

Autonomic Nervous System Function

CoreNotes by Core Concepts Anesthesia Review, LLC

What You Must Know

Target System/Organ	α	β_1	β_2	Muscarinic M
Heart Rate (chronotropy)	0	+	0	-
Inotropy	0	+	0	-
Cardiac Conduction (dromotropy)	0	+	0	-
Vascular Tone (general)	+	0	-	-
Vascular Tone (skeletal muscle, hepatic)	0	0	-	0
Venous Tone	+	0	-	0
Bronchiolar Tone	+/-	0	-	+
Pupil Size	+	0	0	-
Salivary/Lacrimal Glands	0	0	0	+
Gastric Acid Secretion	0	0	0	+
GI/GU Sphincter Tone	+	0	0	-
Renin Release	0	+	0	0
Glycogenolysis/Gluconeogenesis	+	0	+	0
Insulin Secretion	-	0	+	+
Lipolysis	0	+	0	0
Uterine Tone	+	0	-	0
Sweat Secretion	+/-	0	0	+

Alpha-adrenergic receptors have been divided into α_1 and α_2 subtypes. α_1 -receptors are responsible for the effects noted in the table above. α_2 -receptors are predominantly presynaptic receptors that modulate the release of norepinephrine from the nerve terminal. However, α_2 -receptors have been found on the postsynaptic membrane as well. Stimulation of presynaptic α_2 -receptors results in the inhibition of the release of norepinephrine into the synaptic cleft.

Activation of β receptors induces adenylyl cyclase, which converts ATP to cyclic-AMP that functions as a secondary messenger within the effector organ cell.

At least 5 subtypes of muscarinic receptors have been identified and labeled M_{1-5} . M_1 receptors appear to modulate ganglia transmission. M_2 receptors are found in the heart and CNS. M_3 receptors appear responsible for smooth muscle contraction in the bronchioles and eye as well as increasing secretion from exocrine glands, such as the salivary glands. M_4 receptors are found largely in the CNS and promote locomotion. M_5 receptors have also been found in the CNS, although their function has not been totally elucidated. Atropine is effective in blocking all 5 types of muscarinic receptors.

Additional Reading:

Nagelhout, JJ, and Plaus, KL. Nurse Anesthesia. St. Louis: Elsevier, 2013:187