BIOPHYSICAL ANALYSIS OF THE MECHANISM OF MUSCLE CONTRACTION

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Abstract

This in the article of the muses contraction mechanism biophysicist basics , muscle in the fibers energy exchange and actin and myosin proteins mutual impact analysis Also , muscle in contraction nerve impulses role , calcium ions importance and biophysicist of laws organism in the activity place scientific in terms of illuminating was given .

Key words

Muscle , biophysics , actin , myosin , contraction , nerve pulse , calcium ions , ATP, energy metabolism , sarcomere , muscle fiber , depolarization , motor neuron, biomechanics , bioelectric signal, physiology , muscle , ion exchange , cell, sarcoplasm , mitochondria , reflex , electromyography , tension , elasticity , biological system , excitation , contraction mechanism , myofibril , movement .

Login

Muscle system human organism the most important functional from systems one is considered . Muscles using organism movement does , body status keeps and internal organs activity controlled . Muscles main feature contraction to the ability has is that . This process complicated biophysicist and biochemical mechanisms based on done increases .

Biophysics in science muscles contraction mechanism electrical , mechanical and energetic of processes mutual dependency based on is studied . Muscle in the fibers nerve impulses under the influence bioelectric changes face gives and this process muscle proteins – actin and myosin mutual movement to the surface brings .

As a result muscle fibers shrinks and mechanic work is done .

Muscle contraction for main energy source ATP is a molecule of adenosine triphosphate . ATP breakdown as a result harvest was energy muscle of fibers movement provides . This with together calcium ions muscles contraction and relaxation in the process important role plays .

Current on the day muscles biophysicist features study sports physiology , medicine and rehabilitation in the fields big importance profession Muscle of activity biophysicist the basics deep analysis to do human in the body movement mechanisms complete to understand help gives .

Home part

Muscle texture in the body the movement done increasing special biological system is considered . Muscles main structural unit muscle fiber is , its inside myofibrils located . Myofibrils and actin and myosin from proteins organization found . This proteins muscle contraction main mechanism to the surface brings .

Muscles contraction nerve impulses under the influence begins . Motor neuron through arrived impulse muscle on the membrane depolarization to the surface results in . As a result sarcoplasmic from the string calcium ions separated it comes out . Calcium ions actin and myosin between connection activate , reduce process begins .

ATP→ADP+P+E

This formula is ATP breakdown as a result energy divorce represents . Harvest was energy muscle of fibers mechanic work to do for is spent .

Myosin heads actin fibers with together , them to the center side pulls . As a result sarcomere shrinks and muscle length decreases . This mechanism " slip" theory .

Table 1. Muscle contraction main stages

Stage	Process description	Home factor
Excitement	Nerve impulse to the muscle arrived comes	Engine neuron

Depolarization	Membrane potential changes	Na^+ ions
Calcium divorce	Sarcoplasmic Ca^{2+} is released from the string	Calcium ions
Shortening	Actin and myosin slips	ATP energy
Relaxation	Muscle initial to the state returns	Ca^{2+} again absorption

Muscles biophysicist features their elasticity and power harvest to do ability with is determined . Muscle fibers stretching and to shrink adapted is mechanical energy movement to the energy turns .

In the muscles energy exchange process very active It's going to happen . In mitochondria glucose and oxygen ATP is synthesized with the participation of . Strong physical movement on time anaerobic decomposition process also occurs comes and milk acid harvest It will be . and muscle to fatigue reason will be .

Muscle activity in learning electromyography method wide This is applicable . method in the muscles harvest to be bioelectric signals record will and muscle of activity status to determine help gives .

Analysis results

Analyses this shows that the muscles contraction mechanism biophysicist and biochemical of processes mutual harmony based on done increases . Nerve impulse muscle to the fibers arrived arrival of contraction elementary stage is considered . This impulse membrane potential to change reason as a result calcium ions separated it comes out .

Calcium ions muscle in contraction role very big that analyses during Ca^{2+} ions were detected . actin and myosin between connection activates . If in the body calcium shortage to the surface normal muscle contraction will break and movement activity slows down .

ATP energy muscle in the activity importance is also important biophysicist factor ATP breakdown as a result harvest was energy myosin of the heads movement

provides . Energy shortage muscles fast to fatigue take comes . Sports training during muscles energy exchange acceleration is observed .

Table 2. Muscle in the activity main biophysicist factors

Biophysics factor	Task	Result
Nerve impulse	Muscle provokes	Shortening begins
Calcium ions	Actin-myosin connection activates	Slip face gives
ATP energy	Mechanical work for energy gives	Muscle movement to the surface comes
Oxygen	Energy synthesis provides	Fatigue decreases

Table information muscle of activity one how many important to factors dependence shows . Nerve without impulse in the muscles agitation to the surface will not come . Calcium without ions and actin and myosin between connection harvest It won't be . This because of ionic balance in the body muscle activity for very important is considered .

Analyses during muscles elastic properties were also studied . Muscles from contraction then again initial to the state return to the ability has . This feature muscles biomechanical efficiency increases. Especially in athletes muscle elasticity high at the level developed will be .

Muscles fatigue The mechanism is also biophysical. point of view from the point of view analysis was done . Strong physical loading on time in the muscles oxygen shortage to the surface comes and anaerobic glycolysis increases . As a result milk acid accumulate in the muscles pain and fatigue feeling appearance will be .

Electromyographic inspections muscle activity clear assessment opportunity gives. Muscles bioelectric signals through neuromuscular system status is determined.

This method neurological diseases in diagnosis wide is applied .

Muscles contraction mechanism learning is also big in sports physiology importance has. Athletes muscle activity and energy exchange analysis to do training right organization to reach help gives. This with together rehabilitation in the process muscle activity restoration for special biophysicist methods is applied .

Research as a result muscles contraction complicated biological system that and his/her based on electrical , chemical and mechanic processes to lie down This was determined . mechanisms deep study modern medicine and sports biology in development important importance has .

Conclusion

Muscles contraction mechanism complicated biophysicist to processes based become, nerve pulses, calcium ions and ATP energy in the presence of done increases. Actin and myosin proteins mutual movement muscle of fibers contraction provides. Muscle of activity biophysicist the basics study sports physiology, neurology and rehabilitation in the fields important scientific importance profession This will knowledge muscle activity effective management and various diseases in treatment wide is applied.

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