

## Sodium Channels in Pain

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Pain signals originate in nociceptors at the site of pain, and take the form of action potentials. These action potentials propagate through the peripheral nervous system, or PNS, and into the central nervous system, or CNS.

This propagation is driven by voltage-gated sodium channels, or  $Na_v$ s. Following painful stimuli, sodium channels in pain-sensing neurons open, allowing an influx of sodium ions, which generates an action potential that is ultimately perceived as pain after it reaches the brain.

Nine  $Na_v$  subtypes are distributed throughout the body. Some are predominantly expressed in the CNS, while others are found in the heart or muscle.

Three are predominantly expressed in the PNS:

**$Na_v1.7$**  is preferentially expressed in peripheral nociceptive neurons in the PNS, and has been associated with certain neuropathies.

**$Na_v1.8$**  is selectively expressed in peripheral nociceptive neurons in the PNS, and has been associated with the transmission of nociceptive stimuli.

**$Na_v1.9$**  is selectively expressed in peripheral nociceptive neurons in the PNS, and has been associated with episodic pain syndromes.

Sodium channels transmit the action potentials through the PNS, into the spinal cord, and ultimately to the brain. Once the action potentials reach the brain, the signals are interpreted by several brain regions, then perceived as pain.

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