Connexins in the Sinoatrial and Atrioventricular Nodes

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Abstract

The sinoatrial node (SAN) and the atrioventricular node (AVN) are specialized tissues in the heart: the SAN is specialized for pacemaking (it is the pacemaker of the heart), whereas the AVN is specialized for slow conduction of the action potential (to introduce a delay between atrial and ventricular activation during the cardiac cycle). These functions have special requirements regarding electrical coupling and, therefore, expression of connexin isoforms. Electrical coupling in the center of the SAN should be weak to protect it from the inhibitory electrotonic influence of the more hyperpolarized non-pacemaking atrial muscle surrounding the SAN. However, for the SAN to be able to drive the atrial muscle, electrical coupling should be strong in the periphery of the SAN. Consistent with this, in the center of the SAN there is no expression of Cx43 (the principal connexin of the working myocardium) and little expression of Cx40, but there is expression of Cx45 and Cx30.2, whereas in the periphery of the SAN Cx43 as well Cx45 is expressed. In the AVN, there is a similar pattern of expression of connexins as in the center of the SAN and this is likely to be in large part responsible for the slow conduction of the action potential.

The sinoatrial node (SAN) is the pacemaker of the heart [1]. The action potential spontaneously generated in the SAN propagates through the atria to reach the atrioventricular node (AVN). The AVN is the only normal conduction pathway between the atria and ventricles and it delays the conduction of the