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PHARMACOLOGY

Discuss the somatosensory pathways

A somatosensory pathway will typically have three neurons: first-order, second-order, and third-order.

The first-order neuron is a type of pseudo unipolar neuron and always has its cell body in the dorsal root ganglion of the spinal nerve with a peripheral axon innervating touch mechanoreceptors and a central axon synapsing on the second-order neuron. If the somatosensory pathway is in parts of the head or neck not covered by the cervical nerves, the first-order neuron will be the trigeminal nerve ganglia or the ganglia of other sensory cranial nerves). In the periphery, the primary neuron is the sensory receptor that detects sensory stimuli like touch or temperature. The cell body of the primary neuron is housed in the dorsal root ganglion of a spinal nerve or, if sensation is in the head or neck, the ganglia of the trigeminal or cranial nerves.

The second-order neuron has its cell body either in the spinal cord or in the brainstem. This neuron's ascending axons will cross (decussate) to the opposite side either in the spinal cord or in the brainstem. The secondary neuron acts as a relay and is located in either the spinal cord or the brainstem. This neuron’s ascending axons will cross, or decussate, to the opposite side of the spinal cord or brainstem and travel up the spinal cord to the brain, where most will terminate in either the thalamus or the cerebellum.

In the case of touch and certain types of pain, the third-order neuron has its cell body in the ventral posterior nucleus of the thalamus and ends in the postcentral gyrus of the parietal lobe in the primary somatosensory cortex (or S1). Tertiary neurons have cell bodies in the thalamus and project to the postcentral gyrus of the parietal lobe, forming a sensory homunculus in the case of touch. Regarding posture, the tertiary neuron is located in the cerebellum.

Photoreceptors, similar to those found in the retina of the eye, detect potentially damaging ultraviolet radiation (ultraviolet A specifically), inducing increased production of melanin by melanocytes. Thus tanning potentially offers the skin rapid protection from DNA damage and sunburn caused by ultraviolet radiation (DNA damage caused by ultraviolet B). However, whether this offers protection is debatable, because the amount of melanin released by this process is modest in comparison to the amounts released in response to DNA damage caused by ultraviolet B radiation.