# 280. METABOLIC CHANGES IN MYOCARDIAL INFARCTION

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**Introduction:** The focus of this review is the biochemistry of Myocardial Infarction (MI) in general and specifically during ischemia and reperfusion, phases in which intervention is critical and efficient if performed. The key elements that we studied are: reactive oxygen species, calcium handling in the heart, Krebs cycle and mitochondrial MPTP channel activity.

**Materials and Methods:** We analyzed more than 100 articles from databases MEDLINE, EBSCO and HINARY published from 2011 till 2015

**Discussion Results**: Prolonged ischemia can cause considerable damage, and in a highly metabolic organ such as the heart, this effect can be devastating. However, restoration of perfusion seems to paradoxically extend the size of an infarct. The cause is multifactorial, nonetheless, there is substantial evidence that a key role is played by reactive oxygen species (ROS). ROS generation occurs in ischemia/reperfusion (I/R), and sets off pathways that damage cellular components initiating cell death, contributing to MI. On the other hand, ROS can act as signaling molecules that participate in preconditioning by various pharmacological agents. They activate cell survival programs that help tissues better resist I/R.

The MPTP is a non-selective mitochondrial pore and in its normal closed state it preserves the membrane potential and pH gradient required for ATP production. Opening of the MPTP in response to changes in the cell environment during I/R is detrimental to the mitochondria and is thought to be one of the mediators of I/R injury through initiation of cell death by necrosis or apoptosis.

Calcium, a central element in heart physiology is involved in signaling pathways that can also help or damage the heart. Ca2+ influx through the L-type Ca2+ channel increases production of ROS during oxidative stress. CaMKII which regulates contraction is involved in many cardiac diseases. In the stunned heart its activity is beneficial however in irreversible I/R it leads to cell death and necrosis.

A study of metabolic alterations caused by MI showed that in vivo decrease in Krebs cycle activity in the 6-week post-MI heart may represent an early maladaptive phase in the metabolic alterations after MI in which reductions in Krebs cycle activity precede a reduction in PDH flux. Also, changes in mitochondrial metabolism in heart disease are progressive and proportional to the degree of cardiac impairment.

**Conclusion:** Studies show that considerable damage occurs when reperfusion is performed disregarding the reactions it triggers with the formation of ROS. The activation of the MPTP and calcium dysregulation, also have a key role in MI. However, there are attempts to produce agents that can block the MPTP and agents that regulate intracellular calcium handling, thus providing a stepping stone for future treatments and interventions.

**Key Words**: myocardial infarction, reactive oxygen species, mitochondrial permeability transition pore.