**HOW DOES ACUPUNCTURE WORK? A LOOK AT SOME MECHANISMS**

The mechanisms underlying how acupuncture relieves pain have been extensively researched for over 60 years. Sensory nerve pathways involving specialized nerve fibers (Aδ, Aβ and C, to be precise) and descending nervous system pathways have been mapped. Numerous biochemicals have been identified including opioid and non-opioid neuropeptides, and neurotransmitters such as serotonin, norepinephrine, dopamine, cytokines, glutamate, nitric oxide, and gamma-amino-butyric-acid (GABA).

Acupuncture analgesia has been shown to involve several classes of naturally produced opioid neuropeptides including enkephalins, endorphins, dynorphins, endomorphins, and nociceptin (also known as Orphanin FQ). Among the non-opioid neuropeptides, substance P (SP), vasoactive intestinal peptide (VIP) and calcitonin gene-related peptide (CGRP), which plays a central role in the pathogenesis of migraine, have been investigated for their roles in both the analgesic and anti-inflammatory effects of acupuncture.[3](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_3" \o "The Acupuncture Evidence Project – A Comparative Literature Review 2017 – Acupuncture.org.au. 2017;:1–81. https://www.acupuncture.org.au/resources/publications/the-acupuncture-evidence-project-a-comparative-literature-review-2017/)[,13](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_13" \o "Fan AY, Miller DW, Bolash B, et al. Acupuncture’s Role in Solving the Opioid Epidemic: Evidence, Cost-Effectiveness, and Care Availability for Acupuncture as a Primary, Non-Pharmacologic Method for Pain Relief and Management–White Paper 2017. Journal of Integrative Medicine 2017;15:411–25. doi:10.1016/S2095-4964(17)60378-9)

Many biochemical and signaling pathways have been identified as playing a direct role in how acupuncture achieves its clinical effects, but perhaps the most central pathway that acupuncture uses, one that helps explain how it is effective in such a diverse array of clinical areas, is that acupuncture has been demonstrated to directly initiate a process called purinergic signaling, a primitive[14](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_14" \o "Verkhratsky A, Burnstock G. Biology of purinergic signalling: Its ancient evolutionary roots, its omnipresence and its multiple functional significance. Bioessays 2014;36:697–705. doi:10.1002/bies.201400024) and ubiquitous system in the body using adenosine and ATP for signaling and regulation in all tissues and organ systems.[15](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_15" \o "Burnstock G. Purinergic signaling in acupuncture. Science 2014.) It is now understood that all nerve transmission requires ATP as a co-factor and the that the body uses purine levels as a primary background signal of both healthy function and tissue damage. Studies on mice demonstrate that those that were bred to be unable to bind to adenosine did not have pain relief from acupuncture nor any of the chemical changes associated with acupuncture pain relief, while the normal mice did[16,](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_16" \o "Goldman N, Chen M, Fujita T, et al. Adenosine A1 receptors mediate local anti-nociceptive effects of acupuncture. Nat Neurosci 2010;13:883–8. doi:10.1038/nn.2562)[17](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_17" \o "Huang M, Wang X, Xing B, et al. Critical roles of TRPV2 channels, histamine H1 and adenosine A1 receptors in the initiation of acupoint signals for acupuncture analgesia. Sci Rep 2018;8:6523. doi:10.1038/s41598-018-24654-y) and this effect was repeated in humans.[18](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_18" \o "Takano T, Chen X, Luo F, et al. Traditional Acupuncture Triggers a Local Increase in Adenosine in Human Subjects. The Journal of Pain 2012;13:1215–23. doi:10.1016/j.jpain.2012.09.012)

Purinergic signaling has been demonstrated to play a central role in such diverse clinical areas as migraines and headaches,[19](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_19" \o "Fried NT, Elliott MB, Oshinsky ML. The Role of Adenosine Signaling in Headache: A Review. Brain Sci 2017;7. doi:10.3390/brainsci7030030) immune dysfunction and inflammation,[20](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_20" \o "Faas MM, Sáez T, de Vos P. Extracellular ATP and adenosine: The Yin and Yang in immune responses? Molecular Aspects of Medicine 2017;:1–11. doi:10.1016/j.mam.2017.01.002) cancer,[21](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_21" \o "Whiteside TL. Targeting adenosine in cancer immunotherapy: a review of recent progress. Expert Review of Anticancer Therapy 2017;17:527–35. doi:10.1080/14737140.2017.1316197) autism,[22](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_22" \o "Masino SA, Kawamura M Jr., Cote JL, et al. Adenosine and autism: A spectrum of opportunities. Neuropharmacology 2013;68:116–21. doi:10.1016/j.neuropharm.2012.08.013) Alzheimer’s,[23](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_23" \o "Woods LT, Ajit D, Camden JM, et al. Purinergic receptors as potential therapeutic targets in Alzheimer’s disease. Neuropharmacology 2016;104:169–79. doi:10.1016/j.neuropharm.2015.10.031) cardiovascular disease,[24,](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_24" \o "Burnstock G, Ralevic V, Perez DM. Purinergic Signaling and Blood Vessels in Health and Disease. Pharmacol Rev 2014;66:102–92. doi:10.1124/pr.113.008029)[25](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_25" \o "Burnstock G. Purinergic Signaling in the Cardiovascular System. Circulation Research 2017;120:207–28. doi:10.1161/CIRCRESAHA.116.309726) endocrine function,[26](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_26" \o "Burnstock G. Purinergic signalling in endocrine organs. Purinergic Signalling 2013;10:189–231. doi:10.1007/s11302-013-9396-x) embryological development,[27](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_27" \o "Oliveira Á, Illes P, Ulrich H. Purinergic receptors in embryonic and adult neurogenesis. Neuropharmacology 2016;104:272–81. doi:10.1016/j.neuropharm.2015.10.008) and gastrointestinal disorders[28](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_28" \o "Burnstock G. Purinergic Signalling in the Gut. In: The Enteric Nervous System. Cham: : Springer International Publishing  2016. 91–112. doi:10.1007/978-3-319-27592-5_10). While pharmaceutical companies are currently attempting to develop drugs in all of these areas to inhibit or enhance purinergic signaling,[29](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_29" \o "Borea PA, Gessi S, Merighi S, et al. Adenosine as a Multi-Signalling Guardian Angel in Human Diseases: When, Where and How Does it Exert its Protective Effects? Trends Pharmacol Sci 2016;37:419–34. doi:10.1016/j.tips.2016.02.006) safety is an issue as the balance of these compounds at the cellular level is delicate, and both too much and too little adenosine and ATP are associated with disease. However, stimulating improved self-regulation of purinergic signaling through acupuncture treatment is likely both effective and safe.

In addition to biochemical actions, studies also demonstrate direct effects of acupuncture on the central nervous system. These include spinal reflex effects, where acupuncture stimulates muscle relaxation and changes in visceral organs. In the brain, acupuncture has been shown to change functional connectivity, decreasing activity in limbic structures associated with stress and illness while improving the regulation of the hypothalamus-pituitary-adrenal axis, the primary system that the body uses for regulating hormones and the physiological stress response.[30](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_30" \o "Cho ZH, Hwang SC, Wong EK, et al. Neural substrates, experimental evidences and functional hypothesis of acupuncture mechanisms. Acta Neurol Scand 2006;113:370–7. doi:10.1111/j.1600-0404.2006.00600.x) Additionally, acupuncture modulates parasympathetic activity, the branch of the nervous system associated with rest, relaxation, digestion and tissue healing.[31](https://www.evidencebasedacupuncture.org/acupuncture-scientific-evidence/" \l "foot_text_17841_31" \o "Lund I, Lundeberg T. Mechanisms of Acupuncture. Acupuncture and Related Therapies Published Online First: 2016. doi:10.1016/j.arthe.2016.12.001)

Et billede, der indeholder tekst, skærmbillede, paraply

Automatisk genereret beskrivelse

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