The Activity of The Ca2+_Mg2+ ATPase Enzyme

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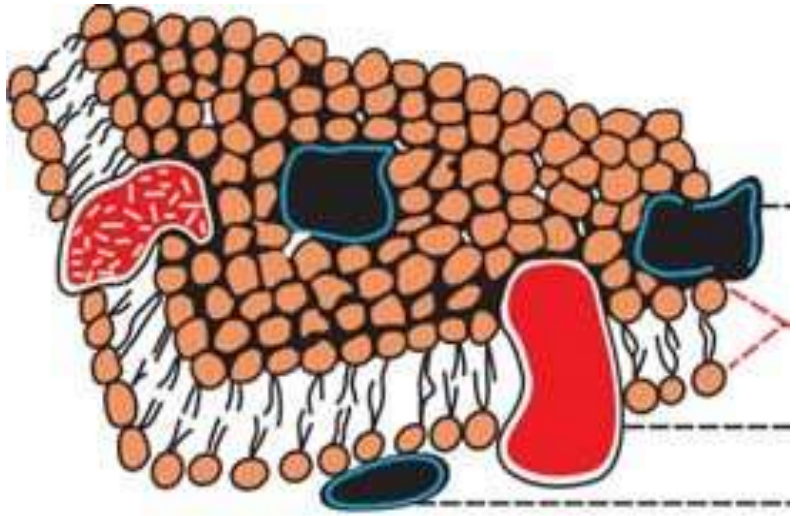


The Ca2+_Mg2+ ATPase are high attraction calcium pump,
that contributes in maintaining
homeostasis by plasma membrane of cytoplasm Ca2+, Mg2+
source to the outside of cell

Homeostasis" means the maintenance of constant internal environment.
organisms multicellular
including man live in a perfectly organized and controlled internal environment

That enzyme catalyzes the hydrolysis of ATP and is activated by mill molar concentrations of either Ca(2+) or Mg(2+). Unlike Ca(2+)- Transporting ATPase it does not require the second divalent cation for its activity .

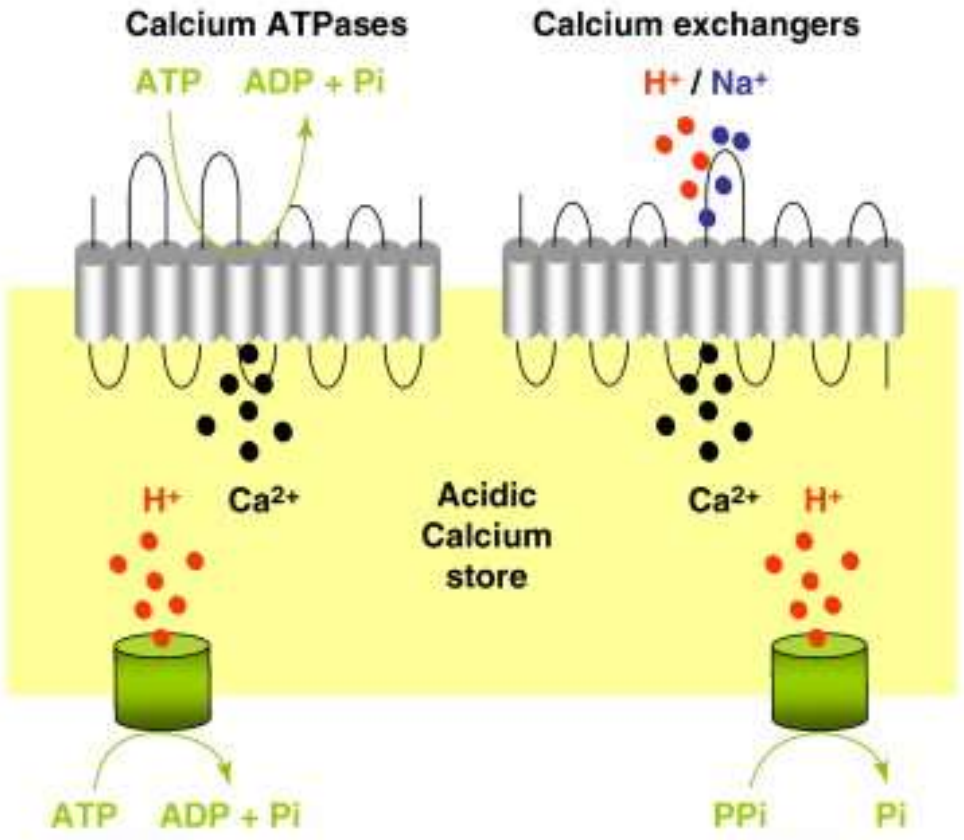
What is the function of the Ca2+- ATPase?

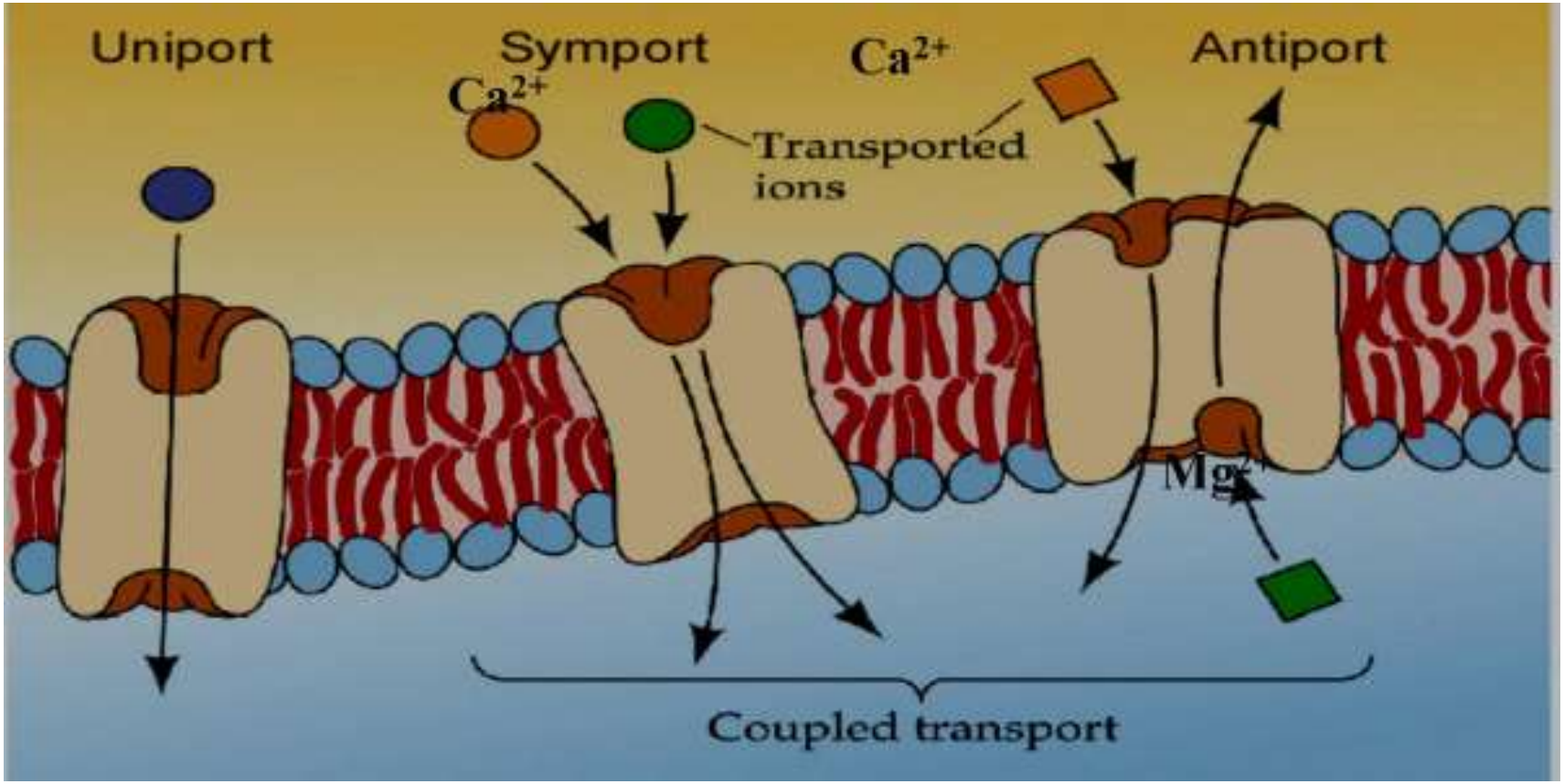
- Its primary function is the regulation of cytoplasmic Ca2+ concentration. A key element in this regulation is the Sarcoplasmic and endoplasmic reticulum ,Ca2+-adenosine triphosphates (SERCA), which by deposing Ca2+ into the SR, induces and maintains relaxation

ATPase are a group of enzymes that couple ATP synthesis or hydrolysis to the transport of ions across membranes. A gradient of protons is the driving force for ATP synthesis, whereas the ATP hydrolysis releases the energy necessary for ion pumping.

Calcium ATPase are pumps found in the membranes of various organelles and in the plasma membrane, which transport calcium against its concentration gradient from the cytosol into the lumen or the extracellular space
This process requires hydrolysis of ATP.

A calcium ATPase related to the plasma membrane type calcium ATPase in mammals is responsible for filling of these stores with calcium




Uniport
Symport
Ca^{2+}
Ca^{2+}
Transported ions
Antiport
Mg^{2+}
Coupled transport

The knowledge of the enzyme Ca2+_Mg2+ ATPase activity in the smooth muscles is important because it lacks of sarcoplasmic reticulum .This led to search to the regulation of calcium ions during the contraction and relaxation.

The Ca2+_ Mg2+ ATPase dependent
role sarcoplasmic reticulum plays an important
deposing in promoting muscles relaxation by
Ca2+ from cytoplasm .
Guideline of the Ca2+
concentration in the plasma membrane is
Complicated for cell survival as impeding in Ca2+
homeostasis, which can change cellular
physiology and lead to cell death .

The activity of Ca2+_Mg2+ ATPase in membrane vesicles isolated from membrane vesicles may play the role of sarcoplasmic reticulum since smooth muscles lack a well- distinguish sarcoplasmic reticulum that responsible of calcium regulation.

A general role of Ca2+, Mg2+ is in controlling Of Ca2+ homeostasis in the cell. The function Of plasma membrane is to pump and Maintain cellular calcium homeostasis.

Mg^{2+} plays a central role in the excitation-contraction (E-C) coupling of muscle fibers of vertebrates. When the fibers are at rest (mill molar range for ATP, about 1 mM Mg^{2+} and approximately 100 nM Ca^{2+}), Mg^{2+} exerts a powerful inhibitory action on the sarcoplasmic reticulum (SR) Ca^{2+}-release channels as it binds to two major classes of cation modulatory sites: the 'Ca^{2+}-activation' site which is only activated by Ca^{2+}, but to which Mg^{2+} also binds without activation, and the Ca^{2+}/Mg^{2+}-inhibitory site where both divalent ions can bind and inhibit the channel

The Ca2+/Mg2+ ATPase is involved in the entry of Ca2+ into the cardiac cells, the transport of Mg2+ across the cell membrane, and extracellular ATP signal transduction.

The purified forms of the enzyme displayed the properties expected of the intact Ca2+ pump; they had an appropriate (Ca2+-Mg2+)-ATPase activity which displayed a relatively low affinity for Ca2+.
Added calmodulin increased both the maximum rate and the affinity for Ca2+ of the enzyme. Mg2+ alone caused no significant ATP hydrolysis in the purified enzyme, indicating that the Mg2+-ATPase is a separate enzyme.

Calmodulin is a multifunctional intermediate calcium-binding messenger protein expressed in all eukaryotic cells. It is an intracellular target of the secondary messenger Ca^{2+}, and the binding of Ca^{2+} is required for the activation of calmodulin

The calmodulin-sensitive Ca2+-Mg2+-ATPase acts as a calcium pump in the red cell and other tissues. Its presence in the kidney distal tubule, a site where hormone-sensitive calcium transport is known to occur, raises the possibility that this enzyme may act as a hormone-regulated pump in this nephron segment