

# Digestive System

University of Jordan  
Faculty of Medicine  
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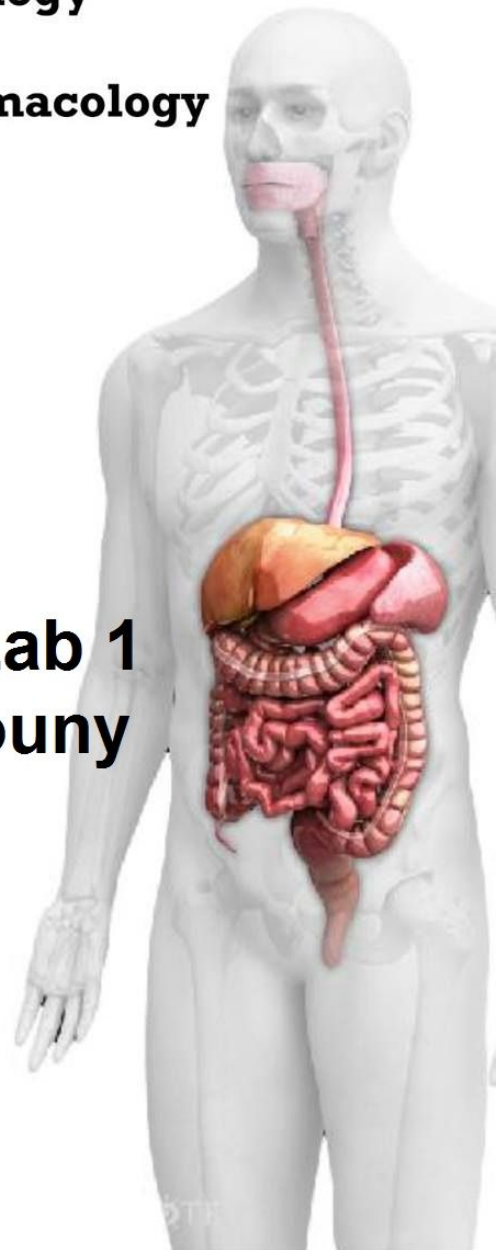


Slide  Sheet  Handout  Other

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| <input type="checkbox"/> Anatomy               | <input type="checkbox"/> Embryology   |
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**Sheet #: Physiology Lab 1**  
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**Date:**  
**Price:**



## The Motor Activity over the GI Tract

### **- What we will do in this lab?**

~ We will take a preparation from the small intestine; fixing one part and the second part is inserted into a lever system. The fixation point has recording stem or stylus, so at any time you have shortening of that lever system, what did happen?? You got contraction in this case (In case of shortening) ,and at any time you have relaxation then you will have elongation. You can record these movements over the time (the x axis is the time), if you are going in a very low speed like the simple muscle twitch, the same thing here, once you have contraction you are getting up recording, and once you have relaxation you are getting recording down and so on.

### **- The motor activities that we have at the level of the small intestine:**

~ You remember that we said that we have segmentation contractions, so in segmentation contraction if you are taking this point, this is in contraction after a while in relaxation, contraction, relaxation, and all the time we have that activity which is **the phasic contraction**.

### **- The peristaltic contractions:**

~ We said that we have contraction up and relaxation down of any segment, if that happens you have something inside, but in addition to contraction up and relaxation down ,you are taking this segment from here to here, all the time we have shortening and elongation, which is also a part of the peristaltic

contraction, what we are recording actually is this part **only**, so what we are recording only are the contraction and the relaxation, **the intestine is empty (no food)**, so we are recording this part **only**, which is **the activity of the longitudinal layer, *which is rhythmic***.

### **- Recording the activity of the circular layer (the segmentation contraction):**

-circular layer contraction: If you would like to record the activity of the circular layer what can we do???? We can record it by cutting the circular layer, so having a ring, then cutting the ring, so you have a strip, so by that you are having the circular layer hanging a strip, and by this you are getting the activity of the circular layer.

-**longitudinal layer** contraction: But if you are hanging in this way, the whole tube, then this is fixed, this is moving. So we have hang that preparation, we have fixed one head and letting the 2<sup>nd</sup> head moving and inserted into the stylus, and after recording what we are getting?? We will get mechanical waves; contraction and relaxation (**the phasic contraction of the longitudinal layer**).

# Longitudinal layer contraction → phasic contraction, peristalsis.

Circular layer contraction → **segmentation contraction.**

# Segmentation involves contractions of the circular muscles in the digestive tract, while peristalsis involves rhythmic contractions of the longitudinal muscles in the GI tract.

### **- Note:**

~So don't mix two things, don't mix these phasic contractions with the slow waves. Slow waves are electrical activities, but these are mechanical activities, so what we are recording are mechanical activities.

## **- The technique and the preparation requirements:**

~The preparation is pathed in a solution which resembles our internal environment, so the 37°C must be respected, with a good oxygenation, and the composition of that solution is also having glucose, having all these nutrients, having all the requirements as an ECF (similar but not exactly identical).

## **- The effect of adding Ach to the solution in which the preparation is pathed:**

~Now, what happens if we have added Ach to that solution?? What happens to the records?? This is the baseline that you get it (you have contraction, relaxation, and so on). What does the Ach do?? It will increase the tonic contraction, so the baseline is increased, and over the new baseline, you are still having contraction, relaxation, and so on.

## **- The effect of Ach over the phasic contraction:**

~So what happens to the phasic (rhythmic) contraction when we add Ach??? Higher or lower amplitude?? Actually, you will get the same rhythm (the same number per the unit time) ; because these phasic contractions are controlled out (the Ach has no role to do), so it has no role in changing the rhythmic contraction but it changes the baseline (the tonic contraction) from the lower tone to an upper tone, but what happens to the amplitude which is the strength of that contraction?? To say before understanding that point, we are having a high amount of Ach, and by that amount what are you getting?? Will we get Rhythmic contractions?? What happens?? Let us say that this is the

maximum contraction, and we have changed the baseline to a higher baseline, then what happens to the maximal contraction (the amplitude) now?? Becomes less and less, so actually, if you are looking to your stomach, once your stomach is empty, then it will have a higher tone, and once it is filled with food, then is having much lower tone. So where you are seeing the phasic contraction more obviously?? In the lower tone or in the higher tone?? In the lower tone. Why?? Because you have much higher differences between the tone and the maximum, so you are starting to see much powerful phasic contraction. The sir (this word is not very clear in the record) has the inverse reaction; we have changed from a lower tone to a higher tone, so what happens now to the amplitude?? Is becoming less and less, and that depends on the amount of the Ach that you are adding, you are adding more amount you can reach that maximum line which is similar to the contraction without any relaxation, but usually we have some relaxation and contraction, and the phasic contraction is present, but we can't record it by our devices, others can do.

~So, by adding Ach where is the change that we are getting will be?? We are changing the tonic contraction to a higher tone (we aren't affecting the rate of the phasic contraction) and it may affect the amplitude of contraction by getting lower amplitude.

### **- The effect of adding atropine to the solution in which the preparation is pathed:**

~The 2<sup>nd</sup> question is that what happens if you have added **atropine** first?? What you are recording?? Are you getting the same thing?? In the logic, it is possible to get the baseline going down ;because we have **decreased** the tonic contraction, **but** that if you are having a good setting with accurate measurements, and the devices that you will see is not that accurate , so you

will see no change, but if after atropine you have added Ach, what you are getting?? It depends on the concentration, but if the concentration is as the previous one then you are getting nothing. So what happens here?? We have **blocked** the muscarinic receptors those are found over the smooth muscle cells and preventing the effect of the Ach over these receptors, and we are getting no change, but a much higher conc. of Ach can start giving some effects to get increase in the tone. But logically, by adding atropine you will get lower tone but that will not be seen in this lab because the devices aren't accurate. Why is that?? Because we have some release of Ach by enteric and autonomic neurons by which we are preventing that effect if we have added atropine and starting to have little bit lower tone.

### **- Recap:**

~ So this is what we're getting in this lab. You will see the effect of Ach over the motor activity that we're having, and you must know that we're only changing the baseline, so we are only changing the tonic contraction (we aren't affecting the phasic contraction or it's rate, but we may affect the amplitude if the dose of Ach that has been used is high increasing the tone and decreasing the amplitude and since the phasic contraction reaches to its maximal level, then the amplitude will be limited between the baseline and the maximal level). By adding atropine first you will see nothing in the lab, but if you have added the same conc. of Ach after atropine then you will see nothing, that means there was a prevention of Ach binding caused by atropine and preventing the motor activity.