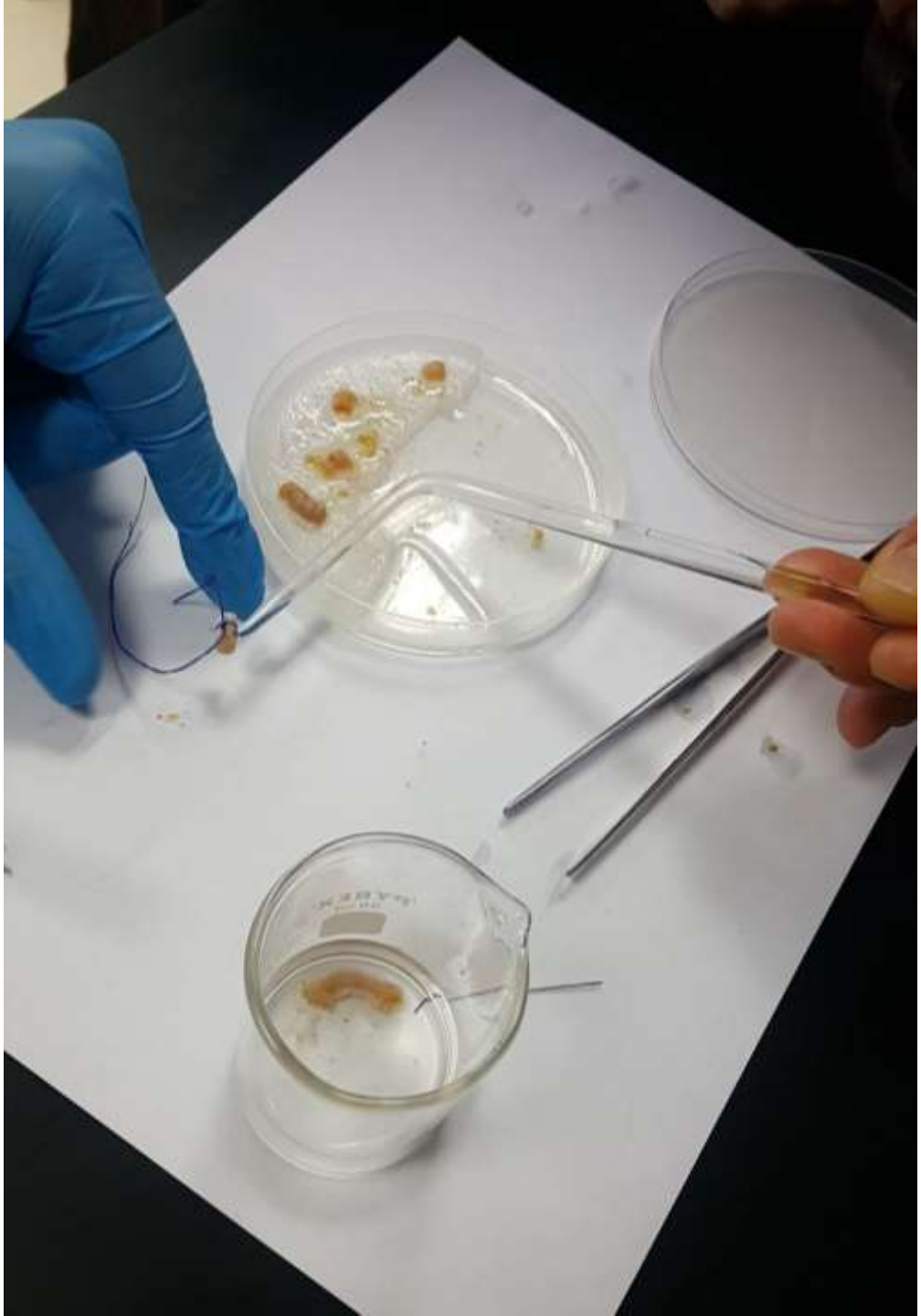
Aim of the experiment

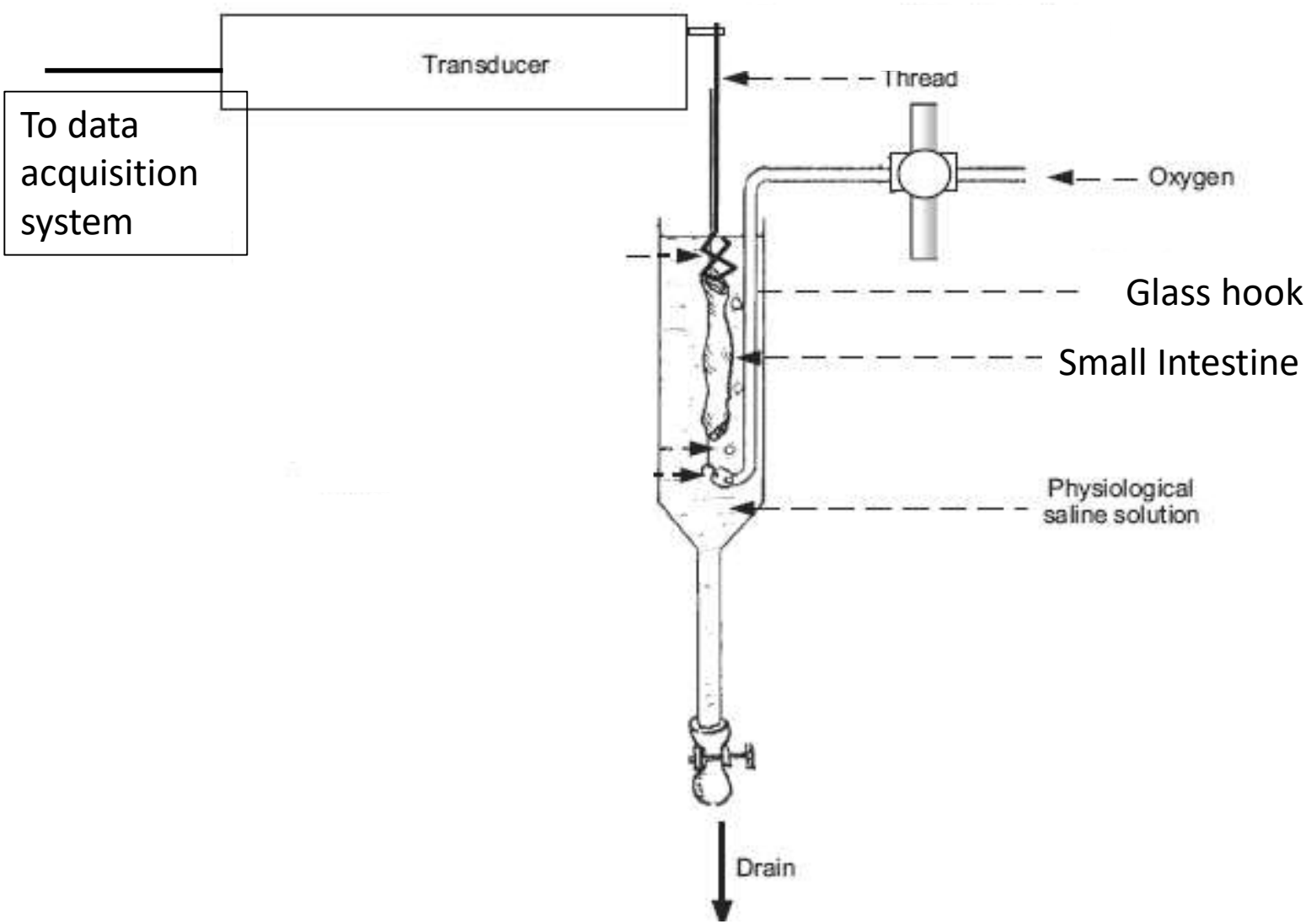
- This experiment investigates the contraction of smooth muscle in the small intestine by :

1. Observing the occurrence of spontaneous contractions
2. The modification of these contractions by acetylcholine and atropine.

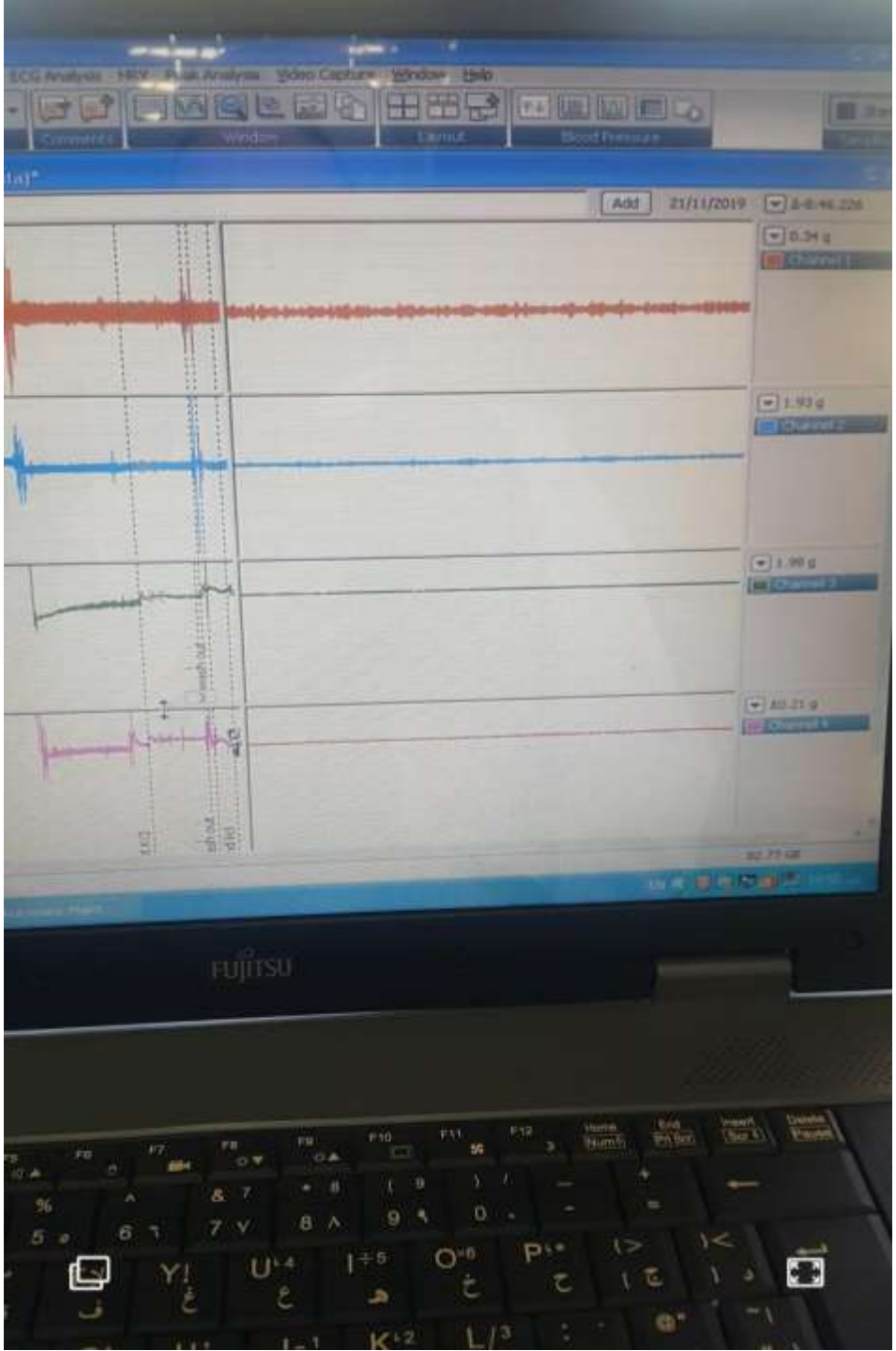

Radnoti


Tension transducer
Organ bath





Arrangement of the organ bath, tissue, and pressure transducer.

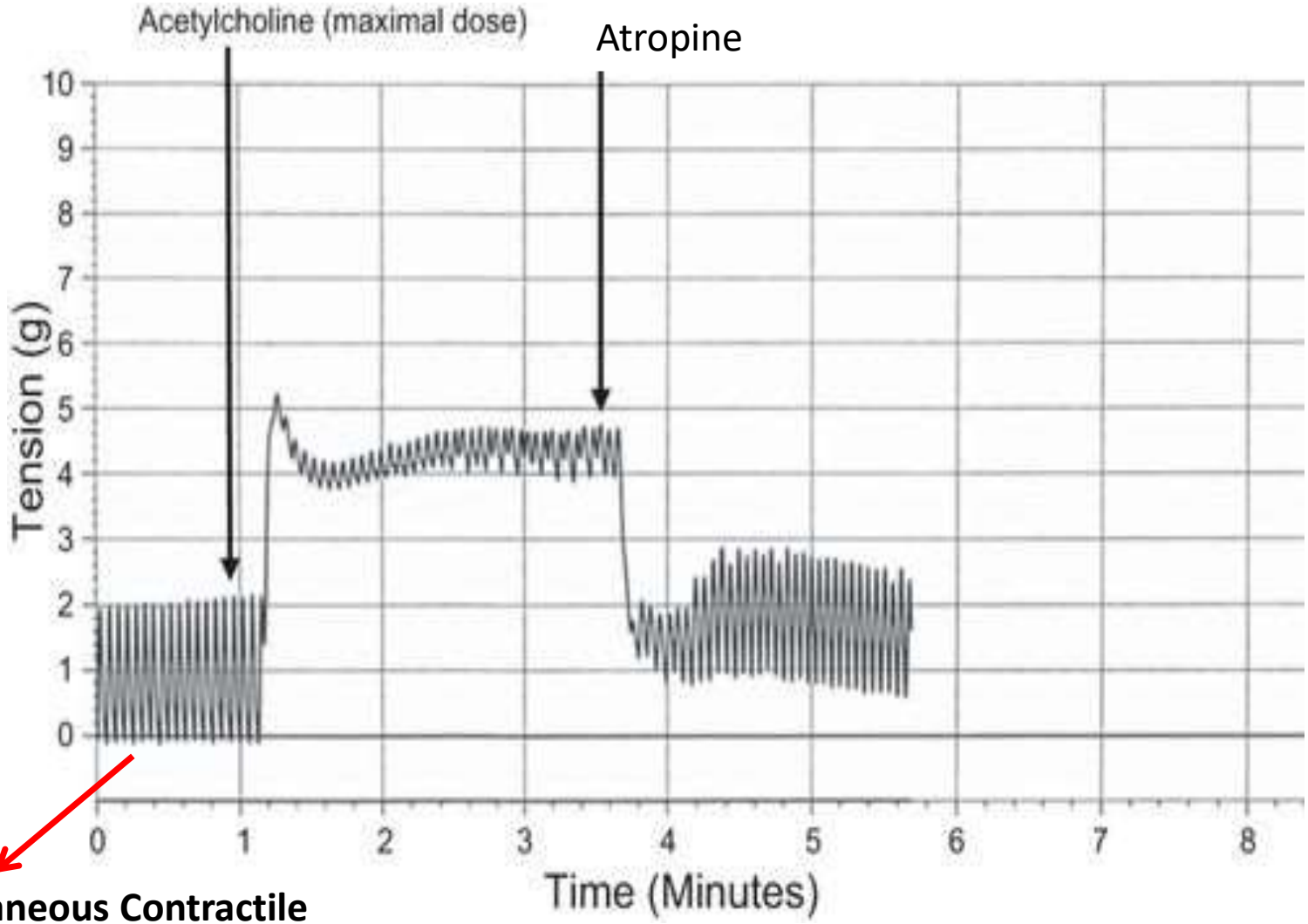

Add
21/11/2019
FUJITSU

Method

- In our experiment we use the small intestine (SI) of the rat.
- Small pieces (2cm) of the SI are hanged vertically by a thread to a glass hook in an organ bath.
- The organ bath contains warm (37^oC) oxygenated buffer. This is essential to maintain the viability of the tissue.
- The SI is connected by a thread to a tension transducer
- The tension transducer converts the mechanical signal generated by the contraction of the small intestine to an electric signal and conveys it to a special software
- The software is capable of displaying a simple graph of tension versus time.

- The tissue is allowed to rest for 15-20 minutes to allow the muscle to recover normal function after being handled.
- Waves of contraction through the strip should be clearly visible once normal function has been restored.
- At this point we start recording the tension created by the small intestinal segment.
- Then Acetylcholine is added to the organ bath.
- Finally Atropine is added to the organ bath.

Results

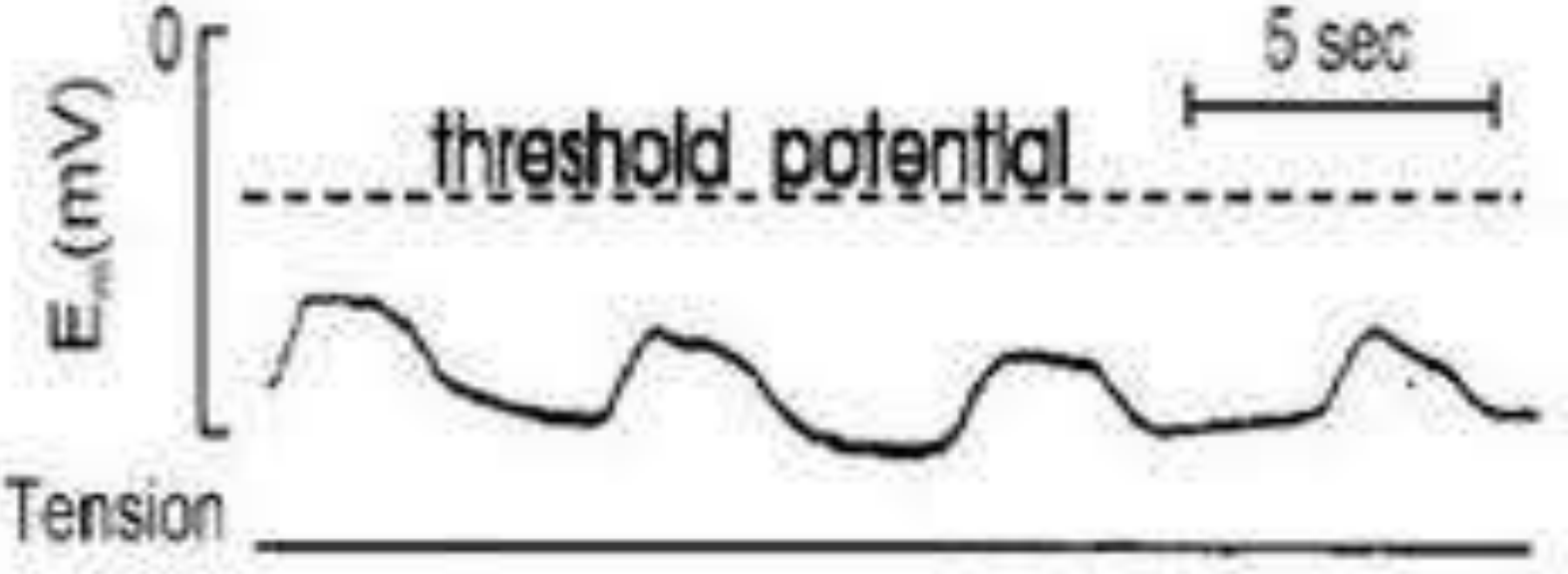


Spontaneous Contractile Activity (caused by stretching the piece of small intestine)

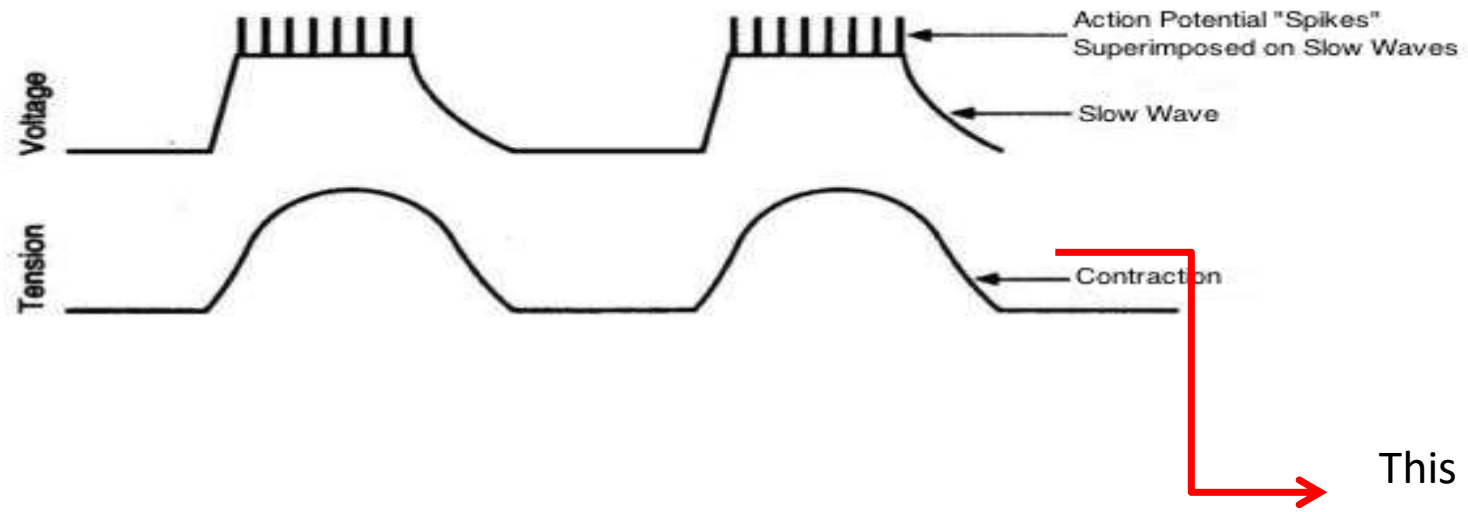
Discussion

- Smooth muscle in the small intestine contracts rhythmically in the absence of neuronal or hormonal stimulation; such contractions are referred to as phasic .
- These phasic contractions are initiated by the activity of a particular cell type, the interstitial cell of Cajal (ICC). ICCs that lie in the myenteric region initiate pacemaker potentials, referred to as slow waves.
- Slow waves aren’t true action potentials and are always there whether contractions occur or not .
- Slow waves set the maximum frequency at which contraction can occur at a particular site.
- Slow waves occur at different frequencies at various points along the gastrointestinal (GI) tract , and these frequencies can range from a few to 30 cycles/min depending on species.
- For a contraction to occur, a spike potential must be generated by smooth muscle cells, seen as transient membrane depolarization superimposed on the plateau phase of the slow wave. Spikes are believed to be generated, at least in part, by inward calcium ions currents

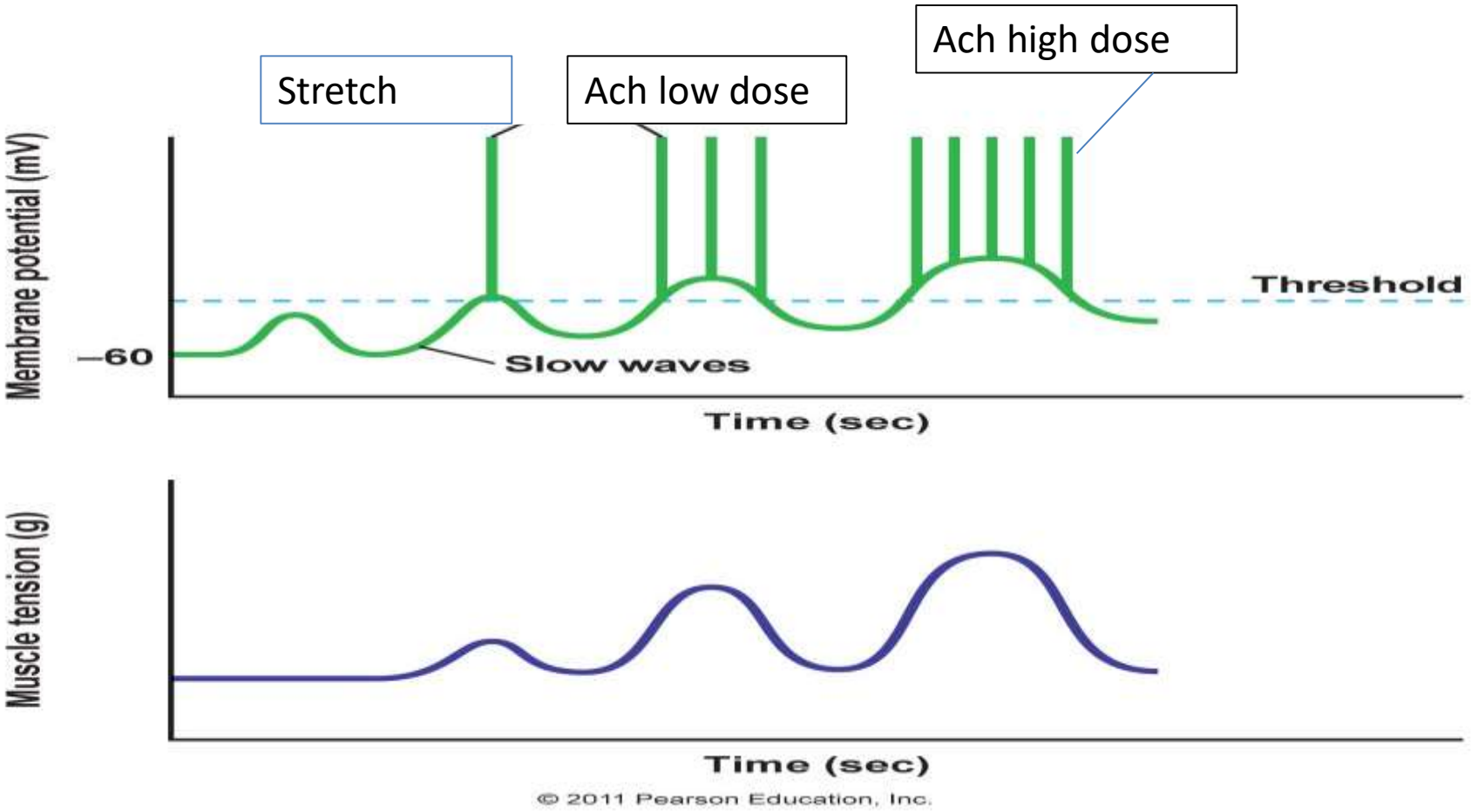
Slow waves without action potentials and contraction



- Remember that in our experiment we measured the actual contraction of the small intestine NOT the slow waves of the basic electrical rhythm (BER).



- Parasympathetic activity promotes increased contractile force while sympathetic activity decreases contractile force. The increase in contractile force is due to an increase in the number spikes not in the frequency of slow waves.



- The basic contractile activity that occurs due to the occurrence of slow waves and spikes is modulated by the enteric nervous system (ENS). The ANS, including sympathetic and parasympathetic nerves, modulates contractile activity indirectly through the ENS.
- Ach is the major excitatory neurotransmitter in the SI, its effect on intestinal smooth muscle cells is mediated through the muscarinic receptors
- Inhibition of the contractile effect of ACh is mediated by adding atropine; a competitive antagonist of Ach at the muscarinic receptor.
- Norepinephrine has a mild inhibitory effect on the **rat's** SI contraction. (we didn't use it in our experiment)

Stay Home... stay safe

tamara.alqudah@ju.edu.jo
tamyws@yahoo.com
Whatsapp or message at 0777471915
Feel free to contact me any time