100 - INDUCED ANALGESIC FOR ELECTRIC ACUPUNCTURE: A RETROSPECT BOARDING ON FREQUENCY STIMULATION

SANDRA MARA SILVÉRIO LOPES MERELIS; PERCY NOHAMA.
Laboratório de Engenharia de Reabilitação
Programa de Pós-Graduação em Tecnologia em Saúde
Pontifícia Universidade Católica do Paraná - Curitiba-PR. - Brasil
sandramerelis@hotmail.com; percy@ppgia.pucpr.br

INTRODUCTION

The acupuncture is one millenarian technique, of Chinese origin, recommended for the OMS in 1979, that it comes being applied in diverse countries (ERNST, 2001) and adopted as option of treatment for relief of pains, in special, musculoskeletal (FERREIRA, 1996; ERNST, 2001; PEREZ, 2000). With the advance of the technological resources, it associated this so old technique the electric stimulation through the needles. The objective biggest and until today considered as justification is the premise of that added the stimulations mechanical (needles) and electric, the analgesic effect is intensified, mediated by opioids endogenous (VALDEZ, 2001; KIM, 1999).

The effect and therapeutical applicability of the electric chain vary as the choice of the wave form, intensity, duration and direction of the chain flow through the fabric in which it is applied (CAMERON,2003).

The electrotherapy as tool of work of the professionals in the whitewashing area already meets organized in some countries, making use of normalization it specifies (American Physical Therapy Association - APT in U.S.A. and Brazilian Association of Norms Techniques - ABNT in Brazil). The electrotherapy, in turn, still lacks today of a standardization of procedures how much to the physical parameters that would have to be used in the therapy equipment and, consequently, normalization that propitiates the inspection of the production and commercialization of these equipment.

The present article of bibliographical revision has as objective to compile information on the band of frequency of the applied electric chain in electrotherapy for analgesic effect, detaching the searched and recommended frequencies more.

The ELECTRIC ACUPUNCTURE: PHYSICAL AND PARAMETERS OPIOIDS ENDOGENOUS

According Amestoy (1998), many studies are based on biochemical and pharmacological methods to demonstrate the importance of chemical mediators (endogenous opioids) in the mechanism of action of acupuncture, mainly involved in the processes analgesics. If, on the one hand, applies to a technique as ancient acupuncture, secondly, the use of electric acupuncture is as recent as the Discovery of endogenous opioids, which took place from 1975.

The therapeutic effects of the application of electrical currents are associated with the acceleration of the processes of trade and depolarization in ionic level of the cell membrane tissues, and in the axon of the nerve fibers A â, á A and C, and more immediate activation of cortical areas Nervous System Center for the production of neurotransmitters. The electric acupuncture therefore no exception to that rule. The nature bioelectric the point of acupuncture promotes the passage of electric current by correspond to an area of least resistance (CHAITOW 1984 and WERNER 1979), creating facilitating and encouraging the effects of acupuncture themselves.

Amestoy (1998) and Huang (2002) recommends the current pulsed electric acupuncture and refers to the form, the pulse duration and frequency, among other parameters that must be closely monitored by acupuncturist. LIN (1998) and HAN (2002, 2003, 2004) also advocate the importance of frequency parameter of the therapeutic effects of electric acupuncture. Frequency, from the point of view of physics, is the number of cycles of a wave electromagnetic per second and its unity is expressed in hertz (Hz) or pps (pulses per second). The very act of drilling the fabric with needle (ACUS - PUNCTURA) provokes a response body in frequencies of 2 to 3 Hz (FILSHE 2002).

In the universe of theories that explain the mechanisms of action of acupuncture, science seeks answers on biochemical studies involving liberators neurons-chemicals, among them, as the endogenous opioid-endorphin, encephalin and dinorphin (ULETT, 1998; HAN, Z.,1999 , and HAN , 2003).

Each has its endogenous opioid-antagonist effects and very specific, being released in the case of electric acupuncture by specific stimuli also involving, in particular, different frequencies. In this approach, it is the teams of scientists of the Neuroscience's Institute at the Beijing University (China), Maryland University (Baltimore-USA), Taiwan National University of (China), which has published articles in the most renowned scientific journals worldwide (Neuroscience, Brain Research, Pain) Based on the assumption that endogenous opioid - are closely linked to the effects induced by painkillers electric acupuncture and they are released on some tracks on specific frequencies, organized to table 1.

Table 1 - Research on release of endogenous opioids-through electric acupuncture

AUTHOR	YEAR	SEARCH FREQUENCY	SET FREE SUBSTANCES
CHENG	1979	4 Hz	Peptides opioids (no specification)
CHAVKIN	1982	4 Hz	Peptides opioids (no specification)
U LETT	1998	2 Hz 100 Hz	Endorphin Dinorphin
LIU	1999	100 Hz	CCK 8
HAN ZHOU	1999	2 Hz	Endorphin
HAN	2003	2 Hz 100 Hz	Encephalin Dinorphin
HAN	2004	2 Hz 15 Hz 100 Hz	Encephalin, Endorphin e Endomorphin Encephalin, endorphin e Dinorphin Dinorphin
ZHANG	2005	10 Hz	P substance
ZHANG	2005	2 e 100 Hz (combination)	Encephalin, Endomorphin e Dinorphin

The first generation of experimental research in the area of acupuncture is used rats and mice. In this period, many experimental studies can be found in journals; however, most reported not using pain research or experimental inflammatory pain induced in rats and/or research developed in a systematic manner with analgesia and less still with electric acupuncture. With the discovery of encephalin in 1975, there was a breakthrough and a greater interest in the research of the mechanisms of analgesia induced by acupuncture. There followed the discovery of other endogenous opioids-associated processes analgesics; The â endorphin (1976), dinorphin (1979),

Endomorphin (1997) (HAN, 2004).

In table 1, is selected and result - if some of these searches, crossing the frequency range used in electrical electric

acupuncture and the corresponding substance released, in case the endogenous opioids. All searches were made in rats. In some of these searches, the author investigated a single substance and a single frequency. However, some authors as ULETT (1998) and HAN (2003 and 2004) in the same search managed to pin the specificity of opioid in different frequencies well. They stress that in low frequency (2Hz), release of endorphin, and high frequencies (100Hz), dinorphin.

In a brief, organized to table 2 from data raised in the literature found, which visually demonstrates each endogenous opioid and the range of frequency of electric acupuncture it was released, according to report of the research evaluated in table 1.

Table 2-Release of opioids as function of the frequency stimulatory employed

FREQUENCY (Hz)	SET FREE OPIOIDS						
	P Substance	Encephalin	Â Endorphin	Dinorphin	Endomorphin	CCK8	Orfamine
100				x	x	x	x
15		x	x	x			
10	x						
4				x	x		
2		x	x		x		

The more data that are repeated or are coincide with the release of â endorphins on 2 Hz; Dinorphins and, in 100 Hz It appeared that the bands are often chosen in polls fluctuate between 2 and 100 Hz. Some authors of the table 1 as HAN (2004) and ZHANG (2005) suggest associate so alternating the use of low frequency (2 Hz) and high frequency (100 Hz), in the same session, as illustrated in Figure 1. According to these authors, this procedure would cause the release of the major endogenous opioids (encephalin and dinorphin), streamlining the analgesic effects by electric acupuncture.

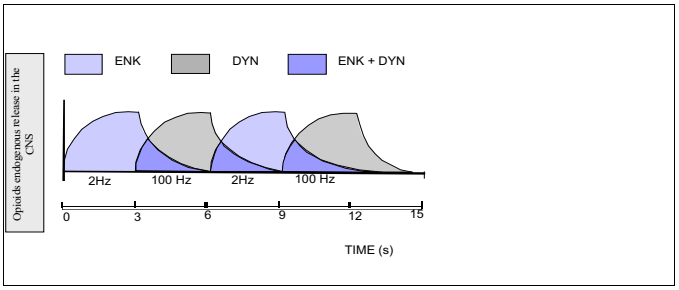


Figure 1-Use in sequence and alternate frequencies from 2 to 100 Hz .Enk equivalent to the release of encephalin and represents Dyn release of endorphin (adapted from HAN, 2003).

Investigations so far reported were conducted in rats / mice and work with technique of radio-immunoassay, histochemistry and / or with principles of biochemistry applied to the study of opioid

antagonists or via its receptor.

In sequence, it is reported other groups of searches and authors who have done work of a clinical trial in humans and or reports of their experiences and some clinics conducted in rats through the induction of experimental pain (Table 3).

Table 3-Research carried out by different frequencies electric acupuncture for analgesia

PRINCIPAL AUTHOR	YEAR	SAMPLE	FREQUENCY	PAIN TYP E	OBSERVATIONS
THOMAS	1994	Human	80 Hz	Low Back Pain	20 Hz low effect
WANG	1997	Human	100 Hz	postoperative	2 Hz no effect
AMESTOY	1998	Human	100 Hz	In Surgery	- - -
AMESTOY	1998	Human	800-1000 Hz	Sharp	Chain pulse Rectangular pulse
QING	2000	Human	120-250 Hz	Cervical Pain	- - -
LAO	2000	Rats	10 Hz	Inflammation Injury	3 V pulse 0,1 ms
KIM	2000	Rats	3 Hz	Light stimulation eye	0,3 mA 0,2 a 0,3 ms pulse
VALDE'S	2001	Human	1 - 50 Hz	Low Back Pain	arthrosès origin
DAÍ	2001	Rats	100 Hz	Sciatic Nerve Inflammation	0,3 ms, 3 mA
LIN	2002	Human	100 Hz	postoperative (hysterectomy)	Square pulse 1 ms, 0,5 mA
TIENYOU	2002	Rats	2 Hz	Thermal stimulation	- - -
HAN	2004	Rats	2 Hz	Thermal stimulation	- - -
HUANG	2004	Rats	100 Hz	Mechanical Pain	No to thermal pain
ZHANG	2005	Rats	10 Hz	Inflammation Injury	3 mA; 0,1 ms de pulse

Surveying the parameters described, it is seen that the frequency bands used in research with induction of experimental pain in rats comply with the same frequency of the studies with liberadores of endogenous opioids already approved in Chart 1 of 2 to 100 Hz It is believed that this fact occur because of the need for a bibliographic reference adopted in scientific research, or the need to evaluate in vivo, via induction of experimental pain, the response (theoretical and practical) of chemical mediators (opioids) released by the Central Nervous System.

When you take the data of the frequencies used in research with humans, it is observed that the range of frequencies tested is higher and expanded, reaching higher frequencies (up to 1000 Hz).

FINAL CONSIDERATIONS

Taking is based on the data summarized in this article, there are differences in physical parameters, in particular the frequency, adopted in each search. Such differences may be associated, among other causes, the diversity of bands of frequencies found in devices available on the market or the methodology adopted to assess the effects of analgesics improves. The research on pain, experimentally induced in guinea pigs, are rats, mice or rabbits, used in vast majority of resources of assessments based on time of latency, which is the period in which the animal would take to remove the paw of a hot surface , for example. In human pain, the measurement involves subjective aspects, constituting themselves into a challenge to the scientific, today.

According ERNST (2001), acupuncture was among complementary therapies more known and accepted and there is a growing acceptance by the public of Complementary Medicine. The electric acupuncture adds to the modern technology an ancient feature that survived thousands of years of history, as an effective method of balancing health. The investigations of the variables psycho-physical and electrophysiological involved in the quality of the analgesic response electric acupuncture are far from a conclusive opinion. Not only the frequencies, but intensity, duration, type of current and wave form of merit study and questioning.

Experiments with human beings applying electrical currents in other frequency ranges can contribute to the scientific progress of electric acupuncture.

ACKNOWLEDGMENTS
The authors thank the FINEP and the SETI-PR for the support received.

BIBLIOGRAPHY

AMESTOY, R. D. F. Eletroterapia e eletroacupuntura : princípios básicos. Florianópolis : Bristot, 1998.
CAMERON, M. Physicals agents in rehabilitation from research to pratice. 2.ed. St. Louis : Saunders Elsevier, 2003.
CHAITOW, L. O tratamento da dor pela acupuntura. São Paulo : Manole, 1984.
CHENG, R.; POMERANZ, B. Eletroacupuncture analgesia could be mediated by at least two pain-relieving mechanisms, endorphin and non endorphin systems. Life Science 25 (1979) 1957-1962.
CHAVKIN, C; JAMES, L.F.; GOLDSTEIN, A. Dynorphin is a specific endogenous legend of the k-opioid receptor. Science 215 (1982) 413-415.
DAI, Yi; KONDO, E.; FUKUOKA, T.; TOKUNAGA, A.; MIKI, K.; NOGUCHI, K. The effect of eletroacunpture on pain behaviors and noxious stimulus-evoked fos expression in rat model of neuropathic pain. The Journal of Pain, vol. 2, nº 3 (2001) 151-159.
ERNST, W. Acupuntura : uma pesquisa cientifica. São Paulo : Manole, 2002.
FERREIRA, M. V. O paciente de dor e a acupuntura : razões na escolha do tratamento. In : Congresso Brasileiro sobre dor, 2 (1996), São Paulo. Anais disponível em : www.acupuntura.org/artigos/acmvar/htm. Acesso em 05/05/06.
FILSHE, J.; WHITE, A. Uso de evidências clinicas : acupuntura médica, um enfoque cientifico do ponto de vista ocidental. 1.ed. São Paulo : Roca, 2002.
HAN, J. Sheng. Acupuncture : neuropeptide release produced by electrical stimulation of different frequencies. Neurociencies Letters 26 (2003) 17-22.
HAN, Ji Sheng. Acupuncture and endorphins. Neurosciense Letters 361 (2004) 258-261.
HAN, Z.; JIANG, Yu-Hui; WAN, Y.; WANG, Y.; CHANG, Jau-Kang; HAN, J.Sheng. Endomorphin-1 mediates 2 Hz but not 100 Hz eletroacupuncture analgesia in the rat. Neurosciense Letters 274 (1999) 75-78.
HUANG, C.; WANG, Y.; HAN, Ji-Sheng; WAN, Y. Characteristics of eletroacupuncture-induced analgesia in nice : variation with strain, frequency, intensity and opioid involvement. Brain Research 945 (2002) 20-25.
HUANG, C.; HU, Zhi-Ping; LONG, H.; SHI, Yu-Shun; HAN, Ji-Sheng; WAN, Y. Attenuation of mechanical but not thermal hyperalgesia by eletroacupuncture with the involvement of opiods in rat model of Chronic inflamation pain. Brain Research Bulletin 63 (2004) 99-103.
KIM, J. H.; MIN, B.I.; SCHMIDT, D.; LEE, H.J.; PARK, D.S. The difference between electroacupuncture only and eletroacunpucture with manipulation on analgesia in rats. Neuroscience Letters 279 (2000) 149-152.
LAO, L.; ZHANG, G.; WEI, F.; BERMAN, B. M.; REN, Ke. Effect of electroacupuncture on hyperalgesia andd Fos-protein expression in rats with persistent inflammation - a new animal model. Clinical Acupuncture and Oriental Medicine (2000) 1 (112-114).
LIN, J.G.; LO, M.; WEN, Y..R.; HSIEH, C. L.; TSAI, S.K.; SUN, W.Z. The effect of hight and low frequency electroacupuncture in pain after lower abdominal surgery. Pain 99 (2002) 509-514.
LIU, X.; ZHU, B.; ZHANG, S. Relationship between the analgesic effect of electroacupuncture and CCK8 content in spinal purfusat in rats. Chine Science Bull 44 (1999) 240-243.
PEREZ, G. R.; DIAZ, I. G.; FALCON, N. D.; FERNANDEZ, O. L. Analgesia acupunctural y bloqueos terapeuticos en pacientes con lumbociatalgia - labor de enfermeria. Revista Cubana de Enfermagem (2000) 18 (111-116).
QING, Y.; ZHANG, H.; JIN, R. Study on the somesthetic evoked potential in eletroacunpucture treatment of cervical spondylopathy. World Journal of Acupuncture and Moxibustion, vol. 10, nº 2, jun 2000 (7-10).
THOMAS, M.; LUNDBERG, T. Importance of modes of acupuncture in there treatment of chronic nociceptive low back pain. Acta Anaesthesiologica Scandinavica. 1994-38 (63-69).
TIENYOU, H. The principle of acupuncture's pain management. Wourld Journal of Acupuncture and Moxibustion, vol. 10, nº 3, september 2000 (47-51).
ULLET, G. A. ; HAN, S.; HAN, Ji-Sheng. Electroacupuncture : mechanisms and clinical apliccation. Biological Psychiatry Society (1998) 44 (129-138).
VÁLDES, FeBoch; MARTINEZ, M.C.R; ARTEAGAS, M.H.; JACOMINO, J.C.G. Acupuntura y eletroacupuntura em el alivio del dolor de la osteoartrosis de la region lumbar. Revista Cubana de Medicina General Integral, v.17, nº 2, 2001 (1-6).
WANG, B. G. et al. Effect of the intensity of transcutaneous acupoint electrical stimulation on the postoperative analgesic requeriment. Anesth. Analg. 85 (1997), 406-413.
WERNER, F. Electro-acupuncture primer. Stuttgard ML Velarg, 1979.
ZHANG, R. X.; WANG, L.; LIU, B.; QIAO, J.T.; REN, Ke; BERMAN, B. M.; LAO, L. Mu opioid receptor containing neurons mediate electroacupuncture produced anti-hyperalgesia in rats with hind paw inflammation. Brain Research. 2005 Jun 28;1048(1-2):235-40.
ZHANG, R. X.; WANG, L.; LIU, B.; QIAO, J.T.; REN, Ke; BERMAN, B. M.; LAO, L. Electroacupuncture suppresses spinal expression of neuroKinin 1 receptors induced by persistent inflammation in rats. Neuroscience Letters, 2005 Aug 26;384(3) : 339-43.
ZHANG, R. X.; WANG, L.; WANG, X.; REN, Ke; BERMAN, B. M.; LAO, L. Electrocupuncture combined with MK-801 prolongs anti-hyperalgesia in rats with peripheral inflamation. Pharmacology, Biochemistry and Behavior 81 (2005) 146-151.

Rua Voluntários da Pátria, 215 - 2º andar
CEP: 80020-000 - Fone (41) 3225.1844 - Curitiba-PR. Brasil.
sandramerelis@hotmail.com

INDUCED ANALGESIC FOR ELECTRIC ACUPUNCTURE: A BOARDING RETROSPECT ON FREQUENCY STIMULATION

ABSTRACT
Since 1979 the OMS recommends the acupuncture as efficient therapeutically resource, in special for analgesic. With the increment of the technological possibilities the association of electric stimulation through the needles was introduced to this so old technique: the electric acupuncture. Still today it has a lack in the standardization of procedures how much to the physical parameters

that would have to be practiced in the electric acupuncture devices. This study of profile of bibliographical revision it has as objective to compile given on band of used electric frequency in electric acupuncture for analgesic effect, verifying which the searched and recommended frequencies. Research with resources biochemists, made in rats, for diverse authors, enters the years of 1979 the 2006, was observed that the bands of searched frequencies more in electric acupuncture are 2, 4 and 100 Hz, with set free endogenous corresponding evaluation of opioids. The data that more are happened again or coincided are the endorphins release of â in 2 Hz and dinorphins in 100 Hz. Some authors suggest in its research to associate in alternating way the use of low frequencies of 2 Hz and 100 high frequency of Hz, in one same session. In research with human beings, he observes yourself that the band of tested frequencies higher and is extended for top varying of 1 the 1000 Hz. One gives credit that these differences in the choice of the bands of frequencies in the research if must the proper characteristics of each author. These characteristics can vary in the available devices in the market until the adopted methodology to evaluate the improvement of the analgesic effect. Studies with human beings, as well as in other bands of frequency can be useful for the scientific progress of the electric acupuncture.

KEY-WORDS: electric acupuncture; analgesia; electric frequency.

ANALGÉSIQUE INDUIT POUR L'ACUPONCTURE ÉLECTRIQUE : UNE RÉTROSPECTION EMBARQUANTE SUR LA DE LA STIMULATION DE FRÉQUENCE

RESUMÉ

Puisque 1979 l'OMS recommande l'acuponcture comment une ressource efficace, dans spécial pour l'analgésie. Avec l'incrément des possibilités technologiques l'association de la stimulation électrique par les aiguilles a été présentée à cette technique tellement vieille : l'acuponcture électrique. Aujourd'hui elle a toujours un manque dans l'étalonnage des procédures combien aux paramètres physiques qui devraient être pratiqués dans les dispositifs électriques d'acuponcture. Cette étude est une révision bibliographique qu'elle a en tant qu'objectif à compiler donné sur la bande de la fréquence électrique utilisée en acuponcture électrique pour l'effet analgésique, vérifiant quel les fréquences recherchées et recommandées. Rechercher avec des ressources biochimistes , faits chez les rats, pour les auteurs divers, écrit les années de 1979 jusque 2006, a été observé que les bandes des fréquences recherchées de plus en acuponcture électrique sont de 2, 4 et 100 Hz, avec l évaluation d'ensemble correspondante librement des opoides endogènes. Les données que plus sont produits encore ou coïncidés sont le dégagement du â endorfins en 2 Hz et des dinorphins en 100 Hz. Quelques auteurs suggèrent dans sa recherche d'associer de la manière complementeur l'utilisation de las fréquences de 2 Hz avec de 100 Hz, en une même session. Dans la recherche avec les êtres humains, il s'observe que la bande des fréquences examinées plus haut et est prolongé pour changer supérieur de 1 jusque 1000 Hz. On donne à crédit ce ces différences dans le choix des bandes des fréquences dans la recherche si nécessité les caractéristiques appropriées de chaque auteur. Ces caractéristiques peuvent changer dans les dispositifs disponibles sur le marché jusqu'à la méthodologie adoptée pour évaluer l'amélioration de l'effet analgésique. Les études avec les êtres humains, comme dans d'autres bandes de la fréquence peuvent être utiles pour le progrès scientifique de l'acuponcture électrique.

MOTS CLÉS: acuponcture électrique; ; analgesie; fréquence électrique.

ANALGESIA INDUCIDA POR EL ELECTROACUPUNTURA ELÉCTRICA: UNA INVESTIGACION BIBLIOGRAFICA RETROSPECTIVA DEL USO DE LA FRECUÊNCIA ESTIMULATORIA

RESUMÉN

En 1979 el OMS recomienda la acupuntura como terapéutico recurso eficiente, en especial para la analgesia. Con el incremento de las posibilidades tecnológicas hubiera introducida a esta tan vieja tecnica,la asociación del estimulo eléctrico en las agujas; la electroacupuntura .Todavía tiene hoy una carencia en la estandardización de procedimientos cuánto a los parámetros físicos que tendrían que ser practicados en los estimuladores eléctricos de la acupuntura. Esta investigacion tiene un perfil de revisión bibliográfica cuyo objetivo és compilar dados cientificos de la frecuencia eléctrica usada en la electroacupuntura para el efecto analgésico, verificando cuál las frecuencias mas investigadas y recomendadas. Investigación con recursos bioquímico, hechos en ratas, por los autores diversos,en un periodo de los años de 1979 hasta 2006, fue observado que las investigaciones de frecuencias buscadas en acupuntura eléctrica son más en 2, 4 y 100 Hz,y con uno sistema la evaluación correspondiente de los opioides endógenos liberados. Los datos que más están sucedidas vezes presentes, o coincididas son el lanzamiento de las â endorfinas en 2 Hz y dinorphinas en 100 Hz. Algunos autores sugieren en su investigación para asociar de manera que se alterna el uso de frecuencias bajas de 2 Hz y de 100 Hz, en una misma sesión.Todavia, en la investigación con los seres humanos, él se observa que el uso y investigación frecuencias és mas altas y alcancan por entre 1 hasta 1000 Hz. Lo crédito de las diferencias de los padrones elegidos de las frecuecias comumente investigados, crea-se és por una necesidad las características apropiadas de cada autor. Estas características pueden variar en los eletroestimuladores disponibles en el mercado, hasta la metodología adaptada para evaluar la mejora del efecto analgésico. Las investigaciones con los seres humanos, cuanto al uso de las frecuencia estimulatorias pueden ser útiles,y se hacen necessarias para el progreso científico de la electroacupuntura.

PALABRAS CLAVES: Electroacupuntura; analgesia; frecuencia de la estimulación.

ANALGESIA INDUZIDA POR ELETROACUPUNTURA : UMA ABORDAGEM RETROSPECTIVA SOBRE A FREQUÊNCIA ESTIMULATÓRIA

RESUMO

Desde 1979, a OMS recomenda a acupuntura como recurso terapêutico eficaz, em especial, para analgesia. Com o incremento dos avanços tecnológicos, foi introduzida a esta técnica tão antiga a associação de estimulação elétrica através das agulhas: a eletroacupuntura. Ainda hoje, há uma carência na padronização de procedimentos quanto aos parâmetros físicos que deveriam ser praticados nos aparelhos de eletroacupuntura. Por isso, neste artigo de revisão da literatura sintetizam-se informações sobre as faixas de freqüência utilizadas em eletroacupuntura, quando aplicada com o objetivo de produzir efeitos analgésicos, identificando quais as freqüências mais pesquisadas e recomendadas. Em pesquisas com técnicas bioquímicos, feitas em ratos, por diversos autores, entre os anos de 1979 e 2006, envolvendo os opióides endógenos liberados, observou-se que as faixas de freqüências mais pesquisadas em eletroacupuntura são 2, 4 e 100 Hz. Os dados que mais se repetem ou coincidem são a liberação de â endorfinas em 2 Hz e dinorfinas em 100 Hz. Alguns autores sugerem em suas pesquisas associar, de maneira alternada, o uso de freqüências baixas de 2 Hz com freqüência de 100 Hz, numa mesma sessão. Em pesquisas com seres humanos, observa-se que a faixa de freqüências testadas é mais alta e ampliada para cima variando de 1 a 1000 Hz. Estas diferenças na escolha das faixas de freqüências nas pesquisas decorrem de motivações próprias de cada autor. Tais especificações podem depender dos aparelhos disponíveis no mercado ou relacionarem-se à metodologia adotada para avaliar a melhora dos efeitos analgésicos. Estudos com seres humanos, bem como em outras faixas de freqüência, proporcionarão progressos científicos na área de eletroacupuntura.

PALAVRAS-CHAVES: Eletroacupuntura; analgesia; freqüência estimulatória.