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THE BLACK BOX: SECRET DRUG TREATMENT OF ROCK SUPERSTARS

*Currents from a black box, designed
by Dr. Margaret Patterson (right), restore harmony to addicts'
discordant lives. Listen to the*

BRAIN TUNER

BY KATHLEEN MCAULIFFE

It looks like a Walkman," explains Pete Townshend, the lead guitarist of and chief songwriter for the Who, the British rock band. "You clip this transistor-size unit onto your belt, and there're two wires leading from it that you attach behind your ears. Then it's a question of tuning in to the right frequency."

The thirty-eight-year-old rock star is not describing the latest advance in recording technology, but a novel treatment for drug addiction—a treatment that may

PHOTOGRAPHS BY EARL MILLER

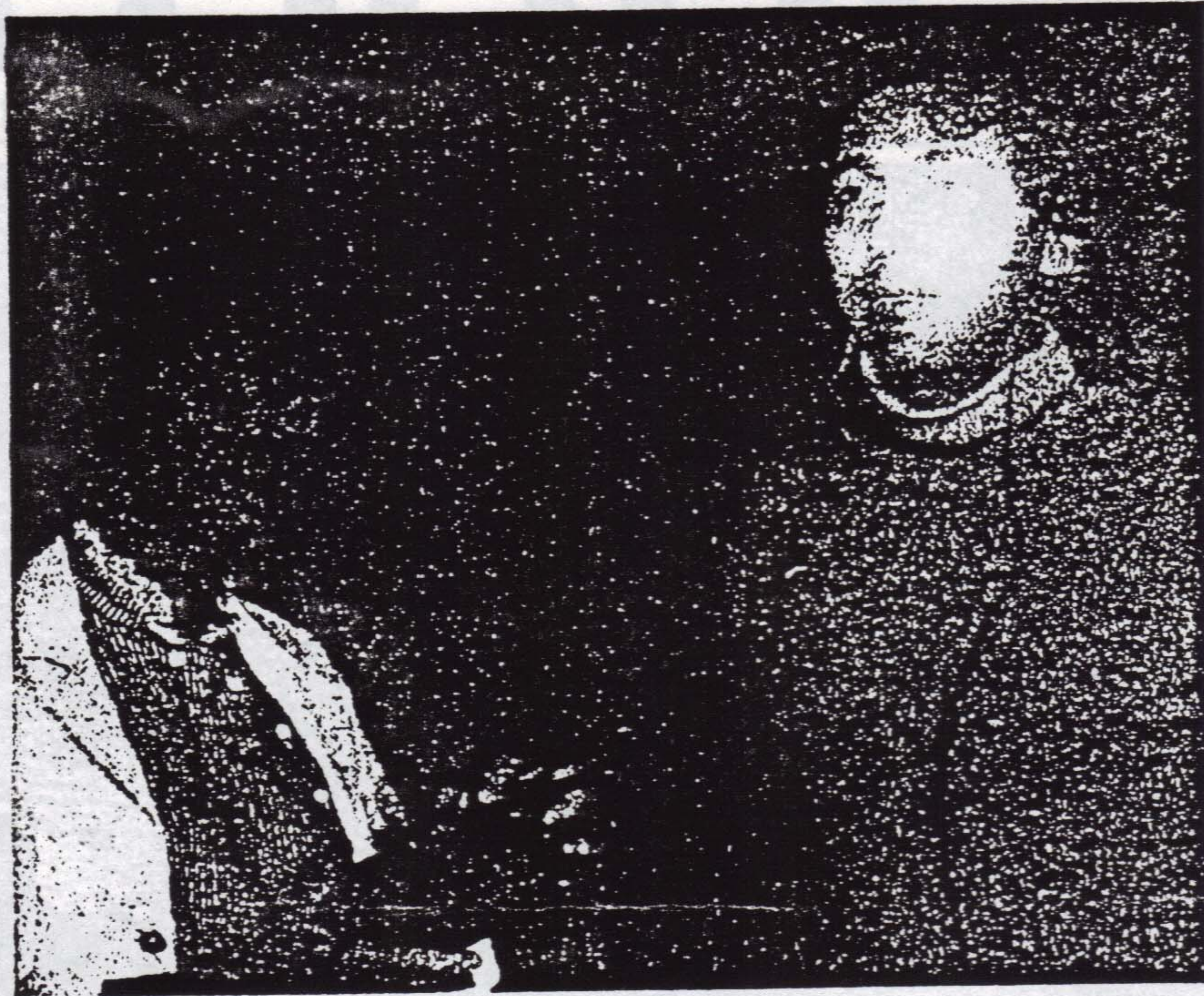
*Patients feel only
a slight tingling, yet this mild therapy
subdues violent reactions.*

work by striking a me-
lodious chord in the brain.
The Walkman look-alike
transmits a tiny electrical
signal that appears
to harmonize with natural
brain rhythms and, in
the process, reduce
craving and anxiety. Or
at least it worked for
Townshend. The little
black box, he says,
saved him from a nearly
suicidal two-year alco-
holic binge that eventu-
ally drove him to heavy
tranquilizers and vir-
tually any other drug he
could get his hands on.
"The treatment works not
only for boozers," Town-
shend emphasizes. "It's
helped people give up
cigarettes, heroin, bar-
biturates, speed, co-
caine, marijuana—you
name it. There is a dif-
ferent frequency that works best for each kind of addiction."

Dr. Margaret Patterson (above), a Scottish surgeon currently
residing in southern California, is the owner and inventor of this
magical device. Her black box (innards of an early model are
pictured on the page opposite) sounds suspiciously like quack-
ery. Just twiddle a few knobs and—presto—you can be cured of
every imaginable vice. But the magic is real to people in the rock
'n' roll industry, who call her a miracle worker. Apparently Town-
shend is not the only celebrity who has benefited from her unusual
remedy. She is credited with having reformed more than a dozen
top recording stars, including ex-heroin addicts Eric Clapton and
the seemingly indestructible Keith Richards, of the Rolling Stones,
whose reckless abuse of drugs became as legendary as his mu-
sic. (For Townshend's personal account of combating drug ad-
diction with Patterson's black box, see page 48.)

Happily, Patterson does not fit the image of either a charlatan
or a cult figure. She is in her fifties, slender of frame, with a kindly
face that radiates compassion. Her pale blue eyes are set off by
a magnificent mane of auburn hair, which is swept up into a graceful,
oversized bun. "I hesitate to use the word *cure*," she says in a
soft, lilting burr. "I prefer to call it a method of rapid detoxification.
The electricity quickly cleanses the addict's system of drugs,
restoring the body to normal within ten days. Most patients report
that their craving also subsides in the process."

Patterson's electrical stimulator is currently pending clinical ap-
proval by the Food and Drug Administration (FDA) in the United
States, where she has lived since 1981. Over the last decade in
Britain, however, almost 300 addicts have received NeuroElectric
Therapy (NET), the technical name for her treatment. Patterson
claims that all but four left drug-free at the end of the detoxification
process—a remarkable 98 percent success rate. "NET should
not be confused with ECT—electroconvulsive therapy for mental



patients," she cautions.
"NET is far milder, in-
volving currents at least
twenty times weaker.
Patients feel only a slight
tingling sensation be-
hind their ears where the
electrodes are taped
on." Yet this "mild" ther-
apy, she insists, will sub-
due the violent physio-
logical reactions that can
make "going cold tur-
key" intolerable for even
the most strong-willed
person. Though nor-
mally soft-spoken, Pat-
terson asserts unequiv-
ocally, "I can take anyone
off a drug of abuse, no
matter how severe his or
her addiction, with only
minimal discomfort."

Of course, not all those
who complete the de-
toxification program re-
main abstinent. Patter-

son emphasizes that NET is most effective when backed up by
counseling, remedial training, and a supportive home environ-
ment. For many individuals, however, the treatment does appear
to have long-lasting effects. If we are to believe the recidivism
figures she cites, they are many times lower than the national
average for every class of addictive drug.

A glance at Patterson's credentials provides reassurance that
she is both serious and highly capable. At twenty-one, she was
the youngest woman to qualify as a doctor at Scotland's Aber-
deen University. Only four years later she obtained her Fellowship
at the Royal College of Surgeons, at Edinburgh University—an
elite circle that few surgeons penetrate before their thirties. And
just before her fortieth birthday she was presented one of her
native land's highest honors by the Queen—an M.B.E., or Mem-
ber of the Order of the British Empire—for her outstanding med-
ical work in India.

Colleagues and patients describe the tiny Scottish surgeon as
warm, confident, and virtually unflappable. "You can't con her,"
says one patient who had spent years cheating and lying to get
bigger drug prescriptions. "And if you try to put one over on her,
she won't turn her back on you like other doctors."

"She's the sort of mother you always dreamed of having," says
a female addict. Still another views her as a saintly figure "with
the selfless devotion of someone like Mother Theresa."

Patterson's close rapport with her patients has made some
professionals question whether her dazzling record in drug re-
habilitation is really attributable to the powers of electricity. "It's
her personality" is the chief disclaimer psychiatrists have at-
tached to her work. "She doesn't control for psychological factors
such as people's expectations," says Dr. Richard B. Resnick, an
associate professor at New York Medical College, who is rec-
ognized as an innovator in the treatment of heroin addiction. "For



PETE TOWNSHEND ON THE BLACK BOX

Who guitarist Pete Townshend traces his downward slide toward drugged oblivion to the troubled spring of 1980. Long months of touring had brought him to the brink of a marital rift. Gross financial mismanagement had left him \$1 million in debt to English banks. And all the while he brooded incessantly about the future of the Who. "I started drinking about a bottle and a half of cognac a day," Townshend recalls. "And to cut through the drunken stupor I was in, I got into this deadly alcohol-cocaine oscillation. Eventually I became such a physical wreck that I went to this doctor, who prescribed me sleeping pills and an antidepressant called Ativan. These Ativans made me feel great, and soon I was taking eight to ten tablets a day, plus three sleeping pills every night. By Christmas, though, the Ativan stopped working, and so I turned to heroin. A month later it dawned on me that I was actually dying; that my macho, 'I-can-do-anything' mentality would kill me. It was then I contacted Meg [Margaret Patterson]."

"Even though I'd seen startling successes with her technique, I didn't know whether it would work for me. But by the second day I knew I was on the home straight. And on the third day I felt feelings of sexual desire returning, feelings of just wanting to go out for a walk. It was incredible! There was a sense of inner joy as I started to gain independence from drugs. A natural energy flow slowly returned to my body. I could feel the old me coming back, and the first emotion I felt was arrogance. I thought, 'This will be easy. A few more days on this machine, and then I'll shoot up to L.A. and go dancing.' That was my frame of mind. But the fourth day I got depressed. Initially I had been given low electrical frequencies for heroin, but when I became depressed, I was given some high frequencies for my cocaine addiction. And at this high setting, I would sometimes have psychedelic experiences. The colors in the room would suddenly start to go woo. Then I had another setback, followed by a day when I felt superhuman. It was just like being on heroin. But the next day I again felt like death warmed over. Some withdrawal symptoms even returned.

"Gradually, though, your mood levels off so that by the tenth day you feel fairly normal. In retrospect, I realize that the treatment is an education in itself. NET reeducates the brain to produce its own drugs, and in the process you learn something about your human potential. You come to realize that somewhere within you is the power to deal with crises, tensions, and frustrations. So the treatment reaffirms one's faith in the self-healing process.

"Of course it seems incredibly crude to shoot a thousand-cycle pulse through the brain—and *voilà!* Yet that's the beauty of it. There's something almost mystical about recovering by such a ridiculously simple technique. Somehow a simple little gadget has made me feel whole. And if I'm ever raped by a crazed pusher and become hooked all over again, I won't hesitate to call Meg and have my addiction handled in this straightforward, completely technical way." □

example, what happens if you fasten electrodes to patients' heads but don't turn on the electricity? You just talk to them and feed them chicken soup. Will they do better, the same, or worse than the group that got current?"

Such skepticism is less common in England, where Patterson's clinical practice was based until recently. There, a number of doctors have already begun to obtain the same beneficial effects with her electrical stimulator model.

Dr. Margaret Cameron, a psychiatrist with the National Health Service, in Somerset, England, reports that NET gives "very, very good results—better than any other treatment I've encountered." Since May 1981, Dr. Cameron has treated 40 alcoholics, 2 methadone addicts, 4 heroin addicts, and a few individuals with mixed addictions involving cocaine and barbiturates. In follow-up interviews conducted six months to a year later, 60 percent of the alcoholics were still off alcoholic beverages and none of the other patients had relapsed. A private practitioner based in New Jersey, Dr. Joseph Winston, shares Cameron's enthusiasm for NET: "As a benign, effective technique for withdrawing people from drugs, it is virtually unmatched."

If NET has met with resistance, it is because its mode of action strains the explanatory powers of modern science. Until recently orthodox medicine refused to recognize that infinitesimal electrical currents may influence the behavior or function of living organisms. Currents less than 100 millivolts—or below the threshold for triggering a nerve impulse—were assumed to have no effect on biological processes. This dogmatic view had to be reassessed when accounts of such unsettling phenomena began appearing with increasing frequency in technical journals over the last decade. NET is, in fact, only one branch of a young, controversial discipline that is still struggling to achieve respectability—the science of electrical medicine.

In the early Seventies scientists began introducing very small currents via electrodes to different parts of the body—with dramatic results. A rat amputee was induced to regrow a forelimb down to the midjoint, according to one exciting—though sometimes contested—report. In human applications, the FDA has approved the use of such currents for stitching together stubborn bone fractures. Recent experimental trials also indicate that trickling flows of electricity promote the healing of chronic bedsores, burns, and even peripheral nerve injuries. The external currents, it is theorized, stimulate rapid healing by augmenting the body's internal currents.

"By contrast, weak currents applied to the brain affect different physiological processes," says Dr. Robert O. Becker, a pioneer of electrical medicine who recently retired from Veterans Administration Hospital, in Syracuse, New York. "But I believe Dr. Patterson is producing profound alterations of the central nervous system.

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BRAIN TUNER

CONTINUED FROM PAGE 48

The psychological set that makes a person become an addict seems to disappear."

Researchers are now starting to elucidate NET's scientific rationale, winning over new converts from the more conservative ranks of the medical profession. In the process, Patterson's black box is helping to unlock the mysterious inner workings of that other black box: the human brain. The stimulus goes in and the response comes out, but seldom are we afforded a glimpse of what happens in between. By probing NET's effects on experimental animals, investigators are shedding light on the underlying mechanisms that control everything from addictive behavior to our most basic drives and emotions. As Dr. Becker surmised, the stimulator does indeed cause "profound alterations of the central nervous system." Underlying consciousness is an intricate orchestral arrangement of trillions of brain cells, firing in concert. Like different instruments in a symphony, subpopulations of neurons are now believed to produce frequencies within a specific range. Frequency, so to speak, is the music of the hemispheres.

Like penicillin and X rays, NET was born of scientific serendipity. It began with an accidental discovery in the fall of 1972. At that time Patterson was head of surgery at Hong Kong's Tung Wah Hospital, a large charity institution with a poor clientele. A neurosurgeon colleague, Dr. H. L. Wen, had just returned from the People's Republic of China, where he had learned the technique of electroacupuncture. Primarily interested in its usefulness in the suppression of pain, he began testing it on patients with a variety of ills. Dr. Wen, however, did not know that almost 15 percent of his patients were addicted to heroin or opium of extremely high purity. At that time the drugs were easily affordable at a daily cost of less than a pack of cigarettes.

"One day," Patterson says, "an addict approached Dr. Wen, announcing that the electroacupuncture had stopped his withdrawal symptoms. 'I felt as if I'd just had a shot of heroin,' he said. Wen initially thought nothing of it, but a few hours later a second addict reported a similar experience, equating the electroacupuncture with a certain dosage of opium."

Further inquiries revealed that a few alcoholics and cigarette smokers in Wen's experimental group had also been freed from their craving. To the eye, however, the electroacupuncture produced the most dramatic response in the narcotics addicts deprived of their drugs. The characteristic runny nose, stomach cramps, aching joints, and feeling of anxiety usually disappeared after 10 to 15 minutes of stimulation by needles inserted inside the hollow of the external ear, at the acupuncturist's lung point. At first these good effects lasted only a few hours. But with repeated treatments,

patients remained symptom-free for periods of longer duration.

The results of Wen's first study with 40 opiate addicts were published in the *Asian Journal of Medicine* the following spring. Of this group, 39 were drug-free by the time they left the hospital, roughly two weeks after starting treatment. When Patterson returned to England in July 1973, however, she found that addicts there were far less enthusiastic about the procedure. The Chinese loved acupuncture; the British hated it. "As bizarre as it may sound," Patterson explains, "Westerners—even those who mainlined drugs—often had an aversion to the needles."

There was another reason not to use needles. Patterson had suspected from the outset that acupuncture was essentially an electrical phenomenon. Even the traditional explanation hinted that this might be so. The ancient practice revolves around the notion that all living things possess vital energy, called *chi*, which circulates through

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mark, I felt
no craving at all.*

the body by way of a network of channels, or "meridians." Sickness was seen to be the result of disharmony, manifested by an obstruction in the flow of *chi*, which the needling was thought to remedy.

Was *chi* the ancients' concept for what modern man now recognizes as the internal currents that course through the body? Could it be that the Chinese, more than 2,500 years before the discovery of electricity, had intuitively sought to alter this life force in an attempt to alleviate pain and to cure disease? Perhaps, Patterson reasoned, the twirling of needles generates a tiny electrical voltage. Viewed in this light, the more recent practice of electroacupuncture was simply a more intense form of the original twirling technique. If so, the electrical signal would be of crucial significance in the treatment of addictions.

Years of clinical trial and error eventually confirmed her hunch. First Patterson replaced needles with surface electrodes. Then she went on to compare direct current with alternating current, while varying the voltage, shape, and other aspects of the electrical signal. Next she altered the electrode placement, finding a position just

behind the ear over the mastoid bone to be more effective than the lung point. But, of all the variables explored, electrical frequency quickly emerged as the single most important element for success. Those addicted to narcotics and sedatives preferred frequencies within the 75-hertz to 300-hertz range, barbiturate addicts responded to lower frequencies, and still other addicts, especially those dependent on cocaine or amphetamines, benefited most from frequencies as high as 2,000 hertz. "Musicians," she fondly recalls, "really helped to strengthen my guesswork during those early days. They invariably found the correct therapeutic setting right away. It was as if their brains were more attuned to frequency."

A further refinement of the therapy was prompted by still another fortuitous discovery: A heavy abuser fell asleep with the electrical stimulator on and awoke 30 hours later, well-rested and eager to take Patterson's children ice skating. From that moment onward, Patterson advocated continuous current application in the initial phases of treatment. She began the search for more comfortable electrodes that could be worn during sleep and for smaller electrical stimulators that could be clipped onto belts, permitting mobility during the day.

By 1976 Patterson had transformed electroacupuncture into an exciting new experimental treatment mode that she christened NeuroElectric Therapy. In her first clinical study, which was reported that year in the U.N. *Bulletin on Narcotics*, opiate addicts given NET as in-patients were all found to be drug-free an average of ten months after completing treatment. In contrast, opiate addicts who received NET only during the day as out-patients did not fare as well: 47 percent were drug-free at the time of the follow-up.

Because this preliminary investigation was limited to 23 patients, her results could not be extrapolated to a larger cross section of addicts. To provide better information about the long-term effects of NET, and also to assess its value in the treatment of other kinds of addictions, Patterson was recently awarded a research grant by the British Medical Association.

Last fall, at a Washington, D.C., symposium sponsored by the American Holistic Medical Association, Patterson presented the findings from this follow-up evaluation, which tracked the progress of patients treated between 1973 and 1980. Data were obtained from confidential questionnaires and, when possible, from personal interviews. Fifty percent responded to the survey, and these respondents included 66 drug addicts (mostly mainline heroin or methadone users) and mixed-addiction cases), 9 cigarette smokers, and 18 alcoholics. At the time of the follow-up, total abstinence was said to be achieved by 80 percent of the drug addicts, 44 percent of the cigarette smokers, and 78 percent of the alcoholics who stated abstinence to be their goal. An additional

7 alcoholics whose goal on admission was controlled drinking all reported success. (As Patterson herself cautions, however, these figures probably represent too favorable an outcome since patients who relapsed, especially alcoholics, may have been less likely to reply to the survey.) Of those who were successfully weaned from their dependence, 68 percent said they never or only rarely experienced craving, 15 percent said they occasionally felt craving, and another 17 percent said they frequently felt craving.

Interestingly, none of the drug addicts at the time of reporting had substituted alcohol for their earlier addiction—a finding that contrasts sharply with the figures cited in other studies. In one national survey, for example, 60 percent of addicts who had given up narcotics became heavy drinkers or alcoholics. Equally noteworthy was the extremely low dropout rate of all addicts enrolled in the program: Only 1.6 percent did not complete detoxification.

All things considered, the success of Patterson's patients is probably most remarkable from the standpoint of the brief duration of the therapy, which, including counseling, rarely extends beyond 30 days. According to a large study of drug abusers admitted to a variety of government-sponsored programs, addicts treated less than three months did not fare any better than those in a no-treatment comparison group.

So NET seems to achieve in a few weeks what few, if any, orthodox treatments can accomplish after months or years.

Not everyone, however, is convinced by the report's conclusions. A look at the history of drug reform in the United States shows that their cynicism is not ill-founded. Consider the government's efforts to curb narcotics use. The first U.S. Public Health Service hospital for heroin addicts opened in Lexington, Kentucky, where 18,000 patients were admitted between 1935 and 1952. All except some 7 percent of the alumni promptly relapsed after dismissal from the institution—a dreary record that other institutions scarcely improved upon in subsequent decades.

By the 1960s heroin addiction had spread like cancer through inner-city ghettos. To control the expanding epidemic, health professionals turned to methadone, a synthetic opiate that is legally prescribed. Today thousands of clinics throughout the nation dispense methadone to certified addicts, and those maintained in these programs show higher rates of employment and fewer criminal offenses than before they began treatment. But methadone, alas, is even more addictive than heroin. As one medical authority points out, "The tragedy of methadone is that we cannot get people off methadone."

For narcotics addicts who aspire to a drug-free existence, society offers two main

alternatives: the highly structured and insulated environments of such residential homes as Daytop Village, Phoenix House, and Odyssey House or out-patient clinics, which provide daily counseling services. As many as 30 to 40 percent of the people who enroll in these community-based programs remain abstinent a year after leaving treatment. But to enter most of these programs, one must first detoxify in a hospital. And here's the hitch: 64 percent don't make it past the acute withdrawal phase to qualify for further treatment.

"It is still not understood why simple detoxification is so ineffective, but the facts are clear and inescapable," says Dr. Avram Goldstein, professor of pharmacology at Stanford University. "As I see it, the reason for the dismal failure . . . is that the newly detoxified addict, still driven by discomfort, physiologic imbalance, and intense craving, cannot focus attention on the necessary first steps toward rehabilitation, but soon succumbs and starts using heroin."

Jean Cocteau, the French writer, who resumed smoking opium after medicine had "purged" him of the habit, put it another way: "Now that I am cured, I feel empty, poor, heartbroken, and ill."

In sharp contrast, NET patients are said to emerge from treatment feeling healthy, energetic, even cheerful. Dr. Joseph Winston, the American physician who collaborated with Patterson in the treatment of

Keith Richards, recalls that the musician "came to us terribly ill. He was literally green. But he slept eighteen hours the first day, and ten days later he was playing tennis, and the group said he had not looked so good in years."

If Patterson's findings seem at total variance with the bulk of the clinical literature, the firsthand accounts of NET patients may help explain why.

Stuart Harris started shooting heroin as a sixteen-year-old cadet in the Royal Navy. By the time he underwent NET in the spring of 1981, he had been addicted to heroin 15 years, and for 11 of those years he had also injected methadone intravenously. "I had the sweats very badly," he says of his experience on NET. "You're emitting all this bad grunge from your body, and you feel like you're speeding [on amphetamines]. But there's no withdrawal at all. That much I'll say for it. I mean when they told me about it, I just took it with a pinch of salt—another treatment they've fobbed off on the poor junkies. But, believe me, if I was getting any pain as I used to have with withdrawals, I wouldn't have stayed there, 'cause I was a voluntary patient. When I discharged myself from hospital, I didn't go searching out for drugs as I would normally have done in the past, say, after methadone reduction or narcosis (that's when they sedate you up to your eyeballs on sleeping pills). After completing all the other methods, I felt so uptight all the time. The first thing I wanted to do was have a massive great fix. But, after NET, all you really want to do is sleep. Everything is so easygoing. I can't say that it [heroin] doesn't

drift into my mind. Like the other day, I fancied a fix. But it passed over in a few minutes. Before, if I'd felt the slightest urge for a fix, off I'd go to London. Something has changed. You feel calmer. You can accept the ups and downs."

A man in his thirties, who requested anonymity, had injected heroin for eight years, combining this dosage with prescribed methadone during the last five years of the period. He received NET in 1974. "The treatment was rough," he says. "I felt as if I had a mild case of the flu, combined with short periods of feeling spaced out—even a bit euphoric. My anxiety and craving subsided right from the beginning, but a few weeks later my craving for heroin went back up again. I wanted to go out and score. And, as a matter of fact, I did. But it was different. It wasn't satisfying. It didn't make me feel that great. I know this treatment changed my head, because I never thought about heroin again after that. You see, I had gotten off heroin for as much as a month, even two months, at a stretch. But the whole of that time I would be thinking of heroin and nothing else."

A twenty-eight-year-old man, who also requested anonymity, combined a high level of alcohol and marijuana consumption with a cocaine habit of two to six grams each week for more than seven years. (The cocaine alone usually cost him more than \$1,000 a month.) He agreed to speak to *Omni* immediately after completing NET treatment in the summer of 1982. "Until this therapy," he says, "I couldn't go three days without feeling an enormous craving for drugs. Cocaine and, to a lesser degree, alcohol would always be on my mind. But from the moment the electrodes were put on my head, my craving immediately diminished. When I had passed the three-day mark, I felt no craving at all, and I still don't. Drugs never enter my mind. Now that I remember what it's like to feel good—to be clearheaded after all these years—I'm certain that I won't go back on drugs."

Rachel Waite, a heavy smoker for five years, was treated for her cigarette addiction in June 1981. "For the first three days on NET," she recalls, "I still had the urge to smoke, and I probably would have lit up had a cigarette been handy. However, by the end of the treatment I definitely did not want one. When I took an experimental puff, it was a different sensation altogether. It tasted foul, and there was no hit whatsoever. It was as if I was drawing on hot air."

Surprisingly, many patients who go on to build drug-free lives do not receive any formal counseling beyond that provided during the brief detoxification program. Yet NET, by itself, cannot remove the root causes of addiction, nor can it replace years of maladaptation with healthy skills for coping with life's stresses and disappoint-

ments. Why then do so many patients experience such a metamorphosis?

The treatment, Patterson believes, simply sets the stage for further growth. "Because they feel so good," she says, "they are better able to face the sort of problems that drove them to addiction in the first place. You see, most people who come off drugs without NET enter a phase of prolonged dysphoria: They suffer from fearful depression and pessimism. They can't eat. They can't sleep. They have no energy. This can last for six months in the case of heroin, and even longer in cases of methadone and barbiturate addiction. But NET restores physiological normality within ten days, which enormously reduces the amount of time needed for readjustment."

If anything, Patterson thinks that euphoria—not dysphoria—is to blame when rehabilitation fails. The newly detoxified addict is optimistic to the point of being overconfident. "In their elated state," Patterson says, "they think it will be easy to stay off drugs and then end up stumbling, because they don't make enough of an attempt to change their ways."

As if obeying Newtonian mechanics, the black box appears to counter one mood shift with an equal swing in the opposite direction, until the emotional pendulum finally comes to rest. Is the black box, in reality, an electronic substitute for a chemical high? How can a physical treatment cause such a swing toward euphoria?

As fate would have it, a scientist who had taught Patterson years earlier, Dr. Hans Kosterlitz, would once again serve as her mentor by illuminating the mainspring of euphoria in the brain. While working with Dr. John Hughes at the University of Aberdeen in 1975, Dr. Kosterlitz identified an endorphin, a natural brain chemical, with a molecular structure very similar to the opiates. For this outstanding discovery, the investigators later received the prestigious Lasker Award, revered as America's equivalent of the Nobel Prize in medicine. Almost overnight their finding triggered an explosion in the understanding of the biochemical basis of behavior, opening a new vista on the controlling factors behind addiction. Opium, heroin, morphine, and other related drugs owe their potency to what Avram Goldstein calls "one of nature's most bizarre coincidences"—their uncanny resemblance to the endorphins.

Over the succeeding years researchers uncovered evidence of myriad other brain hormones that mimic psychoactive drugs, from Valium and angel dust to hallucinogens. Almost every mind-altering substance, it is now assumed, has an analogue in the brain. And the precise mixture of neurojuices in this biochemical cocktail can mean the difference between tripping, speeding, crashing, or seeing the world through sober eyes.

These insights immediately suggested how the addict becomes trapped in a nightmarish cycle of dependency. In the initial phases of narcotic use, for example, the individual is assumed to have normal levels of endorphins in the brain. Injecting heroin causes a sudden and drastic elevation of opiates, which is subjectively interpreted as ecstasy. If, through repeated use, the brain is regularly flooded with opiates, it redresses the imbalance by cutting back on the production of its internal supply. Hence, the well-known condition of tolerance develops. The addict steps up his dosage, and the brain further compensates by calling a massive shutdown of production. Eventually, according to theory, the addict is shooting up solely for the purpose of "feeling normal." Should the drug supply be cut off at this stage, the opiate shortage cannot be instantly remedied. Drought ensues, unleashing withdrawal symptoms.

If an exogenous drug depletes the brain of its natural counterpart, it seemed logical that NET might quite literally juice up the system, rapidly replenishing the scarce neurochemical. Might certain frequencies of current catalyze the release of different brain hormones? Patterson wondered.

To find out, she conducted animal experiments in collaboration with biochemist Dr. Ifor Capel at the Marie Curie Cancer Memorial Foundation Research Department, in Surrey, England. Simply by monitoring the blood of NET-treated rats, the investigators discovered low-frequency currents can indeed cause as much as a threefold elevation of endorphin levels.

In another experiment the researchers examined NET's effects on rats rendered unconscious by massive doses of barbiturates. Once asleep, all the animals had electrodes clipped on to their ears, but only half the group actually received electrical current. The result: At one particular frequency—ten hertz—the experimental group rapidly regained consciousness, sleeping on average 40 percent less than the rats that received no electricity.

Why is the detoxification process hastened? One clue surfaced when the rats' brain tissue was analyzed: It was learned that the ten-hertz signal speeds up the production and turnover rate of serotonin (a neurotransmitter that acts as a stimulant to the central nervous system).

Similar experiments have now been repeated on rats made unconscious by injecting them with alcohol or ketamine (a cousin of angel dust). In almost every instance the frequencies that reduced sleeping time had earlier been proved therapeutic in the detoxification of human addicts. "Virtually every single parameter of current that I had stumbled upon during my clinical work was corroborated by the rat studies," Patterson declares, with barely concealed excitement.

How a weak electrical current can open the floodgates of the mind is still a matter of conjecture, but the implications are ob-

vious. Like a citizen's-band transmitter that infiltrates television frequencies, the black box must broadcast through brain frequency channels. And just as a TV receiver can pick up CB transmissions from a passing truck, the brain undoubtedly responds to the foreign-generated signal as if it originated from within its own communication network.

"As far as we can tell," says Dr. Capel, a rugged Welshman with a melodic voice, "each brain center generates impulses at a specific frequency based on the predominant neurotransmitters it secretes. In other words, the brain's internal communication system—its language, if you like—is based on frequency."

Unfortunately, neuroscientists are not yet fluent in this new tongue. "NET is still a very blunt tool," Capel acknowledges. "Presumably, when we send in waves of electrical energy at, say, ten hertz, certain cells in the lower brain stem will respond because they normally fire within that frequency range. As a result, particular mood-altering chemicals associated with that region will be released. That's what we hope is happening. In reality, however, much of the signal may be lost before it actually reaches the target cells. We just don't know. But if we can fine-tune the signal, I am confident our results will steadily improve."

At her small, two-bedroom home in Corona del Mar, Patterson has begun testing a new, improved model of the stimulator. Her goal—and the major impetus behind her decision to come to the United States—is to obtain funding for the establishment of a center where human and animal research can proceed in tandem. Until FDA clearance is given, however, she cannot begin treating addicts on a routine basis.

Will NET open a new route to salvation for the millions of Americans who each year flock to Alcoholics Anonymous, Smoke Enders, and methadone maintenance clinics? Clearly the final verdict is contingent upon replication of controlled studies. But if a feeble electrical current can truly curb the mind's excesses—from uncontrollable lusts to extremes of mood—its impact is sure to be far-reaching.

"Addicts may represent only a tiny fraction of the people who will eventually be helped by NET," Capel predicts. "In all likelihood it will find an enormous range of uses, especially in the area of pain control." In one preliminary trial, terminal patients suffering from chronic pain found NET just as effective as their daily dose of morphine. "By stimulating the brain's own painkillers, we didn't have to administer drugs," Capel marvels.

Early data also indicate that NET may prove highly promising in the treatment of mental disorders. The frequencies that induce euphoria and reduce tension, according to Dr. Cameron, of Britain's National Health Service, "seem to work wonders for patients suffering from severe depression and acute anxiety. Though it is far too soon to draw any conclusions

she notes that "a few of the half-dozen chronic depressives we've treated have found themselves jobs after years of unemployment."

As for Patterson, she hopes eventually to broaden her practice to include behavioral addictions, from overeating and compulsive gambling to video-game fanaticism. Absurdity aside, these wider applications follow a certain logic. "Her ideas make perfect sense if one accepts the idea that behavioral addictions have a chemical basis," says Dr. William Regelson, at the Medical College of Virginia. "It is very likely, for example, that all activities vital to survival—from sex to physical exercise—are physiologically addictive. It is now thought that the phenomenon called jogger's high is actually endorphin-mediated. In all probability, eating also releases some kind of pleasurable molecule. After all, why do we crave food? Low blood-sugar levels don't explain why. The truth is that we feel abnormal when we haven't eaten in a while. Some chemical in our brain has become depleted. We become restless and agitated, and, after extreme deprivation, we suffer withdrawal symptoms commonly known as hunger pangs. The only way to relieve our discomfort is to get more food. It's a fix—plain and simple."

If basic drives are addictive, then drugs are an ingenious means of shortcutting the elaborate scheme nature devised to ensure that we maintain health and reproduce ourselves. Merely by popping a pill, we can top off our neurochemical reservoirs with no sweat expended. Instant orgasm without any foreplay. A cheap thrill.

But can't the same be said of NET? "Is it not, after all, an electronic fix?" asks Regelson, who fears the black box may become addictive in its own right. Patterson has kept her eyes open to any signs that her patients are becoming physically dependent on the equipment. But she rules out the possibility that there will ever be a black market in black boxes, because individual models can cost upward of \$1,000—a hefty sum to cough up for purely recreational use. Besides, she has not encountered a single instance of electronic addiction in her ten years of practice. The explanation, she believes, "is that drugs—for the very reason that they are foreign—upset the brain's chemistry. NET, on the other hand, simply coaxes the brain to restore its own chemical balance. The body heals itself."

The intuitive feelings of her patients support this view. As reformed heroin addict Stuart Harris says, "At first I thought it would be fun to wire up the human race, so we could all go whizzing about. But after the initial buzz, you feel, well, normal. Frankly, all NET does is help you face reality."

Patterson concurs: "All we can do is give people a chance. We can get them off whatever drug they're hooked to, but it's up to them to fill the void. They've got to find a constructive substitute for the drugs that have dominated their lives." □

Additional Articles by MARGARET PATTERSON, M.D.

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Cranial-electrical stimulation

CES reduces anxiety and depression

CES is a process which utilizes minute electrical stimulation for therapeutic purposes. The individual taking a CES treatment normally feels a mild electrical stimulation, not at all uncomfortable. It is typically applied through stethoscope-shaped electrodes placed behind each ear, just below the mastoid processes (the indentations behind the ear).

The sensation felt by the individual is normally one of relaxation. If there is high stress or anxiety just prior to treatment, the individual may go to sleep while using CES, particularly if in a reclining chair or bed. Sleep at the time of application is not required to benefit from CES, although individuals frequently report an improvement in the quality of their night time sleep.

Usually a treatment lasts for 40 minutes and is taken once per day for 10 to 15 days. Following this initial series, the individual may use CES as desired at times of particular stress, or whenever needed to help relax or sleep.

As with a number of medicines, such as aspirin, the mechanism of action (how it works) of CES is not fully understood. Research has led to the hypothesis that it has a mild effect at the hypothalamic area of the brain. Studies have shown that both physiological and psychological changes toward homeostasis, i.e., the normal or relaxed state, take place following CES treatments.

Variations of CES have been in use in Europe and Russia for more than 30 years. Principal research in the United States however was not initiated until the mid-1960's. A series of studies were instigated in 1967 at the Medical College of Wisconsin, Milwaukee, by the founder of the company to determine if quantifiable physiological changes (reduction in gastric acidity), take place at time of high stress when small (less than one milliamper) CES currents are applied to the head. Initial tests on monkeys, followed by controlled studies and clinical trials with human volunteers, led to the conclusion that CES was of therapeutic value. The Company was formed in 1971 to manufacture and distribute CES equipment as a non-drug and non-invasive treatment for anxiety and potentially for stress-related illnesses.

Another problem in the treatment of chemically dependent persons is frequently recurring "dry withdrawal" in which the individual suffers withdrawal symptoms within several weeks, then again in several months. The phrases used to describe these phenomena are a "dry drunk" followed by the "dry withdrawal." These psychological states lead to high recidivism rates among these individuals as they return to treatment after "falling off the wagon."

CES is now thought of as one of the most effective, non-drug treatments for these periods of withdrawal, and a patient who has a personal CES unit available should be able to use it to prevent a full-blown withdrawal reaction at such times. By doing so he can reduce the need for additional medical treatment in a clinic or hospital setting, and will be less likely to resort to alcohol because of the discomfort accompanying these withdrawal states.

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CES In Relation to Alternative Treatments in Alcohol and Drug Addiction

Assuming that CES were made available via the RelaxPak in a treatment center, that it would be used constantly during the withdrawal period, then daily for one hour or more during other program activities, and finally during the post hospitalization period during periods of significant stress or dry withdrawals at which times the recidivism rate becomes most pronounced, it overcomes the following drawback to each of the treatment modes named below:

Biofeedback

Biofeedback success depends on the active cooperation of the

THE PROBLEM of alcoholism and drug addiction has received increasing attention in America during the past decade and evidence suggests that it will receive even more attention in the 1980's. Foremost among the treatment problems among chemically dependent persons is the need to help them through the psychologically and physiologically demanding period of withdrawal. The body reacts to the depressed physiological state engendered by alcohol and other drugs with a rebound stress reaction. This reaction commonly includes states of extreme anxiety, depression and insomnia, for which CES treatment is known to be effective.

Underlying the addictive state is an insidious and progressive destruction of normal brain functioning including an often incapacitating memory loss, inability to process information involving abstract symbols, and other dysfunctions associated with the organic brain syndrome, an advanced condition which is known as Korsakoff psychosis.

Studies on the use of CES in chemical dependencies are among the best controlled and well-designed research in the U.S. CES literature. They indicate that CES is a highly effective adjunct to methadone withdrawal in heroin addicts, significantly shortening the time to symptom-free withdrawal when compared with methadone alone, and significantly lowering withdrawal anxiety as measured by the Taylor Manifest Anxiety Scale.

Further, the anxiety and depression accompanying and following withdrawal of both alcohol and other drugs in polydrug abusers is significantly reduced when patients receive CES as a post withdrawal treatment.

Most importantly, perhaps, is the finding that CES treatment halts and significantly reverses brain dysfunction in these patients as measured on seven different psychological scales of cognitive function, bringing many such functions back to the level of the pre-addiction state in the majority of patients studied.

(Continued from Page 17)

choice of treatment for each of these superficially similar conditions.

In the following summary, while it is recognized that many physicians tend to rate type and depth of depression from their personal observation of patients before and after given treatments, only those studies are presented which involved measures of depression via a standardized, reliable measuring instrument.

An examination of these studies reveals that five different measuring devices were used with a variety of patients, including long-term psychiatric patients, university counseling center clients, post withdrawal alcoholic patients, and hospitalized para- and quadraplegics. CES treatment yielded a highly significant reduction of depression in each case.

Reactive depression—depression resulting from acute changes in the patient's life situation such as a job change or divorce—responded to six daily CES treatments or less. More deep seated depression—so-called endogenous depression, in some cases—required three weeks or more of daily CES treatments. For this reason, many physicians routinely prescribe a minimum of two weeks to a month of daily CES treatments in depressed patients, since it is frequently difficult to gauge the type or depth of depression with great accuracy.

Since many patients have a "depression habit" physicians should include a home CES unit in their treatment plan so that the patient can meet any new sign of impending depression with effective treatment and thereby break the behavioral reinforcement chain that has both led to and maintained the habit. In this way, a maladaptive habit can be effectively controlled or broken without the use of frequent medications and/or repeated visits to the physician's office. Other research has shown that CES, when used this way, is neither habit forming nor addictive. Such patients use it only when they experience an impending medical necessity.

Insomnia

Because Cranial Electrotherapy Stimulation (CES) was originally called "electrosleep" in European countries, many earlier American studies were designed to learn whether or not such small amounts of electric currents would actually put people to sleep. That is, just as 50 mA of current—called "electro-anesthesia"—put an individual into

anesthesia so that surgical procedures could be performed, 1 mA of CES current was assumed to put them into a normal state of sleep if "electrosleep" worked.

Such studies discovered that while CES does not necessarily "put a person to sleep," it does accomplish some very therapeutic changes in the sleep patterns of persons who complain of insomnia. The studies below show that whether measured by the patient's own ratings, psychiatrists' ratings or by electroencephalograph or polygraph recordings before and after CES treatments, the following effects of CES in insomnia patients can be expected:

1. Sleep onset latency is reduced. That is, once a person has retired for the evening, the amount of time it takes him to actually fall asleep is reduced from one to two hours or more to the more normal twenty minutes or less.

2. The number of awakenings during the night are reduced. That is, while most insomniacs awaken three, four, or more times during the night and have difficulty falling asleep again, those treated with CES typically awaken no more than once or twice following therapy, with most reporting no awakenings. Furthermore, after awakening, they return to sleep much more promptly than before.

3. CES treated patients spend more time in stage four sleep following CES treatments. That is, patients spend more time in the deepest, most restful stage of sleep than they did prior to CES treatment. It should be noted that some patients who have deprived themselves of REM sleep—the stage during which dreaming occurs—by taking drugs or alcohol as a sleep aid, sometimes spend the first two or three nights in unusually vivid dream states when first starting CES treatments. This is considered another indication of the therapeutic effectiveness of CES in that persons are known to become increasingly disorganized mentally, some even to the point of psychotic-like symptoms, when they do not engage in the normal amount of dreaming.

4. Finally, it was discovered that many patients receiving CES treatments report feeling more rested when they awaken in the morning following CES treatments.

Treatment parameters: While some patients begin to respond after the second or third day of treatment, others do not have their best response with fewer than 24 days of treatments lasting from 15 minutes to one hour. The beneficial effects have been measured in some

experimental groups for as long as two years. Some people with insomnia have a habitual pattern of responding to situational stress with an interruption in their sleep patterns. The best results are obtained when CES is used each time unusual stressors occur in their life situations that would ordinarily cause poor sleep. The person is thereby trained over time to expect (and get) a good night's sleep no matter what stressful interruptions occurred in the normal flow of daily life.



The Quiet Revolution: Pain Control and Electromedicine

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One out of every ten Americans suffer from chronic pain. Many others seek medical assistance for temporary or occasional pain. On the average, most have had their pain for seven years, have undergone from three to five major surgeries and have spent from \$50,000 to \$100,000 in medical bills. Many of these patients have been given several different prescriptions including analgesics, sedative-hypnotics, tranquilizers, mood elevators and anti-inflammatories. While drugs of this nature are invaluable for acute problems, dependence, tolerance, prolonged side effects and addiction all become a part of chronic use.

The patient will frequently try a behavioral approach, such as counseling, autogenic therapy, bio-feedback, hypnosis or other techniques. These therapies work well for well-motivated patients, and are frequently geared toward helping the patient to accept the pain they cannot escape from. All in all, the pain business has added up to an annual \$55 billion search for relief.

When dealing with chronic pain, steps must be taken to control it. These patients are frequently in pain twenty-four hours a day. As one might expect, there is also a great deal of depression, anxiety, insomnia and emotional stress concomitant with the problem. The practitioner should take into account such factors as emotional, environmental, dietary and familial stress, the levels of pain and the patient's own level of motivation in seeking relief.

There are basically three forms of electromedical pain control currently available. These are the transcutaneous Electrical Nerve Sti-

mulator, Bioconductive Therapy™, and Transcranial Electrotherapy.

In 1965, R. Melzack and P.D. Wall published their "Gate Theory."¹ This theory proposed that hypothetical "gates" existed in the substantia gelatinosa of the spinal cord and thalamus which could modify pain perception. It explained pain on an anatomical basis, and suggested that it was a more complex event than was previously thought.

In 1967, C.N. Shealy, M.D. utilized a low volt, low frequency milliampere electrical device which proved to be highly effective at mediating pain based on the "Gate Theory."² Working through the skin, the Transcutaneous Electrical Nerve Stimulator (TENS) offered new hope to chronic pain patients. Over fifty companies manufacture TENS devices.

By stimulating A-beta afferent nerve fibers, the pain impulses can be effectively blocked. Relief may last anywhere from several hours to several days. With repeated treatment, effects seem to be cumulative. Patients seem to need less and less TENS as time goes on, as opposed to most alternative therapies. It is thought that some new equilibrium may be established between the pain-carrying (excitatory) nerve fibers and the pain-relieving (inhibitory) fibers.

Caution is advised in masking the pain of progressive pathology, especially where there are beneficial aspects needed for diagnosis. Pain should not be regarded as the enemy. It is, after all, a life-saving alarm system. As an analogy, most houses now are equipped with smoke alarms. One would not want to turn off the smoke alarm while the fire was still burning. It would make

much more sense to extinguish the fire and let the alarm turn itself off. Acute pain usually works this way, and usually does not need to be blocked.

The alternative of bioelectricity has produced some very exciting results. In 1975, investigators isolated an endogenous transmitter substance manufactured by the pituitary gland which modifies pain impulses.³ These substances were called enkephalins and endorphins. They have an activity similar to that of morphine, thus providing a chemically-mediated system of pain relief. Activation of this system may be brought about pharmacologically by stimulation of higher brain centers and by electrical stimulation.

As far back as the eighteenth century, Galvani proposed that animals generated their own electricity.⁴ When injured, the body produces its own electrical signal based on a direct current control system. This has been demonstrated recently by Robert Becker, M.D. and several other investigators, who have found that this electrical system regulates growth and healing.⁵

Self repair is initiated after injury by signals within this electrical system called the Current of Injury (COI). The COI is generated when the mechanical stress of injury is converted into an electrical signal. Experiments have shown that cells can dedifferentiate into more primitive forms and then, by DNA coding, redifferentiate into whatever cell type is necessary for regeneration. Entire limbs have been regenerated in certain animals by electrical stimulation after amputation.⁶

Through evolution, mammals have lost much of the peripheral electrochemical potential due to a diminution of the ratio of nerves to other tissue. Instead, greater ratio of central nervous system tissue to peripheral nervous system tissue has occurred as the evolutionary order increases. This phenomenon, called "encephalization", has resulted in an insufficient COI to stimulate "ideal" repair in more evolved mammals.

The concept serves to explain the fact that lower forms of animals, such as salamander, are capable of

serving the effects on athletes for the past year. There is no question that electromedicine helps relieve pain and facilitates a more rapid recovery from injury."

Electromedicine and pain theory is altering the way many physicians are practicing. As new facts are uncovered about healing and pain perception new research yields more information. The result has triggered a quiet revolution in medicine away from chemistry, as the master science, towards biophysics.

The burgeoning amount of information that is evolving has created a need for one source of education for the health care professional. The International Electrotherapy Institute was organized by professionals to collect, organize and disseminate research from around the world.

IEI dispenses the fundamental information necessary for the progressive practitioner. In short, IEI acts as a "clearing house" for education in electromedicine and pain management.

Electromedicine has provided a new dimension of analysis and treatment for all health professions. As more is learned about pain and the endogenous bioelectrical system, exciting methods have evolved that are painless, non-invasive and have little or no side effects. The technology has arrived and the education is easily available to any concerned health practitioner. There is little doubt that the doctor of the future will utilize electromedicine as a mainstay in everyday practice.

The Transcutaneous Electrical Nerve Stimulator offers new hope to chronic pain patients.

Utilizing low frequency micro-ampere stimulation, the COI can be boosted to effect a rapid repair of tissue. This process is called Bioconductive Therapy.

Transcranial Electrotherapy is based on passing a low frequency microampere current across the cranium to induce an alpha state. The primary applications are in managing stress and relieving anxiety. ■

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