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## Electrostimulation: Addiction Treatment for the Coming Millennium

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### ABSTRACT

At a period of fundamental review of the health care system, it is timely to re-assess one of medicine's most intractable problems—the treatment of addictions. The apparently insoluble dilemmas posed by the acute and chronic withdrawal syndromes underlie universally high drop-out and relapse rates. In a decade of HIV and AIDS infection, poly-substance addiction, potent street drugs, and ossified treatment strategies, it is urgent that policy formulators investigate seriously a flexible system of non-pharmacological transcranial electrostimulation treatment, based on its record of rapid, safe, and cost-effective detoxification in several countries, as one innovative contribution to the challenges presented by addiction in the 1990s. This is a brief report of the introduction of NeuroElectric Therapy (NET) into Germany, describing the responses of the first 22 cases. The daily progress of a heroin addict and a methadone addict are detailed: both were treated as outpatients for 8 hours daily, for 7 and 10 days respectively.

### INTRODUCTION

**B**efore opioid receptors and endorphins were discovered in the 1970s, conventional medical wisdom affirmed that pharmacological support was essential for producing a humane detoxification from opioids, tranquilizers, sedatives, and alcohol. This was a slow process requiring substitution followed by gradual and skilful tapering of the replacement psychopharmacology. Chronic withdrawal syndromes—the profound and prolonged malaise and craving of the addict and alcoholic—were considered to be non-respon-

sive to pharmacology, and ameliorated only by the slow passage of time.

Two decades after those scientific breakthroughs, little has changed clinically—certainly not the high drop-out and relapse rates still reported universally with conventional detoxification treatments, nor their poor reputation among drug and alcohol users. The National Institute on Drug Abuse (NIDA) stated in a review in 1991: "Too few drug abusers are attracted to treatment; treatment retention rates are too low; rates of illicit drug use by clients in treatment are unacceptably high; relapse rates after treatment are unacceptably

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high; treatment programs are not adopting useful research findings into clinical practice" (Pickens and Fletcher, 1991).

This analysis related primarily to heroin and cocaine, two of the most rapid and straightforward chemicals from which to detoxify, and the conclusion was made against a background of three decades of clinical and scientific investigative pursuit. What then of methadone, fentanyl, and codeine; of Ativan®, Valium®, and Rohypnol®; of "ice" and other of the potent cocktails' becoming increasingly popular among young drug users; of alcohol; and of the insidious nicotine?

The reason underlying these failings has been the inherent, historic inadequacy of pharmacology to resolve the problem of chemical dependency detoxification, and especially the chronic withdrawal syndromes. Nevertheless, the long search for a 'drug-cure' for drug addiction continues. In its time, morphine was lauded as the cure for opium addiction, heroin for morphine addiction, methadone for heroin addiction, and now, at least in the United States, buprenorphine (Temgesic)®—already a drug of notoriety in Britain—is being considered as a replacement for the methadone of which one expert has said, "The tragedy of methadone is that we cannot get people off methadone." (Meyer, 1977)

Historically, abstinence orientation has been replaced by harm minimization as the prevailing official treatment strategy (Luger and Batey, 1993). This trend concerned the government of the United Kingdom so much that in 1994, it set up a task force to investigate the efficacy of presently available treatments; their report was published in 1996 (Kleber, 1996).

To substitute dangerous licit and illicit chemicals with potentially dangerous prescribed others, i.e., transference of addiction, over-dosage, cross-potential, toxicity, black-market seepage (Darke, 1994)—the Drug Enforcement Agency has recently restated its concern over methadone diversion—in those already physiologically and psychologically dependent on chemicals for coping, can only be justified by the absence of any effective alternative. The call for research into improved drugs instead of safer, more effective detoxification modalities, is both incomprehensible and futile.

## AN ALTERNATIVE APPROACH

If treatment results have remained consistently poor since the much heralded discovery of opioid receptors in 1972 and the endorphins in 1975, society and the drug scene have changed considerably, as has scientific knowledge about addiction, particularly subsequent evidence that the endorphins and other neurotransmitters, notably 5HT and HIAA, precursor and metabolite of serotonin, are substantially affected by electrical stimulation (Akil et al., 1978; Capel et al., 1982; Stinus et al., 1990). To meet the challenges of a changed society—AIDS and HIV transmission; an increasing prevalence of poly-substance addiction; cheap and increasingly potent drugs, notably crack cocaine and the designer drugs—a radical change in treatment service strategies is demanded, and such a fundamental change is only possible with a radically different and effective detoxification modality.

Transcranial electrostimulation (TES), as utilized and reported by ourselves and others in its various forms and applications, fundamentally changes present treatment options. TES challenges conventional and ossified patient management strategies in that it can safely and benignly detoxify from all substances of addiction faster, more efficiently, cost-effectively, and with better reported short (Patterson et al., 1992) and long-term results (Patterson et al., 1984) than is believed possible under orthodox treatment wisdom.

Internationally, there are two contemporary applications of TES to substance abuse treatment. The first is designated Cranial Electrostimulation (CES) by the FDA.<sup>1</sup> This low amperage, single pulse frequency (100 Hz), is used to reduce the stress of withdrawal and is most commonly used as an adjunct to standard detoxification programs (Gomez and Mikhail, 1978; Schmitt et al., 1986). CES is approved by the FDA to treat stress, anxiety and depression. Collaborative animal model research with the Marie Curie Research Laboratories in the United Kingdom, confirmed that the 100 Hz frequency is effective for reducing stress, as as-

<sup>1</sup>Revised regulations concerning CES devices were issued by FDA in August 1995. Part 882.5800(c)

sessed by plasma cortisol levels (Capel et al., 1979).

The second application is a unique detoxification modality, using multiple and very accurate pulse frequencies and wave-forms, according to the respective substance of addiction and the stage of withdrawal. Independent researchers using such TES applications in France, Russia, and Britain have reported a high rate of success with heroin, alcohol, and multiple detoxifications respectively (Ellison et al., 1987; Grinenko et al., 1988; Patterson, 1986). Most importantly, all who have reported successful application of TES have also found it to reduce notably the psychic distress and aggression which, for patient and staff alike, is such a conspicuous problem in drug treatment (Patterson et al., 1994).

All the above TES applications have their origins in pain control (Patterson et al., 1993). M.A. Patterson's British application, NeuroElectric Therapy (NET), arose through the serendipitous discovery in HongKong in 1972 by three surgeons, Wen, Cheung and Patterson, that electro-acupuncture analgesia (not anaesthesia) could alleviate opiate withdrawal symptomatology in volunteer patients with a heroin or opium addiction (Wen & Cheung, 1973).

However, Patterson believed that only the electrical factors involved in the technique had any therapeutic significance and, upon her return to England, she developed the treatment she named NeuroElectric Therapy. NET was and remains based on Western and Russian electro-medical procedures and hypotheses. Acupuncture needles placed in acupuncture points in the ear were replaced by adhesive electrodes attached behind the ear; brief treatments, as for pain control, were replaced by continuous stimulation including overnight stimulation; and most significant of all, new stimulators were developed that could provide a far greater range of current parameters, particularly accurate pulse-frequencies, that hypothesis and empirical investigation suggested were required to meet the range of different withdrawal syndromes.

NET remains distinctive in its use of multiple frequencies dictated by the individual substance(s) under treatment and given at carefully timed stages of the individual treatment schedule. The significance of electrical current

criteria in clinical success is fully discussed in Patterson et al., 1993.

The results of the first clinical trial into NET (Patterson et al., 1984) demonstrated that patients could be safely, rapidly, and benignly detoxified from daily drug dosages as large as 300 mg of prescribed heroin to 10 G of street heroin; 0.5 to 10 G of cocaine; 40 to 800 mg of methadone; and from various narcotic and psychotropic prescription medication up to 70 tablets daily. All treatments precluded support or replacement psychopharmacology. Moreover, our colleagues in Russia and ourselves state categorically that electrostimulation efficacy is degraded by any concurrent use of such medication.

In the published seven years' follow-up analysis, 80% of 93 traced patients claimed that they were still drug-free, 78% that they were alcohol-free. The drop-out rate for NET-treated patients over 7 years was only 1.6%, and remains much the same to the present. By the end of the 10-day treatment of 102 consecutive patients, 75% claimed that they were free of anxiety and 95% that they were free of craving.

In the NIDA review quoted previously, O'Brien and colleagues (1991) identified the four most significant factors in relapse as psychiatric disorders, especially depression and anxiety disorders; Protracted Abstinence Syndrome; social factors, including employment opportunities and social support; and conditioned responses.

## RESULTS OF NET

Long-term results of NET have already been mentioned. However, it is interesting to report the results in Germany of treatment conducted by physicians who had no previous knowledge of bioelectricity and variable knowledge of the addiction treatment specialty. Their written report is as follows (personal communication):

### *Nicotine, all outpatients*

Three treated; all satisfactorily detoxified and remain non-smokers 4 years later. All given only 4 days of NET.

### *Drug abusers*

Nineteen of 22 addicts used heroin. Others

used a variety of drugs in various combinations, including methadone, codeine, barbiturates, benzodiazepines, cocaine, and alcohol.

**Inpatients.** Nine addicts, 4 of whom were poly-drug users. Three of the 9 dropped out on Days 1, 4 and 4. Six were satisfactorily detoxified in 7–10 days, only one requiring 13 days of treatment.

**Outpatients.** Given 8 hours of NET daily, a CES unit to take home at night, or clonidine (Catapres, an antihypertensive with antiwithdrawal properties) 0.2 mg for 2 nights. There were 13 addicts, 8 of whom were poly-drug users. Five of the 13 dropped out on Days 1, 3, 6, 6 and 6. Eight were satisfactorily detoxified in 6–10 days, this indicating that they were no longer using their substance(s) of abuse, were free of withdrawal symptoms, and had recovered varying degrees of physical and emotional health (see examples in Tables 1 and 2).

Note: As per standard NET procedure, stimulation was not commenced until patients presented in acute withdrawal, to enable them to feel the benefits of treatment within half an hour.

The German researchers commented that "all patients confirmed the symptom reduction described in the tables and stated that, due to the NET treatment, their withdrawal had been shortened and alleviated. They also indicated

that some of the symptoms well known to them appeared weakened or even absent. Above all, they quickly felt calm and balanced and already, after a few days, their yearning (craving) for drugs had disappeared. All the outpatients reported an alleviation of their withdrawal symptoms here as well (most of them slept 2–3 hours immediately after the beginning of treatment); the drop-outs being for reasons unrelated to withdrawal (such as prostitution). They were composed and sociable and the positive experience they had during the day gave them a reason to return to treatment the following day, after they had spent the night without the MegaNET device (the Patterson device). While the patients slept only briefly and rather troubled at the beginning of treatment, most of them were able to sleep 6–8 hours toward the end of treatment. They had not experienced this during former 'cures' for drug addiction."

Whenever possible, the patients were transferred to a rehabilitation center immediately after NET, but most refused this option, as they were not willing to spend a long time in treatment.

## DISCUSSION

For over twenty years, independent TES applications have been used and reported on to

TABLE 1. SYMPTOMS OF 23-YEAR-OLD MALE HEROIN ADDICT, TREATED AS OUT-PATIENT BY NET

| Day                         | 1     |     | 2     |     | 3     |     | 4     |     | 5   |     | 6 |   | 7   |   |
|-----------------------------|-------|-----|-------|-----|-------|-----|-------|-----|-----|-----|---|---|-----|---|
|                             | B     | A   | B     | A   | B     | A   | B     | A   | B   | A   | B | A | B   | A |
| Before/ After NET           |       |     |       |     |       |     |       |     |     |     |   |   |     |   |
| Overall withdrawal severity | 4     | 3   | 3–4   | 2   | 3     | 1   | 1     | 1   | 1   | 1   | 1 |   | 0   |   |
| Irritability, nervousness   | 3     | 1   | 2     | 0   | 2     | 0   | 1     | 1   | 2   | 3   | 0 |   | 1–2 |   |
| Fatigue, anergy             | 4     | 1   | 4–5   | 2   | 5     | 2   | 4     | 4   | 1   | 2–3 | 0 |   | 0   |   |
| Aches, pains                | 1     | 0   | 1–2   | 0   | 0     | 0   | 1     | 1   | 0   | 0   | 0 |   | 0   |   |
| Depression                  | 0     | 1   | 1     | 0   | 1     | 0   | 1     | 1   | 0   | 0   | 0 |   | 0   |   |
| Shivering, chills           | 5     | 2   | 1–2   | 3–4 | 2     | 1   | 1     | 1–2 | 0   | 0   | 0 |   | 0   |   |
| Yawning                     | 6     | 1   | 0     | 0   | 0     | 0   | 0     | 0   | 0   | 0   | 0 |   | 0   |   |
| Watering eyes               | 7     | 0   | 0     | 0   | 0     | 0   | 0     | 0   | 0   | 0   | 0 |   | 0   |   |
| Running nose                | 7     | 0   | 0     | 0   | 0     | 0   | 0     | 0   | 0   | 0   | 0 |   | 0   |   |
| Abdominal cramps, diarrhoea | 1–2   | 2   | 1–2   | 0   | 4     | 2   | 1–2   | 2   | 0–1 | 0   | 0 |   | 0   |   |
| Lack of appetite            | 3     | 10  | 10    | 2–3 | 3–4   | 5   | 2     | 2–3 | 0   | 0   | 0 |   | 0   |   |
| Drug craving                | 8–9   | 8–9 | 7–8   | 6–7 | 5–6   | 5–6 | 4     | 3   | 2   | 1–2 | 1 |   | 0   |   |
| Total score:                |       |     |       |     |       |     |       |     |     |     |   |   |     |   |
| Before NET                  | 49–51 |     | 30–36 |     | 25–27 |     | 16–17 |     | 6–7 |     | 2 |   | 1–2 |   |
| During NET                  | 29–30 |     | 15–18 |     | 16–17 |     | 16–18 |     | 7–9 |     |   |   |     |   |

Self-Assessment: 0 = No Symptoms 10 = Severe Symptoms

TABLE 2. SYMPTOMS OF 26-YEAR-OLD MALE METHADONE ADDICT, TREATED AS OUT-PATIENT BY NET

| Day                         | 1  |   | 2     |     | 3     |     | 4  |   | 5  |   | 6  |   | 7  |   | 8  |   | 9  |   | 10    |   |
|-----------------------------|----|---|-------|-----|-------|-----|----|---|----|---|----|---|----|---|----|---|----|---|-------|---|
| Before/After NET            | B  | A | B     | A   | B     | A   | B  | A | B  | A | B  | A | B  | A | B  | A | B  | A | B     | A |
| Overall withdrawal severity | 3  | 3 | 6     | 4   | 5     | 4   | 5  | 4 | 5  | 4 | 4  | 3 | 4  | 3 | 4  | 3 | 2  | 2 | 2-3   | 1 |
| Irritability, nervousness   | 2  | 2 | 3     | 4   | 3     | 4   | 2  | 1 | 3  | 1 | 1  | 0 | 3  | 1 | 3  | 0 | 0  | 1 | 0     | 0 |
| Fatigue, anergy             | 5  | 3 | 5     | 2   | 6     | 1   | 6  | 4 | 4  | 0 | 3  | 1 | 4  | 4 | 4  | 4 | 0  | 1 | 4     | 0 |
| Aches, pains                | 2  | 3 | 5     | 3   | 6     | 5   | 5  | 2 | 4  | 2 | 1  | 1 | 3  | 2 | 3  | 2 | 2  | 2 | 1     | 1 |
| Depression                  | 0  | 0 | 0     | 0   | 0     | 0   | 2  | 1 | 1  | 0 | 0  | 0 | 1  | 0 | 1  | 0 | 0  | 0 | 1     | 0 |
| Shivering, chills           | 4  | 2 | 4     | 2   | 4     | 1   | 3  | 1 | 3  | 3 | 3  | 3 | 2  | 4 | 3  | 4 | 2  | 1 | 2     | 0 |
| Yawning                     | 3  | 2 | 1     | 0   | 0     | 0   | 0  | 1 | 2  | 0 | 0  | 0 | 0  | 0 | 2  | 1 | 0  | 0 | 0     | 0 |
| Watering eyes               | 0  | 2 | 2     | 0   | 0     | 0-1 | 2  | 1 | 0  | 0 | 0  | 0 | 0  | 0 | 2  | 0 | 0  | 0 | 0     | 0 |
| Running nose                | 0  | 0 | 1     | 0   | 0     | 0   | 0  | 0 | 0  | 0 | 0  | 0 | 0  | 0 | 0  | 0 | 0  | 0 | 0     | 0 |
| Abdominal cramps, diarrhoea | 1  | 1 | 2     | 0-1 | 1     | 0   | 2  | 1 | 2  | 2 | 2  | 1 | 0  | 0 | 1  | 0 | 2  | 1 | 0     | 0 |
| Lack of appetite            | 8  | 8 | 8     | 5   | 8-9   | 5   | 8  | 5 | 8  | 5 | 5  | 4 | 4  | 4 | 4  | 4 | 3  | 2 | 4     | 0 |
| Drug craving                | 0  | 1 | 0     | 0   | 0     | 1   | 0  | 0 | 0  | 0 | 0  | 0 | 0  | 0 | 0  | 0 | 0  | 0 | 0     | 0 |
| Total score:                |    |   |       |     |       |     |    |   |    |   |    |   |    |   |    |   |    |   |       |   |
| Before NET                  | 28 |   | 37    |     | 34-35 |     | 35 |   | 32 |   | 19 |   | 21 |   | 27 |   | 11 |   | 14-15 |   |
| During NET                  | 27 |   | 20-21 |     | 21-22 |     | 21 |   | 17 |   | 13 |   | 18 |   | 18 |   | 10 |   | 2     |   |

Self-Assessment: 0 = No Symptoms 10 = Severe Symptoms

detoxify chemical dependents from the range of substances of addiction. As described elsewhere by the authors (Patterson et al., 1993), all successful clinical applications of TES in the field of detoxification have utilized narrow windows of electrical current criteria, resulting in predictable and replicable clinical results: viz., immediate and substantial reduction in acute withdrawal syndromes, significant amelioration of chronic withdrawal syndromes, and substantial reductions in psychic distress and aggression. Where clinically effective, TES is demonstrated to be a safe and popular modality with high patient compliance and a low drop-out rate. Conversely, those applications where TES has been deemed unsuccessful through questionable procedures, report low patient compliance and high drop-out.

The controversy that presently surrounds TES arises from a few significant areas of scientific uncertainty, namely (1) the large number of possible electrical current combinations and techniques available with even simple electrostimulators, including electrode placement and polarity; (2) the as-yet unestablished significance of a number of these variables, most notably current-output levels and their relation to clinical effect; (3) the still unresolved underlying biochemical mechanisms (Hosobuchi et al., 1979; Salar et al., 1981), e.g., whether neurotransmitter effect is direct or cascade;

(4) the possibility that electrostimulation may heighten the endorphinergic mechanism in therapeutic placebo response (Gariti et al., 1992).

Regrettably, there has also been an increasing number of electrostimulators produced with minimal regard for clinical effect—one consequence of 'alternative' medicine's long marginalization and the resulting paucity of officially enforced standards.

The most urgent clinical challenge presented by the innovative modalities is in which structures can they most effectively be utilized. With a non-pharmacological, abstinence-oriented program, it becomes possible to consider—or reconsider, under different principles—various social and medical treatment contexts. One such interventionist setting is out-patient treatment. Under pharmacological detoxification, an out-patient treatment completion rate of only 13–17% is common, according to Dr. Kleber in 1994, when he conducted an international literature search for the British Task Force Drug Treatment Review (published in 1996). Earlier reports had considered 24% as being acceptable for this setting (Maddux et al., 1980; Alling et al., 1990). Preliminary NET results from Germany suggest that this orthodox treatment completion rate can be significantly increased.

With a drug-free TES treatment process, it becomes possible to recover a positive working

relationship without the battle of will and wile that is the basis of the patient-physician relationship when pharmacology is involved. Without the supervisory constraints demanded by pharmacology, the addict can be encouraged to take greater responsibility for his or her treatment. It also becomes possible to involve the family and/or significant others from the very beginning of care, as a support group prior to detoxification, a control and monitoring group during the vulnerable stage of detoxification, and the basis for follow-up psychotherapeutic activities. Structured rehabilitation is utilized where possible, but if such options are unavailable, a support network based on family, significant others, and close friends is considered essential for on-going support.

As a result of these and other wide-ranging scientific and clinical investigations, along with public pressure and the need to discern the nature of electro-medical controversy, official authorities have recently established the Office of Alternative Medicine as part of the National Institutes of Health. Now, professional and technical standards for the TES addiction field must be set and overseen by a sitting committee who, unlike ourselves, have no commercial or other vested interests in any one individual application of TES.

The drug problem has metastasized into endemic and epidemic addiction. Critical research, as already noted, has not been sufficiently applied to clinical practice. If hope for those in bondage to chemicals, and for their families, is not to wither completely, then a fundamental change in attitude toward addiction treatment and research is the only possible response to the challenges of the 1990s and beyond.

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