

Sympathetic Stimulation of the Heart

- Electrical signals (also known as action potentials) travel down the spinal cord from the brain.
- From the thoracic region of the spinal cord, sympathetic motor neurons project out from the spinal cord and synapse at the top of the right atrium of the heart in the sinoatrial node.
- Sympathetic motor neurons release the neurotransmitter called Norepinephrine (or NE) onto specialized pacemaker cells in the sinoatrial node.
- The sympathetic motor neuron's axon terminal stores neurotransmitters (in this case NE) until stimulated by an action potential. This causes NE to be released from the axon terminal
 - it diffuses across the synaptic cleft, and binds to B1 adrenergic receptors on the pacemaker cells of the sinoatrial node.
- This makes these cells fire more action potentials, which **increases** heart rate since the action potential spreads from cell to cell across the whole heart.
- Norepinephrine also binds to B1 adrenergic receptors on contractile cardiac muscle cells throughout the heart. This results in these cells being flooded with calcium, which causes them to **increase their force of contraction**.
- Beta Blockers - drugs that can be prescribed for conditions such as congestive heart failure and hypertension.
 - These drugs block NE from properly binding to the cardiac cells - the result is a decrease in both heart rate and force of contraction
 - This can ease the strain on a failing heart or lower blood pressure in those with hypertension.