physiology

faculty of medicine - JU2017

Number >>	4- the lab
Doctor	M.Khatatbeh
Done By	Saif Yamin
CorrectedBy	Ahmad omari

1st system - MSS

This is the last sheet and it is about the lab lecture. The doctor mentioned some information which I mentioned them in the sheets before so don't panic

First thing to do in the lab is dissecting a frog to get a muscle preparation which is here **gastrocnemius muscle and the nerve supplying it** .

First experiment is done to record the **amplitude of shortening** in a muscle :

What we do is fixing one head of the muscle and connecting the other one to a recording system to record the amplitude of shortening. And we connect the nerve to an electrical device to stimulate the muscle in order to contract .

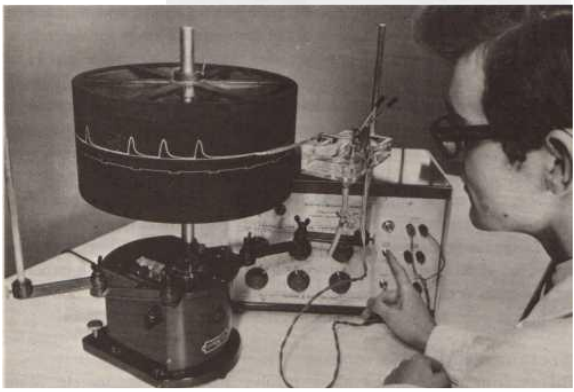
We are not using electronic transducers to measure the tension here, so we are following the changes in length only

The device (in the picture) we are using to record the shortening is called kymograph it is made of a rotating drum above which record the shortening and we have switches down to control the speed of that drum (speed=**distance (circumference)** / time)

The third picture which is the stimulator and we have many switches to control the frequency and the amplitude of the stimulus also we have to outputs for 2 electrodes (- and +) ,we attach them both to the preparation.

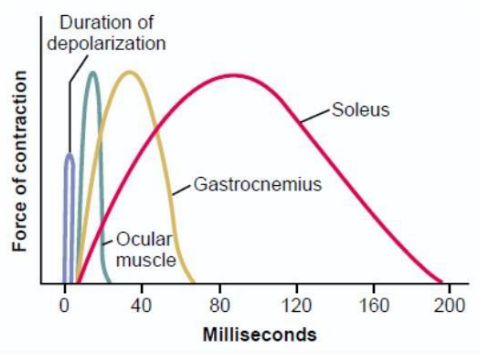
the last picture shows the whole experimental setting.

As we see under the drum we have an arm that is used to close the electrical circuit and by closing it we have one stimulus only from the stimulator at a certain point and one contraction is recorded to study the periods of **the simple muscle twitch**



We know that we have different types muscles: fast and slow , so not all of them contract in the same speed

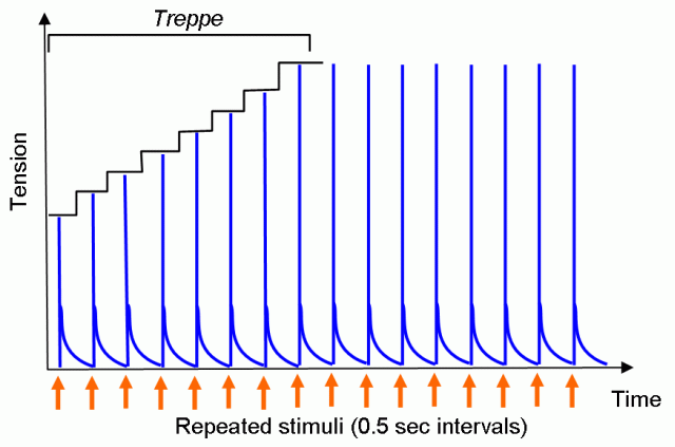
Here we have the simple muscle twitches recorded for different muscles below showing different speeds of contraction, remember: **time = speed X distance(circumference)**



Note that we use the same high stimulus for all the muscles to ensure the contraction of all motor units in that muscles. We have to increase the stimulus till we reach a point we exceed the resistance of the muscle fibers and the resistance of the stylus also

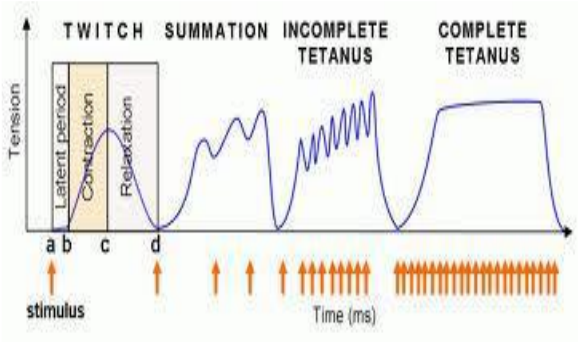
Note: non or all principle is about electrical activity, if that stimulus exceeds the threshold potential, the motor unit **or** muscle fibre will give a complete response; otherwise, there is no response. So what we learned in the past about this principle was wrong " we learned that **all the muscle** will be contracted"

Here we are recording at lower speed so more twitches will appear



Don’t forget that treppe is not a summation and at treppe we have a complete relaxation but the calcium is not pumped totally to the sarcoplasmic reticulum but any decrease in the calcium concentration below the standard contraction amount is considered a relaxation because we have less probability of calcium to bind troponin c

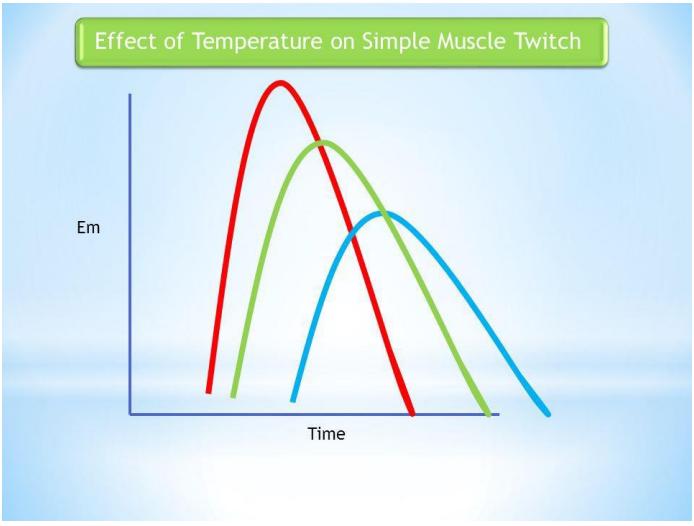
This graph is the twitch summation which involves a second contraction in the relaxation period



Note that some call the third section in the figure "incomplete tetanization" and don't forget that the tetanization is a sort of frequency summation.

After tetanization, fatigue occurs due to depletion of neurotransmitters and this type of fatigue is not seen in our body only in the lab… but if we cut the nerve then we will have something similar to this type of fatigue which is called paralysis.

glycogen may be depleted in the muscle after long hours of contraction which is very RARE and that cause a fatigue also



Now we will discuss the changes of temperature on the contraction of the same muscle.

Don't forget that we are using an amphibian tissue (frog) which can function in both cold and hot conditions not like the mammalian tissue.

The red line is at high temperature (37) degrees we can't use a higher temperature because denaturation of proteins will occur. So what we are having here is faster muscle twitch, more sliding and higher amplitude of contraction because we increased the kinetic energy and higher diffusion of calcium.

Also by increasing temperature we lowered the viscosity of muscle and much easier sliding is achieved because we have less resistance and vice versa is applied when we have low temperature

The green line is at room temperature and the cold is at low temperature which have higher latent period because we lowered the diffusion of calcium