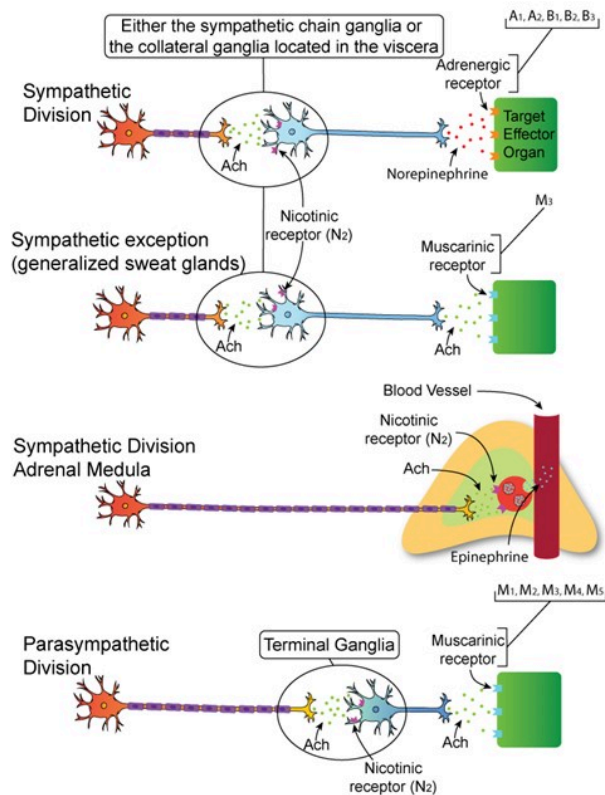


1.5.5

Physiology of the ANS

[Watch this Video](#) on the Autonomic Nervous System

As discussed previously, nerves of the ANS extend from the CNS to smooth, or cardiac muscle, organs, and glands via a two-neuron system - namely a preganglionic neuron and a postganglionic neuron. In this system, there are two synapses; one separating preganglionic and postganglionic neurons, and the other between the postganglionic neuron and effector (see figure below). The preganglionic neuron releases neurotransmitters stored in synaptic vesicles of axon terminals. An action potential reaching the axon terminal causes the release of these stored neurotransmitters into the synaptic cleft. After crossing the synapse, neurotransmitters bind to receptors imbedded in postganglionic cell membranes (see figure below). This binding depolarizes the postsynaptic cell membrane (EPSP) and results in action potentials. Action potentials arriving at the axon terminal lead to the release of neurotransmitters into the synaptic cleft, separating the postganglionic neuron and effector (neuroeffector junction). Finally, binding of the neurotransmitter to the receptor expressed on effector cells can result in excitation or inhibition of the effector. Sympathetic and parasympathetic divisions differ in the types of neurotransmitters they release and the receptors and second messenger systems they express.



ANS preganglionic and postganglionic neurons and locations of ANS receptors.

Image by Nate Shoemaker Spring 2016

Nicotinic receptors are located on the postganglionic neurons of the sympathetic and parasympathetic cell bodies. Nicotinic receptors respond to the binding of acetylcholine (ACH), which causes an excitatory effect. Muscarinic receptors are located on all parasympathetic effector cells and some (generalized sweat glands) sympathetic effector cells. Muscarinic receptors respond to the binding of ACH, and may have an excitatory or inhibitory effect. Adrenergic receptors are located on most sympathetic effector cells. Adrenergic receptors respond to the binding of norepinephrine (NE), which may have an excitatory or inhibitory effect.



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