PEMF

By Dr.Pawluk

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PROFESSIONAL DEVELOPMENT

NCCAOM

ACTIVITY

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Integrating electromagnetic field therapy (PEMFs) into acupuncture practice:

A direct learning experience

William Pawluk, MD, MSc

PROFESSIONAL DEVELOPMENT NCCAOM ACTIVITY

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Workshop Agenda

8-8:30 Introduction
Section 1 Science
8:30 – 9:30 Basic science
Electrical nature of the meridian and acupoint system
Magnets vs PEMFs
Use of static magnets in a/c
9:30-9:45 break
9:45-11:30 PEMFs
Nature of PEMFs
Electrical considerations
Other electromagnetic forms of acupuncture stim
12-1 lunch

Section 1 Application: How to combine PEMFs w a/c
1:00-2:00 The Acupuncturist's perspective
2:00-3:00 Maximizing therapeutic benefits of A/C plus PEMFs
Stand alone PEMF treatment
3-3:15 break
3:15-3:45 PEMF system considerations
Understanding healing timelines
Setting expectations
3:45-4:30 Managing Common Conditions
4:30-5:15 Hands on experience
5:15-5:30 Q&A
Close

This workshop will be a blueprint for using PEMFs
to enhance your acupuncture and
achieve much better results
for your patients

Every clinical discipline has limitations

- medicine, surgery, acupuncture, chiropractic, physical therapy, psychology, hypnosis, etc.
- it takes time for any professional to learn the limitations of their discipline – 5-8 yrs typically
- the question then becomes how to expand one's limiting boundaries
- that may mean going outside that specific discipline and adding other modalities – as I did

Multiple paths to healing

- Herbs/supplements
- Nutrition
- Lifestyle
- Psycho-Cognitive
- Activity/exercise
- Tai Chi/Chi Gong
- Rest/sleep

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SOOOOOO!

why should acupuncturists use PEMFs in their practices?

- increasing interest in PEMFs in society in general
- increasing interest by other specialties, especially chiropractic
- practice differentiator
- expand the range of conditions to be managed
- very safe and effective
- improve symptom management/tissue healing at the same time
- intellectually stimulating to learn a new modality
- scientifically well validated
- increase practice revenue

The benefits of combining PEMFs with acupuncture into your practice

- *practice benefits*

- *patient benefits*

the time is right for this integration

Practice benefits

- *increase practice revenue*
- *competitive advantage*
- *easy to use*
- *integrates easily into a practice*
- *no patient prep*
- *hands-off treatments can free doc time*

Practice benefits

- *faster responses*
- *patients feel the magnetic fields*
- *learn something new*
- *cutting-edge therapy*
- *no insurance approvals*
- *solid evidence*

Treatment benefits

- *PEMFs act in synergy with acupuncture effects*
- *PEMFs work much deeper in the body tissues*
- *direct cellular and tissue healing*
- *address stubborn problems better*
- *makes electro-acupuncture better*
- *PEMFs themselves stimulate meridians and points*
- *larger areas of treatment*

3-year-old girl with avulsed thumb

07.12.12
pre-PEMF

08.06.12
post-PEMF

08.27.12
post-PEMF

10.02.12
post-PEMF

my own experiences with PEMFs

- 3-year-old girl with avulsed thumb
- 60-year-old male with gangrenous legs
- numerous research studies in the Power Tools For Health book

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Who am I?

- former family physician, now holistic medicine
- trained in acupuncture through UCLA program for physicians
- also training in:
  functional medicine, nutrition, homeopathy, herbal therapies, energy medicine, healing, color therapy, sound therapy, hypnosis

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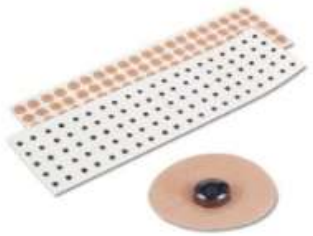
Who am I?

- instrumental in having acupuncturists in Maryland independent of physicians
- working with magnetic fields for ~30 years
- author of 2 books on magnetic field therapies
  - Power Tools for Health:
    how magnetic fields [PEMFs] help you.
  - Magnetic therapy in Eastern Europe:
    a review of 30 years of research.
- authoritative website: DrPawluk.com

My journey

- doing conventional family medicine
- 1985 - 2 patients almost died from G.I. bleeding caused by ibuprofen
- asked the question - there had to be alternatives!
- knew that Eastern cultures used acupuncture
- decided to do training in acupuncture

- finished acupuncture training in 1990
- patients were refusing acupuncture
- looked for alternatives to using needles
- found that little magnets were being used in China, Japan and Korea



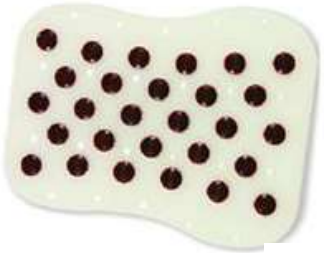
TSUBO-MAG PELLETS

HAND MAGNETS (SJC)

MINI-MAX GP 2.5 MM

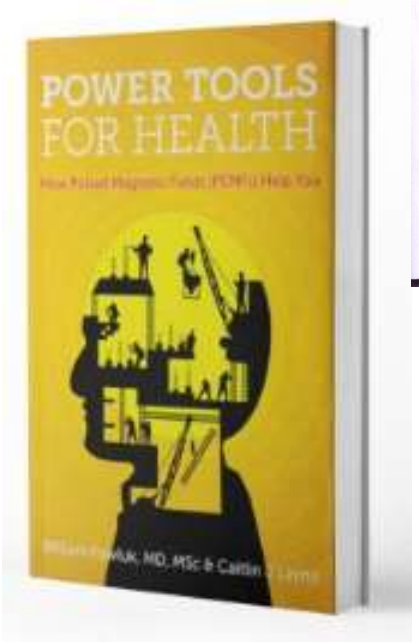
EAR-DOT EZ-100 MAGNETS

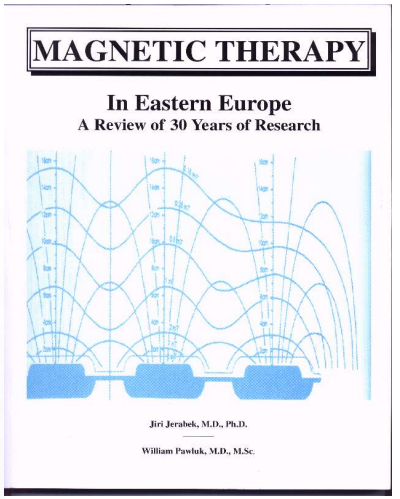
- started using magnets for all sorts of problems
- hand magnetic pellets, ear pellets, necklaces, shoe inserts, magnetic pads, etc.



SCAT™ BAND

- then delved into the science and discovered pulsed PEMFs
- co-authored the book on Eastern European Magnetic Therapy research
- then extensively used PEMFs with better results than static
- 2017 published “Power Tools for Health: how magnetic fields [PEMFs] help you.”





- since 1990 acupuncture has flourished in Maryland and the US in general
- 1990 almost no magnetic field therapy in society
- even now almost none in the acupuncture community

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- I realized there is a fusion between magnetic field (PEMF) therapy and acupuncture
- beyond simply using magnets on acupuncture points for even more effective acupuncture

this is the reason for this workshop

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direct and indirect stimulation

acupuncture is almost entirely indirect stimulation – pushing energy into an acupuncture point and down meridians to exert distal effects

magnetic field therapy is both direct and indirect – more direct tissue and less indirect acupuncture-type, plus other reflex type stimulation

- as I studied the science of acupuncture, I became aware of some of the mechanisms of acupuncture
- research has shown that acupuncture points and meridians have electrical aspects

electrical nature of the Meridian and acupoint system

- a/c system is a “loss-less” DC current system
- a/c point is an electrical vortex
- a/c point as a low electrical resistance area
- a/c point as a high electrical conductance area
- radio tracer pictures of a point/meridian
- Omura’s take on points
- EAV [electroacupuncture according to Voll]

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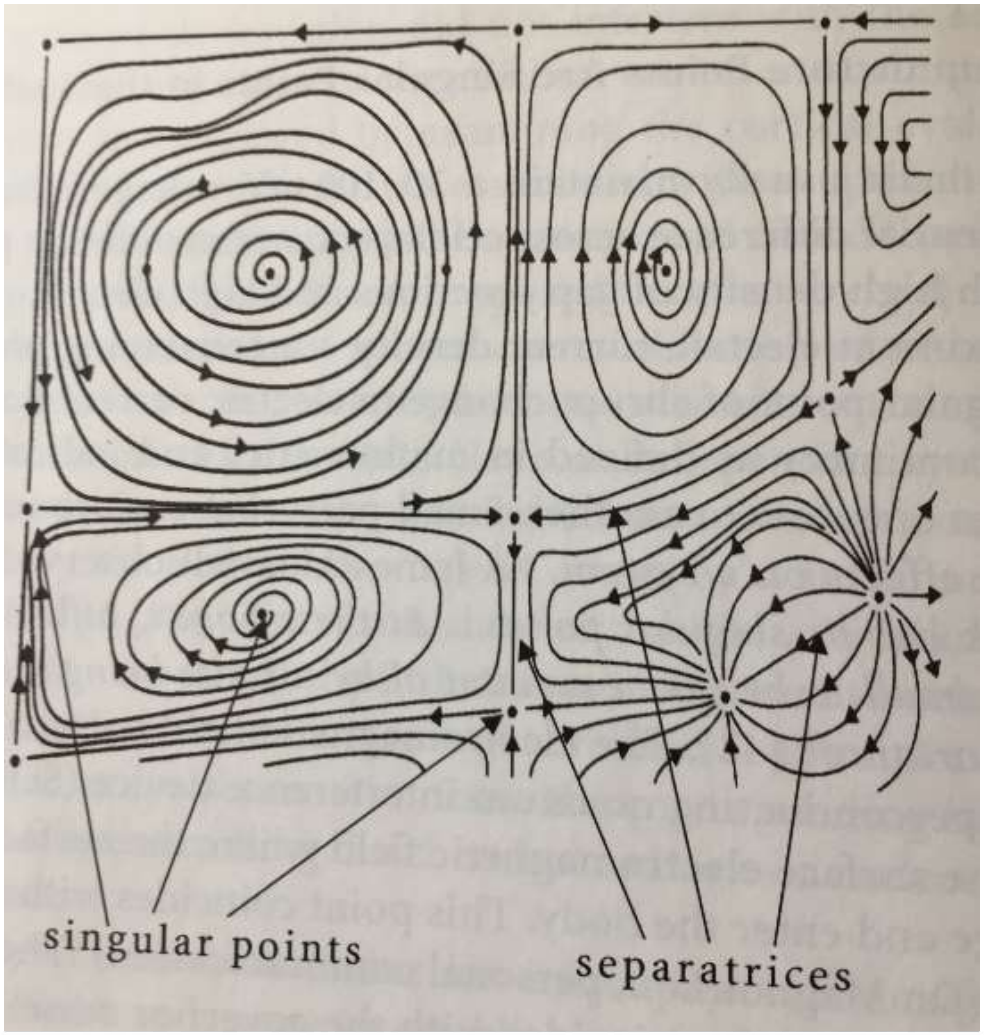
what is an acupuncture point and what is a meridian?

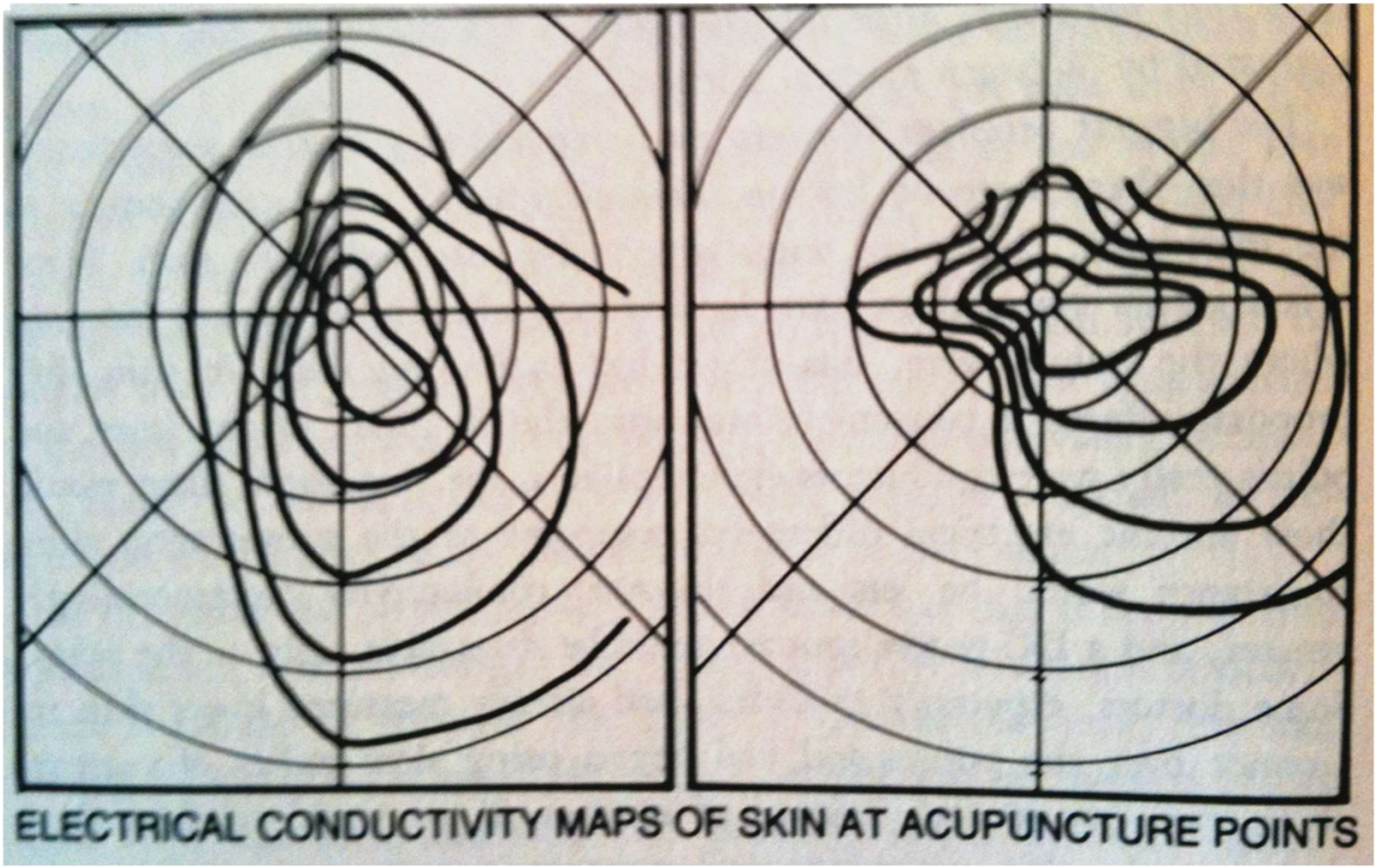
science has been debating these for a long time

what seems to be clear at this point is that there is no specific anatomical structure to define an acupuncture point or meridian

embryologic research suggests that points and meridians exist at variations in anatomic structures where there are electrical and electromagnetic potential differences among surrounding and underlying tissues and tissue structures



The past, present, and future of Meridian system research. C Shang. Chapter 4. Clinical acupuncture: scientific basis. Stuz G and Hammerschlag R, editors. Springer. 2001.



from **Becker, R0 and Selden G. The body electric: electromagnetism and the foundation of life. 1985.**

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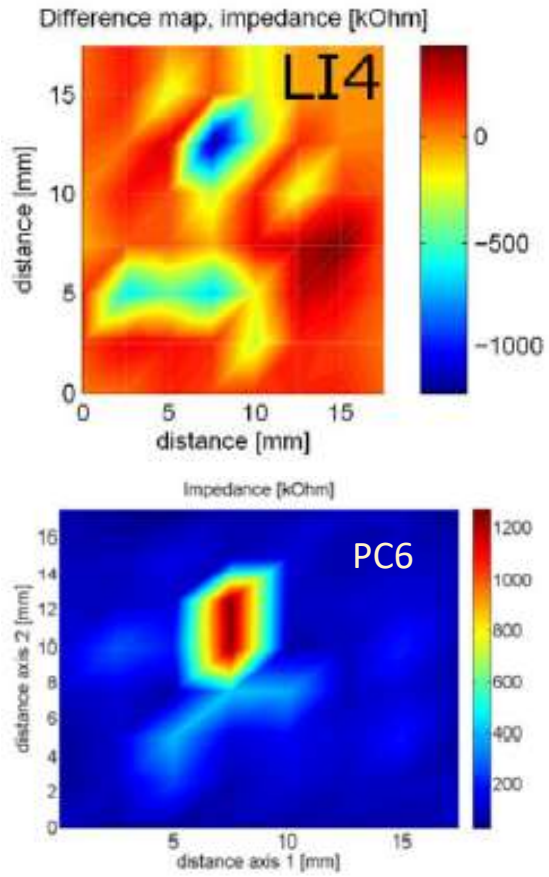
acupuncture point energy vortex

decreased resistance = increased conductivity

Impedance maps of acupuncture points

The experimental protocol includes impedance map measurements before, during, and after EA stimulation of acupuncture system.

Then subtraction of maps obtained after and before stimulation is calculated.



Increased impedance in area of LI4 and PC6.

Teplan M, Kukucka M, Ondrejkovicová A: Impedance analysis of acupuncture points and pathways. Journal of Physics: Conference Series, vol. 329, 2011.

The human skin has a resting potential across its epidermal layer of 90 mV [outside negative, inside positive].

Since acupuncture points have low resistance, they may tend to short-circuit this normal battery across the skin giving rise to a source of current in a “source sink”, in other words, AC points provide a path of least resistance for currents driven by the 90 mV resting potential which exists across the entire skin.

Stux G and Pomeranz B. Acupuncture textbook and Atlas. P 20 – 26. Springer-Verlag 1987.

acupuncture needle = current of injury

- a cut in the skin produces a current of injury due to short-circuiting of the skin battery
- holes made by needles create a current of injury
- needles produce a prolonged decrease in local skin resistance
- a needle hole can create a sufficient current of injury equivalent to 10 µA
- this is precisely the amount of current which can promote nerve growth and limb regeneration

Stux G and Pomeranz B. Acupuncture textbook and Atlas. P 20 – 26. Springer-Verlag 1987.

research has shown that not all classical acupuncture points identified anatomically are electrically sensitive locations

using a point sensor may be more accurate in identifying an acupuncture point. A “true” point may be close but not in the classic anatomic position

Dr. Y Omura has shown the same issue with the stomach 36 point. He was 1st to do a/c anesthesia in a US hospital.

Pointer-Pal™ Point Locator

Phys Med Biol. 2009 May 7;54(9):N143-50. doi: 10.1088/0031-91

Do acupuncture points exist?

Yan X[1], Zhang X, Liu C, Dang R, Huang Y, He W, Ding G.

synchrotron x-ray fluorescence analysis probed distribution of 4 elements in/around A/C points, two each forearm and lower leg. 3/4 points had elevated Ca, Fe, Cu and Zn vs surrounding tissue.

“the mapped distribution of these elements implies that each point seems to be elliptical with the long axis along the meridian.”

3D topographic structures of acupuncture points were investigated by using synchrotron radiation in-line X-ray phase contrast CT.

Zhongji (RN3) and Zusanli (ST36) had accumulation of microvessels at each point region

tissues surrounding acupuncture points do not show such structures. This is the first time that 3D images have revealed there may be specific structures around a/c points

Synchrotron radiation phase-contrast X-ray CT imaging of acupuncture points. Zhang D, Yan X, Zhang X, et al. Anal Bioanal Chem. 2011 Aug;401(3):803-8.

radio tracer study

the detected radioactive pathways were found not to be the result of diffusion of a radio tracer through nerves, veins, or lymphatic vessels but to coincide with the acupuncture meridians

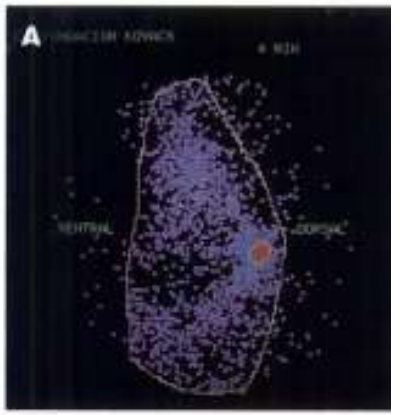


FIGURE 1. Radioactive image obtained 4 min (A) and 25 min (B) after hypodermic injection of ^{99m}Tc into a control point.

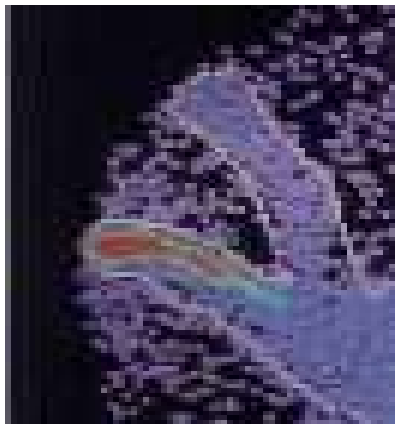
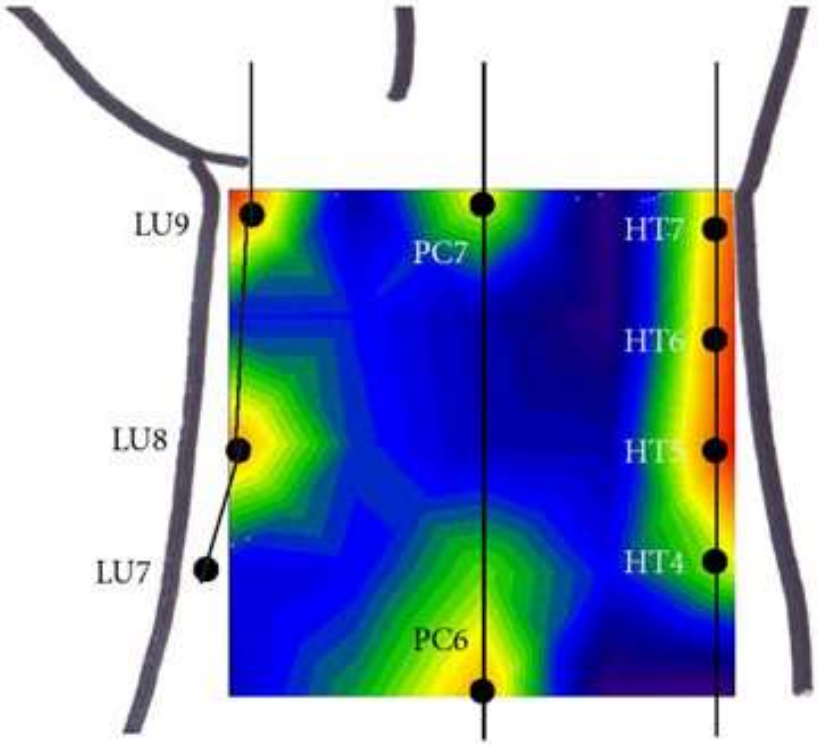


FIGURE 8. Radioactive pathway obtained 4 min after hypodermic injection of ^{99m}Tc into a test point.

Experimental study on radioactive pathways of hypodermically injected technetium-99m. Kovacs FM, Gotzens V, García A, García F, et al. J Nucl Med. 1992 Mar;33(3):403-7.



Research Article

Heterogeneity of Skin Surface Oxygen Level of Wrist in Relation to Acupuncture Point

Minyoung Hong,[1] Sarah S. Park,[2] Yejin Ha,[2] Jaegeun Lee,[1] Kwangsik Yoo,[1] Gil-Ja Jhon,[2] Minah Suh,[1,3] and Youngmi Lee[2]

The regions showing relatively higher pO2 levels compared to the other regions showed a strong correlation to the positions of acupuncture points for all five subjects.

Evid Based Complement Alternat Med. 2012;2012:106762.

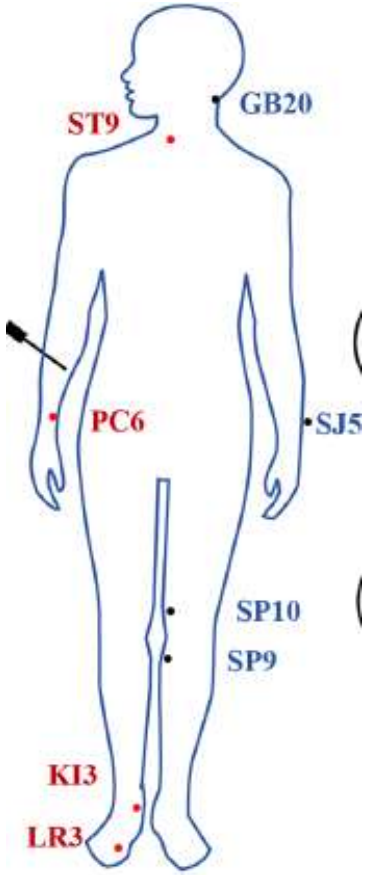
Are there unique anatomical structures at acupuncture points?

1. 71% of AC points are trigger points
2. large peripheral nerves
3. nerves going from deep to superficial
4. cutaneous nerves from deep fascia
5. nerves in bone foramina
6. neuromuscular motor points
7. blood vessels at neuromuscular attachments
8. nerves of varying sizes
9. bifurcating peripheral nerves
10. ligaments
11. suture lines of the skull

Conclusion: no particular or specific anatomic structure dominates at acupuncture points

but … acupuncture anesthesia is abolished by local anesthetics injected into an acupuncture point before stimulation, suggesting nerves are at least some part of the therapeutic benefit

metabolites produced by active versus inactive point treatments



ATG	Baseline	After	P value
Sucrose	19.8	**1.88**	<0.08
Cellobiose	429.2	**87.28**	<0.08
Glycine	1482	**825.6**	<0.08
Hypoxanthine	3.73	**25.14**	<0.08
Hexanoic acid	53.83	**184.4**	<0.08
ketoglutaric acid	5.04	**1.34**	<0.08
Threonine	3.57	**8.36**	<0.08
Uric acid	17.61	**45.03**	<0.08
ITG			
ketoglutaric acid	5.16	**21.95**	<0.08

Active Acupoints Differ from Inactive Acupoints in Modulating Key Plasmatic Metabolites of Hypertension: A Targeted Metabolomics Study. Yang M, Yu Z, Chen X, et al. Sci Rep. 2018 Dec 13;8(1):17824.

Mol. Cells, Vol. 25, No. 2, pp. 178-183

Molecules and Cells
©KSMCB 2008

Molecular Changes in Remote Tissues Induced by Electro-Acupuncture Stimulation at Acupoint ST36

Molecular changes in remote tissues induced by electro acupoint to stimulation at acupoint ST 36

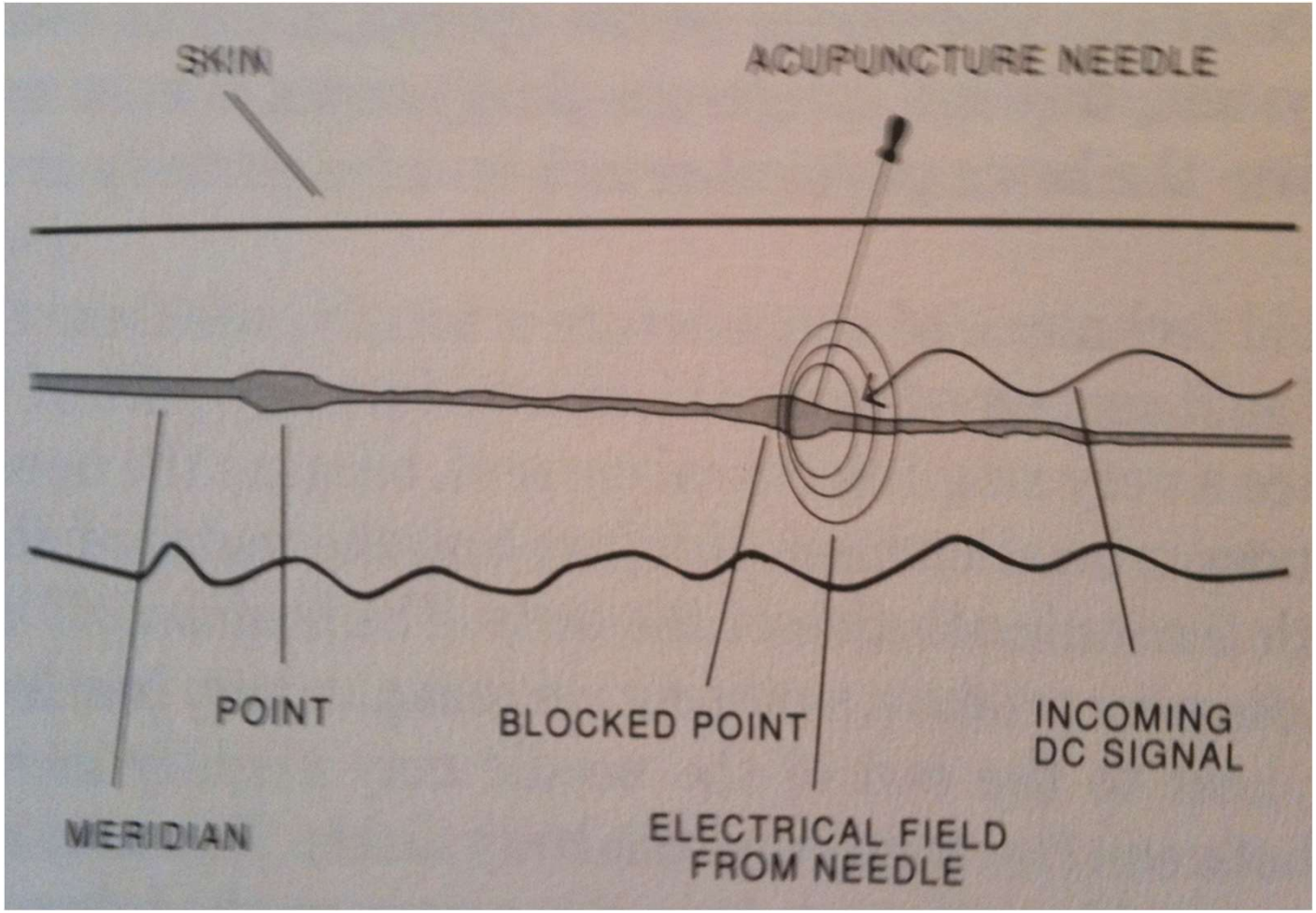
EA treatment increased NK activity in the spleen by 44%. Induced genes related to pain including 5 HTP receptor, endothelin receptor in the hypothalamus, superoxide dismutase in the hypothalamus, liver and red blood cells.

Mol Cells. 2008 Apr 30;25(2):178-83. Molecular changes in remote tissues induced by electro-acupuncture stimulation at acupoint ST36. Rho SW, Choi GS, Ko EJ, et al.

Omura – Professor Yoshiaki Omura, M.D., Sc.D
father of the bi-digital O-ring test

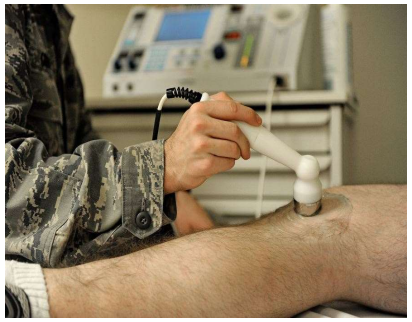
his take on points

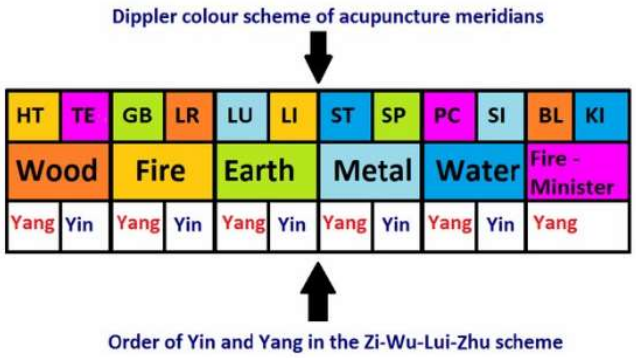
- according to Dr. Omura, using AK resonance techniques, a/c points are like wells, loaded with various biochemical substrates
- when the a/c point is stimulated, the contents are released into the surrounding channels, vessels, and nerves, to create their downstream actions
- it takes 48 to 72 hours for these acupuncture points to regenerate their content, to allow re-stimulation



other electromagnetic forms of acupuncture stim

- color
- ultrasound
- microwaves
- laser





https://www.researchgate.net/publication/267101587_Cosmic_mechanism_of_life/figures?lo=1

other electromagnetic forms of acupuncture stim

- Estim
    - Estim general vs over acupuncture points
    - Estim and charge entering DC system

Electroacupuncture

TENS - transcutaneous electrical nerve stimulation

POINTER EXCEL II LT™
STIMULATOR

PENS – percutaneous electrical nerve stimulation

Systems of Estim

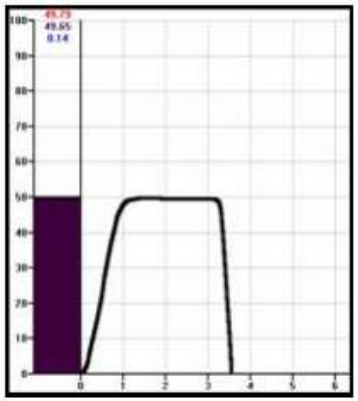
- EAV - Electroacupuncture According to Voll
  - also called EDS (Electro-Dermal Screening) or MSA (Meridian Stress Assessment)
- Ryodoraku

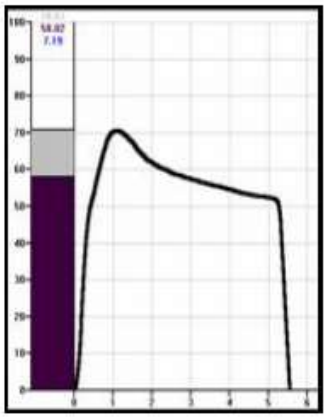
In the late 1940's, a German medical doctor and engineer, Dr. Reinhard Voll, began researching and proving an innovative testing method now known as EAV

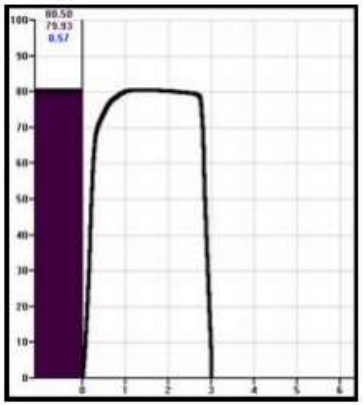
Voll was experimenting with the effects of electricity on the human body. He used a technique known as Electrical Conductivity Metering.
Electricity flows very easily through some materials making them very electrically conductive.
“Conductivity Meters” measure the electrical conductance of different materials.
The body has a large volume of electrically conductive fluids within it.

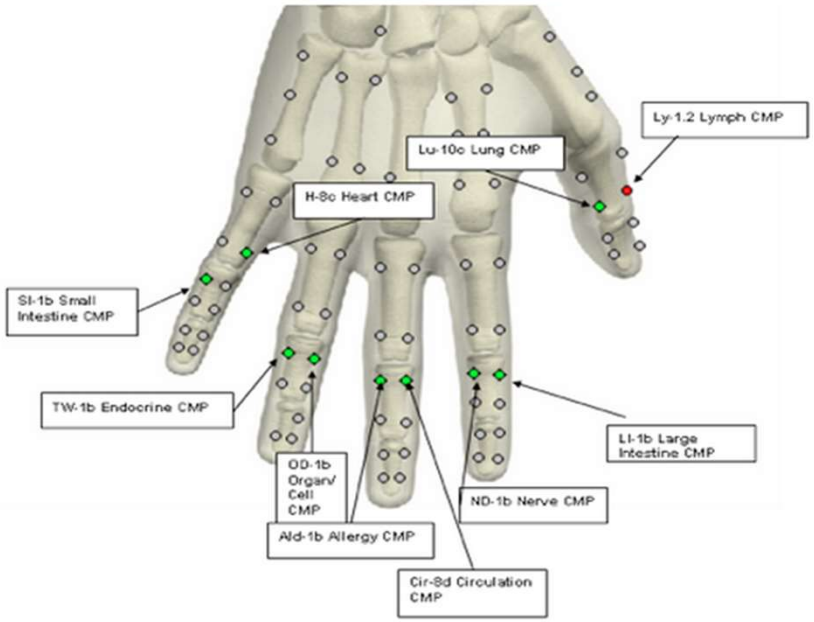
The electrical conductance on any general area of the human body has a fairly low level of electrical conductivity. But, the skin is very resistant to electrical current. At certain specific locations on the body, electrical flow was much more conductive than others. The points found by Voll to be higher in electrical flow corresponded to the acupuncture points and meridians.

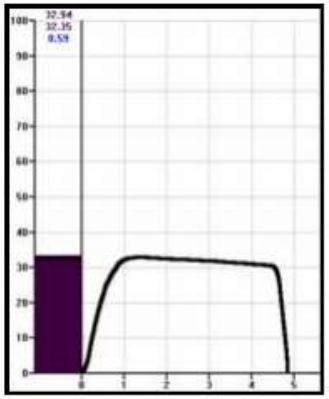
- Voll was experimenting with the effects of electricity on the human body
- he used a technique known as Electrical Conductivity Metering
- electricity flows very easily through some materials making them very electrically conductive
- “conductivity meters” measure the electrical conductance of different materials
- the body has a large volume of electrically conductive fluids within it








Ly-1.2 Lymph CMP
Lu-10c Lung CMP
H-8c Heart CMP
SI-1b Small Intestine CMP
TW-1b Endocrine CMP
OD-1b Organ/ Cell CMP
Ald-1b Allergy CMP
Cir-8d Circulation CMP
ND-1b Nerve CMP
LI-1b Large Intestine CMP



Am J Chin Med. 2014;42(5):1111-21. doi: 10.1142/S0192415X14500694. Epub 2014 Aug 29.

Electrodermal screening of biologically active points for upper gastrointestinal bleeding.

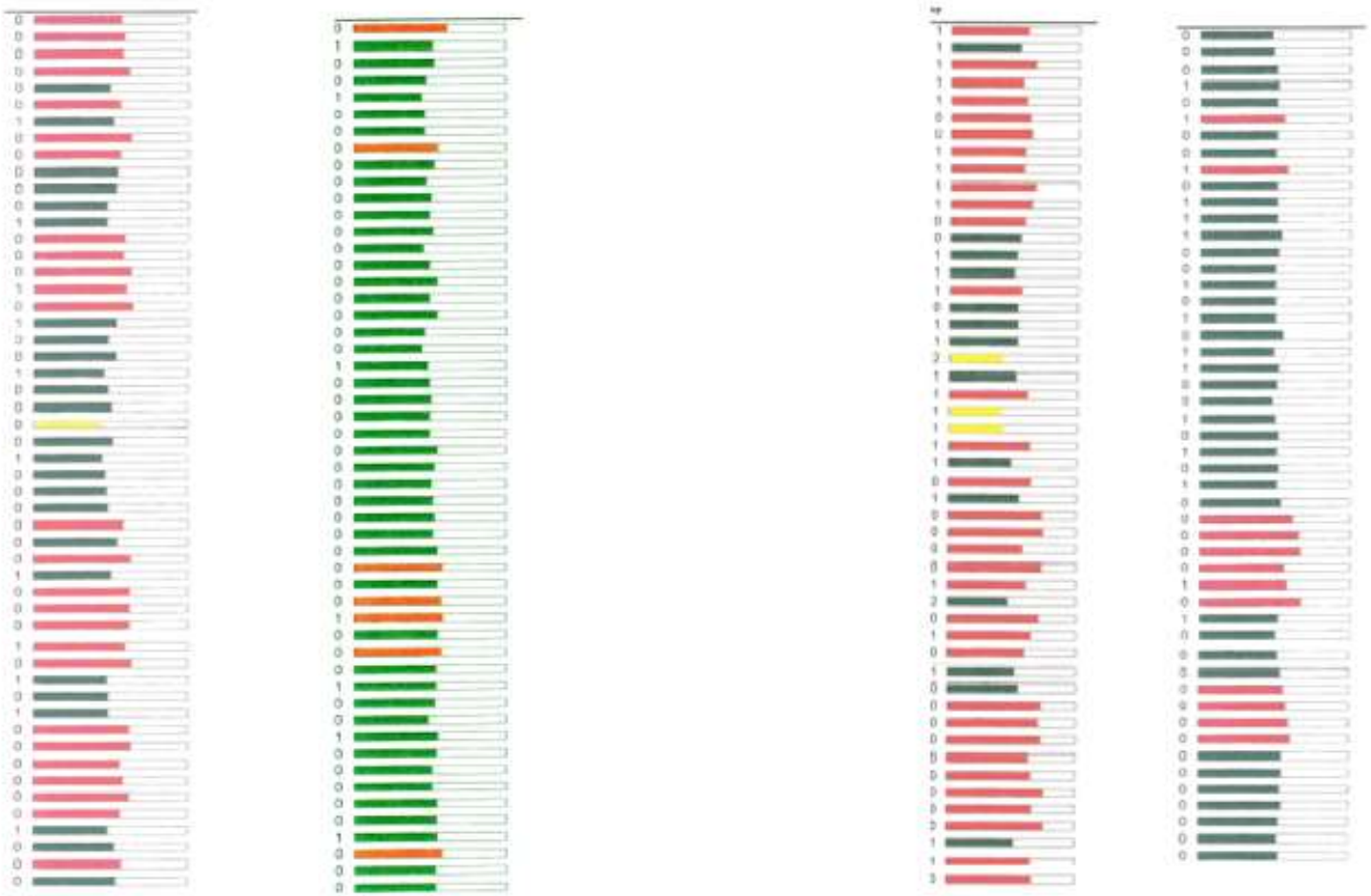
Tsang YJ[1], Hu WL, Hung IL, Hsieh CJ, Hung YC

⊕ Author information

Abstract

The purpose of this case-control study was to investigate the relationship between the electrical resistance of the skin at biologically active points (BAPs) on the main meridians and upper gastrointestinal bleeding (UGIB). Electrical resistance to direct current at 20 BAPs on the fingers and toes of 100 patients with (38 men, 12 women; mean age [range], 58.20 ± 19.62 [18-83] years) and without (27 men, 23 women; 49.54 ± 12.12 [22-74] years) UGIB was measured through electrodermal screening (EDS), based on the theory of electroacupuncture according to Voll (EAV). Data were compared through analysis of variance (ANOVA), receiver operating characteristic (ROC) curve analysis, and logistic regression. The initial readings were lower in the UGIB group, indicating blood and energy deficiency due to UGIB. Significant differences in indicator drop values were observed at nine BAPs ($p < 0.05$) on the bilateral small intestine, bilateral stomach, bilateral circulation, bilateral fibroid degeneration, and right lymph meridians. The area under the ROC curve values of the BAPs on the bilateral small intestine and stomach meridians were larger than 0.5, suggesting the diagnostic accuracy of EDS for UGIB on the basis of the indicator drop of these BAPs. Logistic regression revealed that when the indicator drop of the BAP on the left stomach meridian increased by one score, the risk of UGIB increased by about 1.545-3.523 times. In conclusion, the change in the electrical resistance of the skin measured by EDS at the BAPs on the bilateral small intestine and stomach meridians provides specific information on UGIB.

EAV Test Results before and after PEMF



Ryodoraku Acupuncture

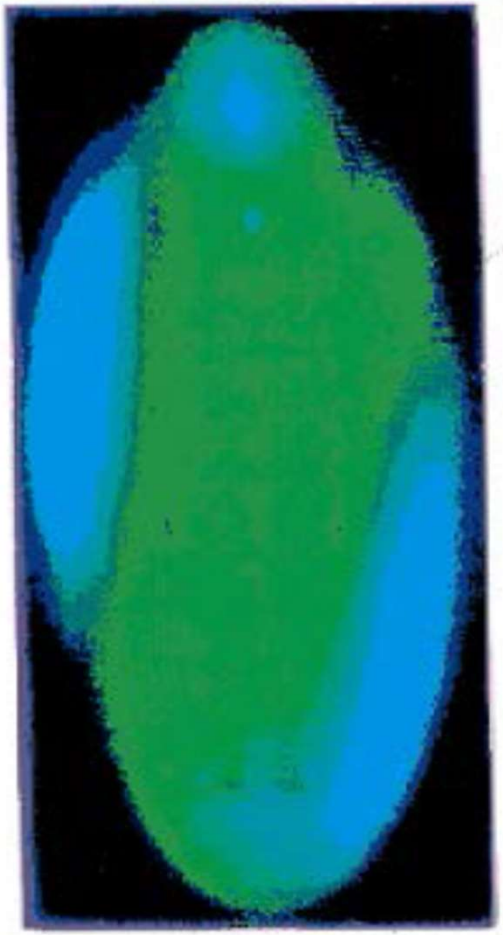
Research References

- Meridian Electrical Properties
- Meridian Anatomy
- Measurement Reliability
- Correlation with Disease
- Measurement Issues

https://www.ryodorakuresearch.com/references.php

electroacupuncture (EA) can be significantly more dynamic in action than standard manual acupuncture, and probably more so than other forms of acupuncture point stimulation, by virtue of injecting current into a meridian and by increasing the voltages induced by cell injury

AURA VIDEO STATION



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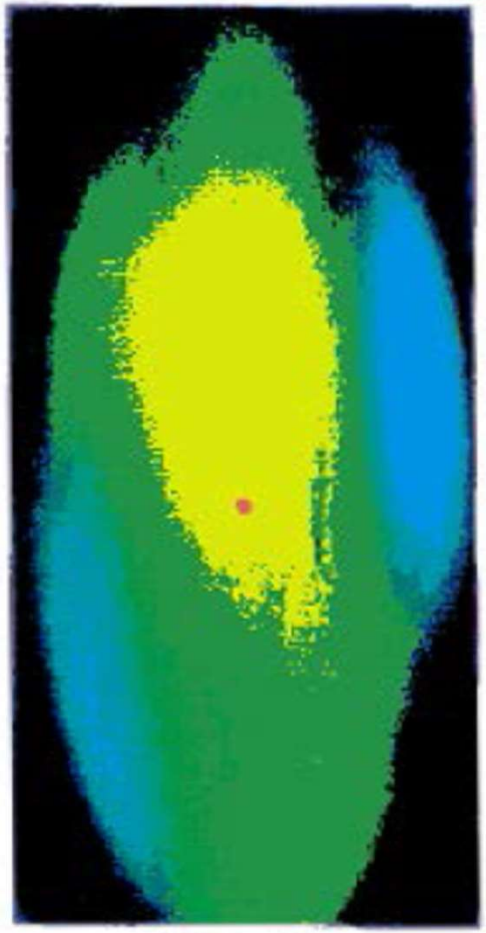

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Meridians

Meridians are distributed along the boundaries between different muscles:

- lung meridian – borders of biceps and brachioradialis
- pericardium between palmaris longus and flexor carpi radialis
- gallbladder – sternocleidomastoid and trapezius
- GV and CV – axis of symmetry on the body surface
- trigger points – free borders of muscles

The past, present, and future of Meridian system research. C Shang. Chapter 4. Clinical acupuncture: scientific basis. Stuz G and Hammerschlag R, editors. Springer. 2001.

A Channel as a Transmission Line

Based on the concept that current flows along the low-resistance path and the equations of transmission line theory, we propose an electromagnetic model of the channel as a possible mechanism for the Chinese meridian system.

The First Postulate

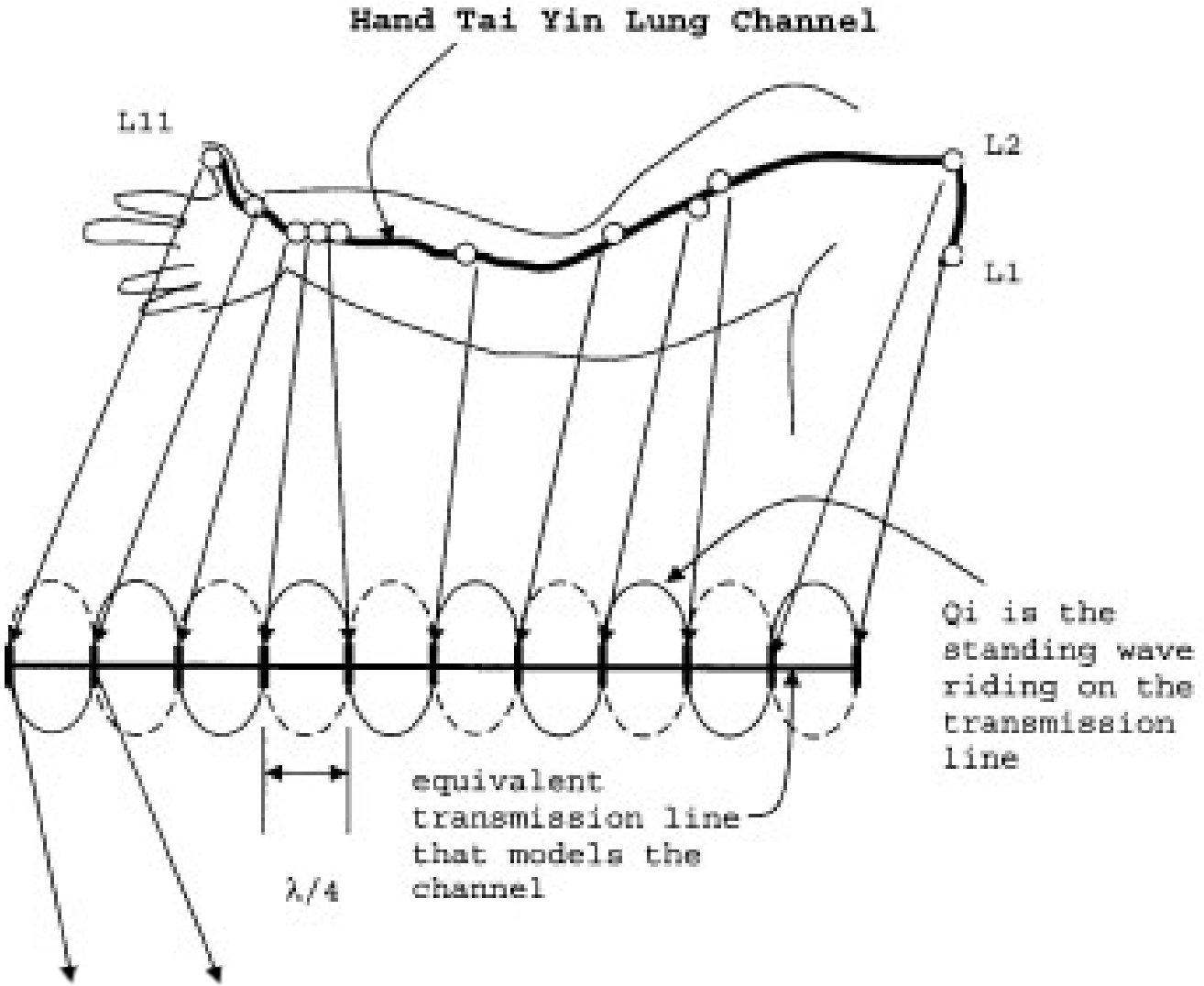
A meridian channel is equivalent to a lossless electromagnetic transmission line and Qi is equivalent to the standing wave riding on the line, with acupoints as its nodes. The Qi standing wave within each segment of the channel separated by acupoints is in natural oscillation, thus the segment behaves as a series RLC resonator and is analyzed as a λ/4 open circuit.

A birdcage model for the Chinese Meridian System: part I. A channel as a transmission line. Yung KT et al. Am J Chin Med. (2004)

An RLC circuit is an electrical circuit consisting of a resistor (R), an inductor (L), and a capacitor (C), connected in series or in parallel.

The circuit forms a harmonic oscillator for current. Introducing the resistor increases the decay of these oscillations, which is also known as damping. The resistor also reduces the peak resonant frequency. Some resistance is unavoidable in real circuits.

RLC circuits have many applications as oscillator circuits. Radio receivers and television sets use them for tuning to select a narrow frequency range from ambient radio waves.



A birdcage model for the Chinese Meridian System: part I. A channel as a transmission line. Yung KT et al. Am J Chin Med. (2004)

a time-varying field outside the body is an emitted electromagnetic wave with an appropriate frequency so that its energy is absorbed …. the EM energy emitted by a (magnetic field generator) may be absorbed by (a) … person's birdcage (the so-called Er-Yin-Hui-Shen phenomenon); if the two circuits are synchronized in frequency and in phase, i.e. a case of coupled oscillation between two oscillators … energy exchange occurs

A birdcage model for the Chinese Meridian System: part III. Possible mechanism of magnetic therapy. Am J Chin Med. 2005;33(4):589-97.

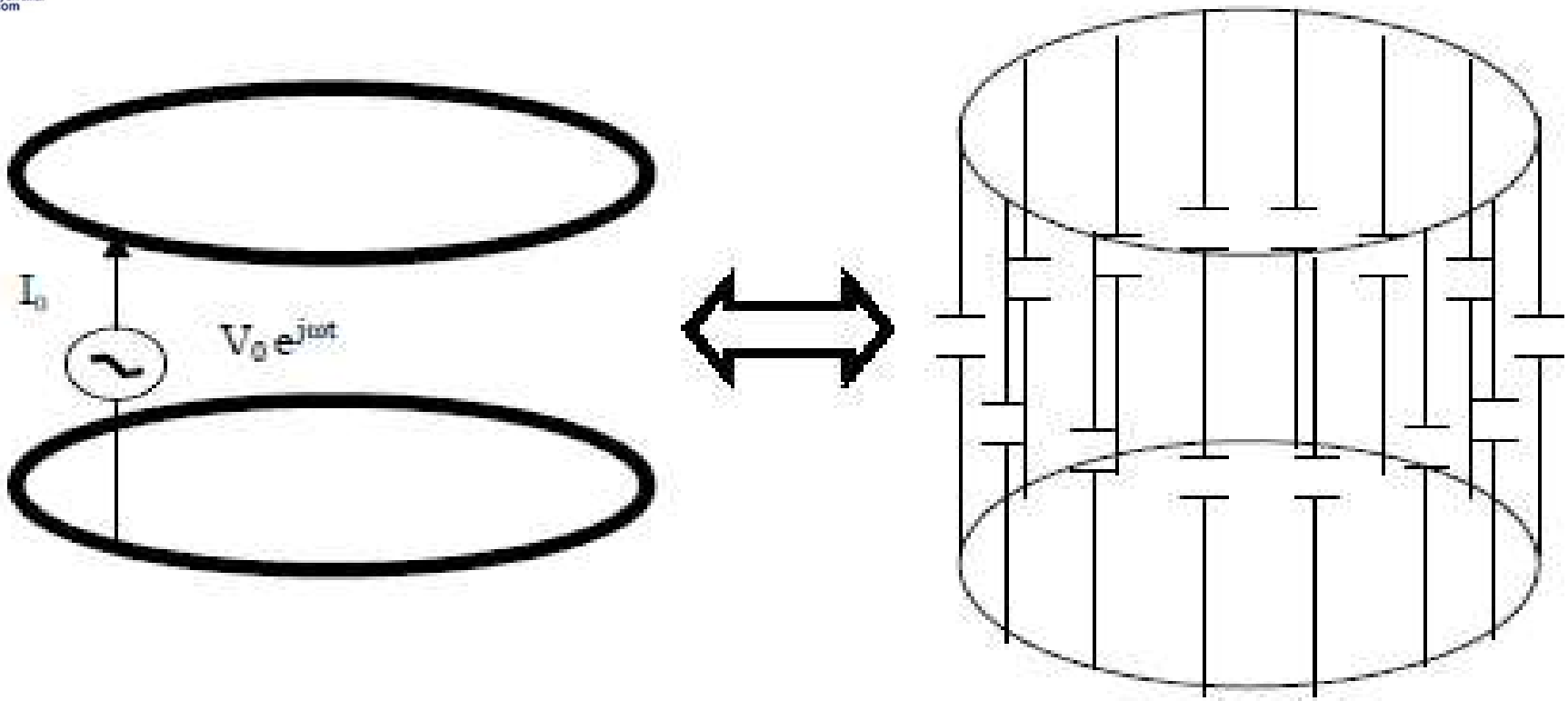


Figure 1. The Meridian System as a whole is one grand transmission line (left), like a ring without ending, and is analyzed (right) as a 28-leg low pass birdcage coil (only 14 legs are shown). Each leg of the birdcage represents one channel and is analyzed as a lossless transmission line itself. The feed voltage $V_0 e^{j\omega t}$ generates a current I_0 from all internal organs with a frequency of f_{50}.

A birdcage model for the Chinese meridian system: part II. The meridian system as a birdcage resonator. Yung KT. Am J Chin Med. 2004;32(6):985-97.

The Fourth Postulate

Since the total capacitance or inductance of a channel is the sum of those of the individual segments, needling certain acupoints of one channel affects electromagnetic-mechanical properties of nearby segments as well as the entire channel, constituting a remote effect on segments at other locations along the same channel, even the entire birdcage.

A birdcage model for the Chinese meridian system: part III. Possible mechanism of magnetic therapy. Yung KT. Am J Chin Med. 2005;33(4):589-97.

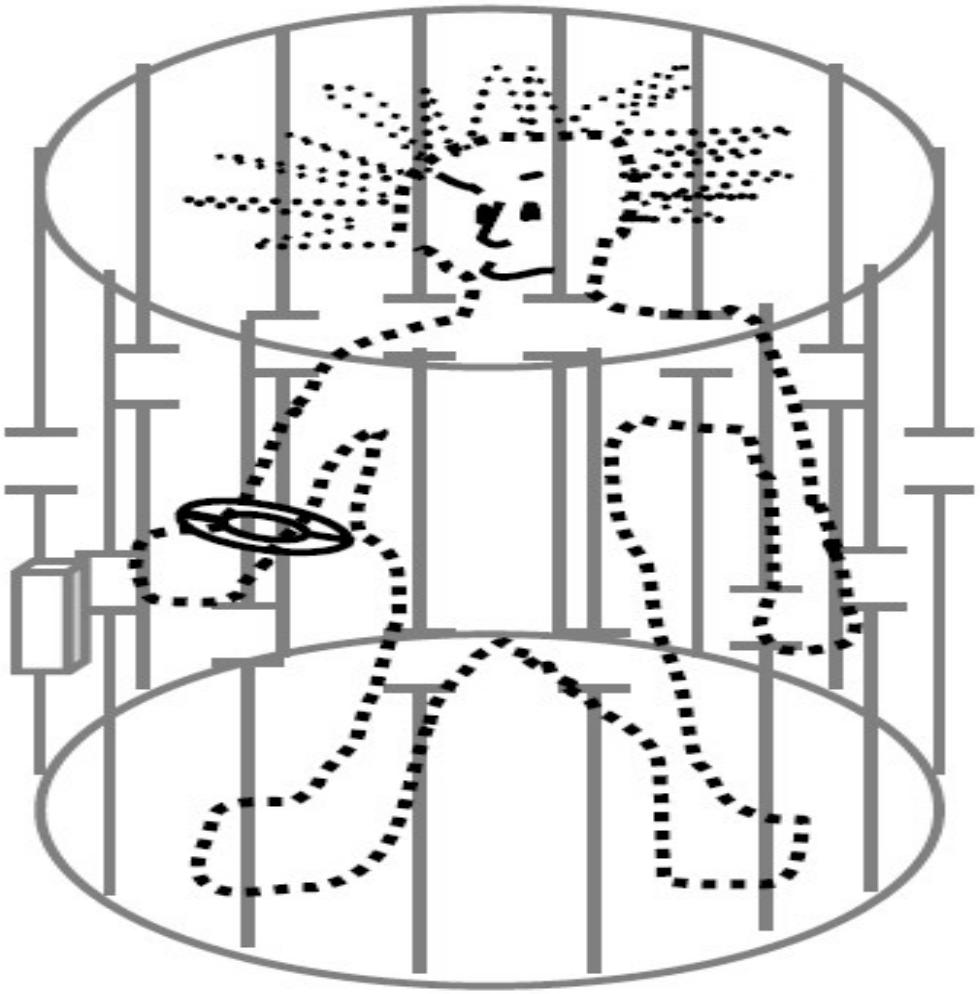


Figure 1. A birdcage coil (in light color) is imposed on a human body (in dark color) wearing a bracelet magnet on her right wrist. The presence of this strong magnet will greatly influence current flows on the six channels that run through her wrist.

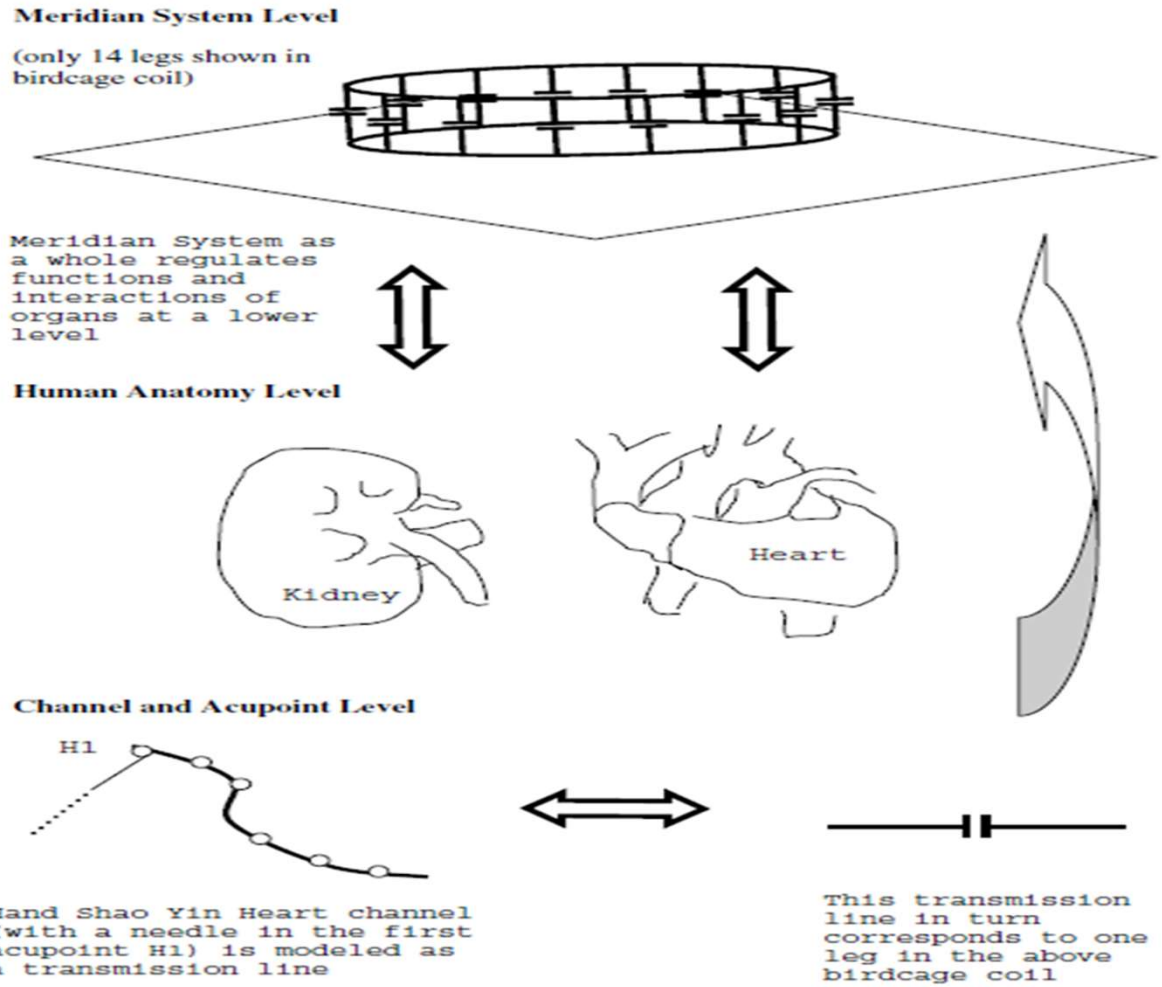


Figure 1. The jing luo network is the most fundamental system of the body, governing the collective functions of all internal organs. Functions of and interactions among organs at the human anatomy level, such as that between the heart and the kidney, are regulated at the meridian system level above, whose functions are represented by the birdcage coil.

birdcage model for the Chinese Meridian System references

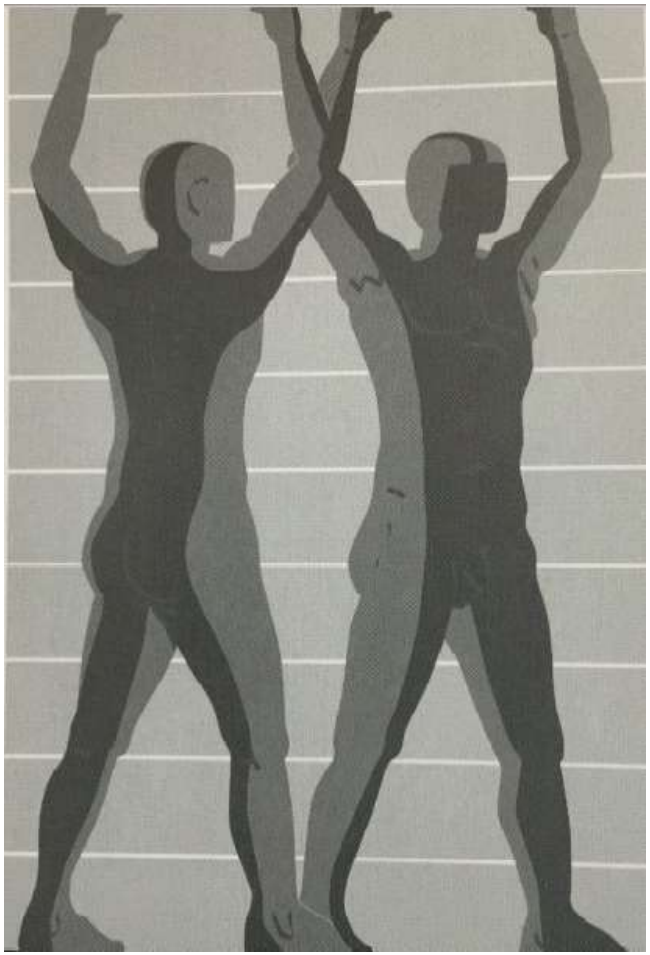
A birdcage model for the Chinese Meridian System: part I. A channel as a transmission line. Yung KT. Am J Chin Med. 2004;32(5):815-28.

A birdcage model for the Chinese meridian system: part II. The meridian system as a birdcage resonator. Yung KT. Am J Chin Med. 2004;32(6):985-97.

A birdcage model for the Chinese meridian system: part III. Possible mechanism of magnetic therapy. Yung KT. Am J Chin Med. 2005;33(4):589-97.

A Birdcage model for the Chinese meridian system: part IV. meridians as the primary regulatory system. Yung KT. Am J Chin Med. 2005;33(5):759-66.

Tendinomuscular Meridians - Yang Example



- where there's charge or electrical conductivity there is magnetic field action
- according to the laws of physics, Faraday's law, the 2 aspects, electro and magnetic are inseparable
- even manual acupuncture is electroacupuncture because the whole a/c point and meridian system is electric
- PEMF therapy amplifies "electro"-acupuncture

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BREAK

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magnetic field therapy

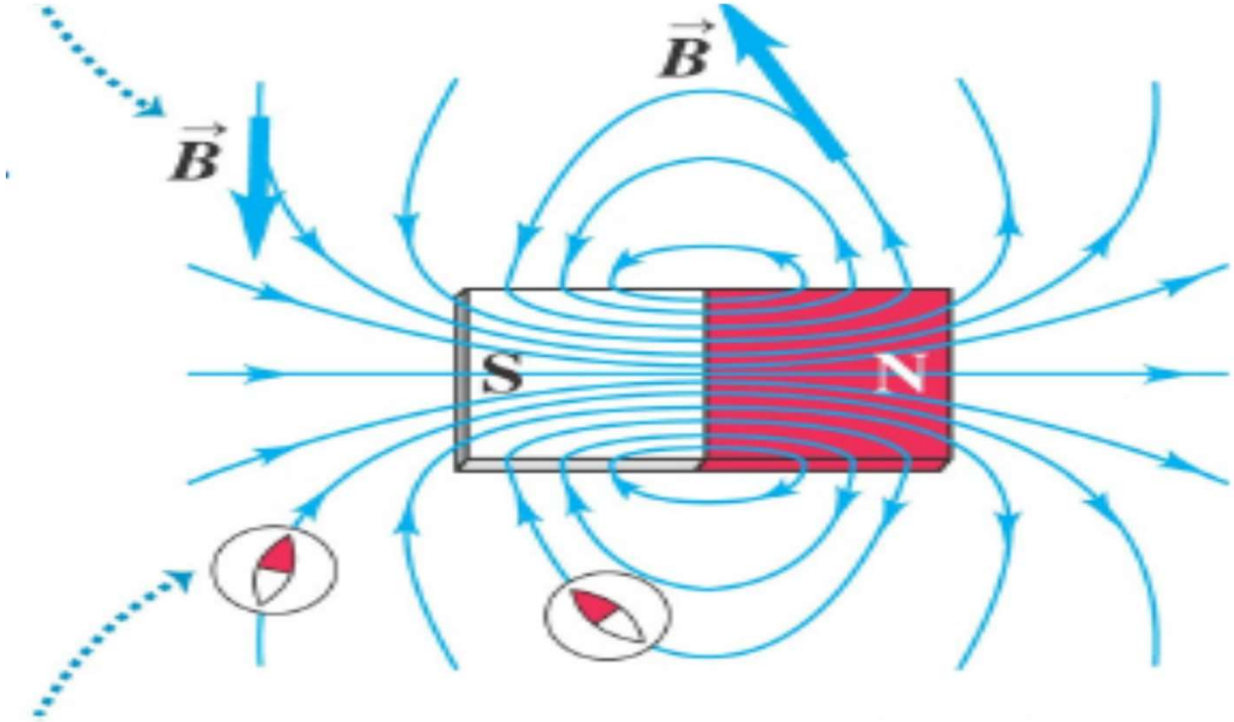
advantages of magnetic field therapy

- non-toxic
- non-invasive
- stimulates body's own capacity
- for healing
- re-usable
- natural – effects electromotive actions in the body
- home or professional use
- complementary to other therapies
- biologic evidence

nature of PEMFs

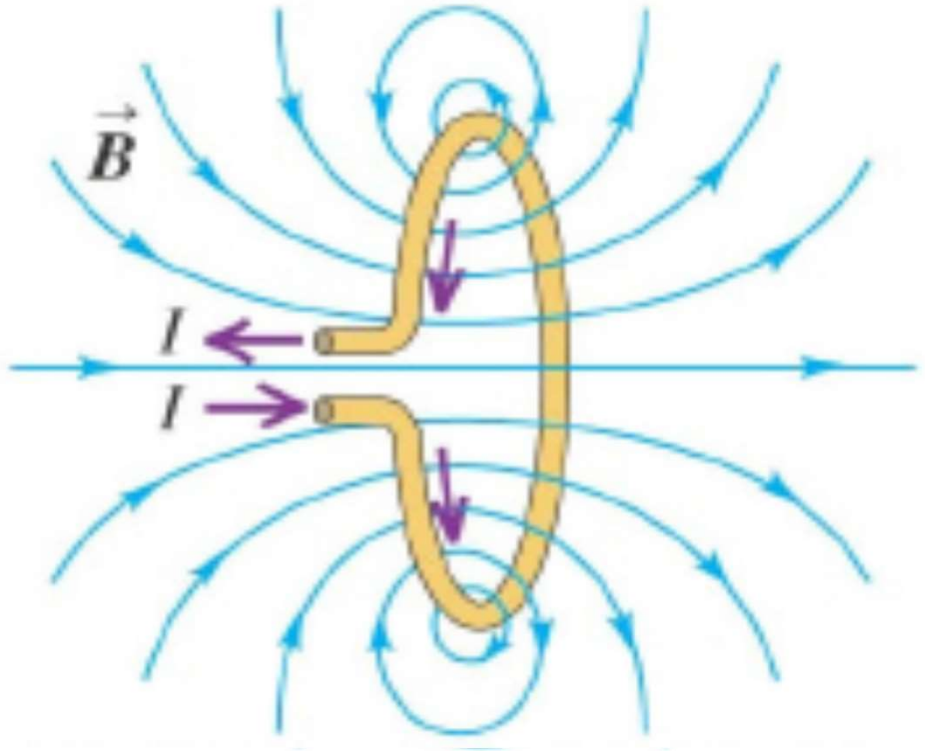
- what PEMFs are
- how PEMFs are generated
- the critical inverse square law
- basic actions of magnetic fields
- biologic actions of magnetic fields
- adenosine and inflammation

static or permanent magnetic fields



the field lines have no flow – they just have direction

pulsed electromagnetic (PEMF) magnetic fields



the field lines flow – and they have direction

https://physics.ucf.edu/~roldan/classes/Chap27_PHY2049.pdf

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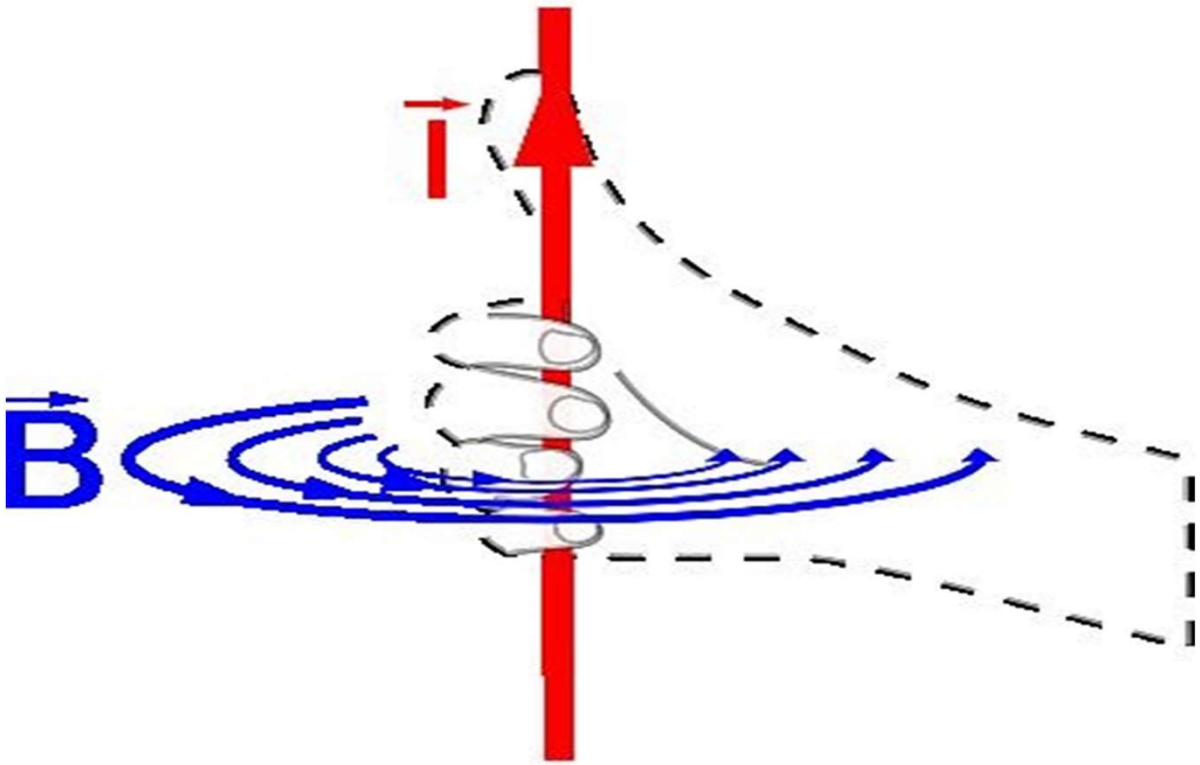
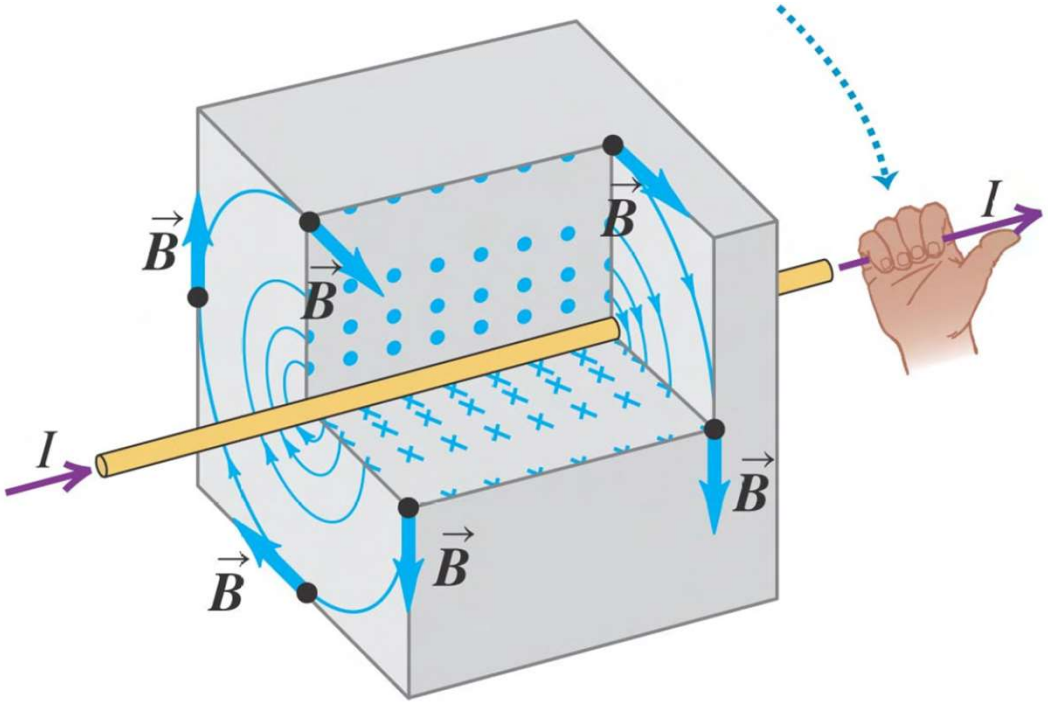
right hand rule



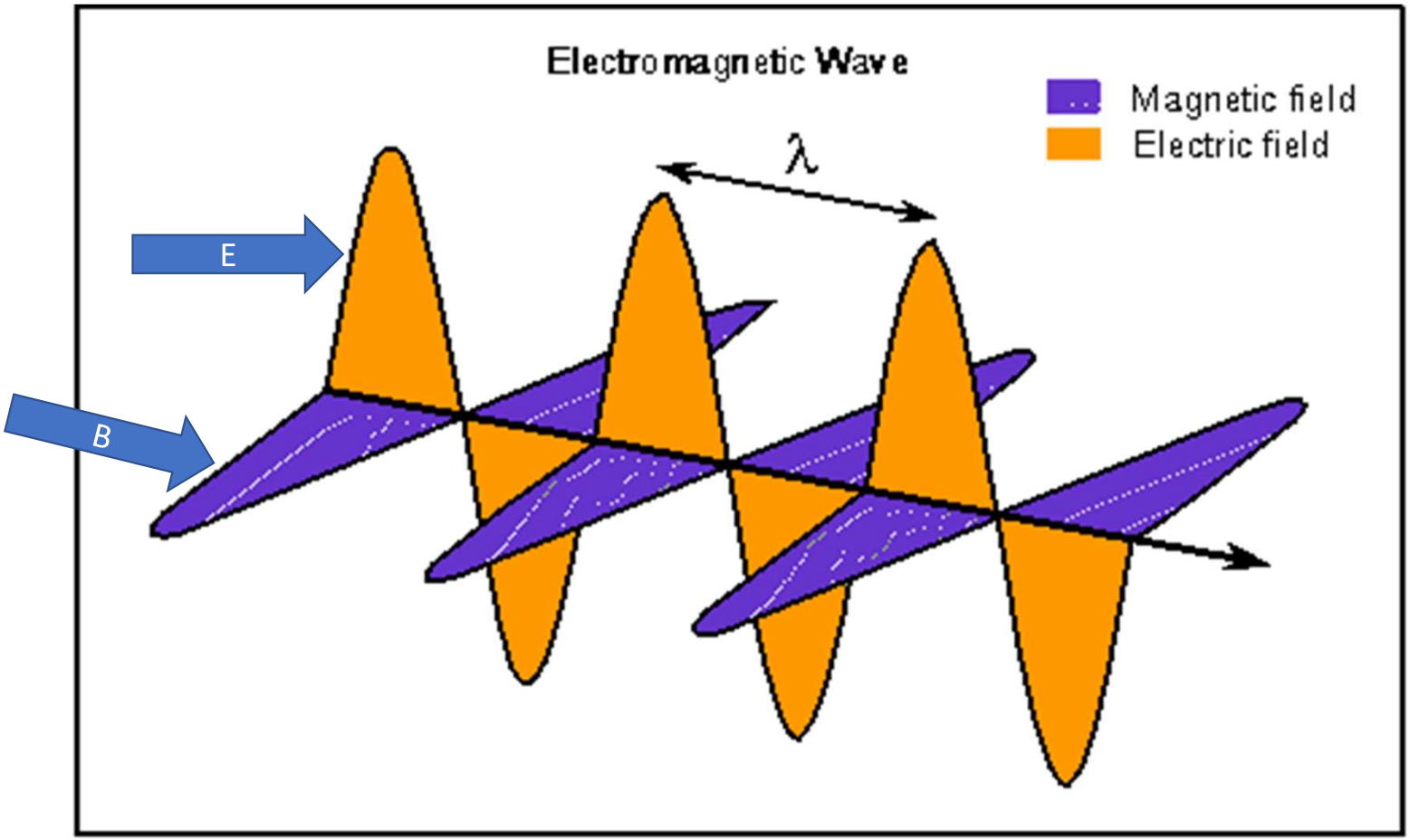
I = electric current and B = magnetic field

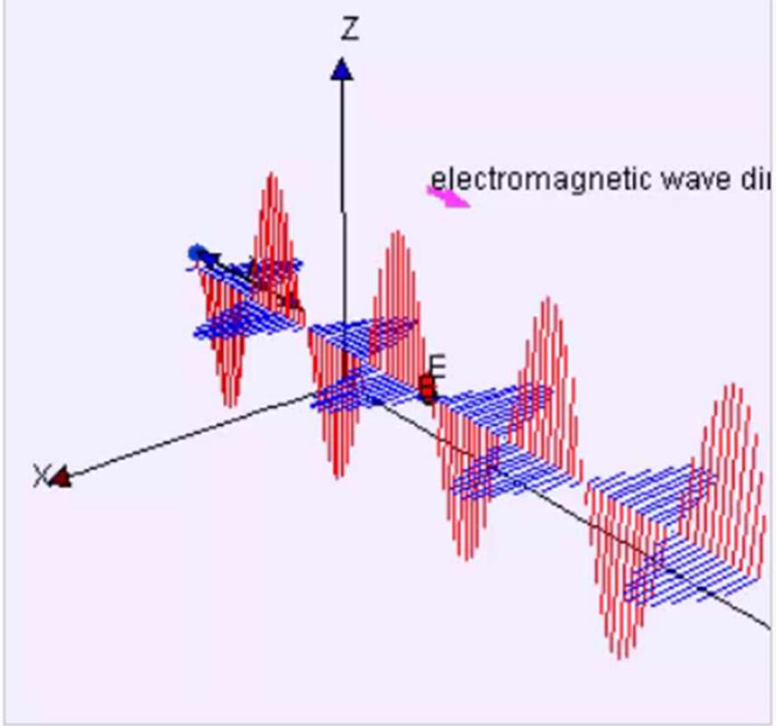
right hand rule



magnetic field lines encircle the current that acts as their source
they form closed loops and never have end points

https://physics.ucf.edu/~roldan/classes/Chap28_PHY2049.pdf


Electromagnetic Wave
Magnetic field
Electric field
λ
E
B



An alternate view of the wave shown above.

biologic and therapeutic issues to consider

- flux density
- gradient
- frequency
- shape
- dB/dT
- pulse
- polarity
- duration
- exposure duration
- volume of tissue
- localization
- vector

applying a pulsed magnetic field to a body is like throwing a stone in a pond … the “waves” – down stream effects – go on and on for a long time

the body is transparent to a low frequency or DC magnetic field

nothing in the body stops, slows or uses up a magnetic field

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intensity

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magnetic field strengths

Tesla		10000 gauss (g)	1gauss=
mT	milliTesla	$1x10^{-3}T=10g$	0.1mT
µT	microTesla	$1x10^{-6}T=0.01g$	100uT
nT	nanoTesla	$1x10^{-9}T=0.00001g$	100000nT
pT	picoTesla	$1x10^{-12}T=0.00000001g$	100000000pT

Earth ~0.5 gauss (50 µT or 0.05 mT)
body ~10 nT to 100 pT
static magnets ~ 1-200 mT

clinical device magnetic field strengths

Tesla – MRI, TMS, high intensity PEMFs
pT – Jacobson
μT – most whole body systems
mT – local & whole body

Carl Friedrich Gauss

German mathematician/physicist

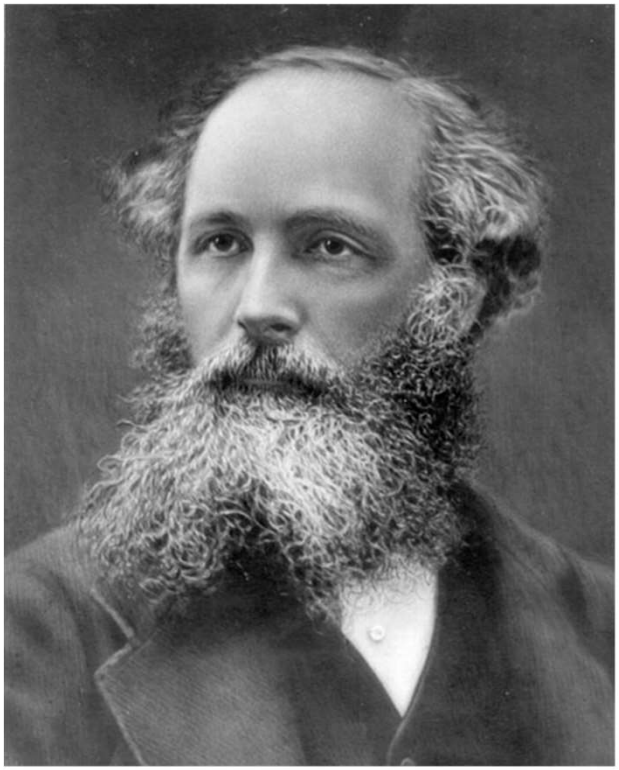
1777 - 1855

gauss, G, cgs unit of magnetic field B also "magnetic flux density", or "magnetic induction

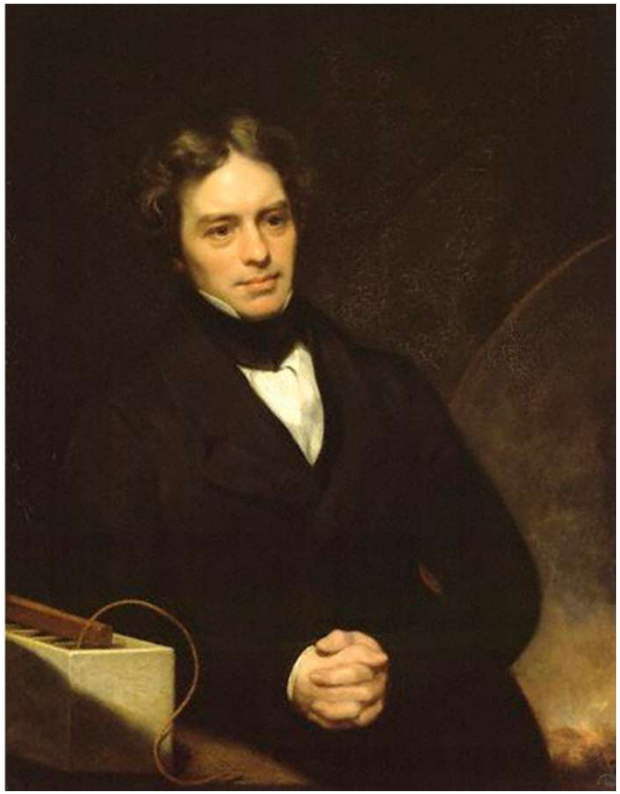
1 gauss=1 maxwell/cm2=0.0001 Tesla

Gauss's law: magnetic field lines never begin nor end but form loops or extend to infinity

Maxwell
1831-1879



Faraday
1791-1867



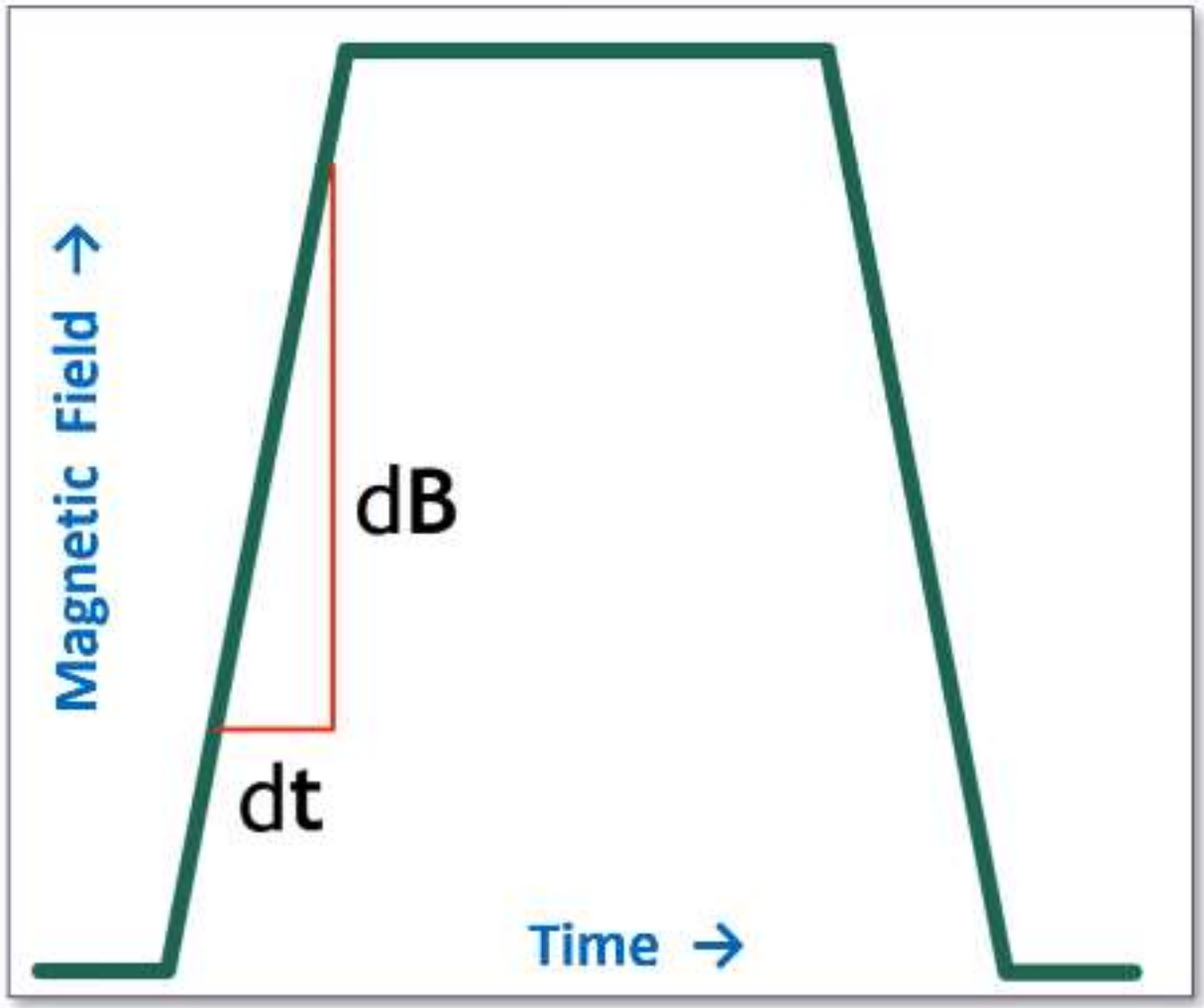
Faradays' Law

electromagnetic force is proportional to the rate of change of the magnetic flux

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

time varying magnetic fields induce
an electric field whose magnitude
is proportional to its rate of change

$$dB/dT$$


Magnetic Field →
dB
dt
Time →

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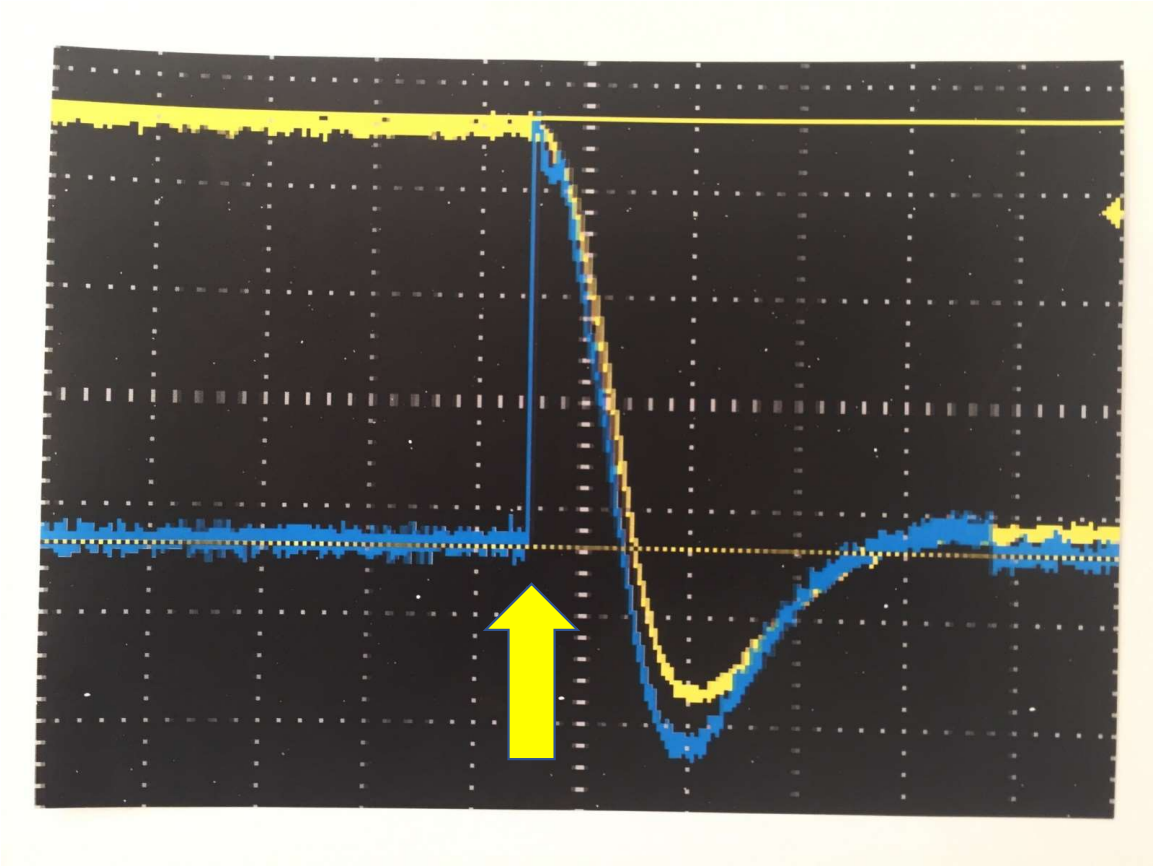
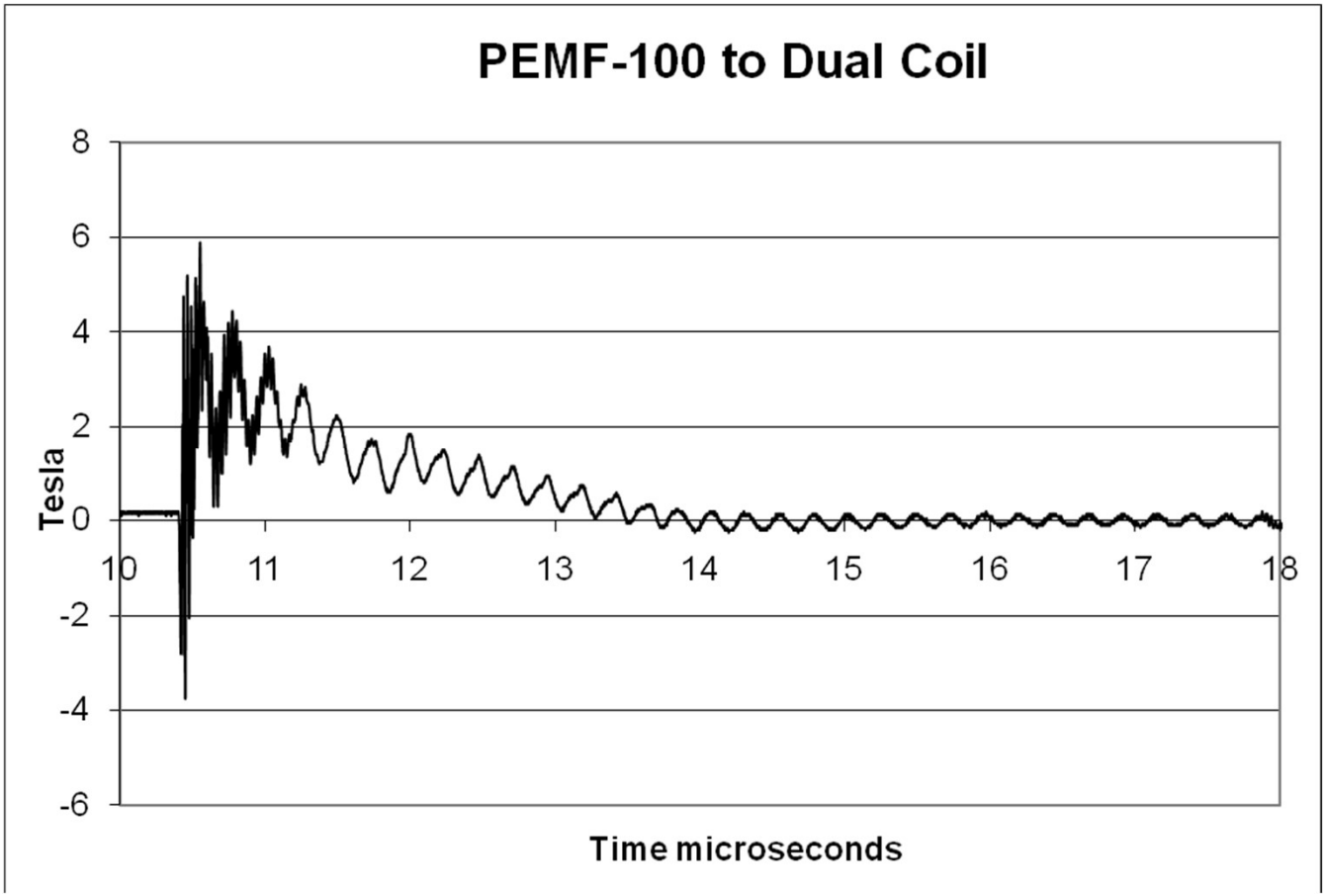
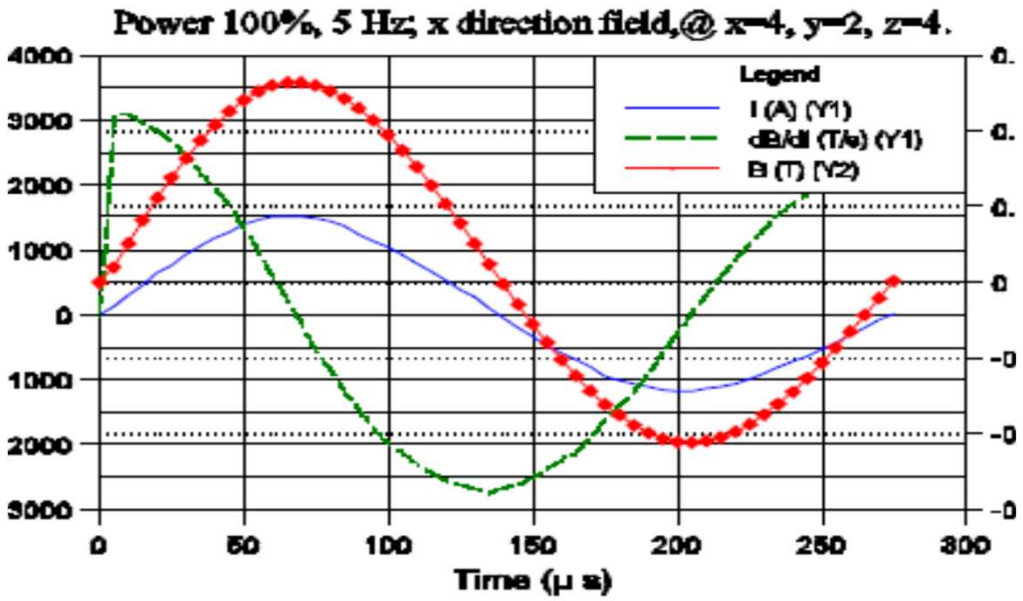
TeslaFit signal





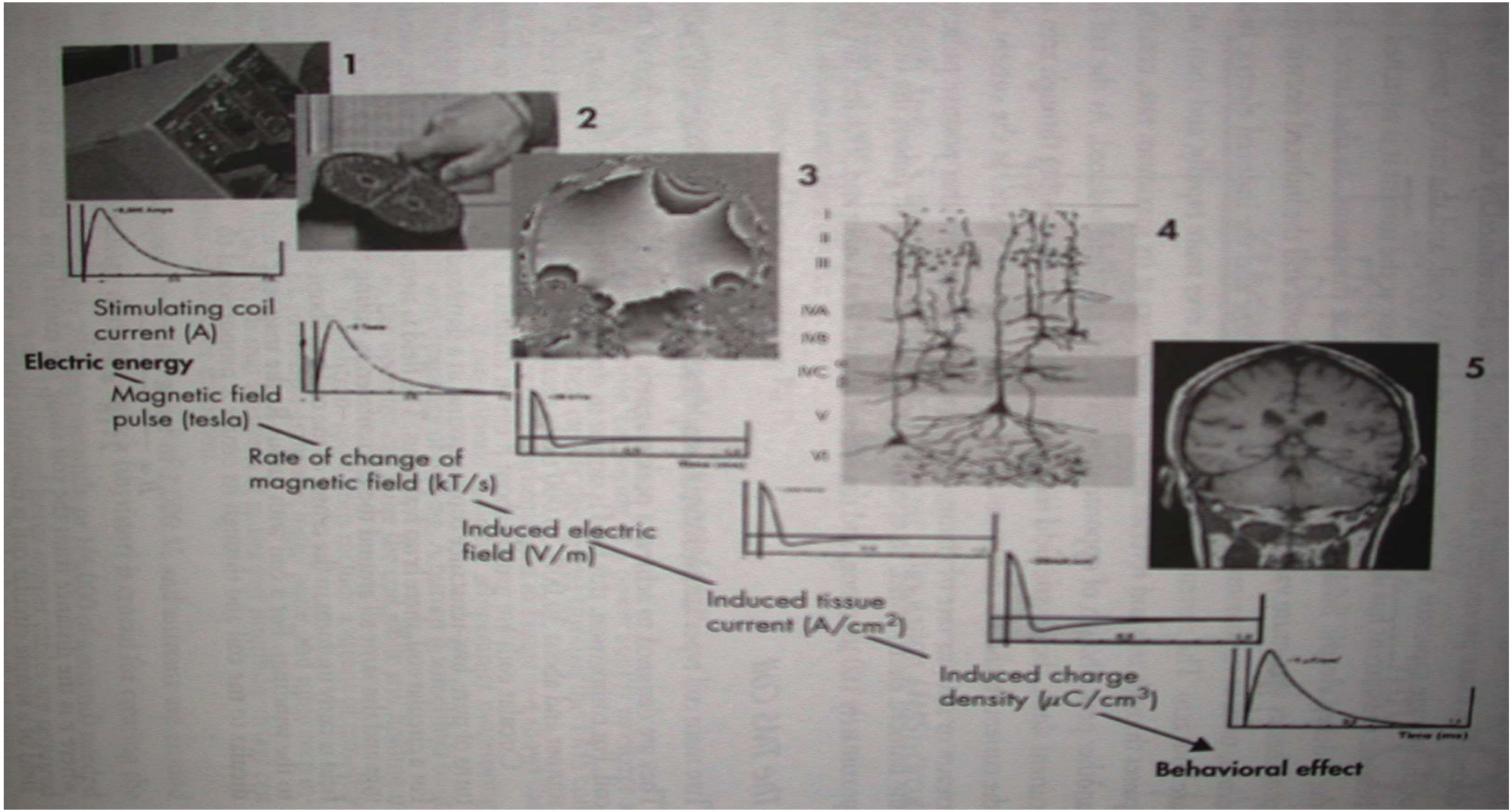
T/microsecond max rate of change (dB/dt)

Current and B fields



e simulator core current and dB/dt (left axis) along w through integration.

may produce in excess of 3,000 T/s at 100% power, enough to induce muscle contractions
the stronger the intensity the stronger the contractions



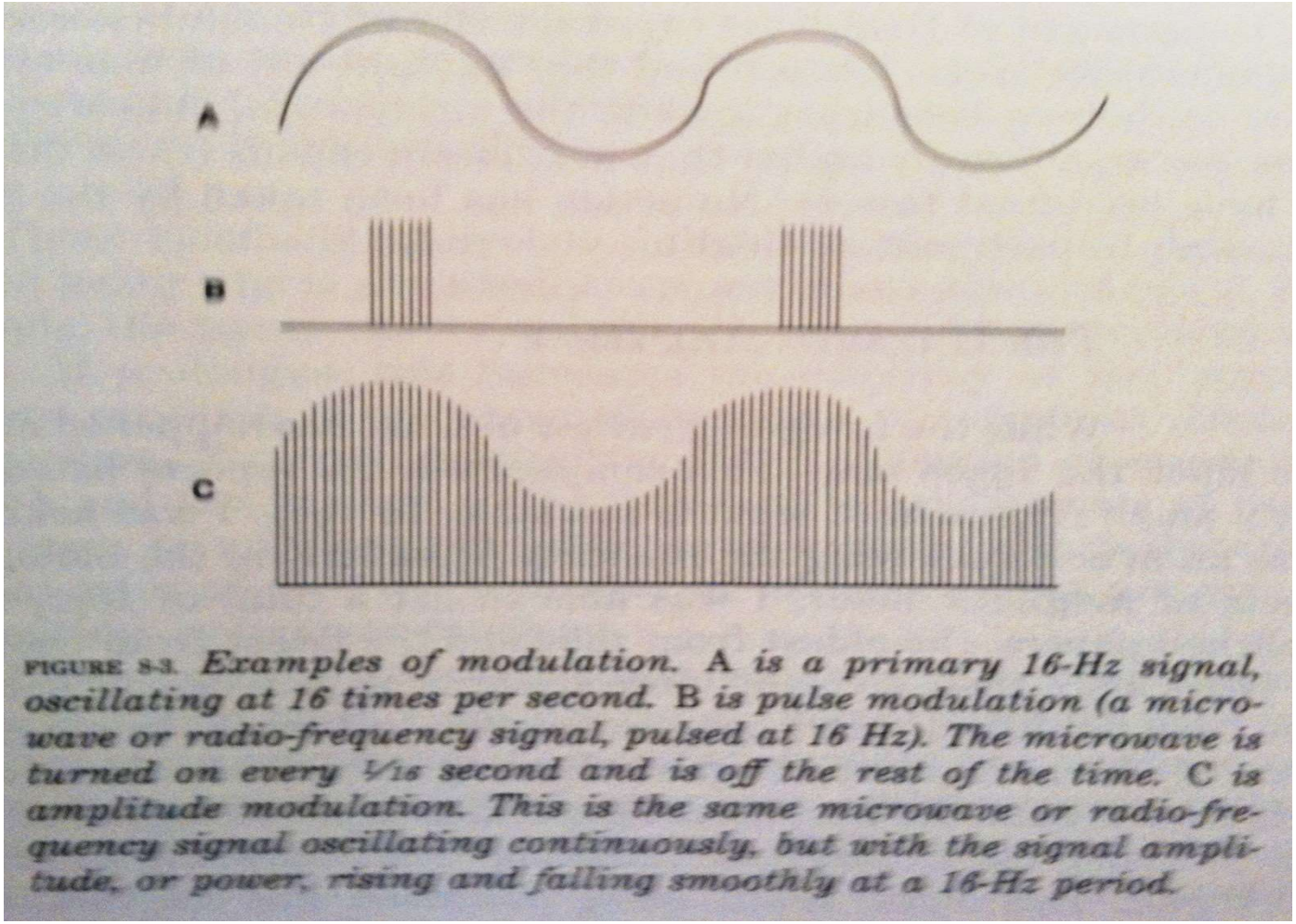
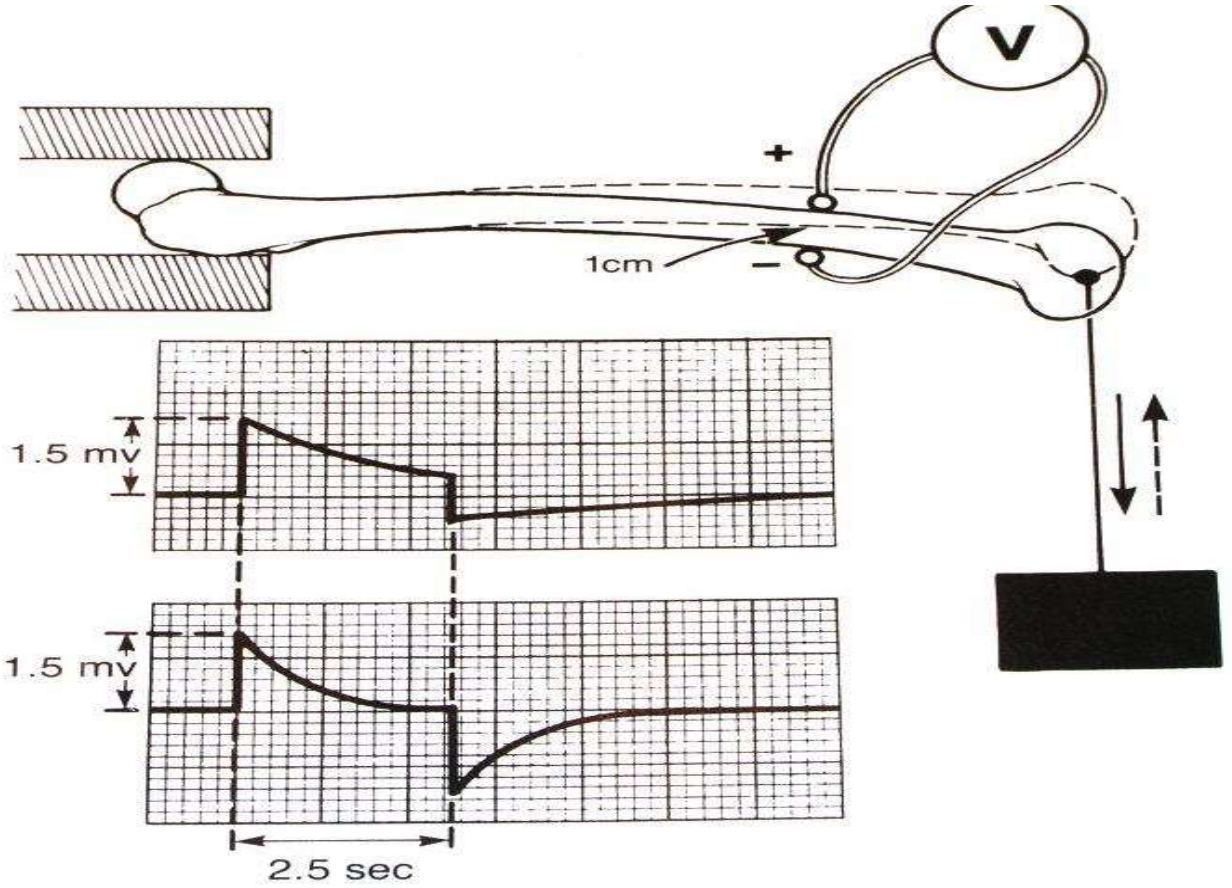


FIGURE 8-3. *Examples of modulation.* A *is a primary 16-Hz signal, oscillating at 16 times per second.* B *is pulse modulation (a microwave or radio-frequency signal, pulsed at 16 Hz). The microwave is turned on every 1/16 second and is off the rest of the time.* C *is amplitude modulation. This is the same microwave or radio-frequency signal oscillating continuously, but with the signal amplitude, or power, rising and falling smoothly at a 16-Hz period.*

all magnetic fields, esp. strong magnetic fields, create pressure waves in tissues

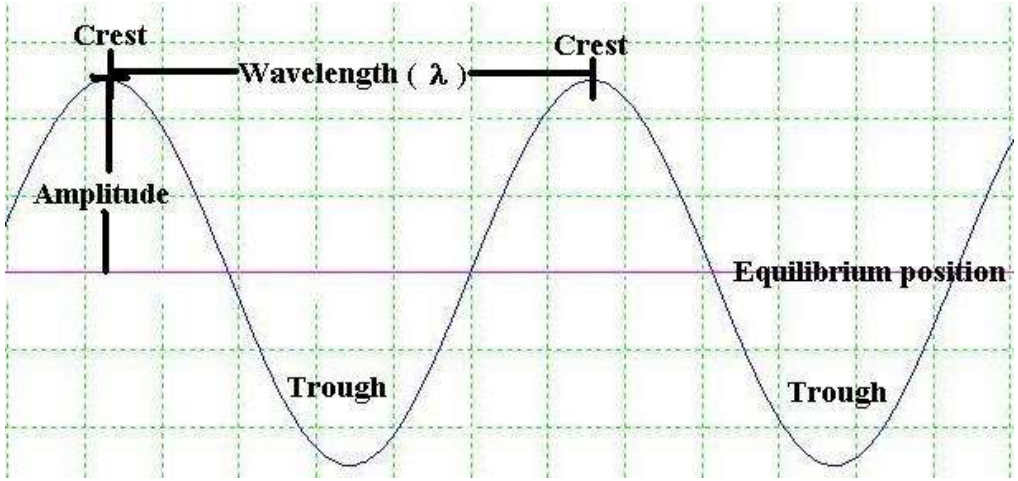
one way PEMFs generate charge, because of these pressure waves, is the piezo-electric effect



wavelength in meters

frequency Hz	light	sound in air
1	3E+08	343
5	59,958,492	69
10	29,979,246	34
20	14,989,623	18
50	5,995,849	7
100	2,997,925	3

1609 m in a mile


Crest
Wavelength (λ)
Crest
Amplitude
Equilibrium position
Trough
Trough

Faraday's law of induction (Faraday's law)
basic law of physics

predicts how a magnetic field will interact with an electric circuit to produce an electromotive force (EMF)—a phenomenon called electromagnetic induction.

Faraday's law of induction (Faraday's law) basic law of physics

the basis of how PEMFs interact with charges in the tissues and the electric charges in the acupuncture points and meridians to induce magnetic fields and create even more charge in the cells and tissues of the body that result in rebalancing and healing responses

induced currents

most of the actions of PEMFs have been considered to be the result of induced charge or current by the magnetic field, i.e.

they generate inductively coupled electrical stimulation

there is no physiologic difference between the action potential initiated by an electric field delivered by surface electrodes and the action potentials that can be induced by specific PEMFs, except that

PEMFs don’t shock the body and go much deeper

induced currents

- electromagnetic bioeffects from relatively weak (below heating and excitation thresholds) signals can be produced with a time-varying electric field, E(t), induced from an applied time-varying magnetic field, B(t).

- a large number of electromagnetic clinical devices in present use (particularly for bone and wound repair) induce 1–100 mV/cm peak E at the treatment site

induced currents

- the induced E field will be greater when the magnetic field intercepts a greater cross-sectional treatment area, i.e., maximum E field in the target depends upon target size
- dB/dt (in T/s) is a measure of the peak induced electric field, for a given EMF signal.
- eg, a common clinical bone repair signal produces 20 G peak magnetic field in 20 µsec. dB/dt = 106 G/sec & peak Eϕ(t) = 1 V/m = 10 mV/cm at a radius of 2 cm in the target

induced currents

all organized tissue is developed and maintained by an ensemble of complex geometry cells which have coordinated activity.

the most prevalent cell shape in living system tissue is elliptical and flattened, with processes extending in at least two directions.

human fibroblasts can typically exceed 100 µm when attached to a substrate (connective tissue). Nerve axons can be tens of centimeters in length

since the body is transparent to a magnetic field –

measurements of induced fields in air accurately reflect those at the target site
(except for high frequency fields)

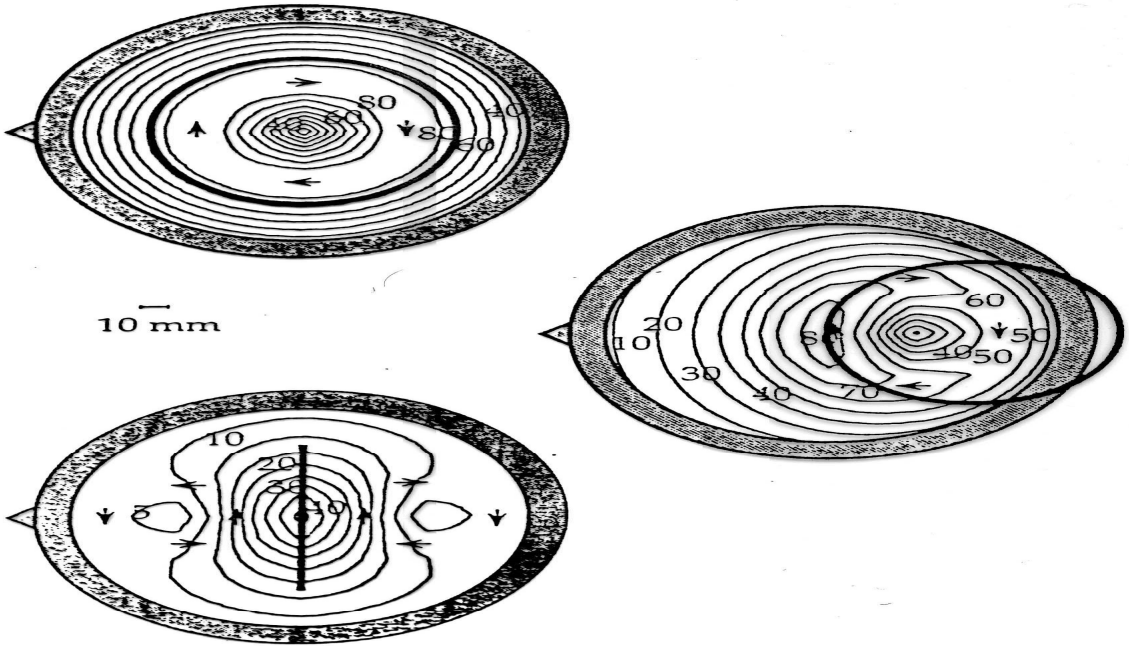
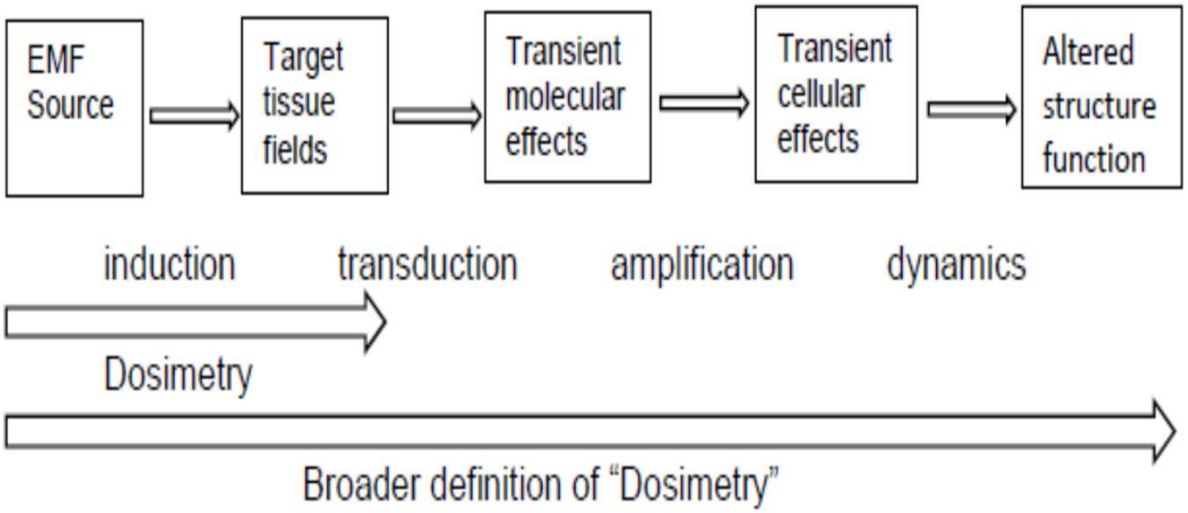


Fig. 5. The magnitude of the electric field 3 mm below the surface of the cortex produced by a circular coil (bold circle or line) with a radius of 50 mm, 8 turns, a current changing at a rate of 100 A/μsec. and with its edge 10 mm above the vertex. Three different coil orientations are shown. arrows indicate the approximate direction of the electric field. and the field strength is given in units of V/m (adapted from Roth et al. 1991).

Clinical Dosimetry Model



Bowman J. RF exposures to the general public: lessons from "dosimetry" for ELF – EMF epidemiology. Joint NIOSH/DOE Workshop. EMF exposure assessment and epidemiology: hypotheses, metrics, and measurements. Cincinnati Ohio, September 1994.

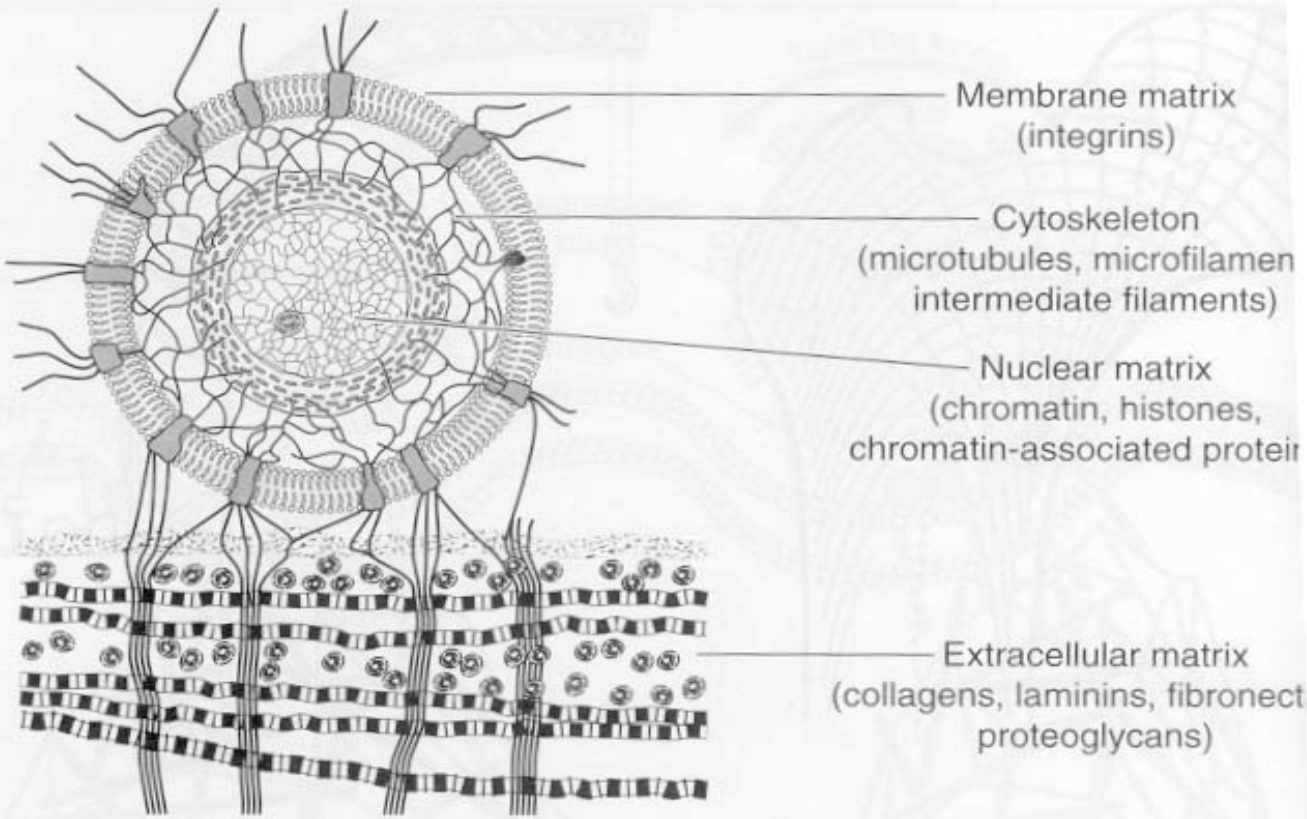
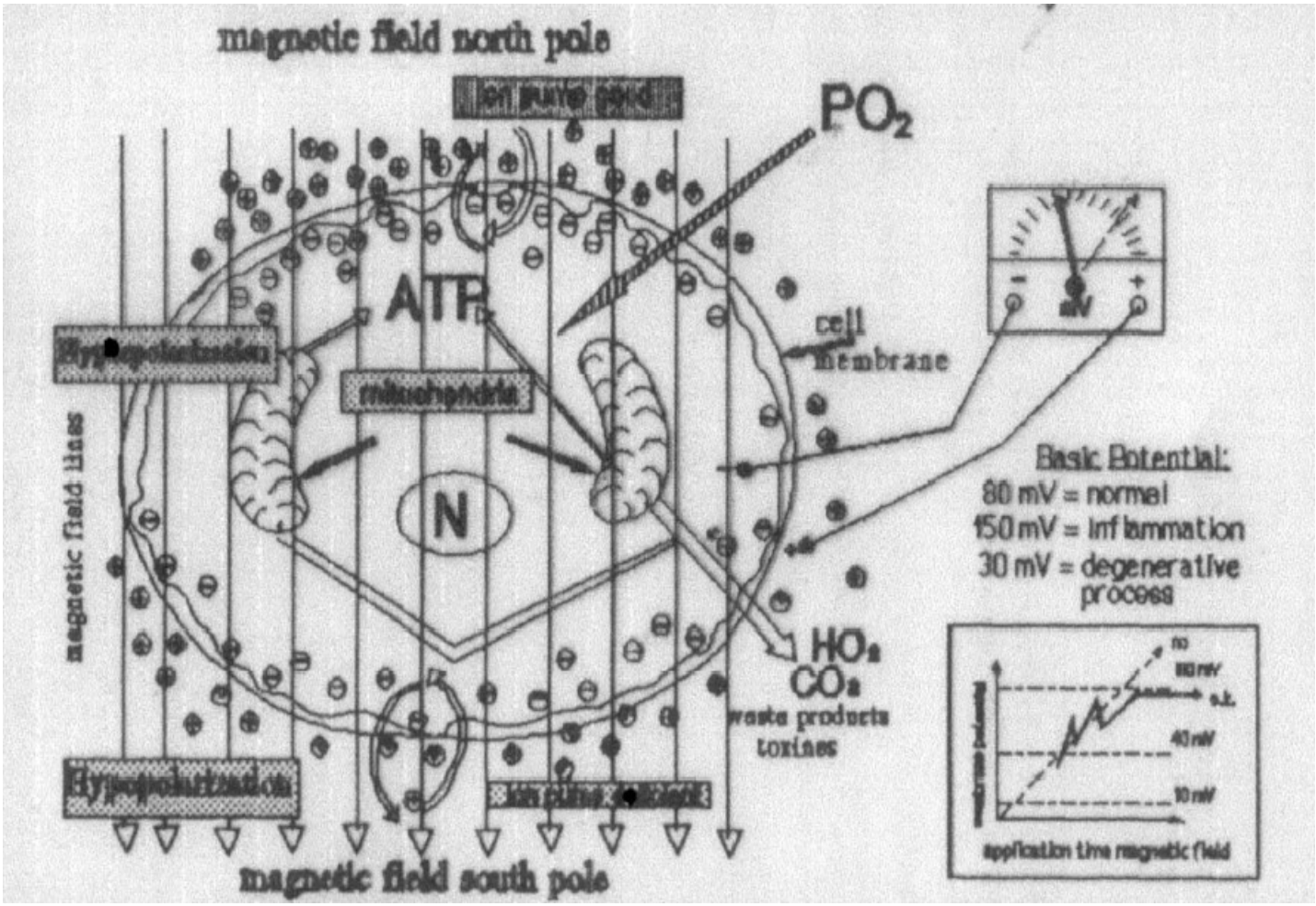
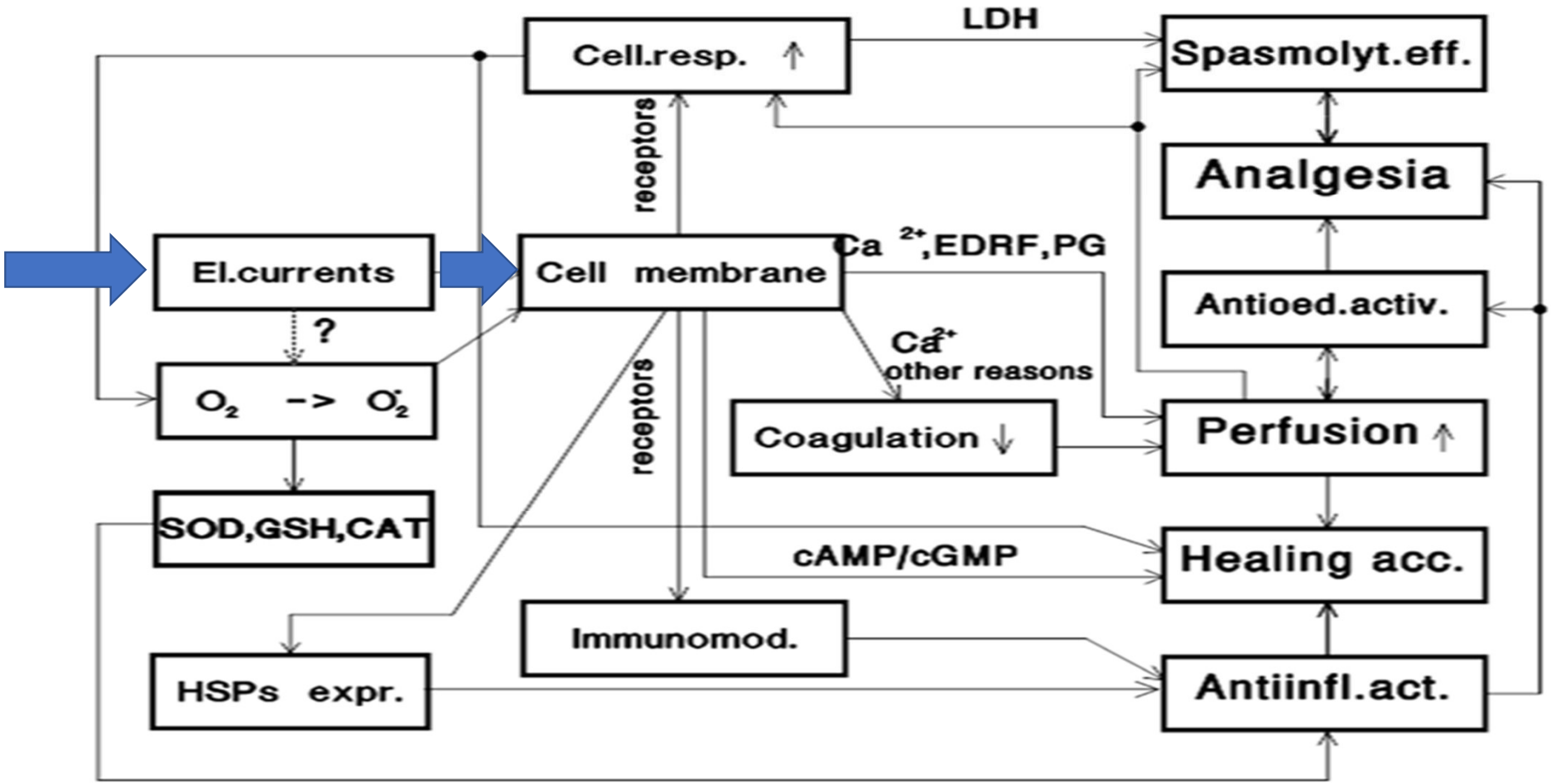


Fig. 4.6 The tissue matrix system as described by Pienta & Coffey 199
(Reproduced with permission from Medical Hypotheses.)


magnetic field north pole
PO_2
ATP
cell membrane
mV
Basic Potential:
80 mV = normal
150 mV = inflammation
30 mV = degenerative process
N
HO_2
CO_2
waste products
toxines
magnetic field south pole
application time magnetic field

Local action of magnetic fields



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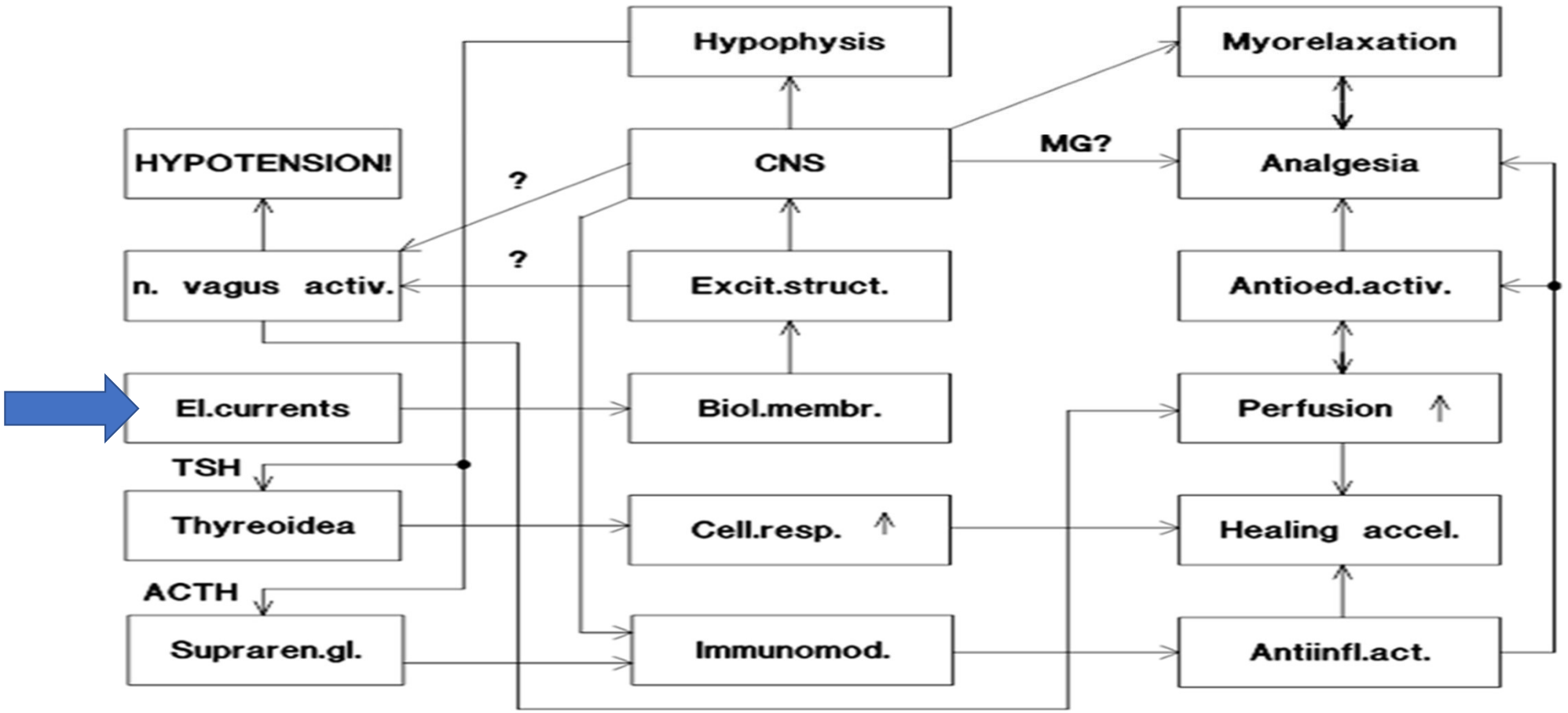
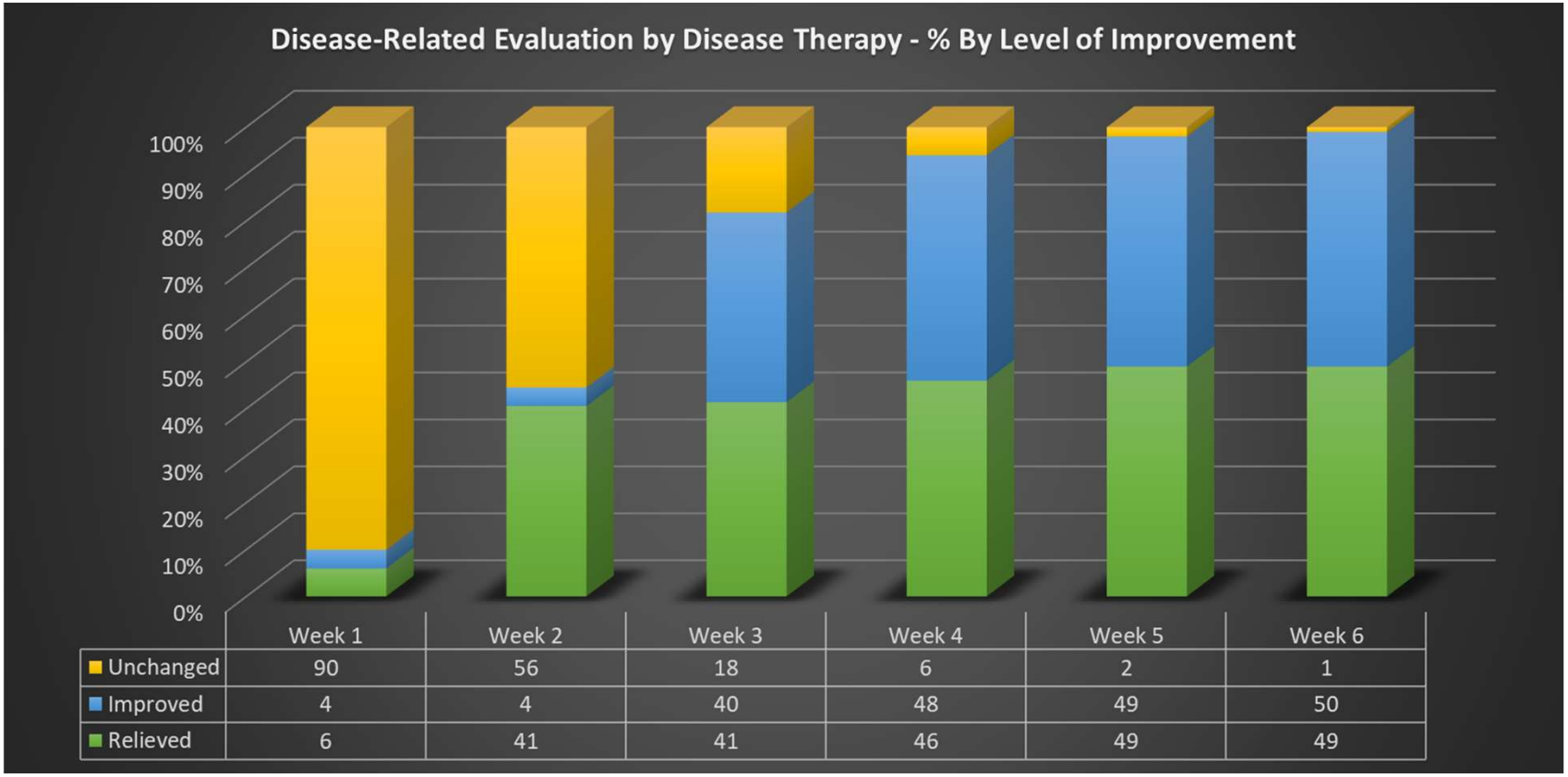
Systemic action of magnetic fields



magnetic field effects

1. vasodilatation
2. analgesic action
3. anti-inflammatory
4. spasmolytic activity
5. healing acceleration
6. antiedema activity
7. reduced bruising
8. acupuncture
9. anti-coagulant effect



response to PEMF treatment of musculoskeletal problems

PEMFs stimulate stem cells

~400% increase neural stem cells

~150 growth factors expressed

magnetic field effects

1. vasodilatation
2. analgesic action
3. anti-inflammatory
4. spasmolytic activity
5. healing acceleration
6. antiedema activity
7. reduced bruising
8. acupuncture
9. anti-coagulant effect

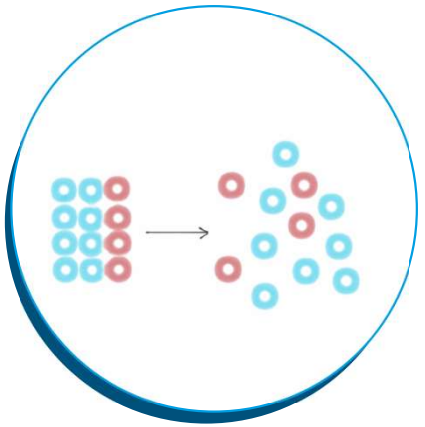
Ultimate goal of natural medicine = optimization of health

- Insufficiency: identify and address
- Sufficiency: maintain against entropy
- Optimization: add continuing strategies to gain ground on entropy

ENTROPY

1. A thermodynamic quantity representing the unavailability of a system's thermal energy for conversion into mechanical work, often interpreted as the degree of disorder or randomness in the system.

2. Lack of order or predictability; gradual decline into disorder.



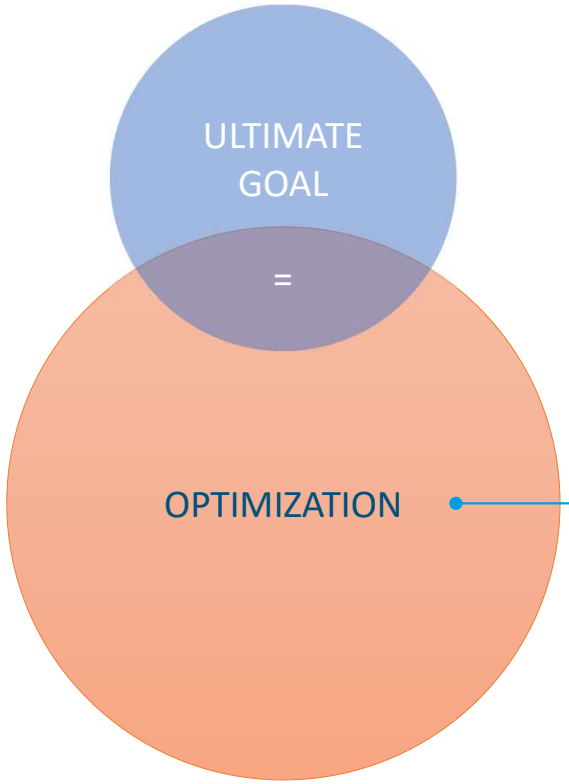
ENTROPY

All biologic (organized) systems are subject to various degrees of entropy.

Entropy is inevitable in organized systems.

Entropy accelerates logarithmically with aging.

Aging = accelerating entropy



= Add strategies to gain ground on entropy without
Further depletion of resources or accelerating aging

Sufficient ATP

- Most important goal is to keep up the energy in a system
- Keeping up the energy in a system = Sufficient ATP

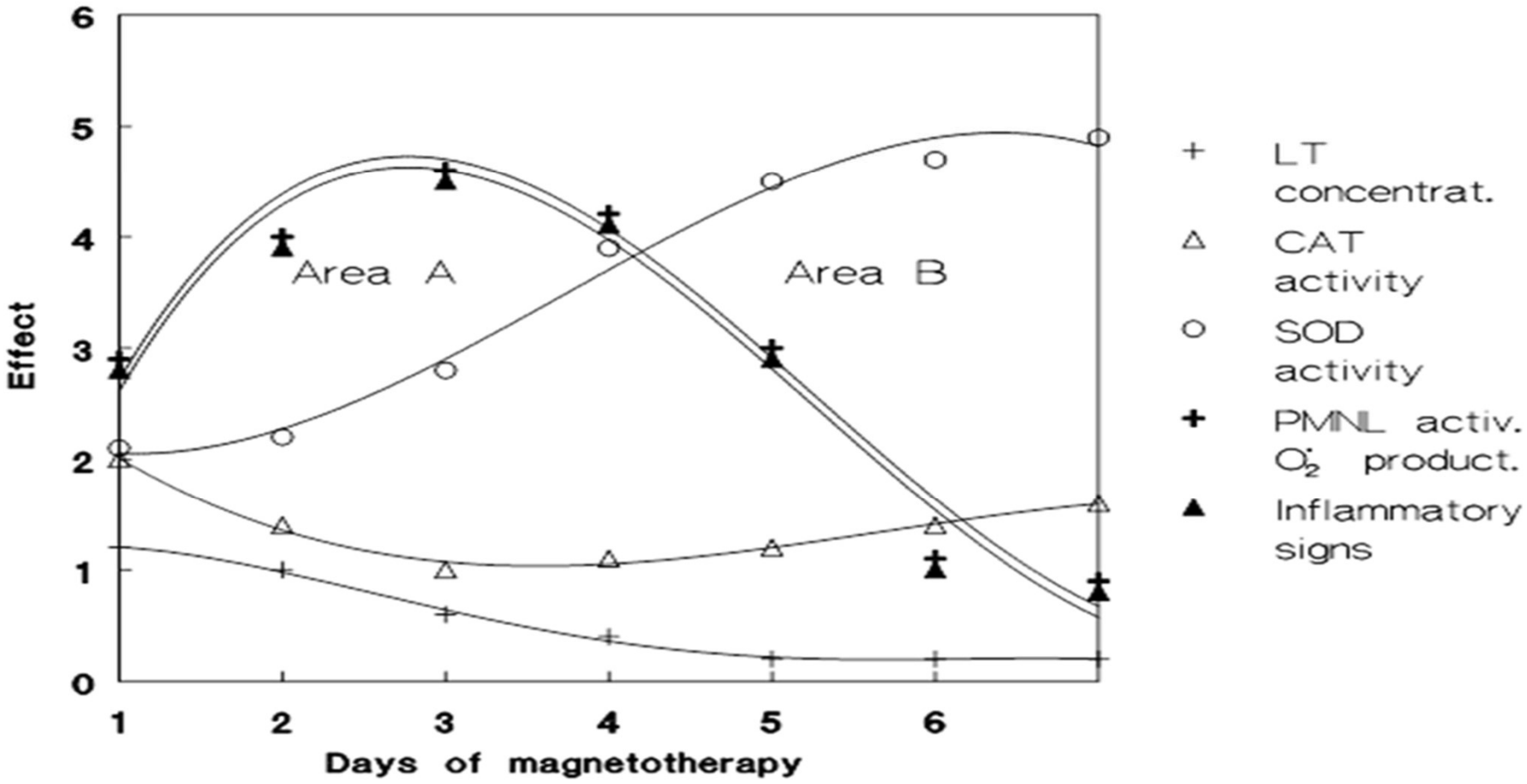
The majority of ATP is recycled from ADP

- At any given time, the total amount of ATP + ADP remains fairly constant.
- The energy used by human cells requires the hydrolysis of 100 to 150 moles of ATP daily, which is around 50 to 75 kg.
- A human will typically use up his or her body weight of atp over the course of the day.
- Each equivalent of ATP is recycled 500-750 times during a single day (100 / 0.2 = 500).

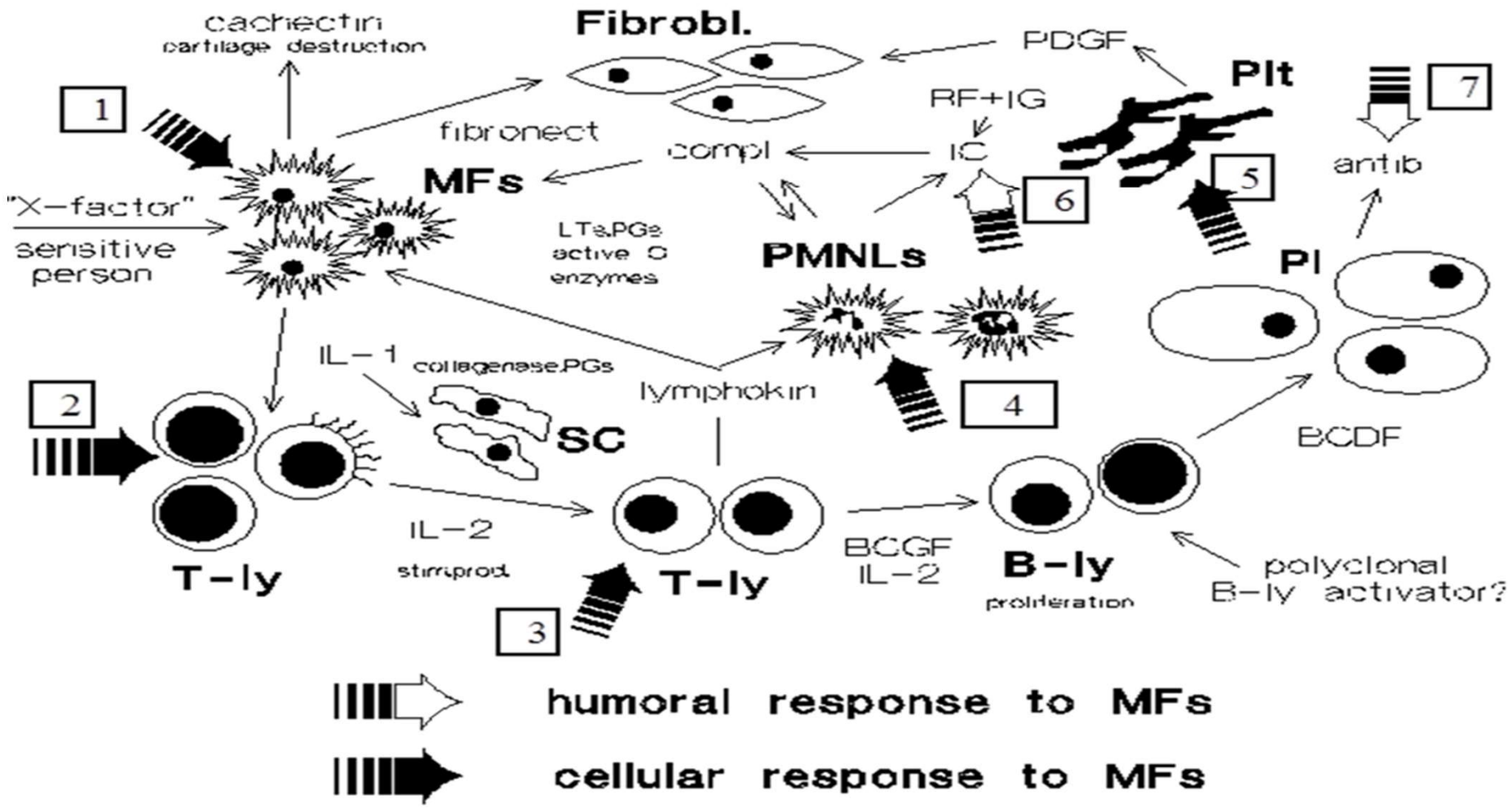
PEMFs produce, maintain and restore ATP keeping the cycle going optimally

One study found that even 20 mins of PEMF increases ATP by an average of 100% and even up to 600%

Proposed antiinflammatory activity of time-varying magnetic field



Proposed action of MFs in RA



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TREATING CHRONIC INFLAMMATION

- most common use of PEMFs is to reduce chronic inflammation
- root or a major part of majority of health conditions in humans
- because of PEMF actions on inflammation, help with many health conditions: infection, pain, sleep problems, arthritis, bone stimulation (fractures and bone surgery), cancer, ischemia, wound healing, and problems with the eyes, liver, lungs, heart, and nervous system, among many other tissues

ADENOSINE: THE “GUARDIAN ANGEL”

most inflammation control is through adenosine acting on its receptor, the adenosine receptor (AR)

adenosine is a building block for RNA/DNA and a part of the energy molecule ATP

adenosine regulates the function of every tissue and organ in the body hence is a “guardian angel” in human disease

- all cells release ATP at low levels.
- release is enhanced with PEMF stimulation, inflammation, pH change, hypoxia, tissue damage, or nerve injury in all the tissues of the body
- mitochondria need adenosine to make ATP in all cells
- adenosine released by breakdown of ATP to ADP to create energy
- then it's re-used to create more ATP in a perpetual cellular cycle
- adenosine is naturally at low levels in body fluids between cells of unstressed tissues
- increase rapidly in response to cell injury-causing stress conditions, low oxygen (hypoxia/ischemia, inflammation, or trauma
- short half-life in the blood (a few seconds) and 1-20 mins in CSF

- 4 subtypes of adenosine receptors: A1, A2A, A2B and A3
- ARs widely distributed throughout the body
- part of both physiological and pathological functions
- affect, at least, cardiac rhythm and circulation, breakdown of fat, kidney blood flow, immune function, regulation of sleep, development of new blood vessels, inflammatory diseases/inflammation, blood flow, and neurodegenerative disorders.
- ARs in immune cells, including neutrophils, macrophages, dendritic cells, and mast cells.

- PEMFs mostly influence A2A and A3 ARs
- do not appear to influence A1 or A2B ARs
- PEMFs stimulate activation of ARs, increase functionality, and augment other chemicals that also stimulate ARs
- PEMF actions on A3 ARs benefit bone marrow and lymphatic, GI and skin conditions

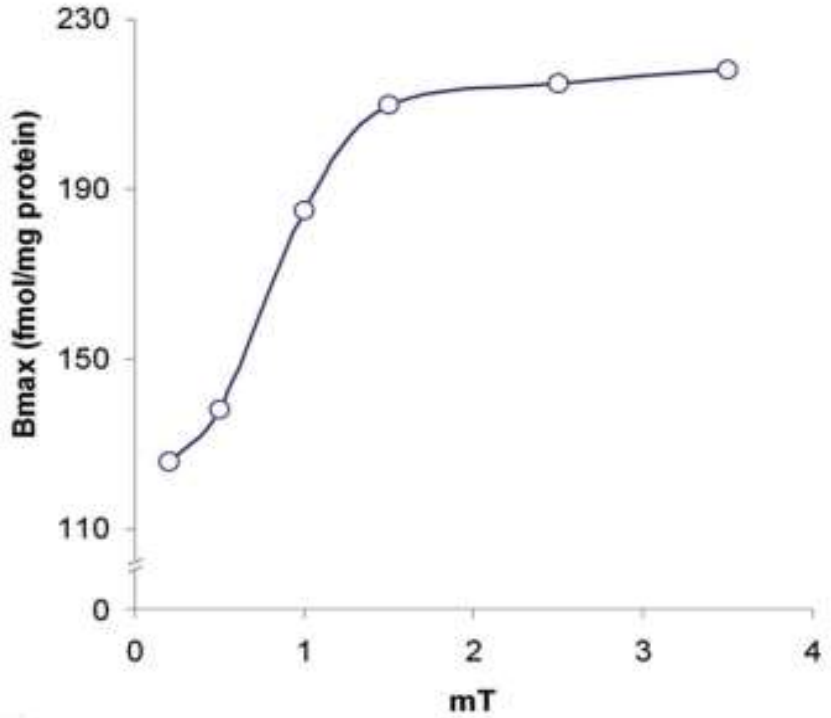
NOTE: very low intensity PEMFs between 3-5 microTesla (µT) do not affect many ILs's

PEMF stimulation ARs reduces inflammation by lowering proinflammatory tissue cytokines, including:

- tumor necrosis factor-α (TNF-α)
- interleukin (IL): IL-1β, IL-6, and IL-8 in microglial cells
- IL-6 and IL-8 in cartilage and bone cells
- IL-8 and NF-kappa B in skin cells
- synovial fibroblasts

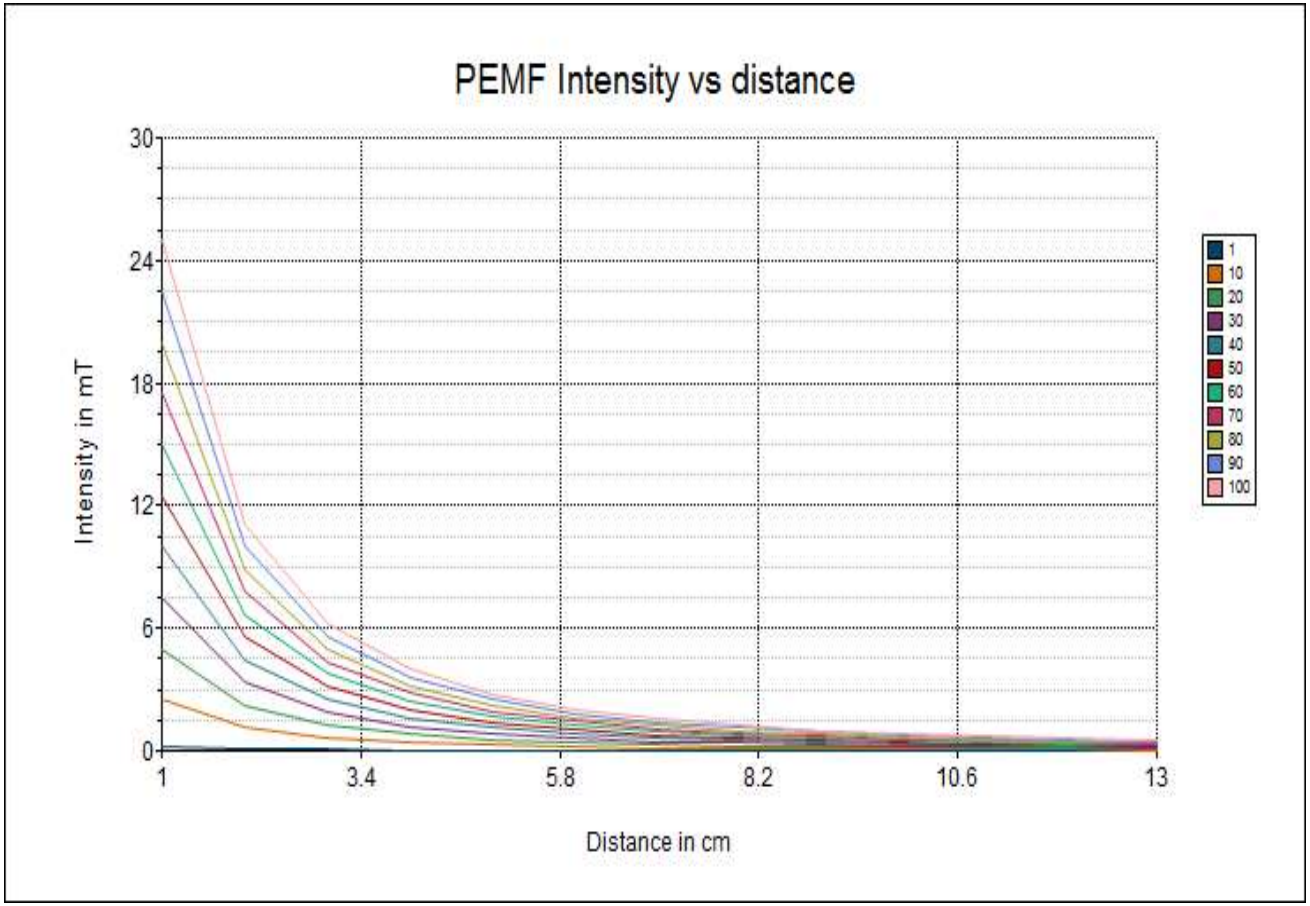
NOTE: very low intensity PEMFs between 3-5 microTesla (μT) do not affect many IL's

optimal PEMF dose at the adenosine receptor to affect inflammation



Saturation binding of A2A adenosine receptor as a function of magnetic field peak intensity (mT) in human neutrophil membranes. Bmax = receptor binding capacity.

Adapted from Massari (2007). Massari L, Benazzo F, De Mattei M, et al. CRES Study Group. Effects of electrical physical stimuli on articular cartilage. J Bone Joint Surg Am. 2007 Oct;89 Suppl 3:152-61.



graphically represented this is what rapidly declining intensities look like
the color codes for the starting intensities are in the legend to the right on the graph

calculated for the 1.5 mT goal intensity at various depths in the body using Newton's inverse square rule.

Target Depth (in)	0	0.4	0.8	1.2	1.6	2	2.4	2.8	3.2	3.6	4
Target Depth (cm)	0	1	2	3	4	5	6	7	8	9	10
Intensity needed (mT)	1.5	6	14	24	38	54	74	96	122	150	182
Intensity needed (G)	15	60	140	240	380	540	740	960	1220	1500	1820

calculated for the 1.5 mT goal intensity at various depths in the body using Newton's inverse square rule

Target Depth (in)	4.4	4.8	5.2	5.6	6	6.4	6.8	7.2	7.6	8	8.4
Target Depth (cm)	11	12	13	14	15	16	17	18	19	20	21
Intensity needed (mT)	216	254	294	338	384	434	486	542	600	662	726
Intensity needed (G)	2160	2540	2940	3380	3840	4340	4860	5420	6000	6620	7260

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10 Hz PEMF mouse paw inflammation study

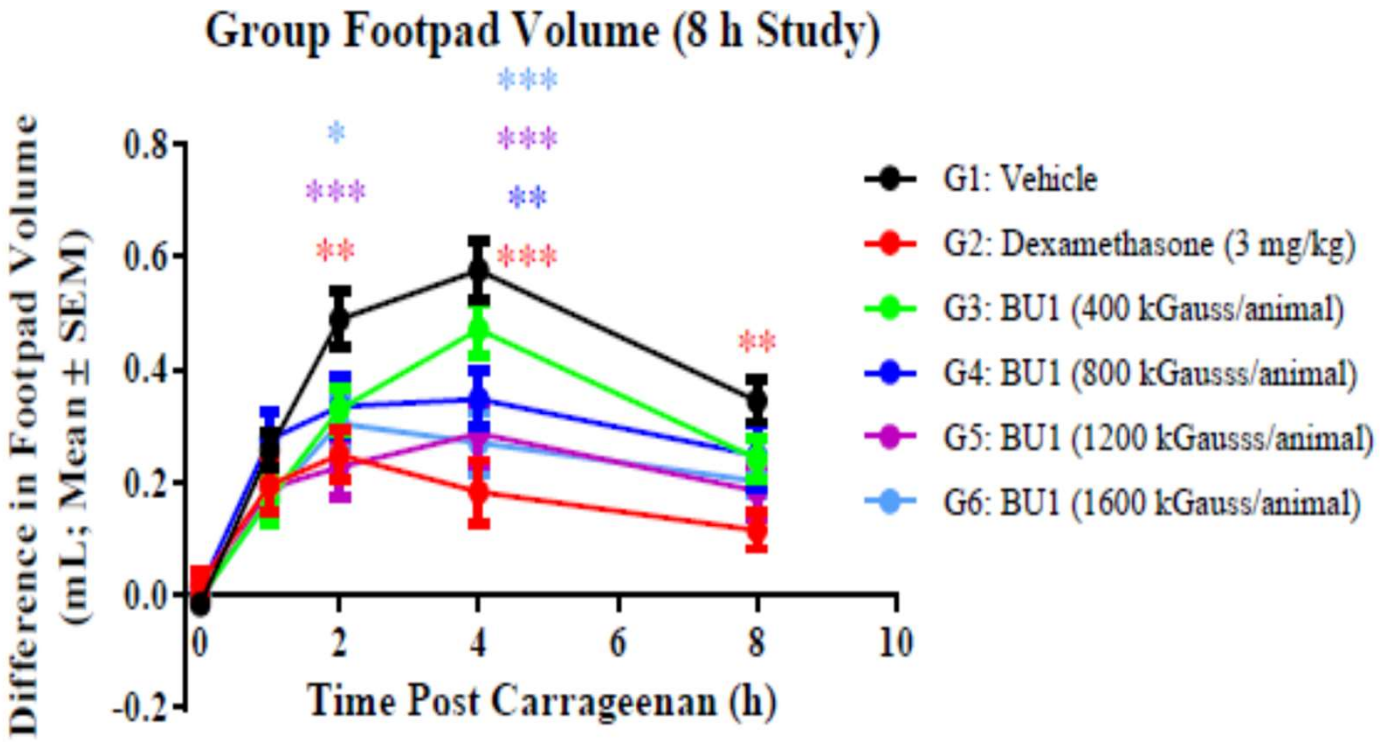
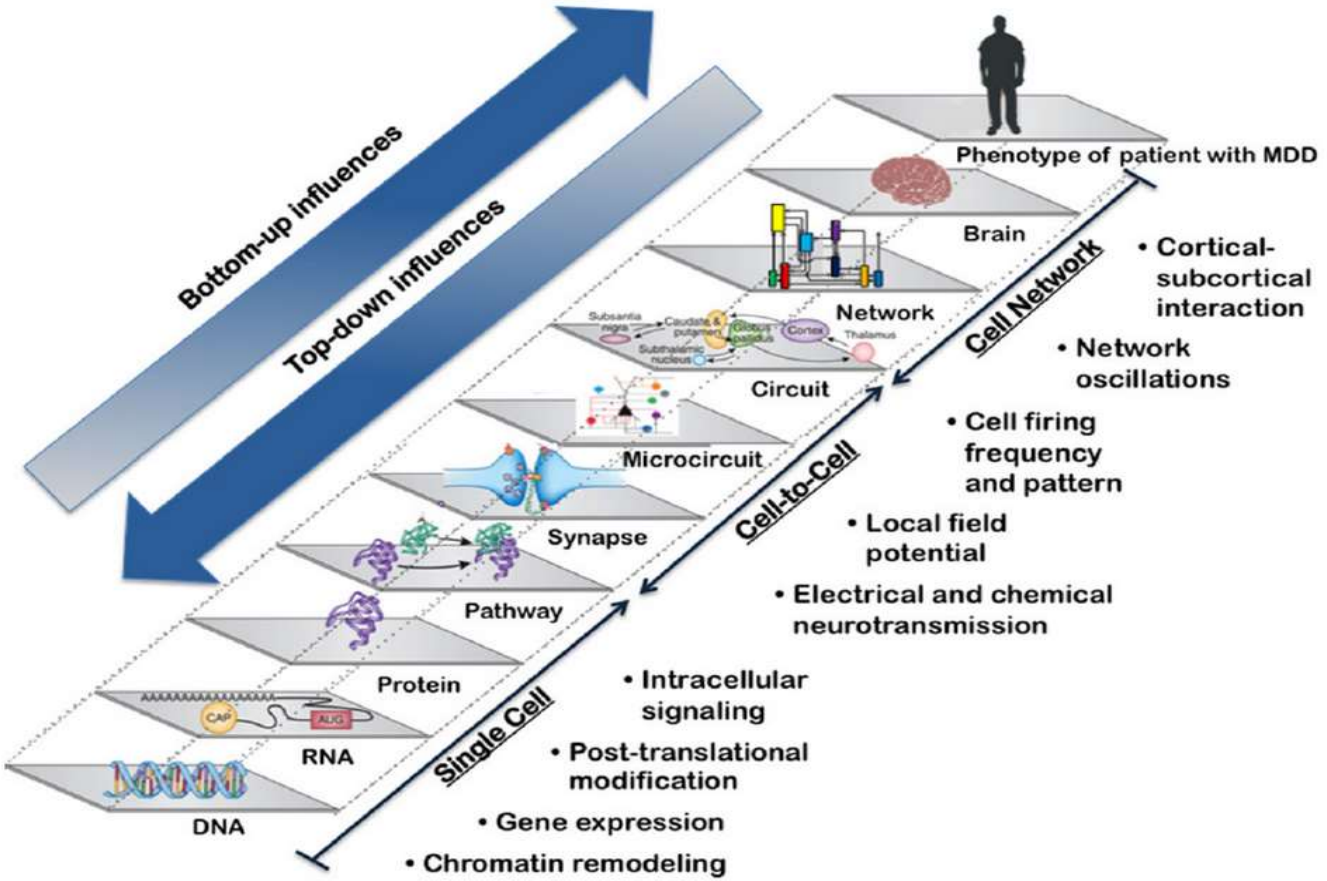


Figure 3 Group footpad volume difference between the carrageenan-injected and saline-injected paws was calculated by time and field intensity. Significance (one-way ANOVA and post-hoc Dunnett's test): * = P ≤ 0.05; ** = P < 0.01; *** = P < 0.001, compared to Group 1. Permission of Dr Dennis.



Leuchter AF, Hunter AM, Krantz DE, Cook IA. Rhythms and blues: modulation of oscillatory synchrony and the mechanism of action of antidepressant treatments. Ann N Y Acad Sci. 2015 May;1344:78-91.

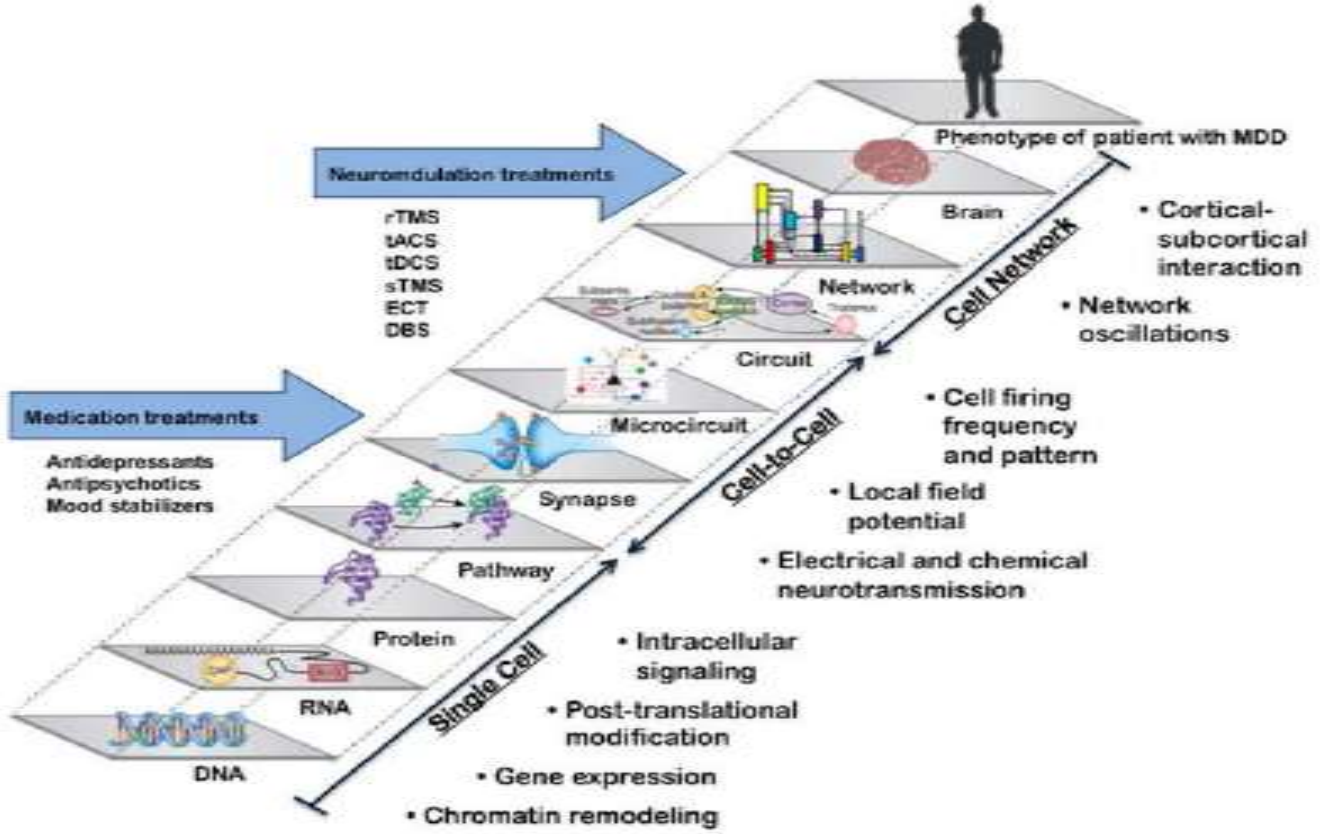


Figure 3. Hypothesized action of antidepressant treatments at different levels of biological complexity in the brain. Antidepressant

Leuchter AF, Hunter AM, Krantz DE, Cook IA. Rhythms and blues: modulation of oscillatory synchrony and the mechanism of action of antidepressant treatments. Ann N Y Acad Sci. 2015 May;1344:78-91.

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LUNCH

Acupuncturists talk about their use of PEMFs in their practices

- Dr Riz Lakhani
- Dr Donna Dupre

Dr. Donna Dupre
L.Ac., DAOM

Dr. graduated from SAMRA University 2000 with Master of Science in Oriental Medicine, year of study in Acupuncture Orthopedics at Lerner Education, board-certified 2002.
Doctor Acupuncture and Oriental Medicine at Emperor's College of Traditional Oriental Medicine 2007. Board-Certified Diplomat in Acupuncture Orthopedics and Licensed in Acupuncture and Herbal Medicine
Practicing in the Burbank area since 2000
Prior to private practice, staff acupuncturist at St. Vincent's Medical Center in Los Angeles, treating cancer patients with staff oncologists and radiologists

She is passionate about her work and believes a good clinician is always a student. She continues to educate herself in order to provide the best care possible to her patients.

Dr. Donna Dupre

- 20 years private practice
- differential TCM diagnosis and treatment plans
- acupuncture, herbology, cupping and moxibustion
- functional medicine with bloodwork, imaging, nutrition and supplements
- never advertised
- practice built by referrals and word of mouth

- most frustrating is a patient who does not respond
- always searching for other synergistic modalities to enhance what I do
- to bring practice to the next level

- tried everything from neurofeedback to essential oils
- patients love that always trying new ways to help them heal
- this energizes me, my patients and my practice

- 4-5 years ago, patient gave book on PEMF
- intrigued and started researching
- confused with all the different equipment out there
- everyone said their equipment was the best

through internet search found Dr. Pawluk
guided through the process of selecting the best equipment

- purchased Parameds super with a full body mat, then FlexPulse (FP), then TeslaFit (TF)
- always try new modalities or equipment on myself first
- spent whole day using the full body mat
- felt like 5 cups of coffee
- no real adverse affects.

Case Study 1

- 51 year old male - multiple cervical disc bulges C4 – C7
- severe R neck/shoulder pain, numbness, tingling down arm
- pain kept awake at night, uncomfortable at desk at work
- could no longer exercise, irritable
- Ortho wanted to do surgery
- wanted to avoid surgery
- discomfort lying down
- saw another Acupuncturist with chair treatment
- laid face down on table for TF rx

- TF coil 15 mins, high intensity, R neck and shoulder area
- needles distal points arms and legs
- after 15 mins of PEMF,
- needles to ashi, DU, GB, hua tuo jia ji, and UB
- uncomfortable first few treatments
- placed coil around needles throughout treatment
- relieved pain and allowed 30 mins treatment
- then moving cupping and herbal formula

- after few weeks started using TF first
- then full body mat + acupuncture
- so comfortable during rxs fell asleep
- rxs twice a week for ~4 mons,
- pain > 80-90% better
- avoided surgery
- sleeping at night, pain free at work returned to gym and exercise

- generally use full body mat and TF daily
- FP for insomnia, anxiety, concussion, or traumatic brain injury
- try FP a few sessions, then recommend to purchase machine for home use daily

- since bringing PEMF into my practice, use very little EA
- find it more gentle and effective way to stimulate the needles
- don’t get flare ups or muscle contractions with PEMF vs EA
- adverse reactions with PEMF only aching if TF on high setting
- turn down the intensity or turn it off.
- one depression patient with mild headache, FP on forehead and headache got worse.
- removed it and put needles in yintang ,GB14, Du 20, Du24 and taiyang, plus points for depression and it improved

- another patient had headache after body mat
- full body mat rarely can increase anxiety, but only one patient reported that
- anxiety is common in LA area
- never use full body mat with arrhythmias because of potential for triggering an episode.
- never use current with pacemakers

- always treat myself with acupuncture, herbs and supplements
- added the full body mat and FP to daily routine and TF to areas of pain 3x/wk with acupuncture
- important for healers to care for self, makes work easier so as not to burn out
- PEMF part of personal daily routine

Questions?

Dr Riz Lakhani, L. Ac., M. Ac.

Practicing in Maryland since 2013. Graduated from Maryland University of Integrative Health (formerly Tai Sophia Institute). Prior to acupuncture, worked for large telecommunications companies.

Riz became interested in PEMFs to blend technology and medicine. Internships and certification in Sports Medicine and Orthopedic Acupuncture, Electro-Acupuncture Medicine, PEMF Therapy, and the Acupuncture Technology Summit.

In 2018, added PEMF Therapy to his private practice.

Riz is excited to help educate other acupuncturists in PEMF Therapy, which he believes fits very synergistically with the work acupuncturists are trying to do with many of their patients.

prior to becoming involved in acupuncture and healing (I prefer the term “helping”), had a background in telecommunications and wireless

made a career change in 2010 because wanted to do more meaningful and impactful work to help the community in a unique way

discovered acupuncture was a regulated, licensed profession requiring a Masters’ degree - and this lead to learning about other modalities

things I've tried and used in the clinic…

acupuncture, including electroacupuncture and dry needling of trigger and motor points

manual therapies: cupping (negative pressure and decompression), gua sha (scraping/myofascial release), photobiomodulation (cold laser and LED), percussion massage, moxibustion

other therapies: infrared heat, microcurrent (cranial electrical stimulation), and most recently, PEMF!

introduction to PEMF

at a local health fair, I was approached by a retired nurse who was a distributor for a PEMF company

never heard of it before and was open to learning, so she came to my office and did a demo

had a treatment and didn't notice anything, but was curious to learn more - and discovered many connections between PEMF and acupuncture

effects of PEMF treatment

- increased blood flow
- reduced inflammation
- increase in cellular charge
- better ability to detox
- improved recovery times
- improved oxygenation
- stronger bones
- …all the things we are trying
  to do with acupuncture, and more …!

taking the plunge…

researched PEMF extensively for over a year, reading and listening to everything I could about it

soon afterward, I knew I wanted to add this to my practice - but had to plan and save for a high intensity system

rented a TeslaFit device for 3 months and used it with patients, and also purchased a FlexPulse device after learning the benefits of portable PEMF

practitioner benefits

relatively easy when compared to acupuncture - no needles! Many points and channels can be treated simultaneously

patients feel PEMF's in their body and know that something is happening

a treatment that doesn't require insurance billing

the practitioner can treat themselves frequently with PEMF, which cannot always be done with acupuncture

the patient benefits, and therefore the practitioner does too…

some cool patient stories

DC's A-fib episodes that usually go away within several hours of treatment

SC's shoulder injury - 10 minutes of treatment allowed her to turn her head and check her blind spot while driving, which she hadn't done in years

LG's head trauma - a baseball struck her head causing dizziness, pain, and inability to open her mouth. One PEMF treatment significantly improved both the jaw ROM and dizziness/head symptoms - she's usually a skeptic about most things and was happy.

BE's unusual insomnia and constipation/stomach discomfort

some cool patient stories

MDW's ankle injury that persisted for 18 months - 1 PEMF treatment resolved it (but we did another one anyway just to be sure). Her PCP was so impressed that she came to the clinic to experience PEMF herself!

JC's low back and right wrist - a retired nurse that travels to me from Annapolis

FlexPulse for reducing anxiety in the moment, a la Dr. Pawluk's story from Power Tools

Questions?

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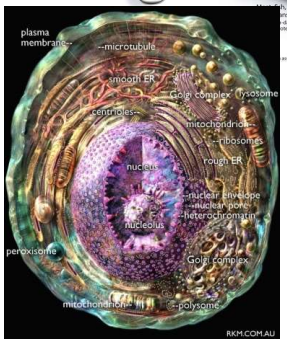
practical considerations for applying PEMFs

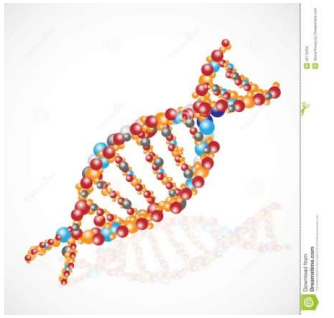
to build a house you need:

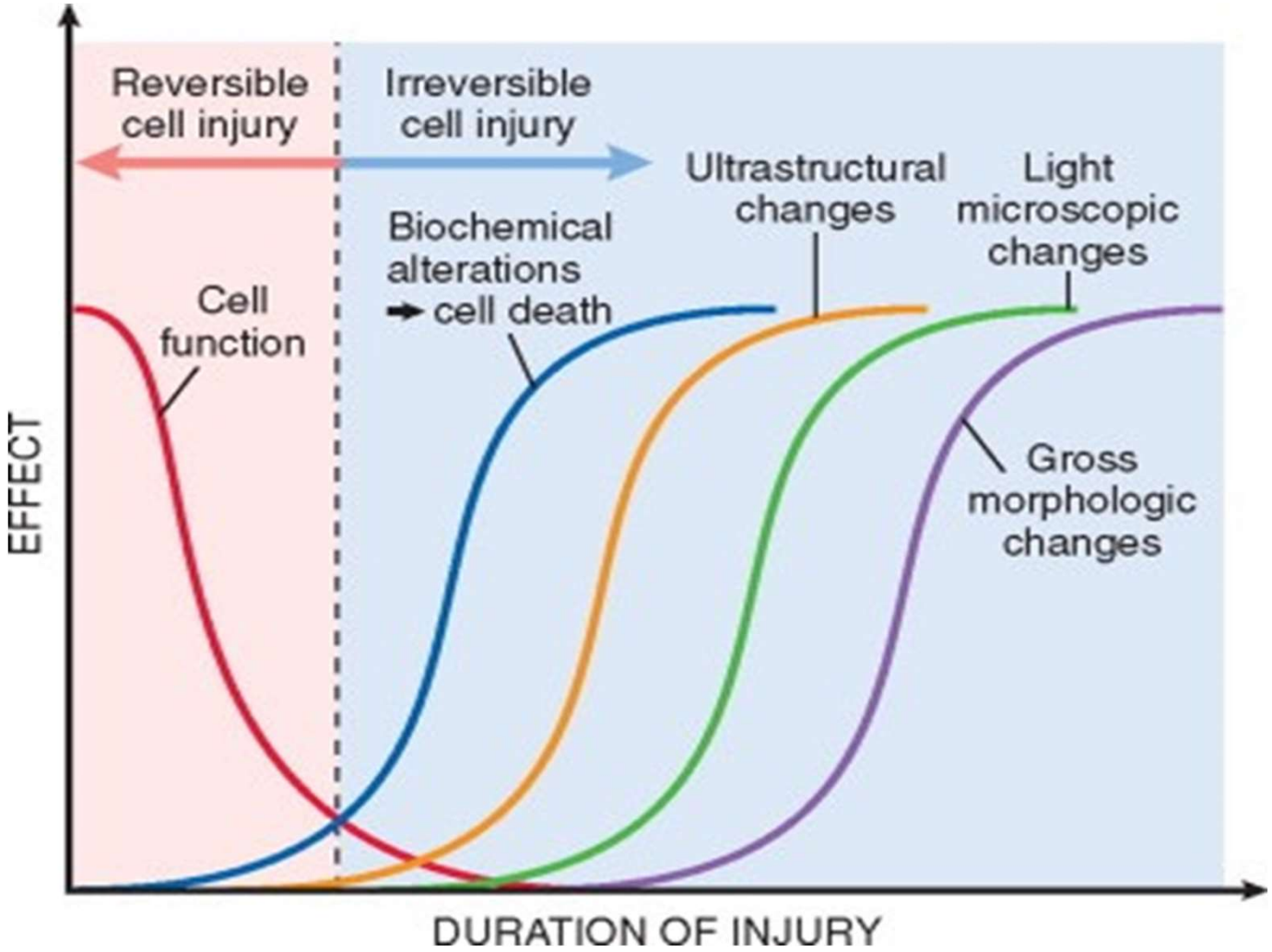
- bricks and mortar
- workers
- plans
- tools
  - hand tools vs
  - power tools
- power

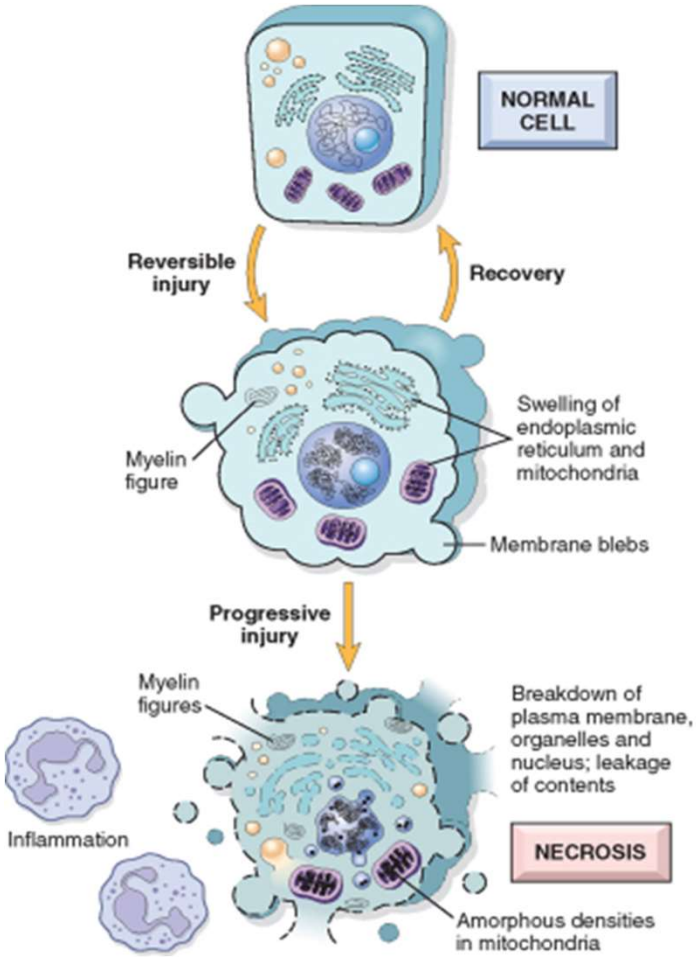
to repair the body you need:

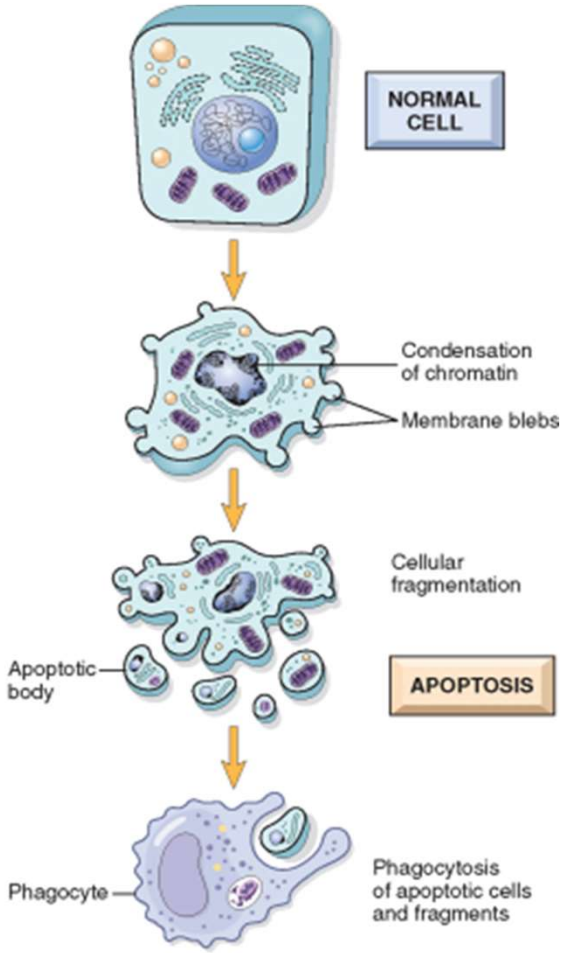
- nutrients
- functional cells
- functional genetics
- fuel/energy
- natural vs
  stimulated energy

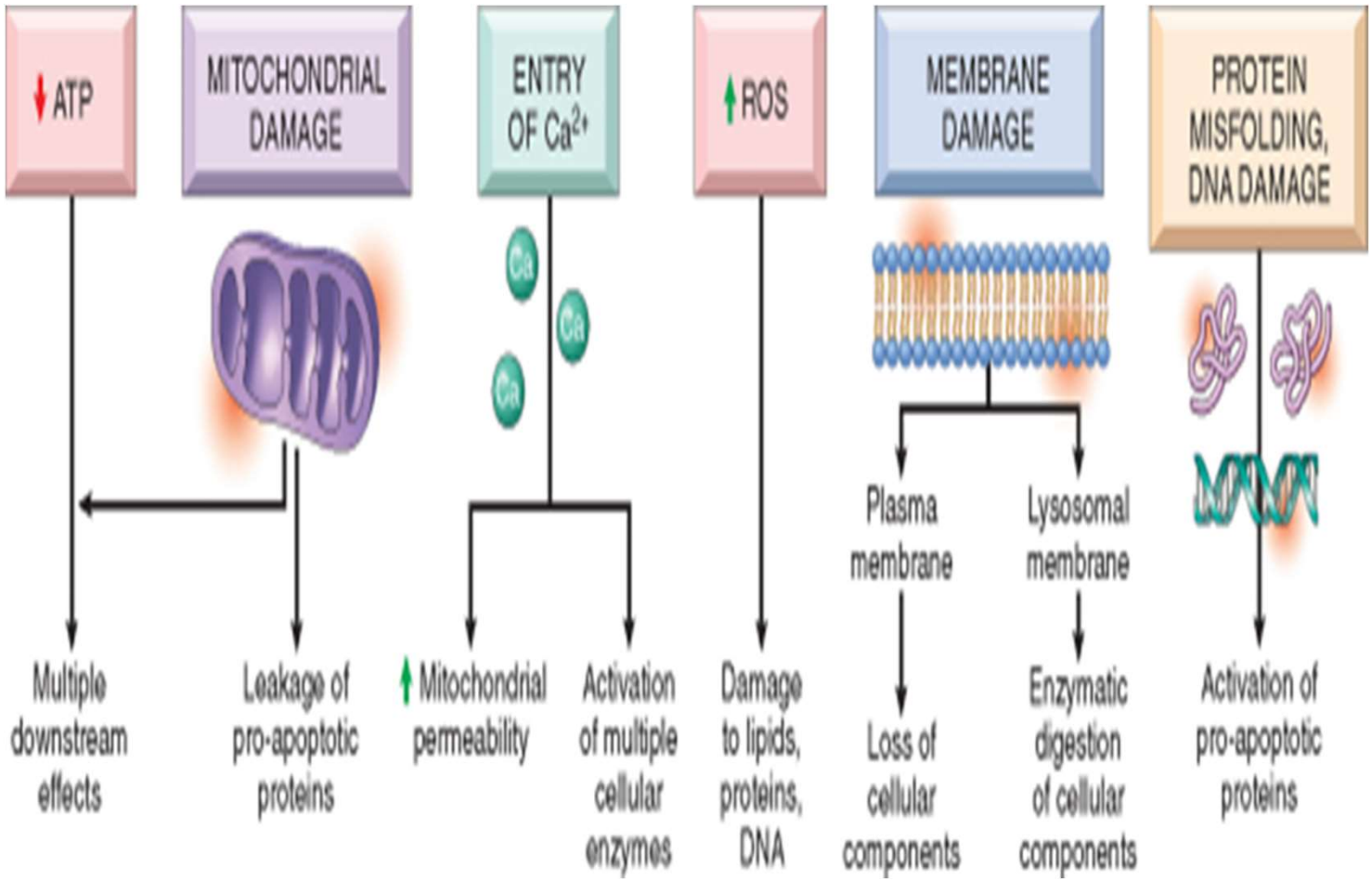





Reversible cell injury
Irreversible cell injury
Ultrastructural changes
Light microscopic changes
Biochemical alterations → cell death
Cell function
Gross morphologic changes
EFFECT
DURATION OF INJURY







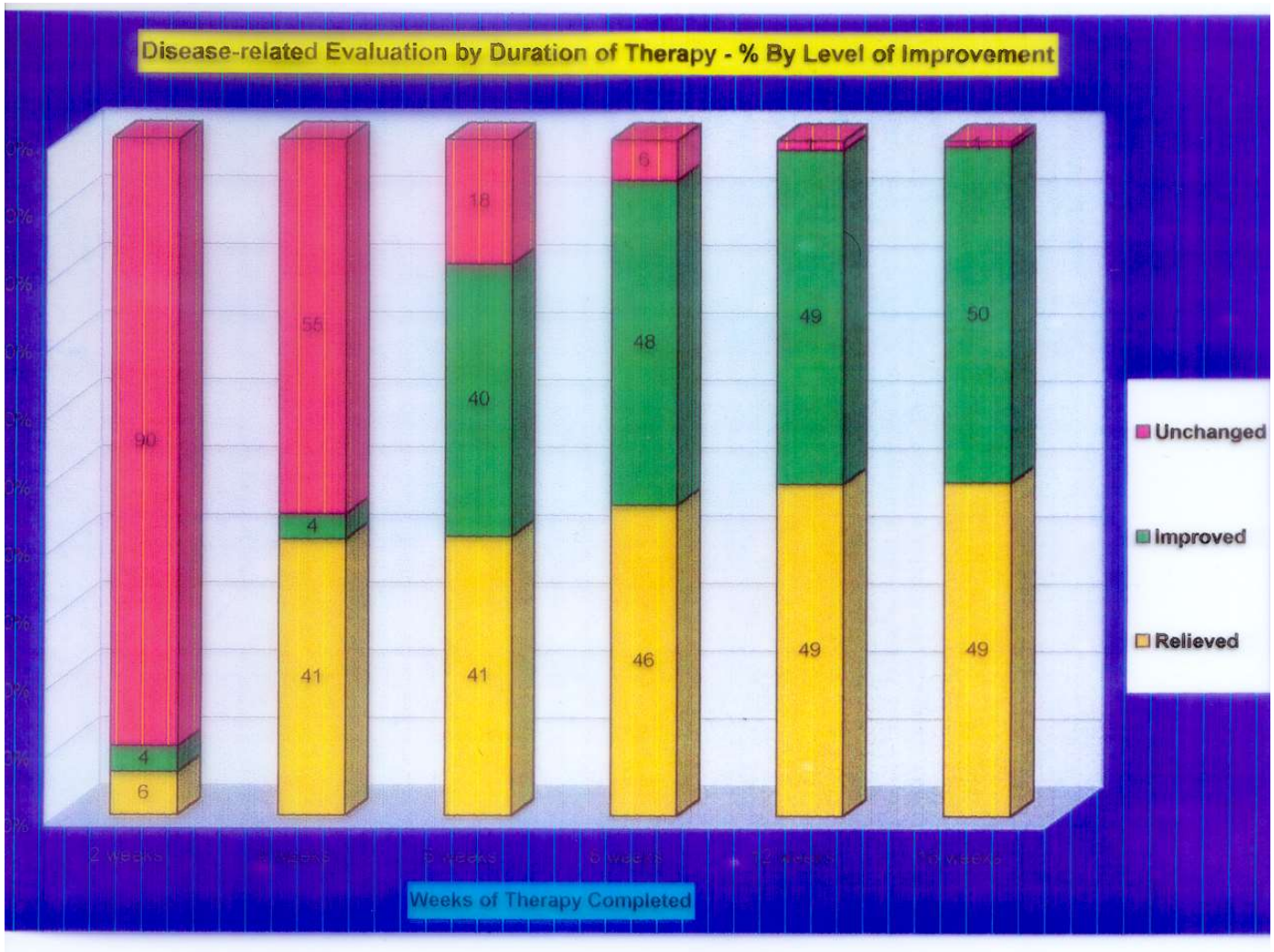
levels of illness

- the body may progress through 1 or more stages of reaction to physical insults.
- using common cold, as an example, the stages are:
  - energetic stage (i.e. tired/achy)
  - physiological stage (i.e. runny nose, sneezing)
  - patho-physiological stage (i.e. coughing, phlegm)
  - pathologic stage (i.e. pneumonia, abscess)

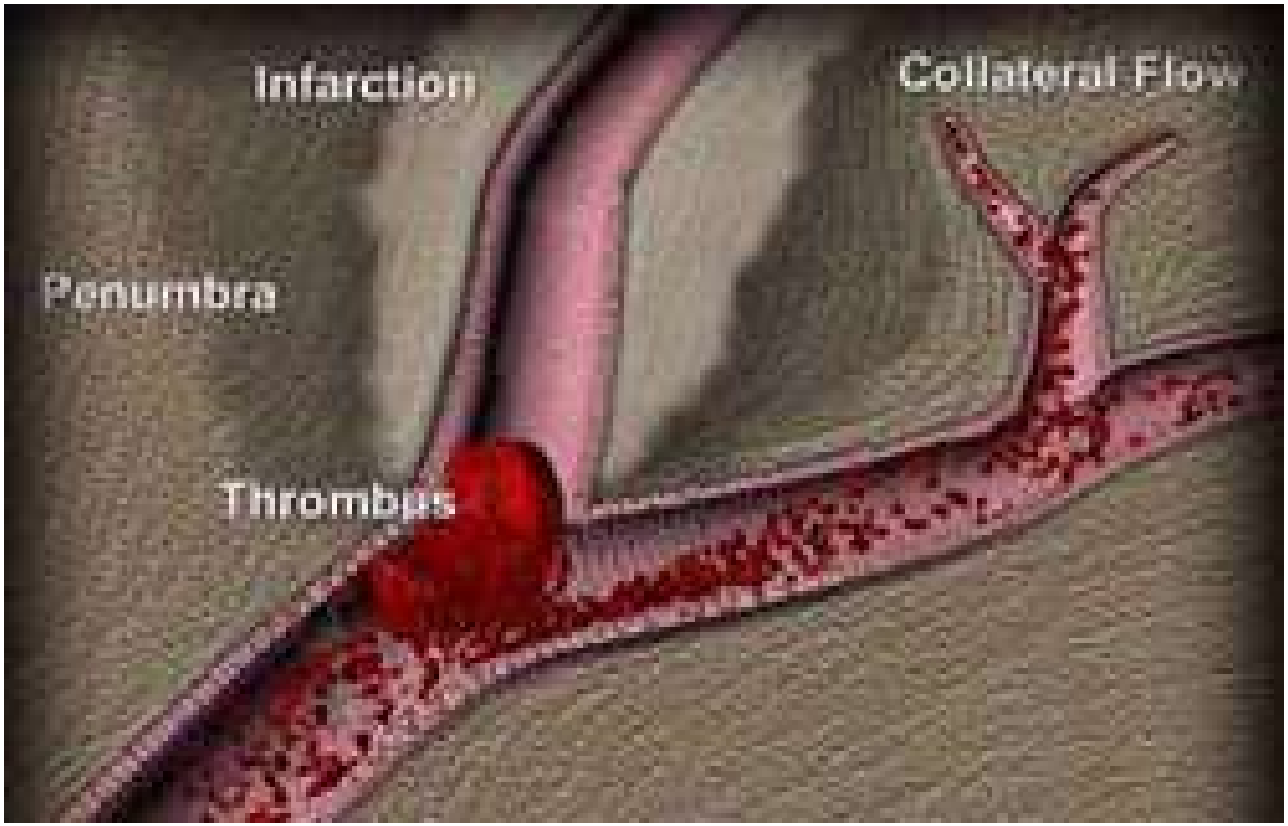
levels of illness

treatment response

- energetic stage - very rapid – mins to hrs
- physiological stage - quick – hrs to 1-2 days
- patho-physiological stage – days to weeks
- pathologic stage – weeks to yrs


Disease-related Evaluation by Duration of Therapy - % By Level of Improvement
90
4
6
55
4
41
18
40
41
6
48
46
49
49
50
49
Unchanged
Improved
Relieved
Weeks of Therapy Completed

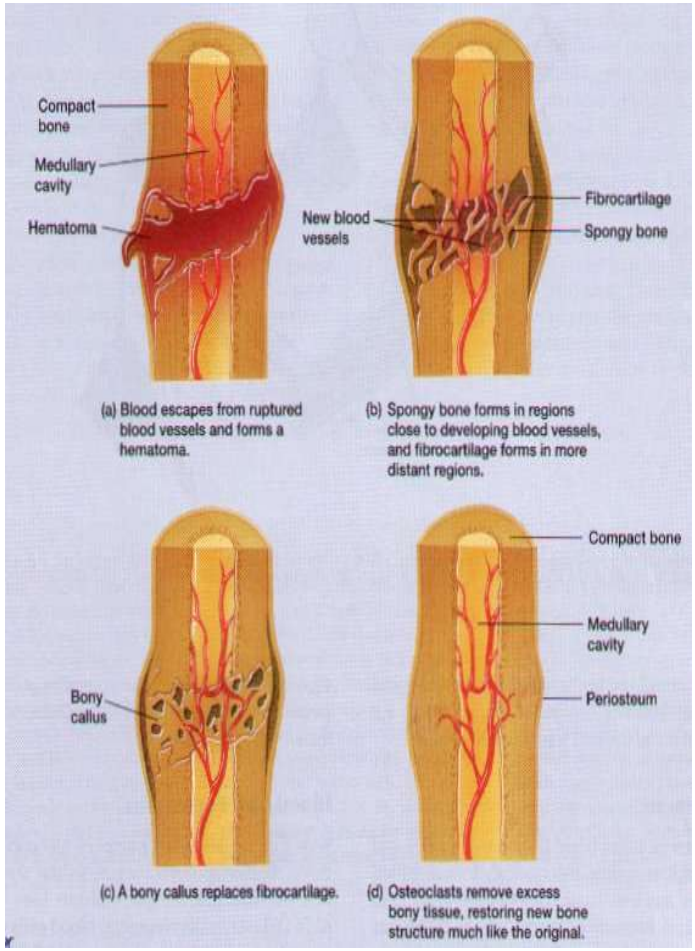
penumbral effect

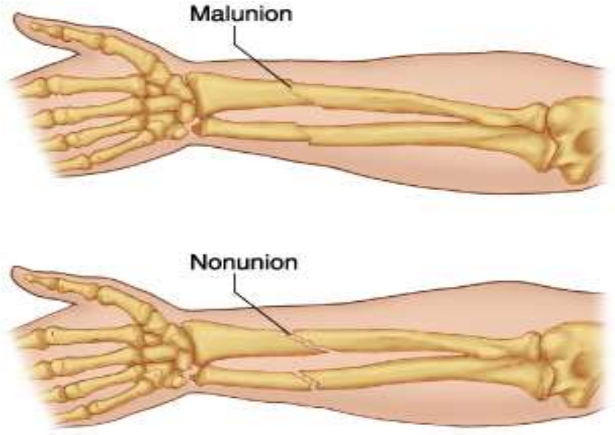


tissues heal at their own pace

- cornea – 24 hrs
- GI cells – 72 hrs
- skin/muscle - 2-4 wks
- bone – 2+ years
- nerves – axon 2 mm/day (small nerves) and 5 mm/day (large nerves)
- brain – maybe never
- tendons - months

patho-physiologic lesion – nonunion fracture





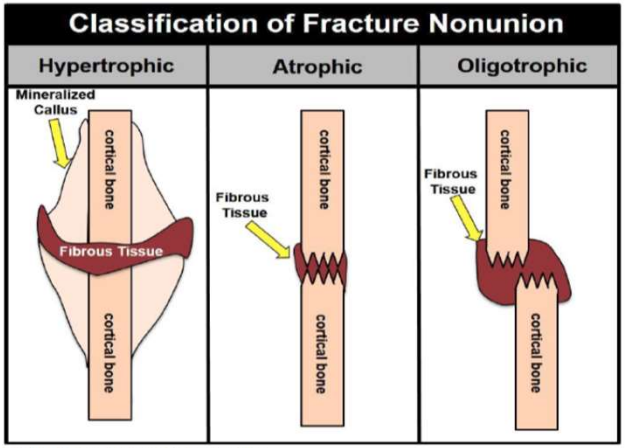


Figure 2: Classification of fracture nonunion

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sham

active

14 days

28 days

PEMFs and bone healing

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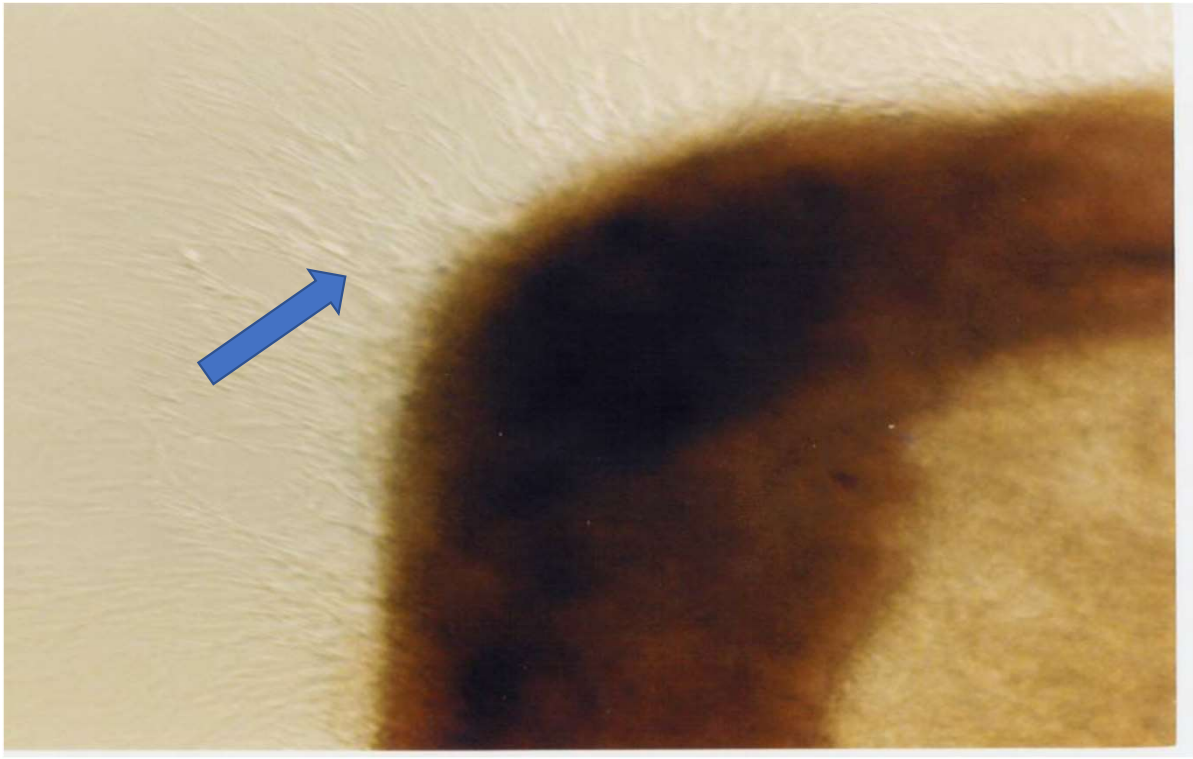
PEMFs stimulate stem cells

~400% increase neural stem cells

~150 growth factors expressed



Close inspection of the edge of the corona reveals NHNP cells attempting to grow in an oriented fashion away from the transplanted tissue.

07.12.12
pre-PEMF

08.06.12
post-PEMF

08.27.12
post-PEMF

10.02.12
post-PEMF

my own experiences with PEMFs

- 3-year-old girl with avulsed thumb
- 60-year-old male with gangrenous legs
- numerous research studies in the Power Tools For Health book

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magnetic field therapies do not raise the dead !

risk

- Macaque monkeys exposed 18 hr/day for 21 day periods.
  - no striking or consistent changes in appearance, demeanor, or behavior
  - brains of 5 autopsied animals normal
  - no significant metabolic alterations
- rats electrically stimulated to produce seizures, PEMFs inhibited generation of seizures.
- rTMS studies found reductions in suicidality in PCS; minimal side effects; no one died of suicide within 6 month follow-up.

- *George MS, Raman R, Benedek DM, et al. A two-site pilot randomized 3 day trial of high dose left prefrontal repetitive transcranial magnetic stimulation (rTMS) for suicidal inpatients. Brain Stimul. 2014 May-Jun;7(3):421-31.*
- *Ossenkopp KP, Cain DP. Inhibitory effects of acute exposure to low-intensity 60-hz magnetic fields on electrically kindled seizures in rats. Brain Res 442(2):255-260, 1988.*
- *Wolpaw JR, Seegal RF, Dowman R. Chronic exposure of primates to 60-Hz electric and magnetic fields: I. Exposure system and measurements of general health and performance. Bioelectromagnetics. 1989;10(3):277-88..*

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risk

- TMS or rTMS does not carry risk since total time too short.
- 1 patient w 70 treatment sessions over 12 months, 420,000 pulses, with no side effects
- 75-yo had 130 sessions over 26 mons, 156,000 stimuli
- 7 patients had 60 sessions over 12 months, 72,000 stimuli
- healthy men had 12,960 rTMS magnetic pulses a day for up to 3 days in 1 week, 38,880 pulses over 1 week
  - one of the largest known rTMS exposures
  - no significant side effects
- doses to 12,960 pulses/day appear safe and tolerable

- *Anderson B, Mishory A, Nahas Z, Borckardt JJ, Yamanaka K, Rastogi K, George MS. Tolerability and safety of high daily doses of repetitive transcranial magnetic stimulation in healthy young men. J ECT. 2006 Mar;22(1):49-53.*
- *Rossia S, Hallett M, Rossini, PM, Pascual-Leone A. The Safety of TMS Consensus Group1. Safety, ethical considerations, and application guidelines for the use of transcranial magnetic stimulation*

risk

- relapsing remitting MS with TBI
- no patient had relapse during follow-up for over 8 mons
- magnetic brain stimulation easy to perform, painless, and safe

Ingram DA, Thompson AJ, Swash M. Central motor conduction in multiple sclerosis: evaluation of abnormalities revealed by transcutaneous magnetic stimulation of the brain. J Neurol Neurosurg Psychiatry 51(4):487-494, 1988.

risk

- question of whether PEMFs act as cancer promoter
- rats w experimental brain glioma
- no promotion tumor growth

Eberhardt JL, Persson BRR. Development of rat brain tumours during exposure to continuous and pulsed 915 MHz electromagnetic radiation (meeting abstract). First World Congress for Electricity and Magnetism in Biology and Medicine, 14-19 June, Lake Buena Vista, FL, Abstract No. I-1, p. 27-28, 1992.

who will be “over” sensitive?

- very anxious
- very sensitive to medications
- extreme weather sensitivity
- sensitive to computer terminals
- hands on healers
- dowsers
- neg. reactions to other magnets
- hyper inflamed
- neuro-toxicity
- borderline personalities

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side effects

- no serious, permanent side effects reported in Japan in 20 yrs use
- studies of MRI workers indicated no adverse, long term effects to higher magnetic fields
- initial exacerbation of discomfort, burning, warmth in some according to anecdotal use

harmful effects are not normally observed during exposure to even strong MFs

strong fields should be used with caution if at all in those with magnetically sensitive foreign bodies, electrical devices, pregnancy and possibly those known to be especially vulnerable to cardiac dysrhythmias

CONTRAINDICATIONS/CAUTIONS

- pregnancy, pacemakers
- pain modulators
- insulin pumps, defibrillators
- hyperthyroidism, myasthenia gravis
- active bleeding [especially GI]
- adrenal/hypothalamic/pituitary dysfunction
- active Tb, acute serious viral infections
- cancer, active current
- psychoses

BREAK

devices

beyond theory

what PEMF systems are available?

FDA-approved	OTC
Neocontrol/Neotone	low intensity
?Regenerix; IVIVI	- FlexPulse
EBI/Osteologic/others	- many others
Magnatherm/Diapulse	high intensity
transcranial stimulation	- PEMF-120
others	- TeslaFit

Neurostar

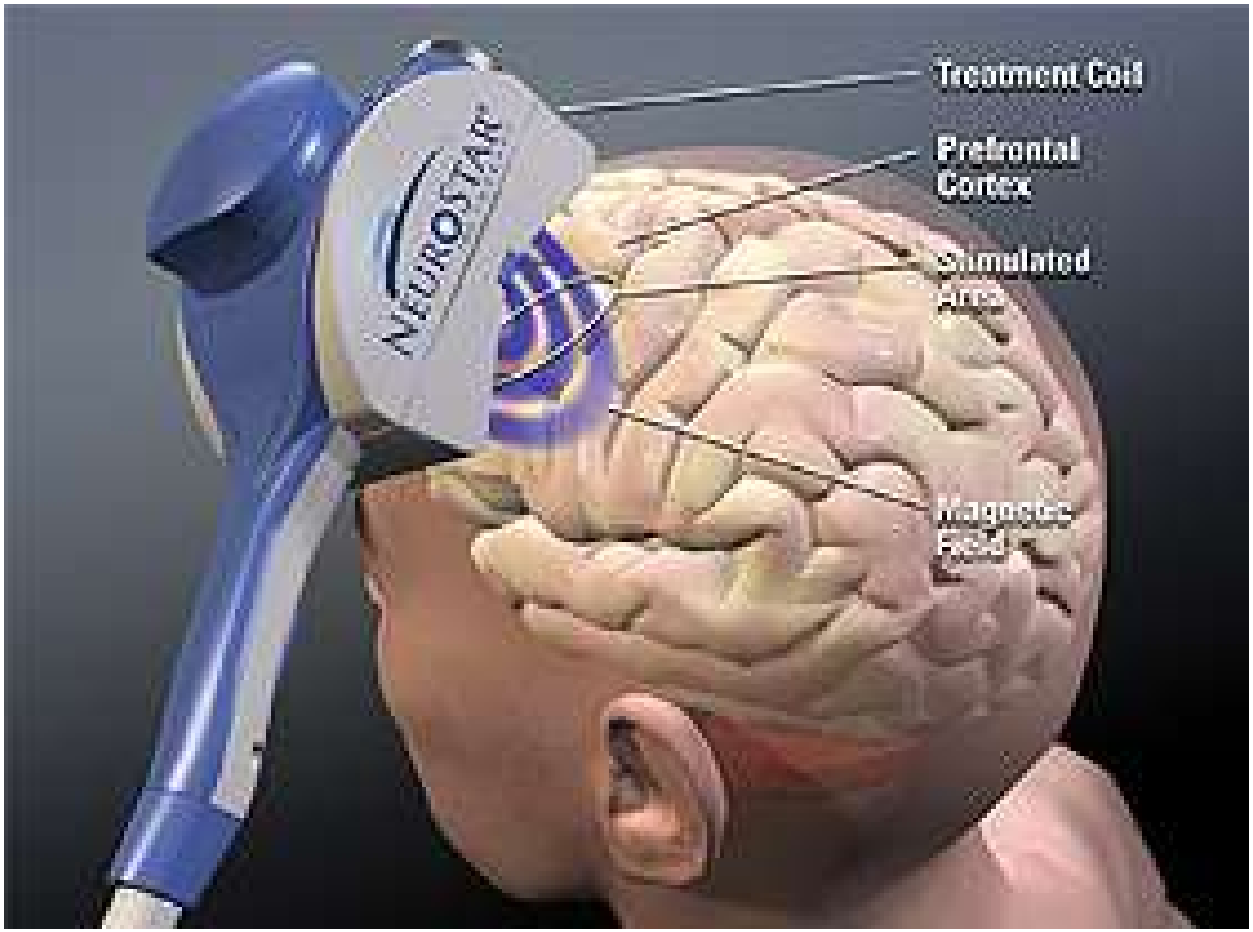
Treatment Coil
Prefrontal Cortex
Stimulated Area
Magnetic Field
NEUROSTAR

Figure 9–1. Coil positioning for active TMS (center) as well as several commonly used sham techniques (inserts). Active TMS is performed with the figure-eight coil tangential to the scalp, with the intersection of the figure-eight in direct contact with the scalp. All of the sham manipulations consist of angling the coil slightly off the head such that the superficial

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NEOCONTROL™

choosing a PEMF system

based on:

- cost
- convenience
- programs
- intensity
- applicators
- condition/s being treated
- value
- reliability
- science

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iMRS Professional

waveforms: sawtooth large pad;
square small pad
max intensity:
  pads 0.64 gauss (64 µt);
  probe 3 g (300 µt);
sensitive setting ~1-10 µt
frequencies: 0.1-32 hz
programs: 4
duration: 2-60 minutes
small pad - 4 brain wave levels
add-ons: audio jack/light goggles; HRV

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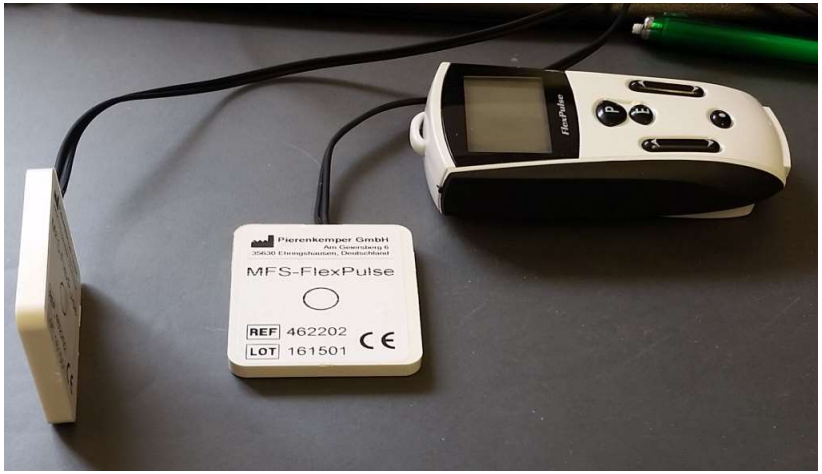
FLEXPULSE

wave form: trapezoidal
max intensity: 200 gauss (20000 µt)
frequency range: 3 – 1000 hz
programs: 6
duration: 10 – 60 min. or continuous

battery-operated



FlexPulse

Program	Function
1: 10Hz	Cellular Stimulation
2: 10Hz/100Hz	Cellular Repair
3: 3Hz	Deep Relaxation
4: 7.83Hz	Balance/restoration
5: 23Hz	Alertness/e-smog
6: 1,000Hz	Mood Balancing

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TeslaFit systems

- high intensity systems
- with muscle contracting capability
- produce better effects, faster

_____

solid state switch
vs
capacitor discharge

TeslaFit Pro

intensity settings: 10
max intensity: 8290 gauss (829000 µt)
pulse rate: 1-50 pulses per second
duration: 5 min.

TeslaFit DUO

intensity settings: 5
max intensity: 5460 gauss (546000 µt)
pulse rate: 1-50 pulses per second; 10 Hz in between
duration: 5, 10 min.
2 independent channels

TeslaFit Plus 2

intensity settings: 2
max intensity: 3990 gauss (3990000 µt)
pulse rate: 1-50 pulses per second ; 10 Hz in between
duration: 5, 15 min high - 30 min low.

PEMF 120

wave form: spark chamber
max intensity: 9360 gauss (0.93T)
analog variable intensity settings
pulse rate: 1 – 50 pulses/sec
duration: 1 – 10 minutes

what is acupuncture most used for?

chronic pain

- low-back
- neck
- osteoarthritis
- tension headaches
- migraine headaches

Table 2. Disease Spectrum of Acupuncture Researches in Recent 3 Years

No	Disease classification	Total number
I	Certain infectious and parasitic diseases	1 (1.33)
II	Neoplasms	8 (10.67)
IV	Endocrine, nutritional and metabolic diseases	2 (2.67)
V	Mental and behavioral disorders	1 (1.33)
VI	Diseases of the nervous system	30 (40.00)
IX	Diseases of the circulatory system	3 (4.00)
XI	Diseases of the digestive system	7 (9.33)
XII	Diseases of the skin and subcutaneous tisaue	1 (1.33)
XIII	Diseases of the musculoskeletal system and connective tissue	16 (21.33)
XIV	Diseases of the genitourinary system	3 (4.00)
XIX	Injury, poisoning and certain other consequences of external causes	1 (1.3)
XVI	Certain conditions originating in the perinatal period	1 (1.33)
XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	1 (1.33)

Current Tracking on Effectiveness and Mechanisms of Acupuncture Therapy: A Literature Review of High-Quality Studies. Yang FM, Yao L, Wang SJ, et al. Chin J Integr Med. 2019 Feb 1.

Neurology

- stroke
- migraine
- Parkinson's
- chronic fatigue
- CTS
- Alzheimer's
- spinal cord injury
- epilepsy
- perinatal hypoxia

Cancer

- hot flashes
- nausea from chemo
- chemo neuropathy
- anxiety
- depression

GI

- constipation
- dyspepsia
- increase gastric emptying
- chronic gastritis

mechanisms underlying acupuncture

- nonspecific effects play important roles
- modifying pain through a top-down approach

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Direct and indirect stimulation

- acupuncture is almost entirely indirect stimulation – pushing energy into an acupuncture point and down meridians to exert distal effects
- magnetic field therapy is both direct and indirect – more direct tissue and less indirect acupuncture-type and other reflex type stimulation.

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BASIC BIOLOGIC EFFECTS OF PEMFs

- Acupuncture Stimulation
- Antibacterial, Antifungal, and Antiviral Actions
- Anti-Coagulant effects
- Anti-Edema activity
- Anti-Inflammatory response
- Anti-spasm activity
- ATP and Mitochondria
- Autophagy
- Circadian Rhythms
- Circulation
- Collagen, Hyaluronic Acid, and GAGs
- Detox
- Growth Factors and Nitric Oxide
- Healing Acceleration
- Heart
- Immunology
- Nerves and Nerve Conductivity
- Oxygen
- Pain
- Psychological and Cognitive Function
- Red blood cells
- Skin
- Stem cell stimulation
- Stress
- Tissue healing and regeneration
- Water

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Clinical applications for specific health conditions

- Addiction
- Adhesions, abdominal
- Alkaline Balance
- Anxiety, Panic and PTSD Disorders
- Arthritis
- Atrial Fibrillation
- Back Pain
- Bone Healing and Repair
- Bruising
- Cancer
- Chronic Fatigue Syndrome
- Concussion and Traumatic Brain Injury
- Dental Issues
- Depression
- Diabetes
- Eczema
- Enuresis, nocturnal
- Erectile Dysfunction
- Eye Conditions
- Fibromyalgia
- Fungal Skin Infections
- Heart Conditions
- Hepatitis, viral
- Intestinal Function
- Joint Replacements and Implanted Prosthetics
- Keloids
- Liver Regeneration
- Lyme Disease
- Migraine
- Multiple Sclerosis
- Neuromyelitis Optica
- Obesity
- Osteopenia/porosis
- Pain Management
- Pancreas
- Paraplegia and Spinal Cord Injury
- Parkinson's Disease
- Premenstrual Syndrome (PMS)
- Prostate Hyperplasia
- Psoriasis
- Radiation Damage
- Scleroderma
- Shingles
- Sleep
- Smoking Cessation
- Stroke
- Testosterone
- Tremor
- Urinary Incontinence & Overactive Bladder
- Wounds

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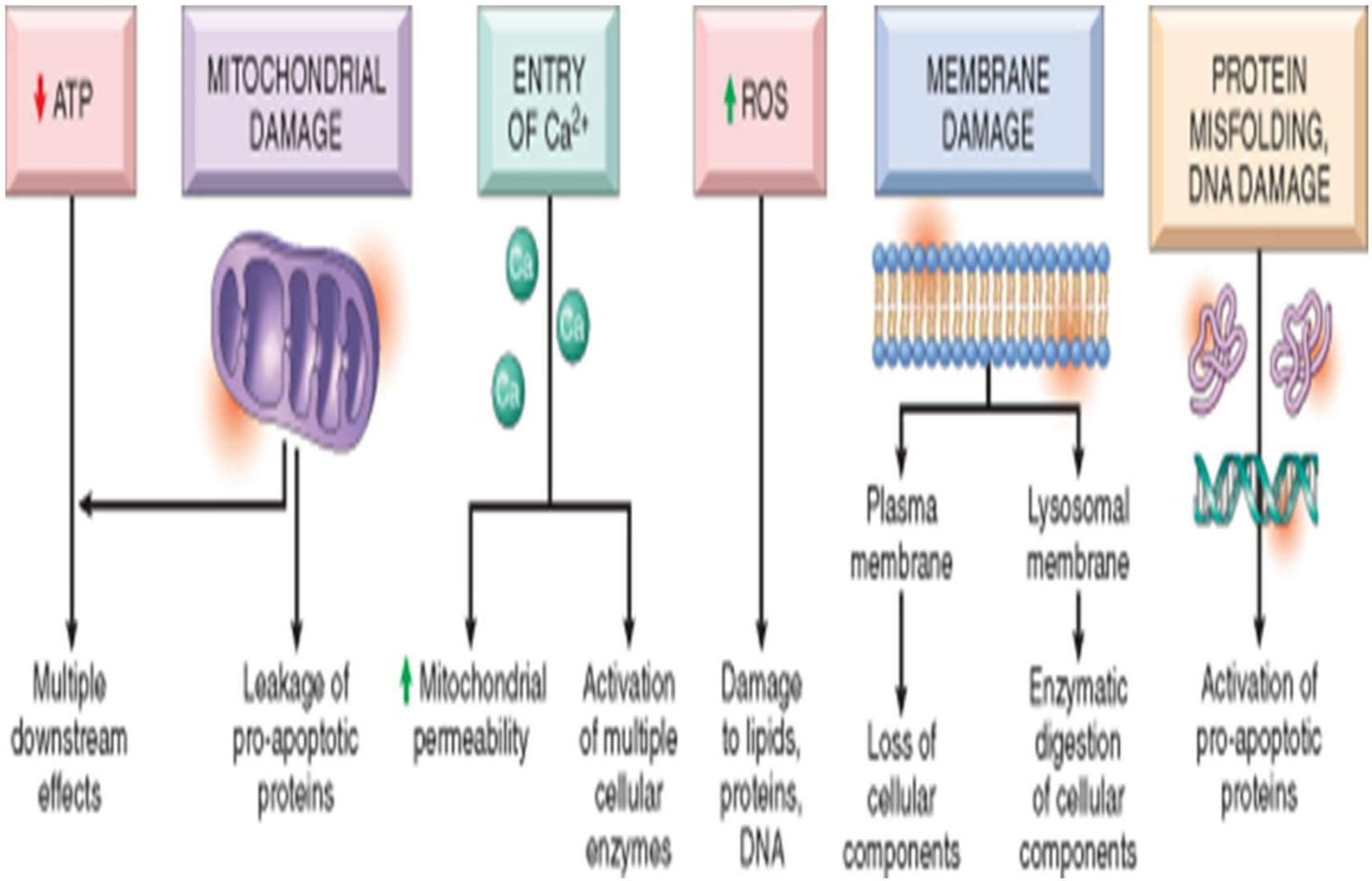
setting a healing timeline

levels of illness and onset of response

treatment response

- energetic stage - very rapid – mins to hrs
- physiological stage - quick – hrs to 1-2 days
- patho-physiological stage – days to weeks
- pathologic stage – weeks to yrs



- some symptom improvement 1st
- followed by physiologic change
- followed by healing and regeneration

- each level has a different timeline
- each depends on the others to varying degrees

levels of illness and onset of response

treatment response

- energetic stage - very rapid – mins to hrs
  - rarely see people at this stage
- physiological stage - quick – hrs to 1-2 days
  - the physiologic change may or may not be the cause of the symptoms

early symptom improvement
does not depend on local factors entirely

- natural anti-nociceptive effect locally rapidly
  = ~10 mg morphine
- reduction of edema and
  improvement of circulation happen rapidly
- never neglect the brain and/or the spinal cord,
  especially for pain

treatment response

- patho-physiological stage – days to weeks
  treat and wait and see
- the body will tell you what it can do and is doing

treatment response

- the body will tell you what it can do and is doing depending on:
    - age, severity, vitality, lifestyle factors, supplementation, nutrition, other diseases.
    - all help or hinder the process

treatment response

I tell people I’m an M.D. not a G.O.D.
and… even G.O.D.
doesn’t give you everything you want

treatment response

So … acupuncture and PEMFs are G.O.D.-given

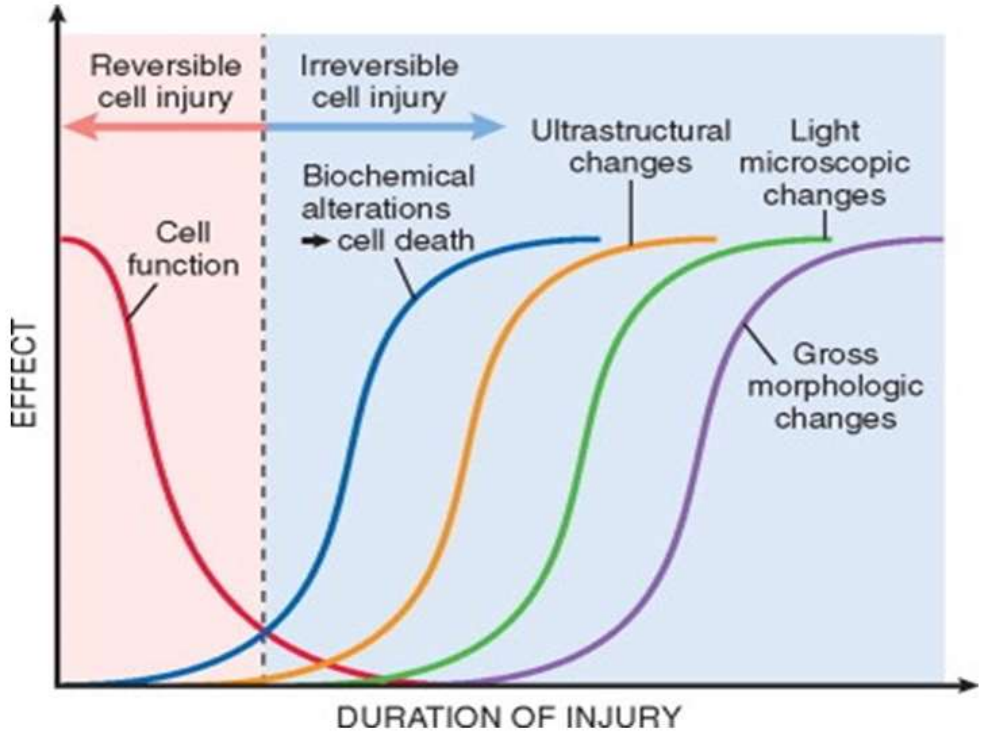
and subject to what G.O.D. and YOU allow or will

treatment response

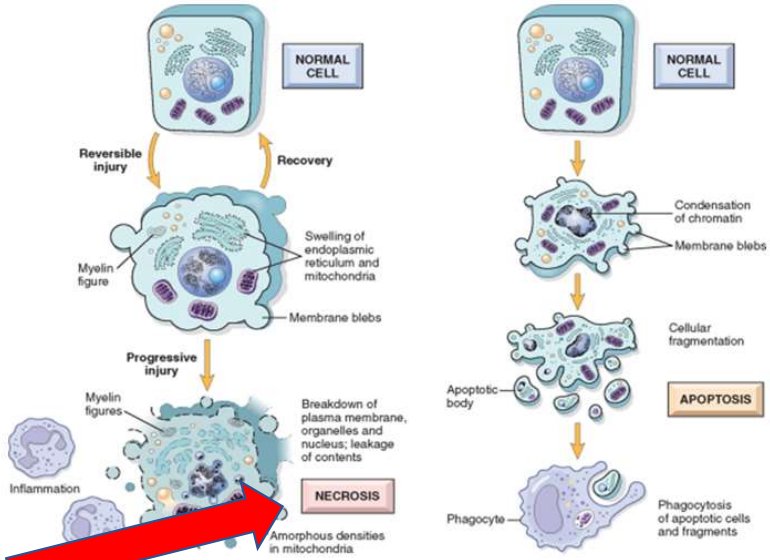
treatment response

- energetic stage - very rapid – mins to hrs
- physiological stage - quick – hrs to 1-2 days
- patho-physiological stage – days to weeks
- pathologic stage – weeks to yrs

pathological –my use of this term is the effects of a cell injury process that is evident in body tissues



pathological –my use of this term is the effects of an unnatural cell injury process that is evident in body tissues



necrosis - factors external to the cell or tissue, such as infection, toxins, or trauma

apoptosis - naturally occurring programmed and targeted cause of cellular death.

outcomes of healing of
pathological processes is
very individual and variable and
results in non-normal tissue

a scar is still a scar – it may be a
better looking scar, but
it’s still a scar

- skin incisions
- adhesions in the belly
- shortened extremities
- burn scars
- seizure foci in the brain
- changes in bowel function
- loss of vision
- organ failure
- etc.

even these, left to heal on their own can be improved upon, after so-called healing is presumed to be finished

leaving cell injury to heal on its own leaves too much to chance, especially when we have PEMF and acupuncture tools available to help

- pre session treatment
- in session treatment
- post session treatment
- combination
- home treatment

questions to ask before treating a person

- goals
- priorities
- nature of the pathology
- symptoms
- what will happen 1st
- what will happen after that
- how many treatments will be needed
- are the objectives short-term or long-term
- concurrent treatments
- possible interactions
- remember the levels of healing

- innovate
- can almost never do harm
- don’t be afraid to combine
- ask the patient how they want to proceed
- it is always an experiment
- chronic problems need more time
- clinician should go beyond symptoms
- sustainable responses depend on the degree of healing
- explain healing timelines and tissue healing times

- remember the risk of sensitivity
- PEMF therapy is like training – in this case cellular training
- go low and slow to start
- explain the risks of hard and fast
- some people want hard and fast

when to add home treatment

- matter of clinical judgment
- more likely necessary for more severe problems that are chronic with little likelihood of significant tissue healing or reversal of pathology
- if patients are not getting sustainable benefits from office treatments, bridging home treatment may be better able to maintain symptomatic benefit, especially using a lower cost, portable, PEMF system
- patient's personal preference for ongoing office treatments versus home treatment - this is a cost-benefit decision considering the costs of purchasing expensive, reasonably high intensity, home equipment

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disadvantages of PEMFs

- daily treatment
- cost of equipment
- risk of sensitivity
- go low and slow
- bulkiness
- awkward to apply
- can’t help everything
- need to combine with other lifestyle measures

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disadvantages of acupuncture

- get undressed
- minor soreness
- cannot possibly cure
- aid pain or symptoms
- regularly scheduled follow-up treatments
- short term benefits
- cost
- often not covered by insurance
- results aren’t guaranteed
- infections from needles

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How to use PEMFs for:

- pain of almost any kind
- shingles
- headache.migraine
- chronic fatigue
- lupus
- MS
- stroke
- Bell's palsy
- cerebral palsy
- carpal tunnel syndrome
- sciatica
- hepatitis
- chemotherapy/
- radiation
- anxiety
- depression
- stress
- insomnia
- addiction
- tendinitis
- muscle spasms
- etc.

charging for treatment

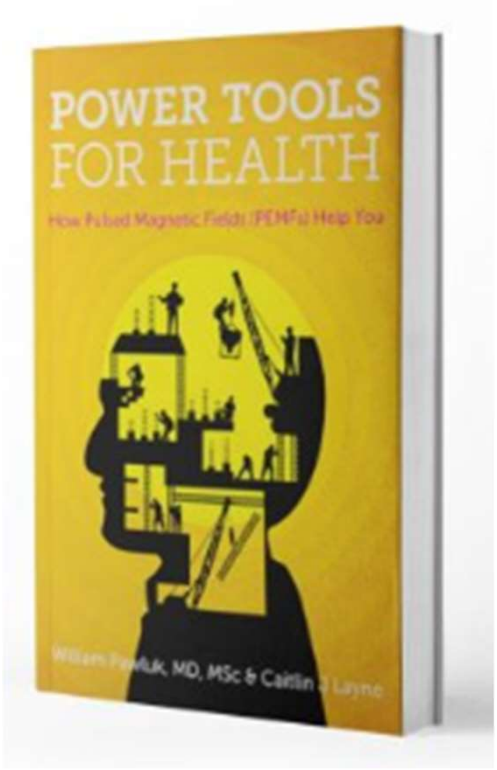
$1-3/minute

packages

no insurance codes

RESOURCES

www.pemftrainingacademy.com
www.drpawluk.com
www.bioelectromagnetics.org
www.emf-portal.de
Power Tools for Health book



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Q&A


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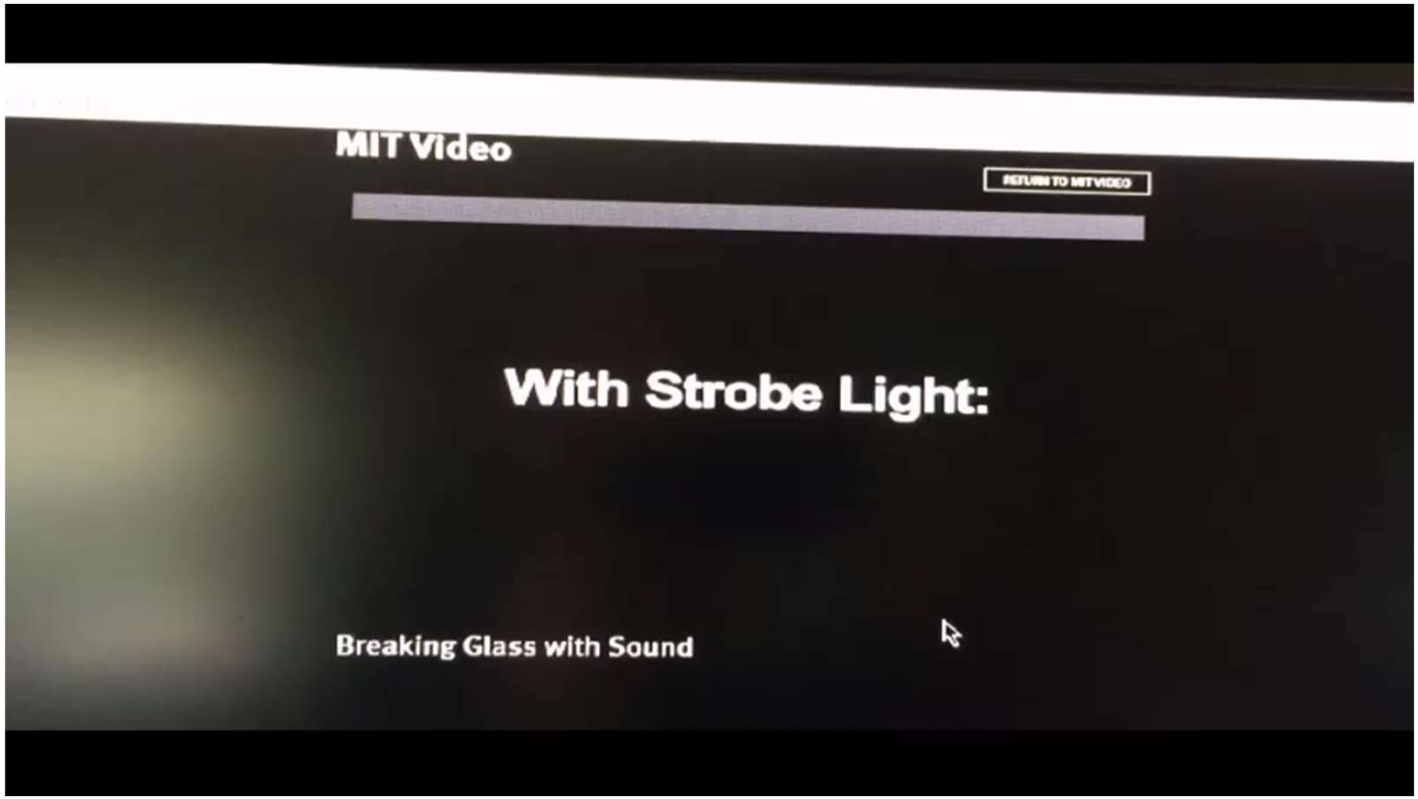
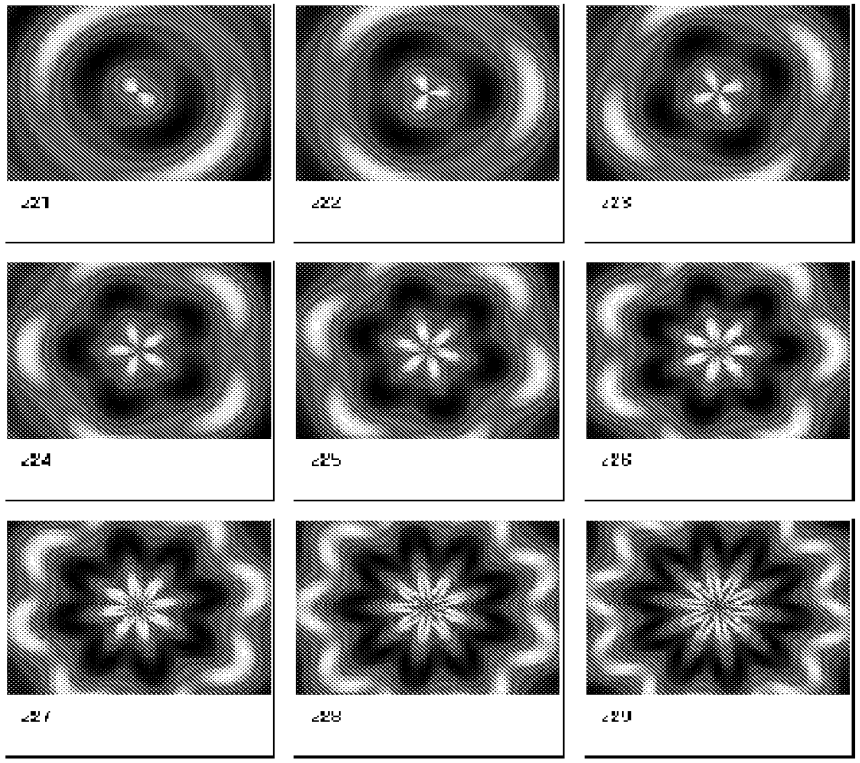

MIT Video
With Strobe Light:
Breaking Glass with Sound

since the body is about 70% water …

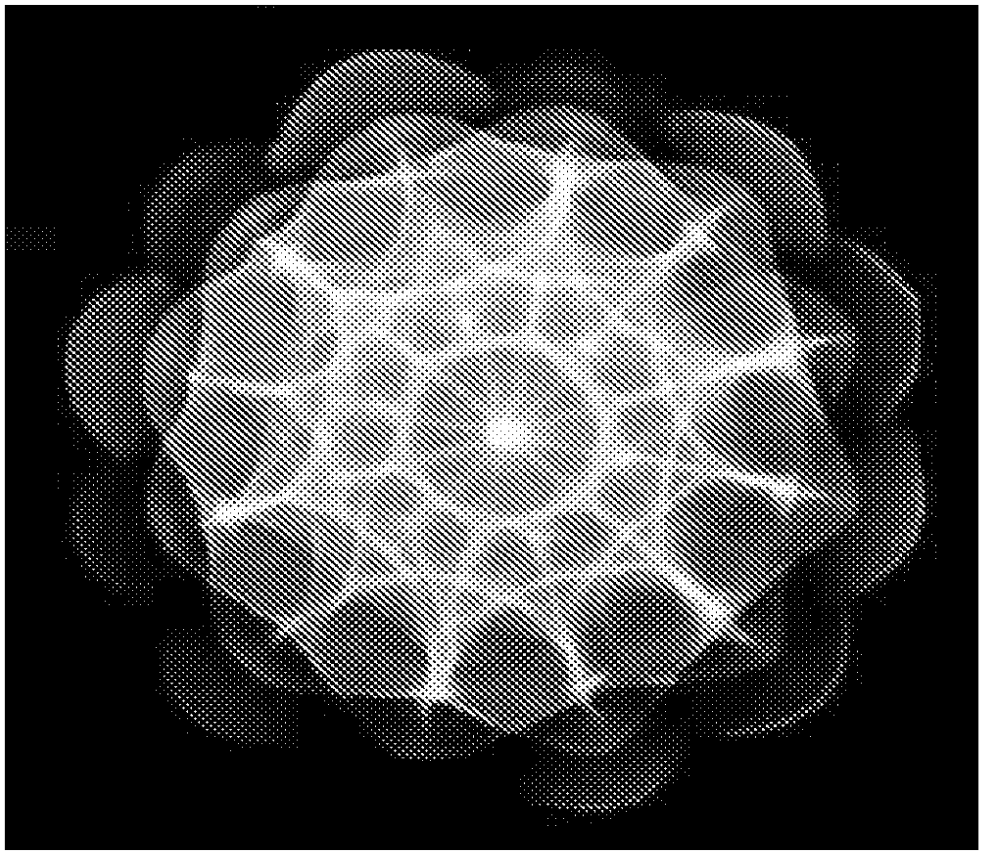
Cymatics, from Greek: κῦμα, meaning "wave", is a subset of modal vibrational phenomena

https://www.youtube.com/watch?v=Q3oItpVa9fs



Sound structures in the water drop as a function of the wavelength

and a function of the extent



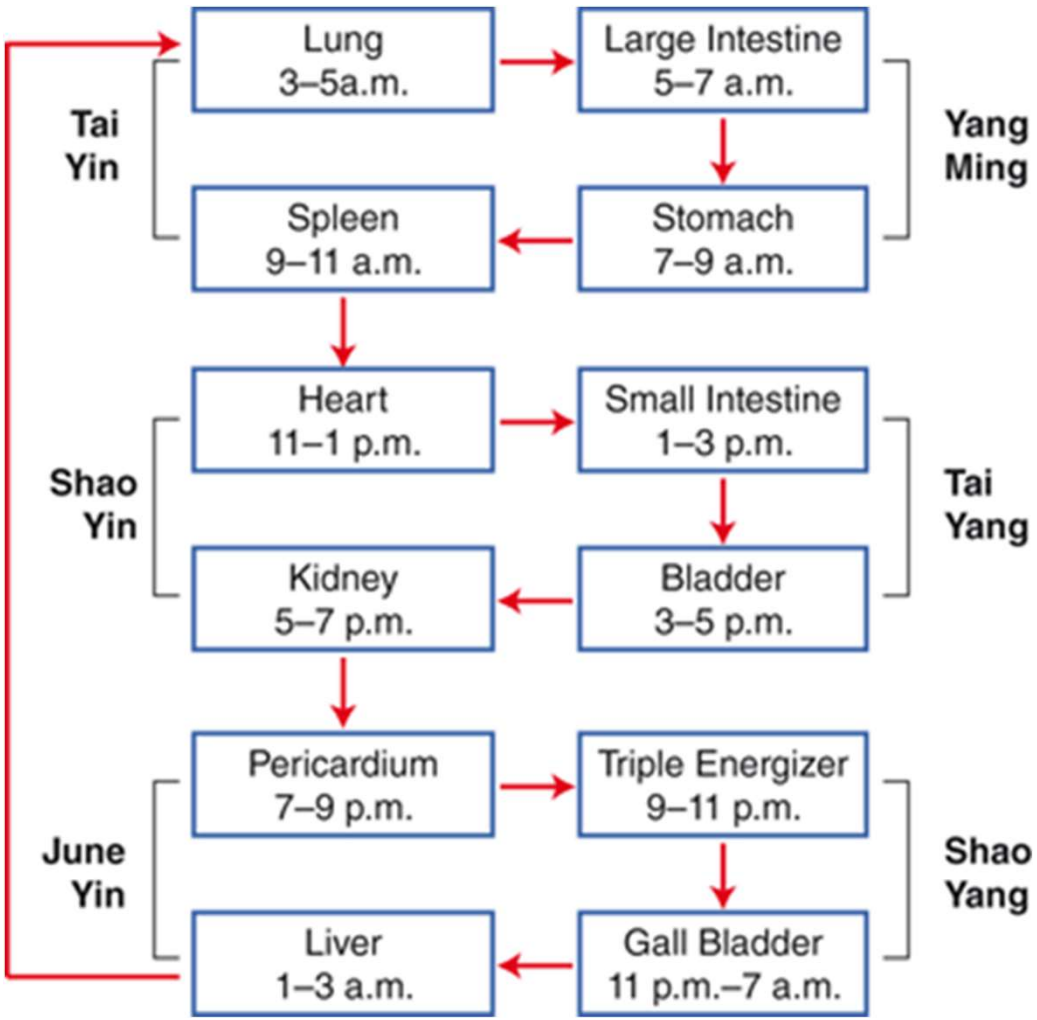
Chladni Figure – sound and sand

Bonuses Recap

- Reduced price on the workshop: $1000 to $195 $805
- Power Tools for Health book: $25
- Magnetic Therapy in Eastern Europe book: $39
- Online Power Tools for Health course: $1000
- 10% discount on devices up to $1900
- Continued educational and technical support: > $1000
- PEMF Training Academy access > $1000

Total estimated value **$5964**

Your cost $195


Lung
3–5a.m.
Large Intestine
5–7 a.m.
Tai
Yin
Yang
Ming
Spleen
9–11 a.m.
Stomach
7–9 a.m.
Heart
11–1 p.m.
Small Intestine
1–3 p.m.
Shao
Yin
Tai
Yang
Kidney
5–7 p.m.
Bladder
3–5 p.m.
Pericardium
7–9 p.m.
Triple Energizer
9–11 p.m.
June
Yin
Shao
Yang
Liver
1–3 a.m.
Gall Bladder
11 p.m.–7 a.m.