

The Pleiotropic Role of Extracellular ATP in Myocardial Remodelling

ABSTRACT

Myocardial remodelling is a molecular, cellular, and interstitial adaptation of the heart in response to altered environmental demands. The heart undergoes reversible physiological remodelling in response to changes in mechanical loading or irreversible pathological remodelling induced by neurohumoral factors and chronic stress, leading to heart failure. Adenosine triphosphate (ATP) is one of the potent mediators in cardiovascular signalling that act on the ligand-gated (P2X) and G-protein-coupled (P2Y) purinoceptors via the autocrine or paracrine manners. These activations mediate numerous intracellular communications by modulating the production of other messengers, including calcium, growth factors, cytokines, and nitric oxide. ATP is known to play a pleiotropic role in cardiovascular pathophysiology, making it a reliable biomarker for cardiac protection. This review outlines the sources of ATP released under physiological and pathological stress and its cell-specific mechanism of action. We further highlight a series of cardiovascular cell-to-cell communications of extracellular ATP signalling cascades in cardiac remodelling, which can be seen in hypertension, ischemia/reperfusion injury, fibrosis, hypertrophy, and atrophy. Finally, we summarize current pharmacological intervention using the ATP network as a target for cardiac protection. A better understanding of ATP communication in myocardial remodelling could be worthwhile for future drug development and repurposing and the management of cardiovascular diseases.