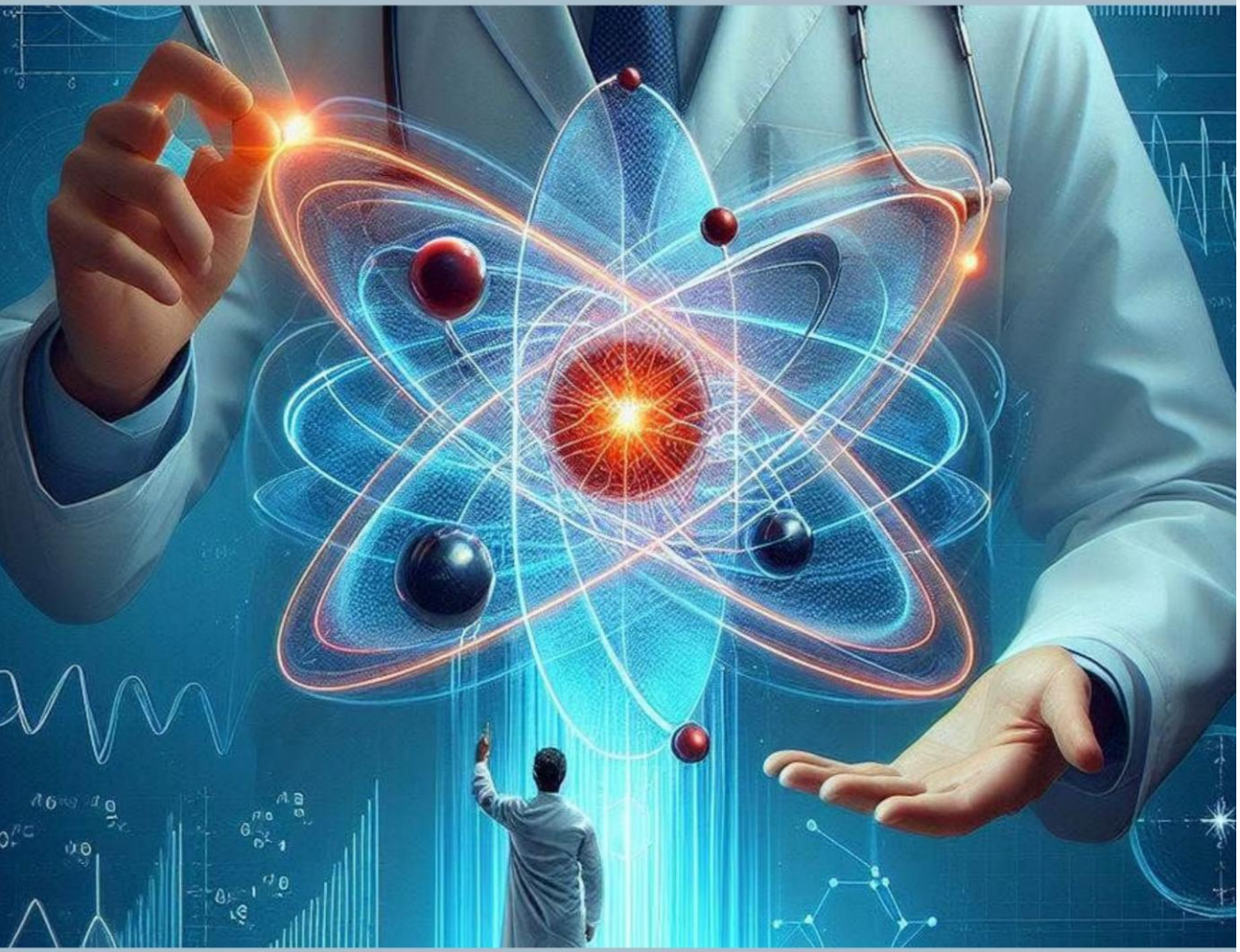


ISDT
International Society of Diamagnetic Therapy

PERISO ACADEMY

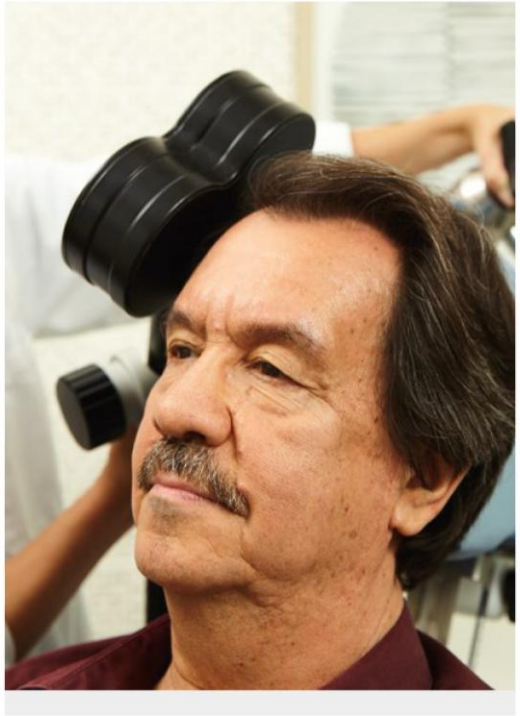
Neuro Rehabilitation and Biotechnology

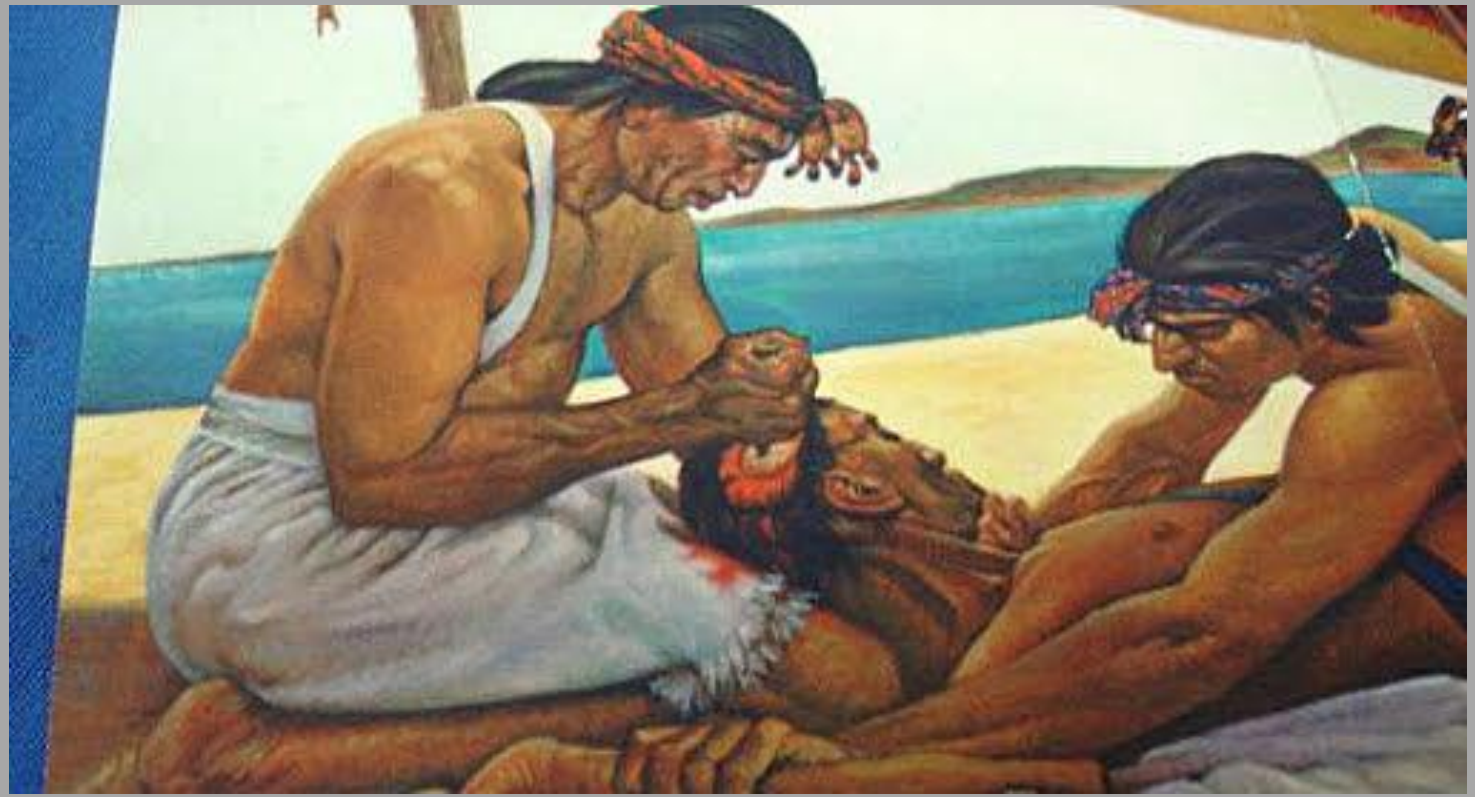
Serafin Ortigueira

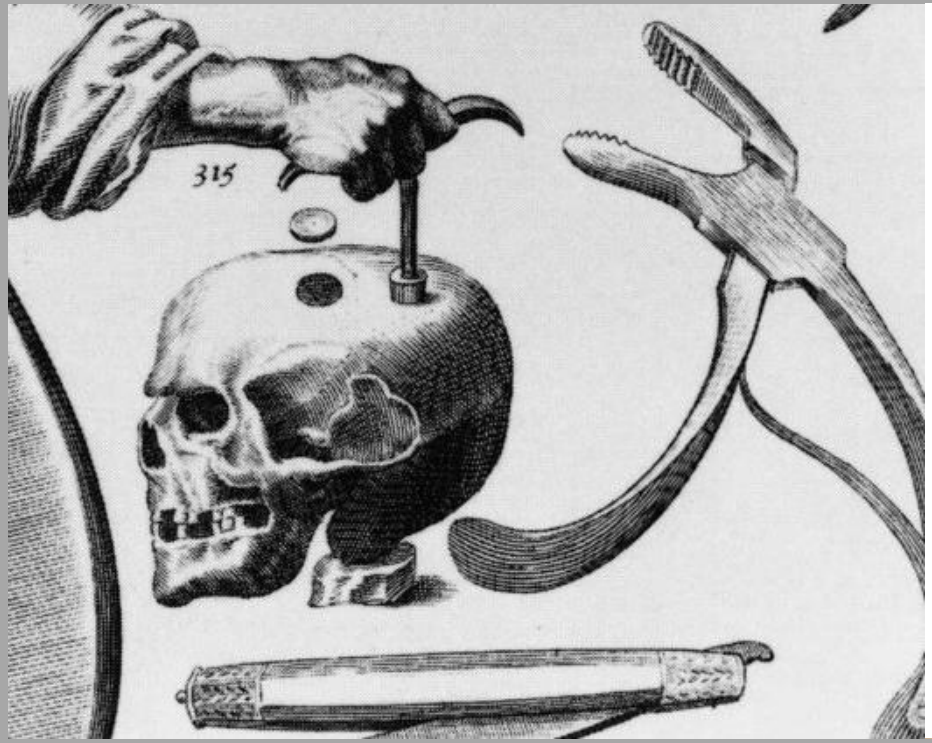
cefine NEUROLOGÍA

UNIVERSIDADE DA CORUÑA

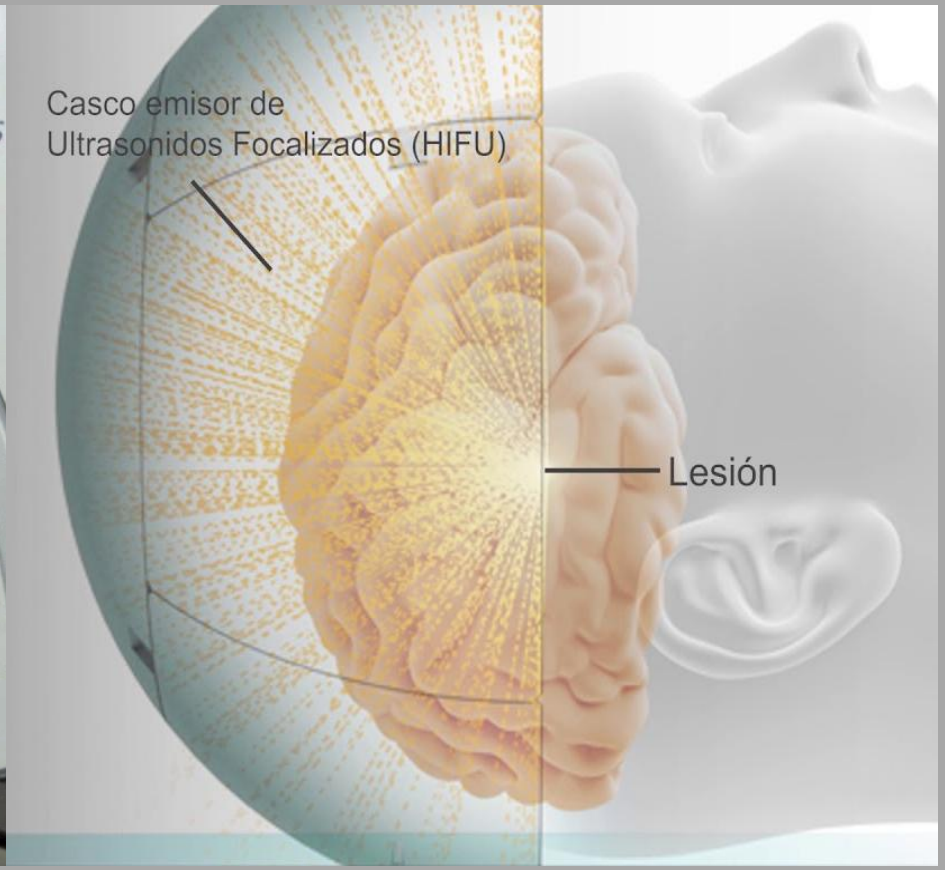
INTRODUCTION



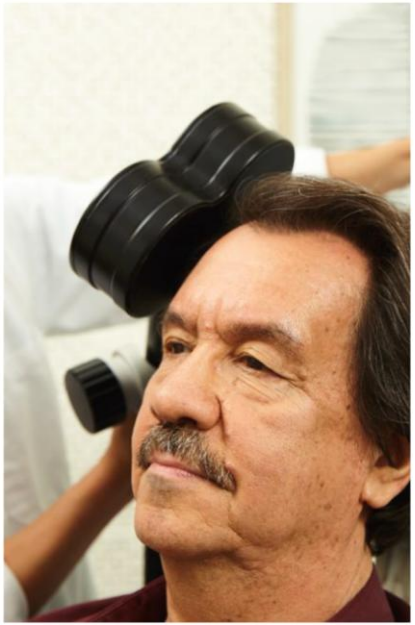



315


hm hospitales


Casco emisor de
Ultrasonidos Focalizados (HIFU)
Lesión

Neuro Rehabilitation and Biotechnology

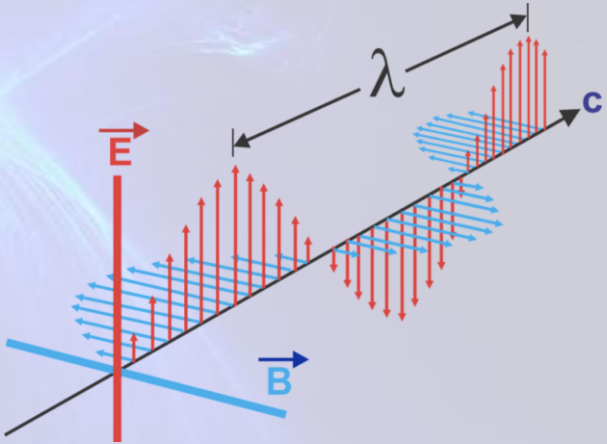


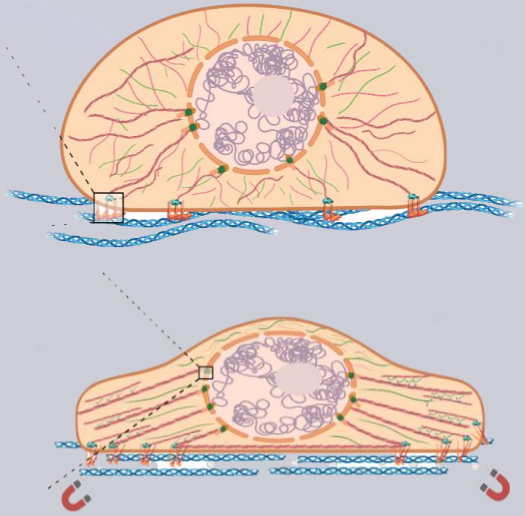
"La incidencia del ictus ha crecido en los últimos años entre la población menor de 50 años debido al incremento de malos hábitos como fumar, consumir drogas o excesivas cantidades de alcohol, el sedentarismo, una mala alimentación o el estrés"

Rafael Arroyo, jefe del Departamento de Neurología del Hospital Universitario Quirónsalud Madrid y del Complejo Hospitalario Ruber Juan Bravo

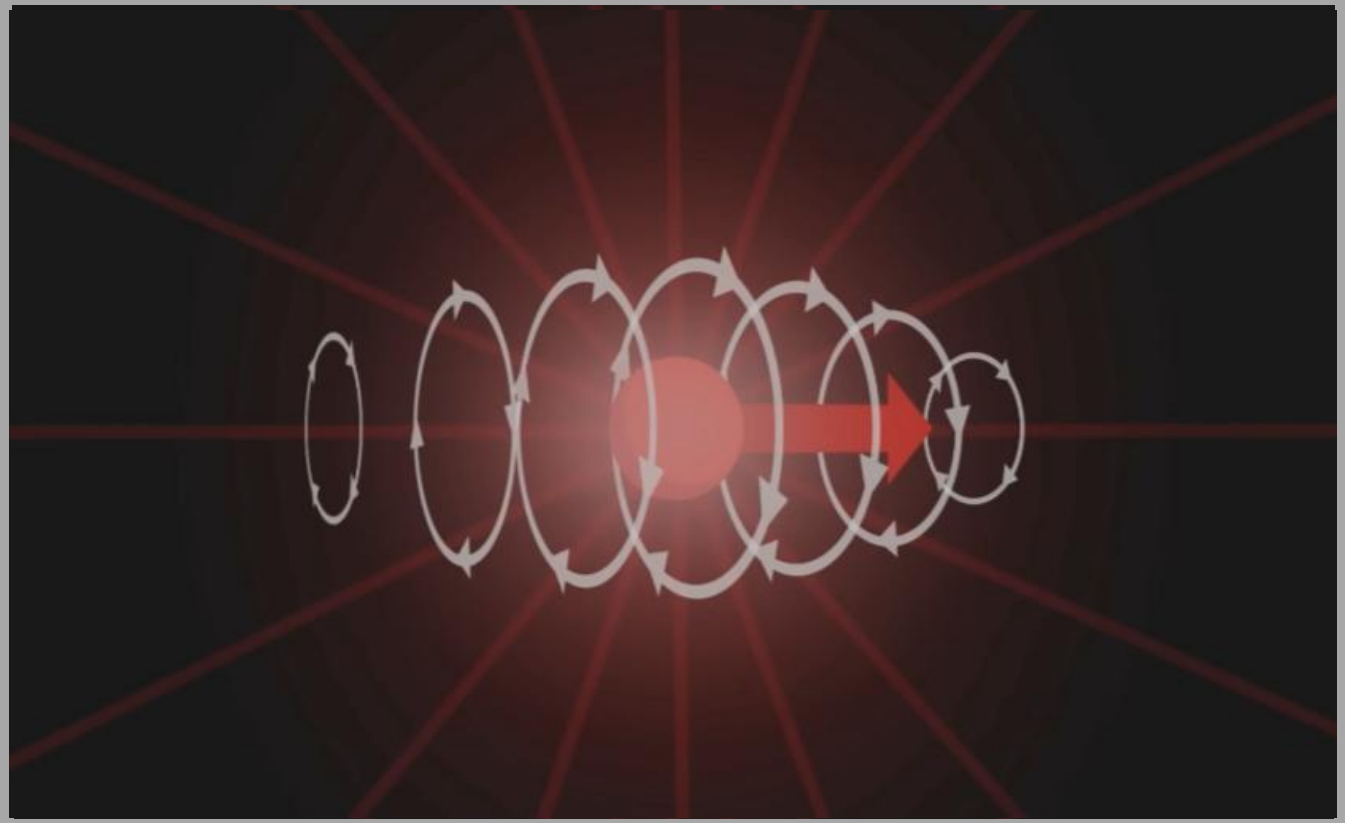
En España, más de 100.000 personas sufren un ictus al año. Aproximadamente, una de cada seis muere. Es la primera causa de muerte en mujeres y la segunda en hombres, según datos de la SEN. Es también la primera causa de discapacidad en adultos de ambos sexos. De aquellos que sobreviven, un 30% se convierte en dependiente funcional debido a las secuelas.

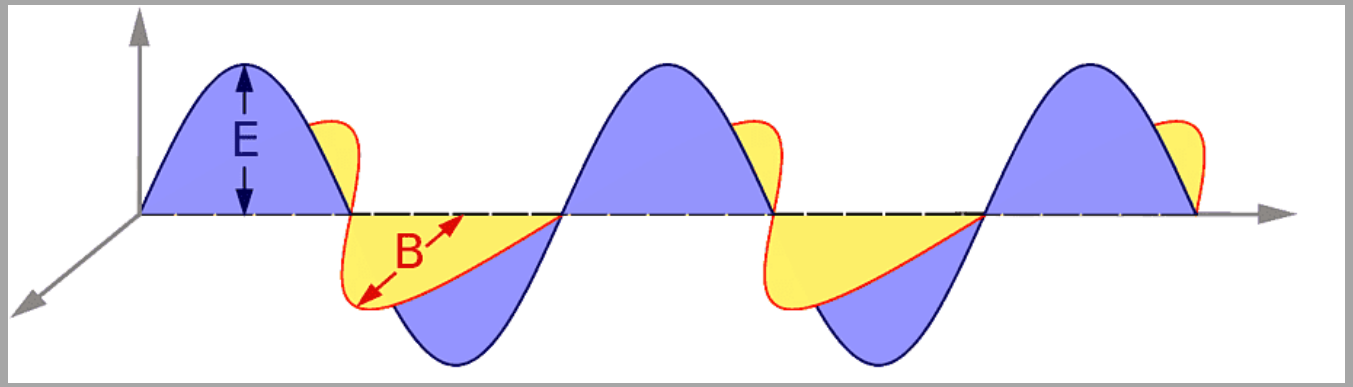
PEMFs

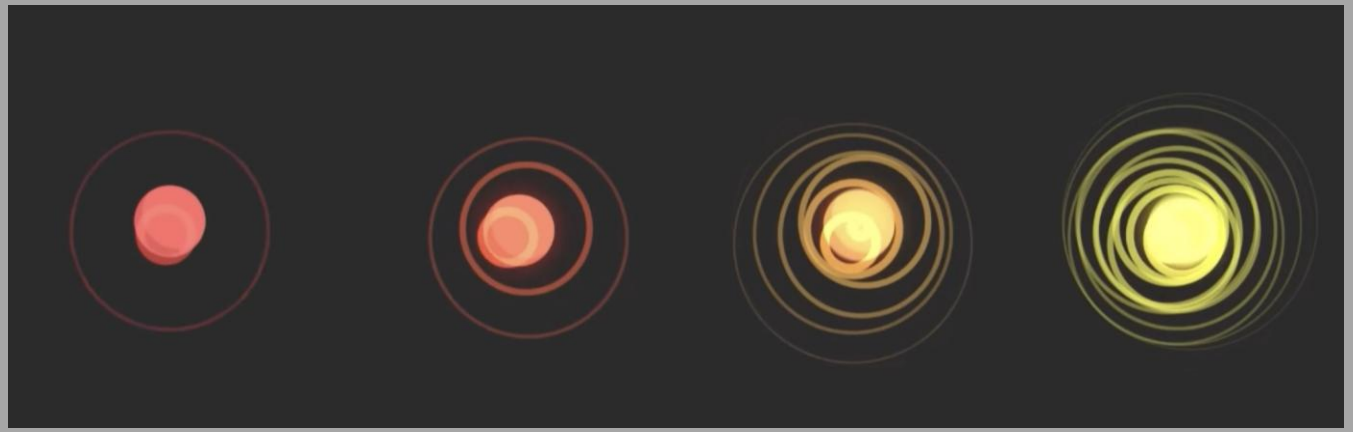


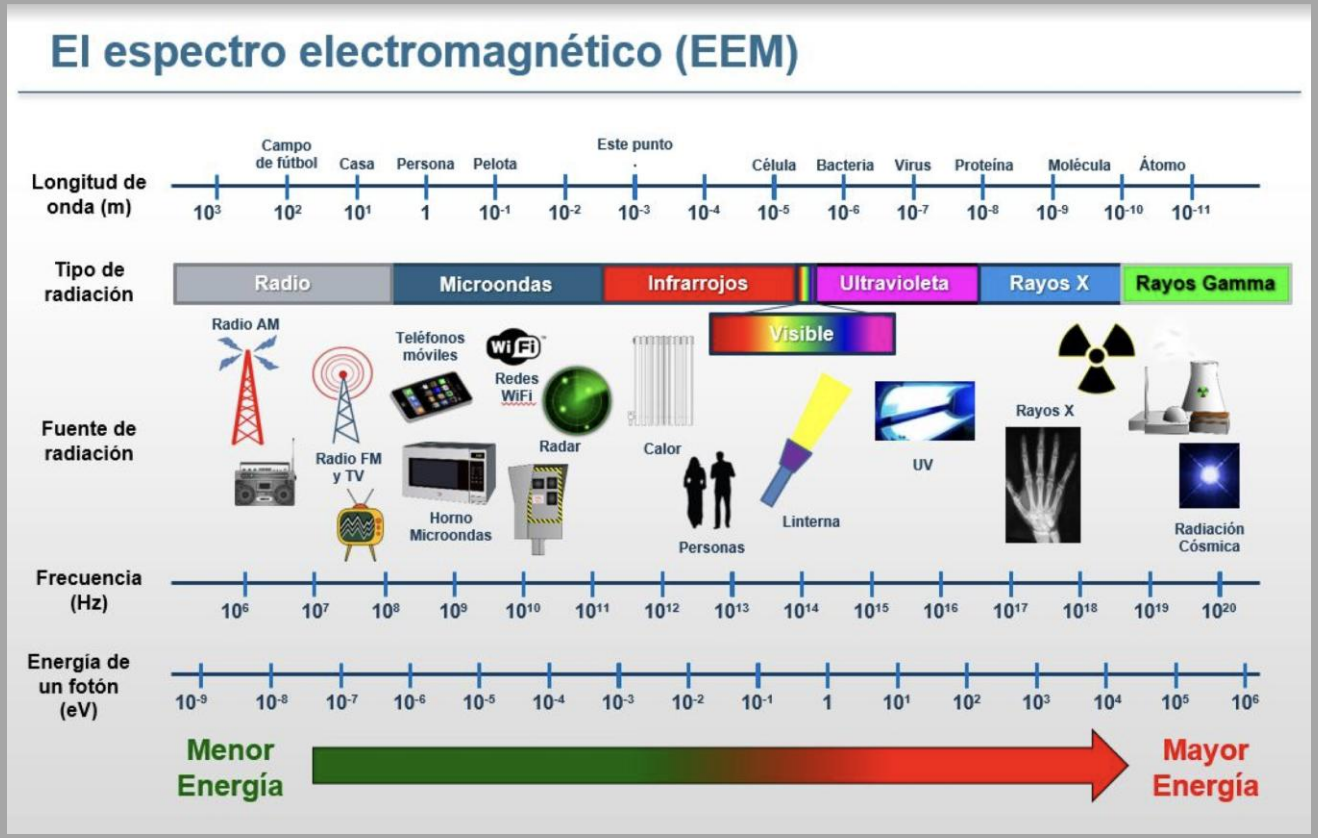


Neuro Rehabilitation and Biotechnology




E
B




El espectro electromagnético (EEM)
Longitud de onda (m)
Campo de fútbol
Casa
Persona
Pelota
Este punto
Célula
Bacteria
Virus
Proteína
Molécula
Átomo
10^{3} 10^{2} 10^{1} 1 10^{-1} 10^{-2} 10^{-3} 10^{-4} 10^{-5} 10^{-6} 10^{-7} 10^{-8} 10^{-9} 10^{-10} 10^{-11}
Tipo de radiación
Radio
Microondas
Infrarrojos
Visible
Ultravioleta
Rayos X
Rayos Gamma
Fuente de radiación
Radio AM
Radio FM y TV
Teléfonos móviles
Redes WiFi
Radar
Horno Microondas
Calor
Personas
Linterna
UV
Rayos X
Radiación Cósmica
Frecuencia (Hz)
10^{6} 10^{7} 10^{8} 10^{9} 10^{10} 10^{11} 10^{12} 10^{13} 10^{14} 10^{15} 10^{16} 10^{17} 10^{18} 10^{19} 10^{20}
Energía de un fotón (eV)
10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 1 10^{1} 10^{2} 10^{3} 10^{4} 10^{5} 10^{6}
Menor Energía
Mayor Energía

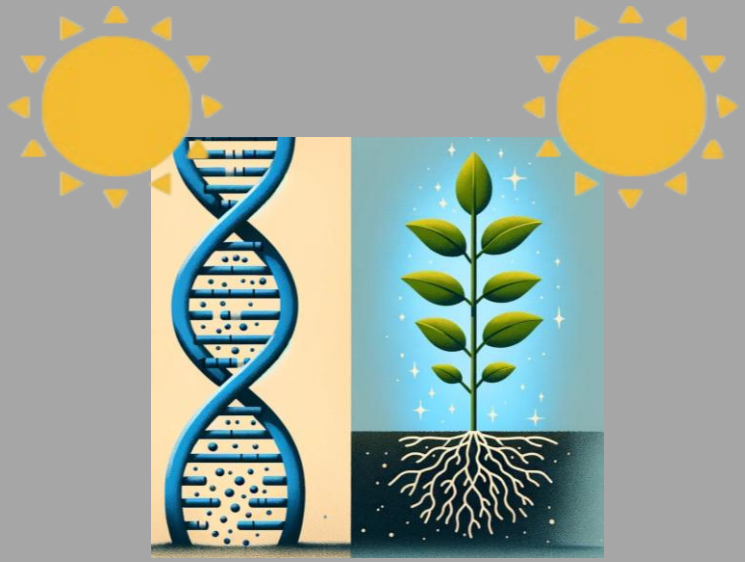
PEMF

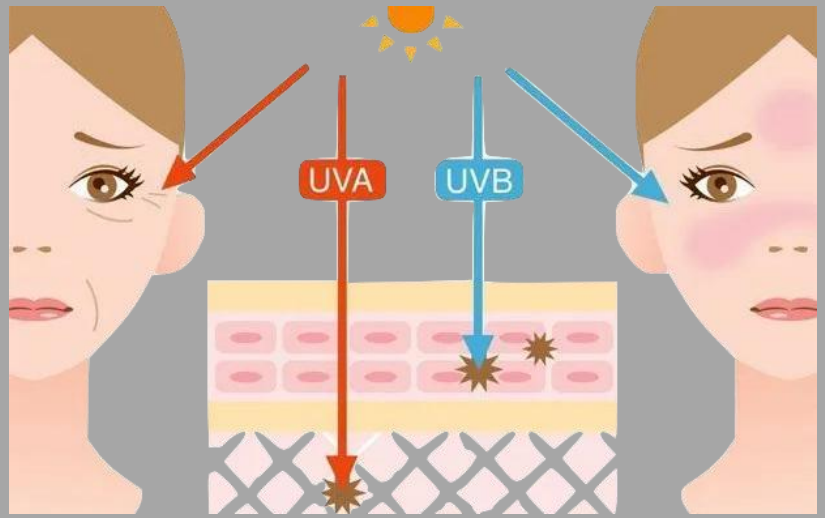
The magnetic field creates a force on molecular structures present in the tissue depending on their magnetic properties.

The electric field that exerts a force on ions and other electrically susceptible bodies present in tissues

PEMF

BIOLOGIC EFFECTS





INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION

ICNIRP
INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION

ICNIRP STATEMENT

A DESCRIPTION OF ICNIRP'S INDEPENDENT, BEST PRACTICE SYSTEM OF GUIDANCE ON THE PROTECTION OF PEOPLE AND THE ENVIRONMENT FROM EXPOSURE TO NON-IONIZING RADIATION

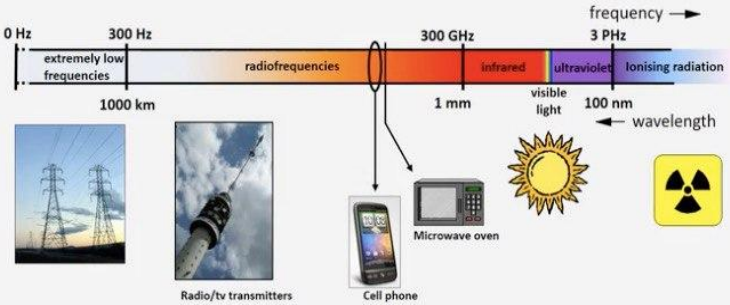
PUBLISHED IN: **HEALTH PHYSICS 122(5):625-628; 2022**

DOI: **10.1097/HP.0000000000001561**

ICNIRP
INTERNATIONAL COMMISSION ON NON-IONIZING RADIATION PROTECTION

Purpose of the guidelines

- To protect people exposed to radiofrequency electromagnetic fields in the range 100 kHz to 300 GHz



Review Article

Evaluation of Pulsed Electromagnetic Field Effects: A Systematic Review and Meta-Analysis on Highlights of Two Decades of Research In Vitro Studies

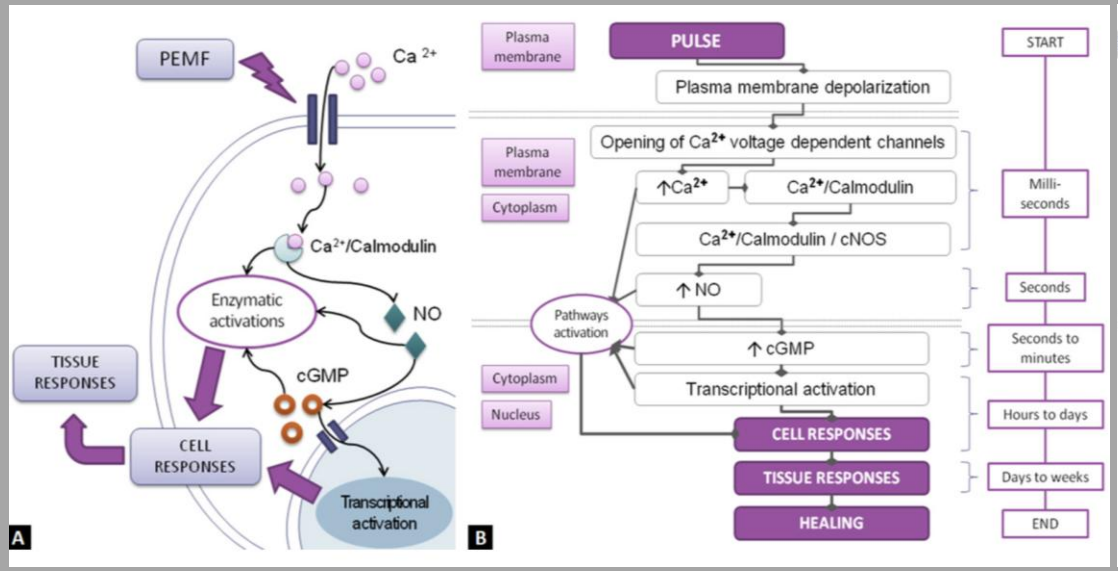
Hindawi
BioMed Research International
Volume 2021, Article ID 6647497, 22 pages
https://doi.org/10.1155/2021/6647497

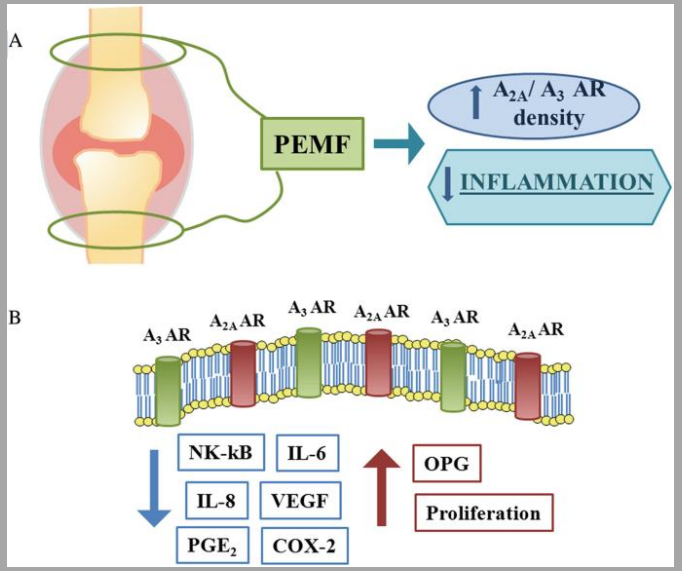
2	Adipose-derived mesenchymal stem cells (AD-MSCs)	Frequency of 5 Hz Intensity of 1.1 mT	Cell proliferation	PEMF can be beneficial to tissue-derived stem cell proliferation	2018	Daish et al. [16]
3	Adipose-derived stem cells (ASCs)	Frequency of 50 Hz Intensity of 1 mT	Cell proliferation, cell differentiation Gene expression Protein expression	PEMF could promote cell proliferation and osteogenic differentiation. Bone-related gene expression and protein expression of OPN, OCN, and RUNX-2 increased	2018	Yin et al. [17]
4	Human adipose-derived mesenchymal stromal cells (hAMSC)	Frequencies:10, 16, 20.6, 23.8, 26, 33, 49.9, 52.3, 75.6, and 90.6 Hz	Cell proliferation, gene expression Protein expression	PEMF showed significant upregulations of collagen I, alkaline phosphatase, and osteocalcin	2018	Poh et al. [18]
5	H4 glioma cells	Frequency of 7 Hz Intensity of 30 mT	Cell apoptosis	LFPEMF stimulation of H4 glioma cell cultures induced apoptosis in exposed cells.	2018	Kaszuba-Zwoińska et al. [38]
6	Mesenchymal stem cells (hMSCs)	Frequency of 75 Hz, the intensity peak of 1.5 mT	Gene expression	The exposure to PEMFs did not produce any change on notch-related genes	2017	Bagheri et al. [20]
7	Human umbilical vein endothelial cells (HUVECs)	The frequency of 50 Hz Intensity of 2.25 mT	Cell proliferation Gene expression Protein expression	Proteins and mRNA expression levels of Akt, mTOR, and TGF-β1 were elevated	2017	Cheng et al. [59]

Review
Pulsed Electromagnetic Fields (PEMF)—Physiological Response and Its Potential in Trauma Treatment
Jonas Flatscher [1,†], Elizabeth Pavez Loriè [1,†], Rainer Mittermayr [2,*], Paul Meznik [2], Paul Slezak [1], Heinz Redl [1] and Cyrill Slezak [1,3,*]
International Journal of *Molecular Sciences*

Direct celular response	Procesos celulares esenciales
Ion channels	Apoptosis
Adenosine receptors	proliferation, migration and reprogramming
	Differenciation
	Inflammation
	Neuroprotection

MOLECULAR AND CELLULAR RESPONSE: ion channels and adenosine receptors





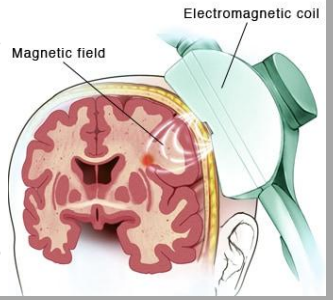
[Frontiers in Bioscience-Scholar, 13(2), 181-189, DOI:10.52586/S561] https://www.fbscience.com

Review

A short review on the influence of magnetic fields on neurological diseases

Richard H. W. Funk[1,*], Manfred Fähnle[2]

[1]*Institute for Anatomy, Medical Faculty, TU Dresden, 01307 Dresden, Germany,* [2]*Schönblickstraße 95, 71272 Renningen, Germany, former member of the Max Planck Institute for Intelligent Systems, Stuttgart, Germany*



PARKINSON DISEASE	ALZHEIMER DISEASE	MULTIPLE SCLEROSIS
Positive clinical effects with TMS (motor and emotional symptoms)	• peripheral blood mononuclear cells, low frequency-PEMF tmodulated gene expression in cell functions that are dysregulated (LF-PEMF can stimulate epigenetic regulation mediated by miRNAs) • TMS (rTMS) can enhance cognitive functions such as spatial reasoning, executive function, and memory recall.	• EMF exerts therapeutic effects through modulation of immune-relevant cells. • Normalization of NO levels in cellular models of MS

Serafín Ortigueira
cefine NEUROLOGÍA

PEMFs and STROKE

frontiers in Molecular Biosciences
REVIEW
published: 07 September 2021
doi: 10.3389/fmolb.2021.742596

Electromagnetic Field as a Treatment for Cerebral Ischemic Stroke

Amanda Moya Gómez[1,2], Lena Pérez Font[3], Bert Brône[1] and Annelies

[1]UHasselt Hasselt University, BIOMED, Diepenbeek, Belgium, [2]Department of Biomedical Engine Telecommunications, Informatics and Biomedical Engineering, Universidad de Oriente, Santiago Nacional de Electromagnetismo Aplicado, Universidad de Oriente, Santiago de Cuba, Cuba

Neuromodulation: Technology at the Neural Interf

Received: March 1, 2021 Revised: May 18, 2021 Accepted: June 7, 2021

https://doi.org/10.1111/ner.13489

Pulsed Electromagnetic Fields: A Novel Attractive Therapeutic Opportunity for Neuroprotection After Acute Cerebral Ischemia

Fioravante Capone, MD[1]; Simona Salati, PhD[2]; Fabrizio Vincenzi, PhD[3]; Micaela Liberti, PhD[4]; Giorgio Aicardi, MSc[5]; Francesca Apollonio, PhD[4]; Katia Varani, PhD[3]; Ruggero Cadossi, MD[2]; Vincenzo Di Lazzaro, MD[1]

Electromagnetic Field as a Treatment for Cerebral Ischemic Stroke

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[1]UHasselt Hasselt University, BIOMED, Diepenbeek, Belgium, [2]Department of Biomedical Engineering, Faculty of Telecommunications, Informatics and Biomedical Engineering, Universidad de Oriente, Santiago de Cuba, Cuba, [3]Centro Nacional de Electromagnetismo Aplicado, Universidad de Oriente, Santiago de Cuba, Cuba

frontiers in Molecular Biosciences

REVIEW
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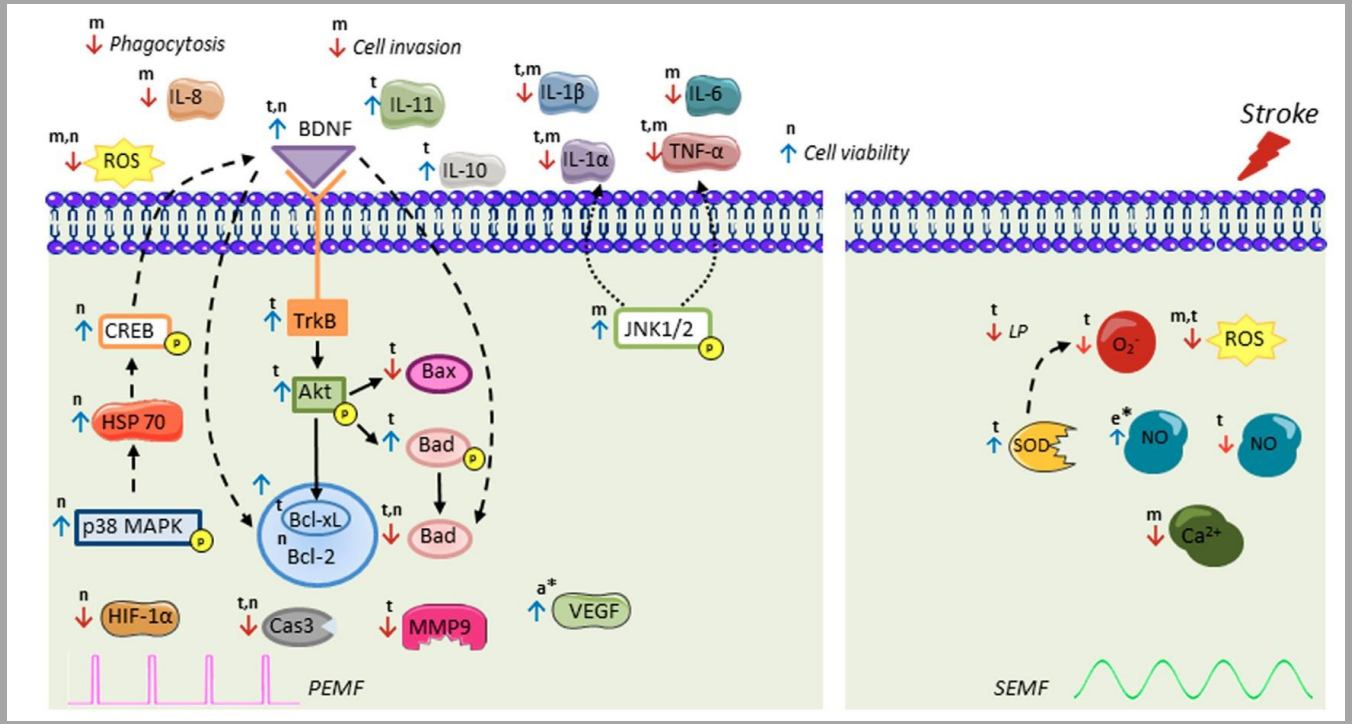

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Neuromodulation: Technology at the Neural Interface
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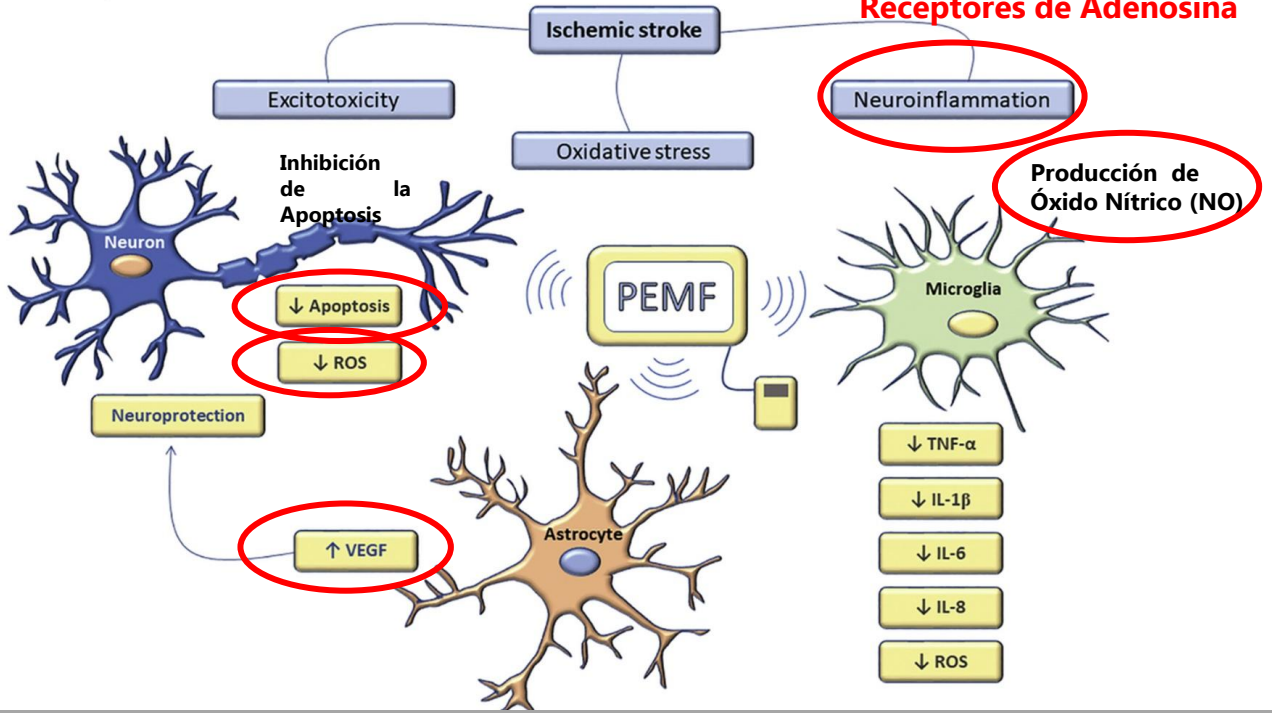
Modulación del Calcio Intracelular

Receptores de Adenosina



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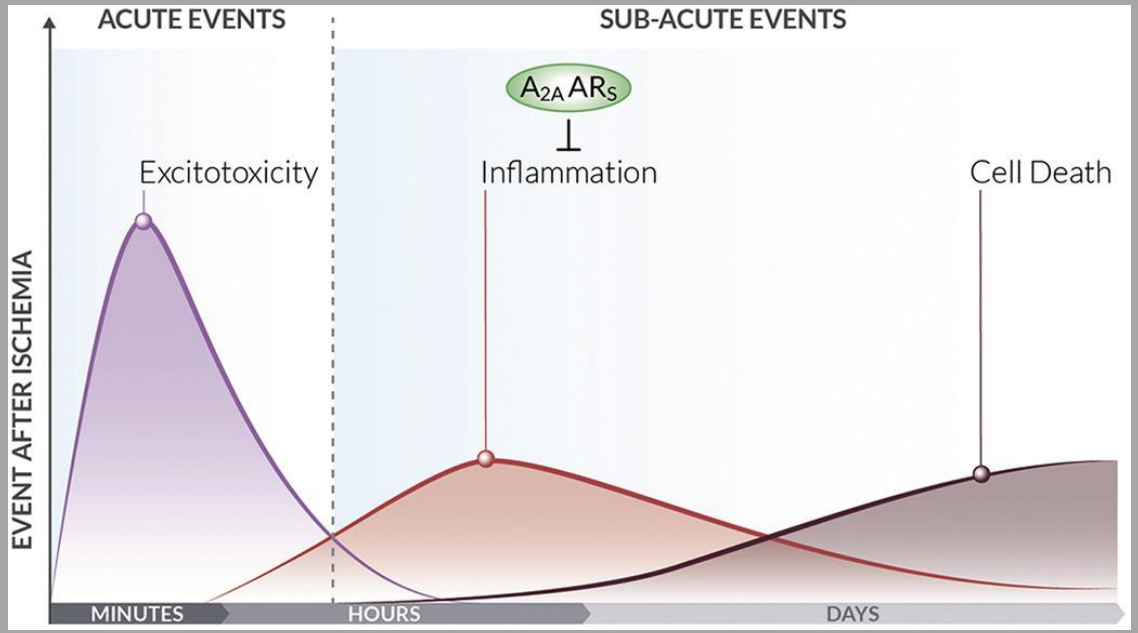
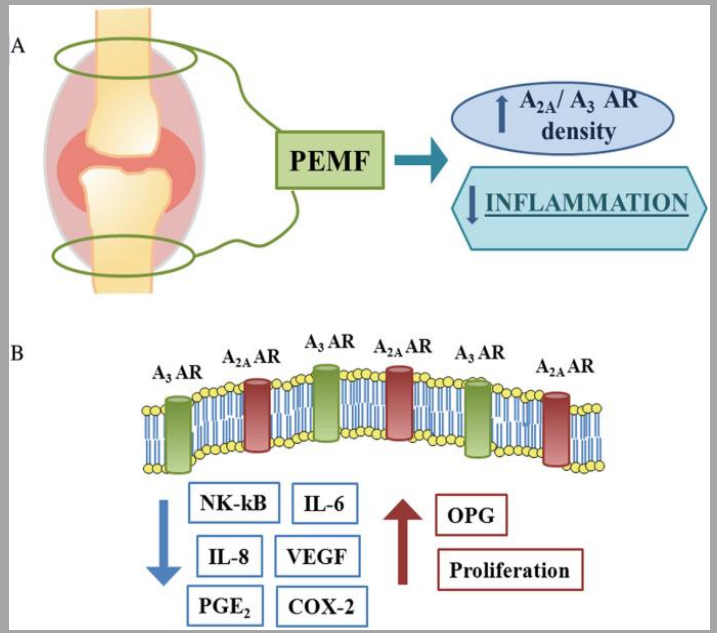
Adenosine Receptors



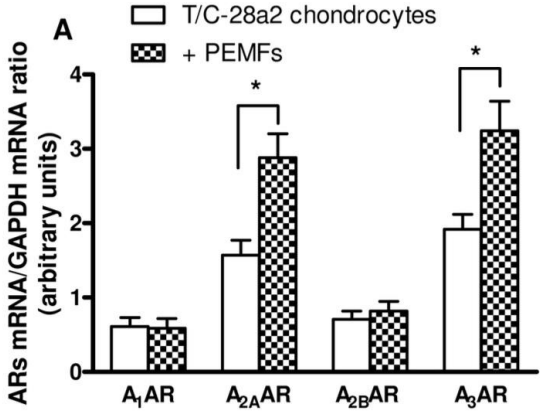


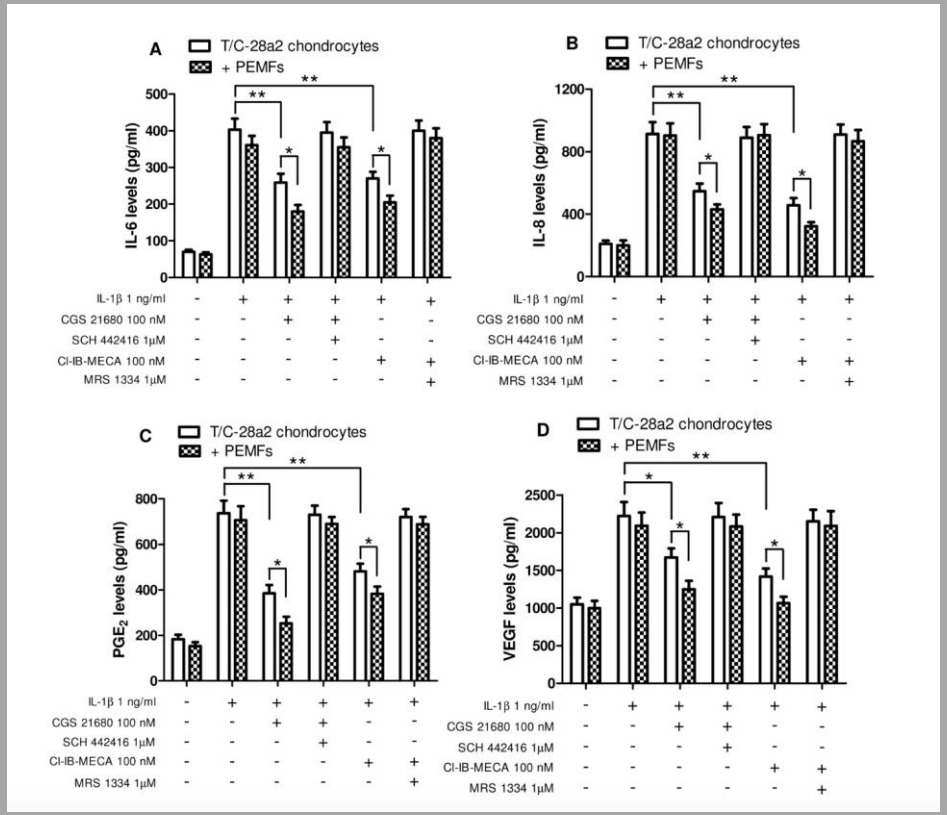
OPEN ACCESS Freely available online
PLOS ONE

Pulsed Electromagnetic Fields Increased the Anti-Inflammatory Effect of A_{2A} and A_3 Adenosine Receptors in Human T/C-28a2 Chondrocytes and hFOB 1.19 Osteoblasts

Fabrizio Vincenzi[1], Martina Targa[1], Carmen Corciulo[1], Stefania Gessi[1], Stefania Merighi[1], Stefania Setti[2], Ruggero Cadossi[2], Mary B. Goldring[3], Pier Andrea Borea[1], Katia Varani[1]*

1 Department of Medical Sciences, Pharmacology Unit, University of Ferrara, Ferrara, Italy, **2** Igea Biophysics Laboratory, Carpi, Italy, **3** Laboratory for Cartilage Biology, Hospital for Special Surgery, Weill Cornell Medical College, New York, New York, United States of America





NO production (nítric oxide)

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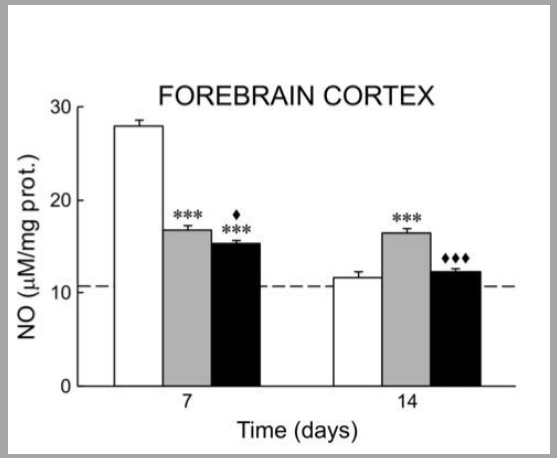
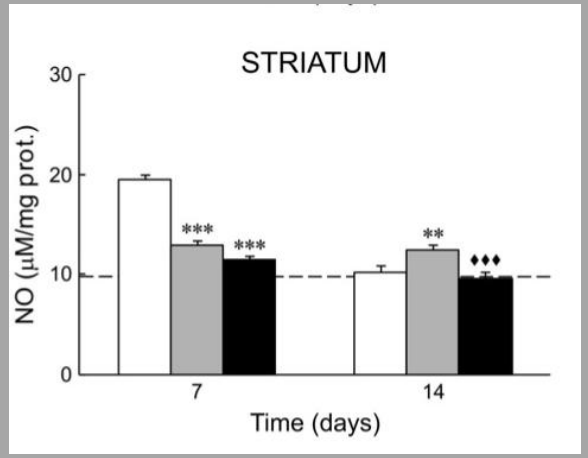
PLOS ONE

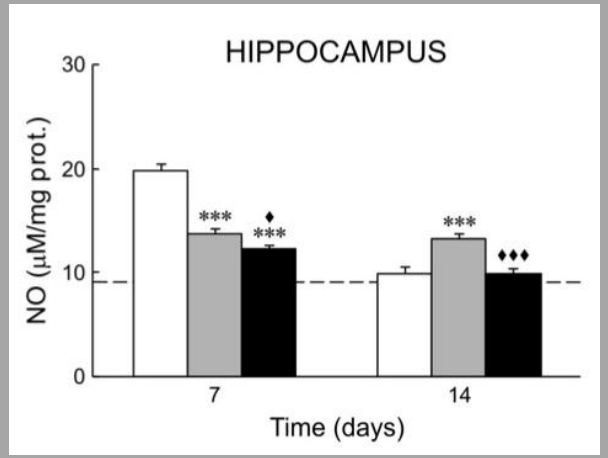
Extremely Low Frequency Magnetic Field (50 Hz, 0.5 mT) Reduces Oxidative Stress in the Brain of Gerbils Submitted to Global Cerebral Ischemia

Snežana Rauš Balind[1]*, Vesna Selaković[2], Lidija Radenović[3], Zlatko Prolić[1], Branka Janać[1]

1 Institute for Biological Research, University of Belgrade, Belgrade, Serbia, **2** Institute for Medical Research, Military Medical Academy, Belgrade, Serbia, **3** Department of Physiology and Biochemistry, Faculty of Biology, University of Belgrade, Belgrade, Serbia







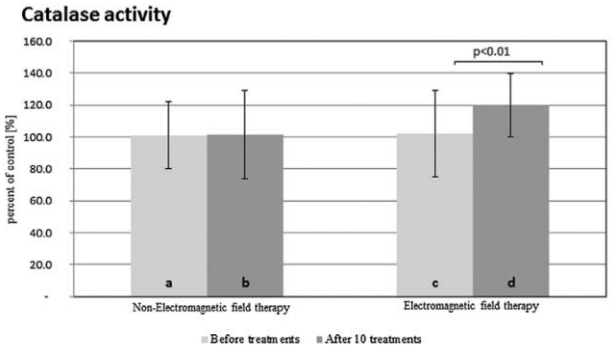
---Control level ☐ELF-MF ▩Ischemia ■Ischemia + ELF-MF

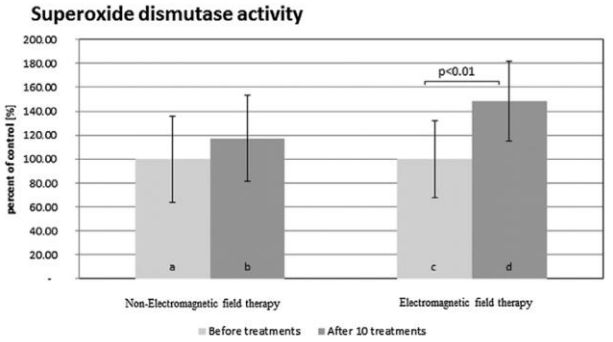
regulation of oxidative stress

Bioelectromagnetics 38:386–396 (2017)

Extremely Low Frequency Electromagnetic Field (ELF-EMF) Reduces Oxidative Stress and Improves Functional and Psychological Status in Ischemic Stroke Patients

Natalia Cichoń,[1]* Michał Bijak,[1] Elżbieta Miller,[2,3] and Joanna Saluk[1]



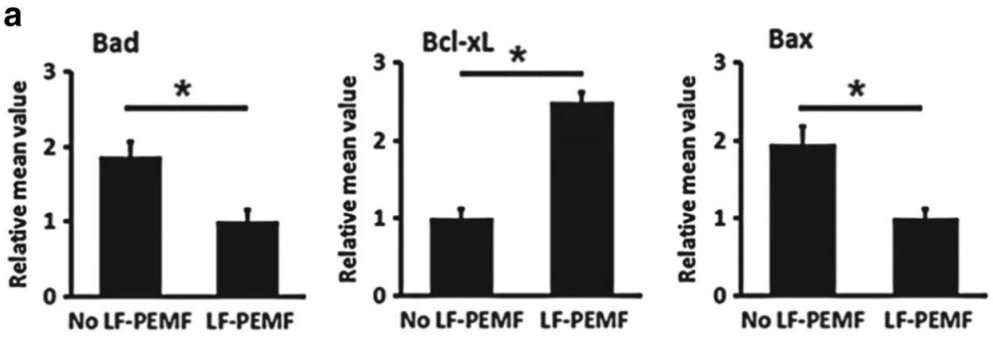


Apoptosis Inhibition

Appl Biochem Biotechnol (2017) 181:1360–1371
DOI 10.1007/s12010-016-2289-z

Neuroprotective Effect of Low Frequency-Pulsed Electromagnetic Fields in Ischemic Stroke

Enerelt Urnukhsaikhan[1] · Tsogbadrakh Mishig-Ochir[2] · Soo-Chan Kim[3] · Jung-Keug Park[1] · Young-Kwon Seo[1]



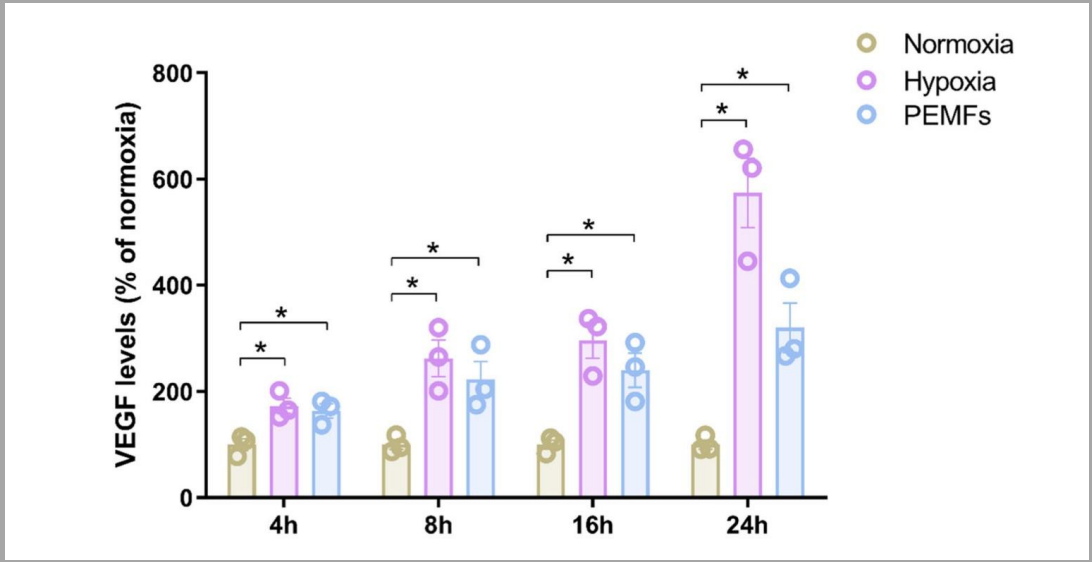
Angiogenesis stimulation

International Journal of Molecular Sciences
MDPI

Article

Pulsed Electromagnetic Fields Stimulate HIF-1α-Independent VEGF Release in 1321N1 Human Astrocytes Protecting Neuron-like SH-SY5Y Cells from Oxygen-Glucose Deprivation

Fabrizio Vincenzi [1,*,†], Silvia Pasquini [1,†], Stefania Setti [2], Simona Salati [2], Ruggero Cadossi [2], Pier Andrea Borea [3] and Katia Varani [1]



Effect on Neuroinflammation

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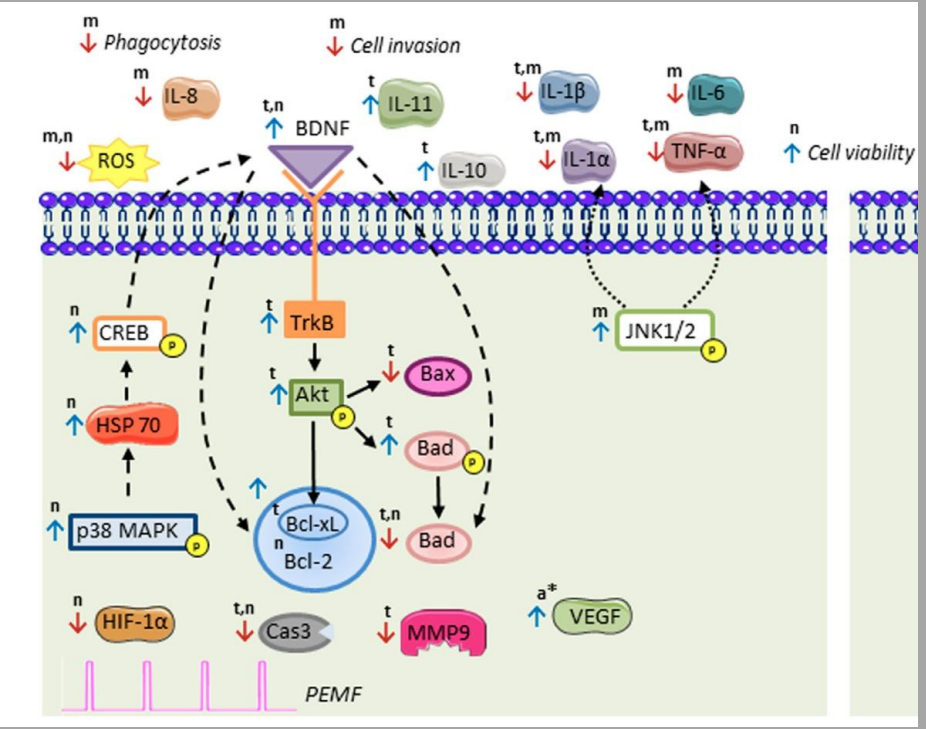
[1]UHasselt Hasselt University, BIOMED, Diepenbeek, Belgium, [2]Department of Biomedical Engineering, Faculty of Telecommunications, Informatics and Biomedical Engineering, Universidad de Oriente, Santiago de Cuba, Cuba, [3]Centro Nacional de Electromagnetismo Aplicado, Universidad de Oriente, Santiago de Cuba, Cuba



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Pulsed Electromagnetic Fields: A Novel Attractive Therapeutic Opportunity for Neuroprotection After Acute Cerebral Ischemia

Fioravante Capone, MD[1]; Simona Salati, PhD[2]; Fabrizio Vincenzi, PhD[3]; Micaela Liberti, PhD[4]; Giorgio Aicardi, MSc[5]; Francesca Apollonio, PhD[4]; Katia Varani, PhD[3]; Ruggero Cadossi, MD[2]; Vincenzo Di Lazzaro, MD[1]

Results: PEMFs counteract hypoxia-induced apoptosis and ROS production in neuronal-like cells and exert a strong anti-inflammatory effect on microglial cells. Data from stroke animal models showed that PEMFs exposure is able to reduce the size of the infarct area and decrease the levels of pro-inflammatory mediators. In clinical studies, PEMFs stimulation proved to be safe and well tolerated. Preliminary results on acute ischemic stroke patients showed a dose-dependent reduction in the lesion size.

Effect on Neuroinflammation

inhibition of apoptosis

Angiogenesis stimulation

regulation of oxidative stress

NO production (Nitric Oxide)

Adenosin Receptors

Inntracellular Ca2+ modulation

HI-PEMFs AND STROKE

Premi *et al. BMC Neurosci (2018) 19:34*
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BMC Neuroscience

RESEARCH ARTICLE Open Access

Modulation of long-term potentiation-like cortical plasticity in the healthy brain with low frequency-pulsed electromagnetic fields

Enrico Premi[1,2*], Alberto Benussi[2], Antonio La Gatta[3], Stefano Visconti[4], Angelo Costa[1], Nicola Gilberti[1], Valentina Cantoni[2], Alessandro Padovani[2], Barbara Borroni[2] and Mauro Magoni[1]

HI LF-PEMf

Fig. 1 CTU Mega 20 device. The original equipment used in the study, directly provided by PERISO SA (http://www.periso.ch/)

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PERISO ACADEMY

HI-PEMFs and STROKE CEFINE NEURO

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Neuro Rehabilitation and Biotechnology

Caso de Jesús G. G.

Evaluated 19/10/2023

- Does not maintain sitting position without help
- STRAIGHTENING REACTION DEFICIT
- GREAT Pelvic Retroversion
- ABSOLUTE DEPENDENCE

Caso de Jesús G. G.

Caso de Jesús G. G.

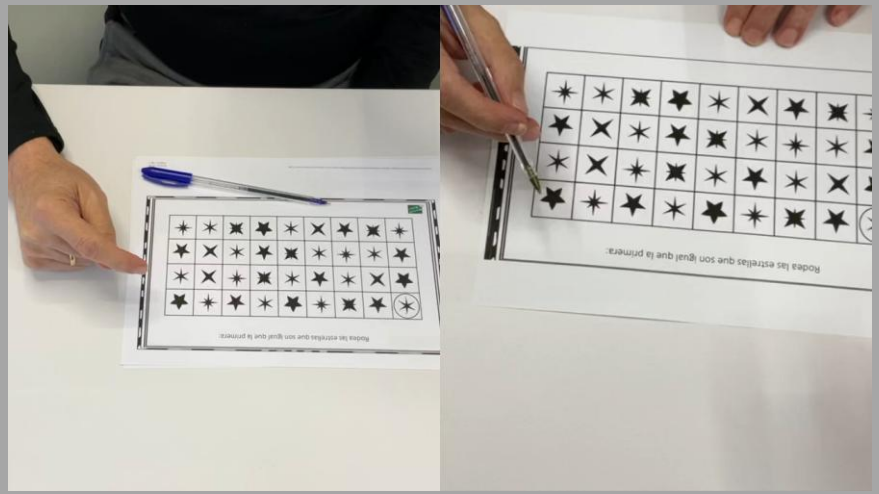



Caso de Jesús G. G.

Caso de Jesús G. G.

Caso de A. G.

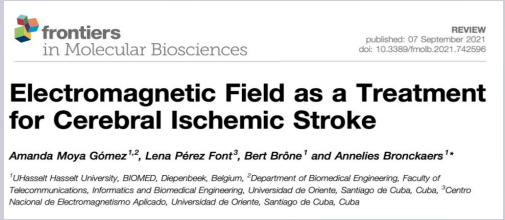
Caso de J. L. R.



Neuro Rehabilitation and Biotechnology

CONCLUSIONS

- *PEMF: SCIENTIFIC EVIDENCE IN ANIMAL MODELS AND CELLULAR SIMULATIONS OF STROKE IS PROMISING*


frontiers in Molecular Biosciences

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Electromagnetic Field as a Treatment for Cerebral Ischemic Stroke

*Amanda Moya Gómez[1,2], Lena Pérez Font[3], Bert Bröne[1] and Annelies Bronckaers[1]**

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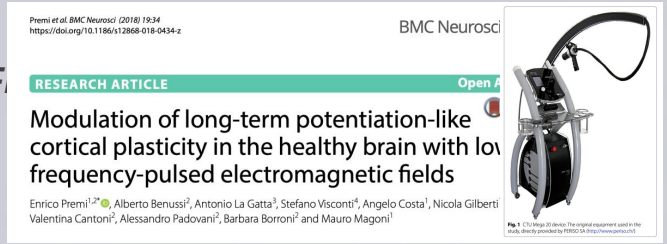
- *HI LF-PEMF: APPEARS TO BE A SAF TREATMENTE IN HUMNAS*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RESEARCH ARTICLE Open A

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- *HI LF-PEMF: IT SEEMS TO BE A USEFUL TREATMENT IN PATIENTES WITH STROKE*

DESAFÍOS

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Electromagnetic Field as a Treatment for Cerebral Ischemic Stroke

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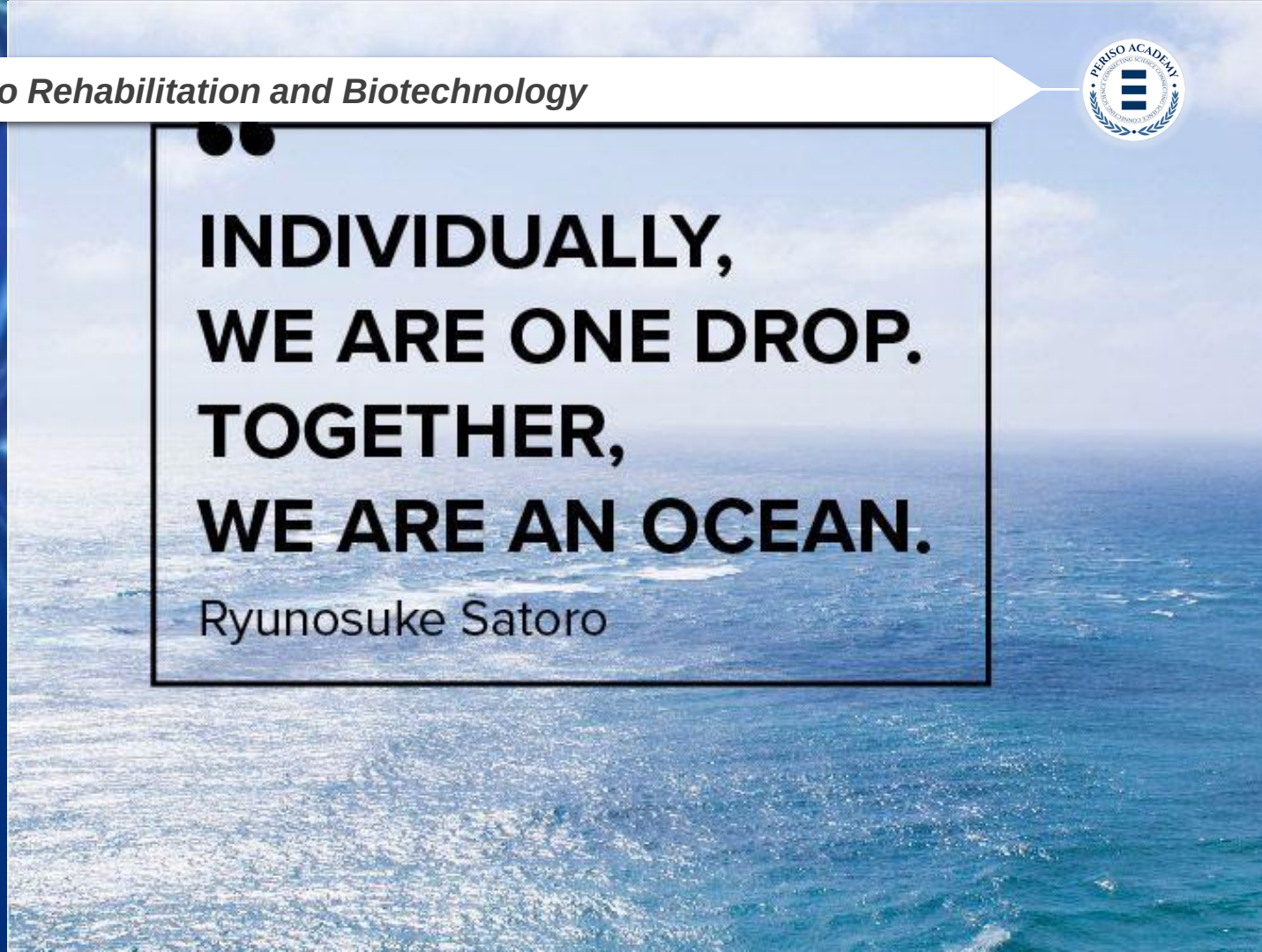
CONCLUSION

As can be appreciated from this review, there is increasing evidence that supports the idea that therapeutic effects can be achieved from EMF in ischemic stroke. However, except for application to orthopedics (i.e., non-union fractures), there is a long way to go before this promising treatment can be accepted as a conventional medical practice. One of the reasons is that different magnetic field exposure conditions are reported in the literature. There are several combinations of EMF: the type of the wave, intensity, frequency, the technology used, and time of exposures.


INDIVIDUALLY,
WE ARE ONE DROP.
TOGETHER,
WE ARE AN OCEAN.
Ryunosuke Satoro

THANK YOU