IASP 2026
GLOBAL YEAR
Neuropathic Pain

FACT SHEET

How Damage to Nerves Throughout the Body (Peripheral Nerves) Causes Pain

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What Is Neuropathic Pain?

Neuropathic pain is a type of pain that arises from damage to the nervous system. Read An Overview of Neuropathic Pain and Its Impact (https://www.iasp-pain.org/resources/fact-sheets/an-overview-of-neuropathic-pain-and-its-impact/) for a detailed description.

The nervous system has two main parts: the central nervous system and the peripheral nervous system. The central nervous system includes the brain and spinal cord. The peripheral nervous system includes all the nerves outside the brain and spinal cord, reaching the arms, legs, and organs. Together, these systems help the body feel sensations such as touch, heat, cold, and pain. This fact sheet focuses on peripheral neuropathic pain, which happens when nerves outside the brain and spinal cord are damaged or not working properly.

Neuropathic pain is like an alarm system that isn't working properly. When nerves are damaged, they may send abnormal or unhelpful pain signals to the brain, even when there is no injury or danger. This can make the body feel ongoing, unusual, or hard to explain pain. This means the body feels pain without a clear cause, or reacts too strongly to normal touch, like an alarm going off when there's no real danger.

Peripheral Neuropathic Pain

Peripheral neuropathic pain is very common among the adult population. Many causes include diabetes, shingles, chemotherapy (used to treat cancer), nerve injuries from accidents or surgery, and trapped nerves. In these conditions, the nerves become unhealthy and begin sending abnormal pain signals.

Why Does Nerve Damage Cause Pain?

Nerve damage causes pain for several reasons. Changes inside the nerves, communication with nearby cells and the immune system, and the way nerves heal and regrow can all make pain signals abnormal, overactive, and long-lasting.

Healthy nerves send danger signals only when needed, such as when you touch something too hot. Damaged nerves behave differently. They can become overly sensitive and send danger signals too often or for no clear reason. Because of this, pain can continue even after the original injury has healed.

Overactive Pain Nerves

Nerve damage causes pain because injured nerves become overly sensitive. Instead of responding only when needed, they may react to gentle stimulation, like light touch, or send danger signals on their own. Even after the original injury has healed, these nerves can continue sending danger signals to the brain. As a result, the pain does not go away.

Important Ion Channels

After nerve injury, nerve cells undergo changes that make them more active than normal. These changes often occur in the part of the nerve cell that processes signals. Inside the nerve cells, tiny structures called ion channels help control how signals are sent. Injury can cause these channels to stop working properly. Some may open too easily, some may close too slowly, and others may stop working altogether. When this balance is disturbed, nerves send danger signals too often, and pain increases. Once this process begins, it may not switch off.

Other Cells Also Play a Role

Pain is not controlled by nerves alone. Other cells in the skin and surrounding tissues also affect how pain feels. Skin, connective tissue, and immune cells can release substances that act on nearby nerves and make them more sensitive. This increases pain at the site of injury.

The Immune System and Pain

The immune system also plays an important role in neuropathic pain. After a nerve injury, immune cells become active to help with healing. However, these cells can also release chemicals that increase nerve sensitivity. These chemicals can increase nerve activity and make it last for long periods. This ongoing communication between nerves and immune cells can continue even after the injury has healed, allowing pain to persist.

Damage to Nerve Fibers and Their Unusual Regrowth

When a peripheral nerve is injured, part of the nerve breaks down during the natural healing process. At the same time, the body tries to repair the damage by growing new nerve fibers. In some cases, this regrowth happens in a disorganized way. New nerve endings may grow too much or in the wrong direction, leading to ongoing sensitivity and pain. While nerve regrowth is necessary for recovery, abnormal regrowth can contribute to long-lasting neuropathic pain.

Why Neuropathic Pain Is Hard to Treat

Neuropathic pain is often difficult to treat because we do not fully understand the exact problem inside the nerves, which makes it hard to know what to target. Each individual may experience different changes in their nerves and immune system. Many available treatments only reduce pain partially, and some cause unwanted side effects. For these reasons, better treatment options are still needed.

New Directions in Treatment

Ongoing research is improving our understanding of how neuropathic pain develops and persists. This research may lead to new treatments that target specific ion channels, reduce harmful immune signals, or focus only on peripheral nerves. These approaches may provide better pain relief with fewer side effects in the future. Understanding how damaged nerves, immune cells, and nerve repair work together helps guide better care for people living with neuropathic pain.

Key Messages

- Peripheral neuropathic pain happens when damaged nerves become overactive.
- Pain continues because:
  - Nerves become too sensitive
  - Immune cells increase nerve activity
  - Nerve repair can become abnormal
- These processes work together to sustain pain. Understanding these processes helps guide better care for people with neuropathic pain.

Disclosures

DMM is supported by NIH R01 NS104295-01 and NIH R01 AR077691-01.

ACT is supported by the MRC Clinician Scientist Fellowship (MR/Z504075/1) and is a member of the MRC/Versus Arthritis funded PAINSTORM consortium, which is part of the Advanced Pain Discovery Platform (MR/W002388/1).

AF is funded by a Medical Research Council-UK grant (UKRI1511).

HO has no interests to disclose.

JGJH received grants from the Prinses Beatrix Spierfonds (W.0K17-09, W.TR22-01 and W.OR24-04), outside the submitted work.

ALa receives councelling fees from Grünenthal, Netri and Orion.

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