

# Tracking an internal analgesic

## Acupuncture's biological basis

Dr. Bruce Pomeranz, a medical doctor and professor of neurobiology at the Zoology Department of the University of Toronto, has gone far in establishing the biological basis of acupuncture. His work, supported by the Natural Sciences and Engineering Research Council (NSERC), provided the first scientific proof that acupuncture confers real neurological benefits; further, it has clarified the complex biochemical pathways by which acupuncture exerts its healing effect.

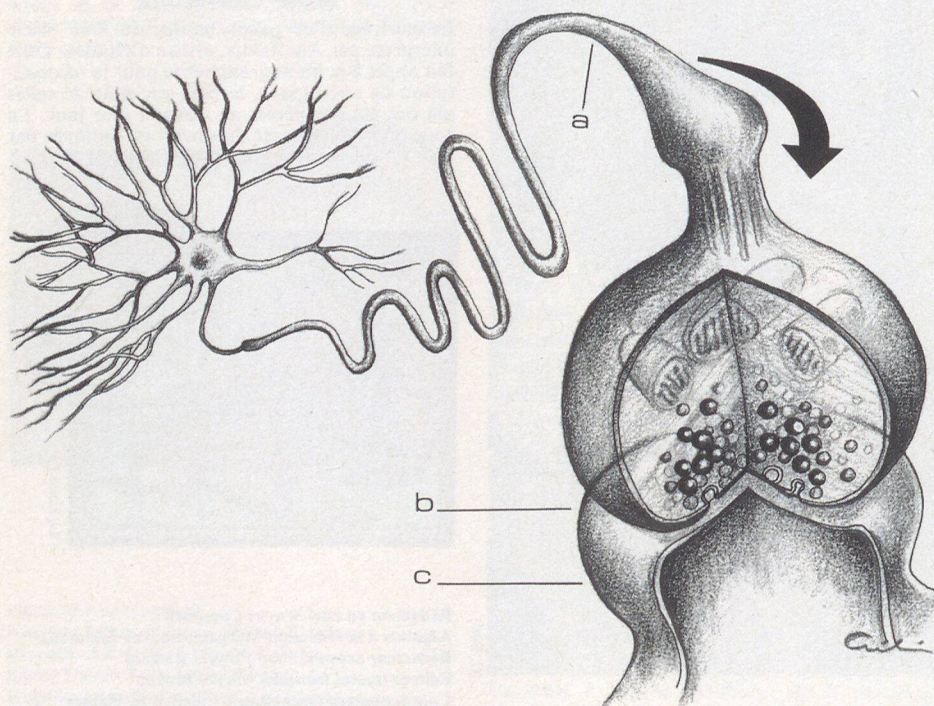
"Acupuncture," he comments, "can be an invaluable, noninvasive, nonaddictive therapeutic tool with

which to turn on the body's own, built-in painkilling and healing mechanisms. We now know a great deal about how this works."

In matters of science Dr. Pomeranz is an ultraconservative. He runs dozens of controls for every experiment, requiring many convergent lines of proof before accepting any fact or proposing any mechanism. He may carry out hundreds of experimental observations, he says, "to catch one datum or result," and always runs double blind studies and does sham (or false) acupuncture as well as other controls. "This kind of caution," he stresses,

Nerve impulses are transmitted from one nerve cell to another at "synapses"; here, the "axon" of the sending cell (A) contacts a specialized region on the receptor cell (B). Chemical transmitters released from vesicles in the axon by the impulse convey the "message" across a cleft region (C); the receptor cell either fires in turn, or the likelihood of its firing is reduced. These events begin and end almost instantly, whereas the onset of acupuncture's analgesic effect is delayed, and persists for some time once started.

L'influx nerveux se propage d'une cellule nerveuse à une autre en franchissant les synapses; ici, l'axone d'une cellule afférente (A) innerve une région de la cellule réceptrice (B). Des transmetteurs chimiques, dont la sécrétion par des vésicules situées le long de l'axone est déclenchée par l'influx nerveux, acheminent le message jusqu'à la cellule réceptrice en franchissant une scissure (C). Ceci peut se traduire soit par l'excitation de la cellule réceptrice, soit par l'inhibition partielle de son activité. Alors que ces mécanismes se déroulent à la vitesse de l'éclair, l'effet analgésique de l'acupuncture tarde à se manifester et dure longtemps.



"is vital in a field like this which is so fraught with controversy and politics."

Pomeranz's studies on acupuncture began in 1974, more by chance than design, when a Chinese student, Richard Cheng, joined his lab while he was working on pain circuits in mice and cats. His system was recording pain signals from neurons (single nerve cells) in the spinal cord of anesthetized animals and Cheng suggested looking at the effect acupuncture might have on pain transmission. "I was fully prepared to find nothing," recalls Pomeranz, "since at the time I believed, like most physicians, that acupuncture was more a psychological or imagined effect than a physical reality. We were amazed at what happened to spinal cord pain cells." After 20 min or so of electroacupuncture, applied at the distant *Hoku* point on the back of the animal's paw (between thumb and forefinger), the pain signals diminished and remained shut off for an hour or more after needling had ceased. The pain dampening continued long after acupuncture stopped. It was a puzzling and unexpected finding.

"For each experiment," stresses Dr. Pomeranz, "we did rigorous controls, gave sham acupuncture at nonacupuncture points, and found no pain lessening. In other words, we deliberately chose to stimulate a nerve distant from the pain cell we were measuring to counter arguments that our effects were due to overstimulation or fatigue."

Acupuncture consistently diminished pain signals, but its delayed onset and prolonged persistence defied current ideas about the nervous system, which postulated millisecond rapidity and instant recovery for neural events. "Our results simply didn't fit the currently held explanations of how acupuncture might work," says Pomeranz.

The *placebo* or psychological idea suggested that acupuncture worked in some inexplicable fashion by suggestion or distraction.

The *gate theory*, equally complex, depended upon the inhibition of pain signals by other, competitive neural processes.

"I had the perfect set-up to check out both theories," notes Pomeranz, "and my results refuted both the placebo and gate theories."

In Pomeranz's single cell experiments where pain signals were reduced, the animals were anesthetized; that is, their brain cortical circuits were shut off, ruling out a placebo or psychological explanations.

(Alii Kurtis)