Sensibilité aux champs électromagnétiques:

Quelle maladie est-ce vraiment ?

Docteur Frédéric GRECO
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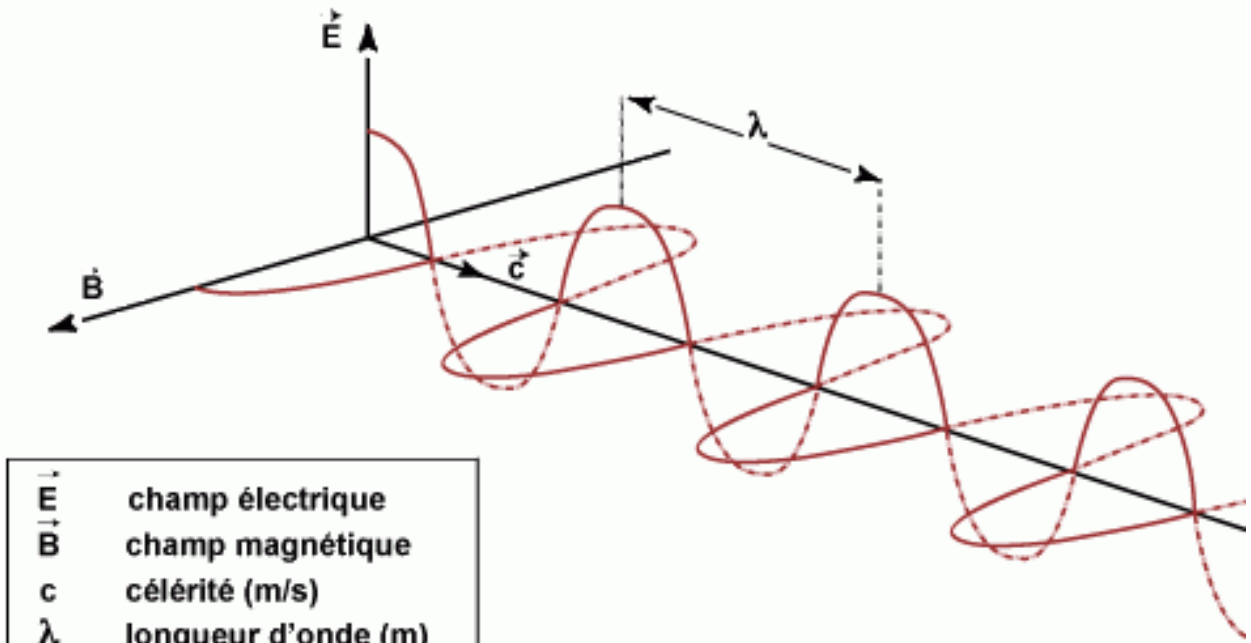
29/10/2020-Université du Tiers Temps de Montpellier

ÉLECTROSENSIBILITÉ

Capacité pour un être vivant

- d’être affecté de manière consciente ou inconsciente
- par un changement du rayonnement électromagnétique environnant
- et ce pour des intensités inférieures au seuil thermique

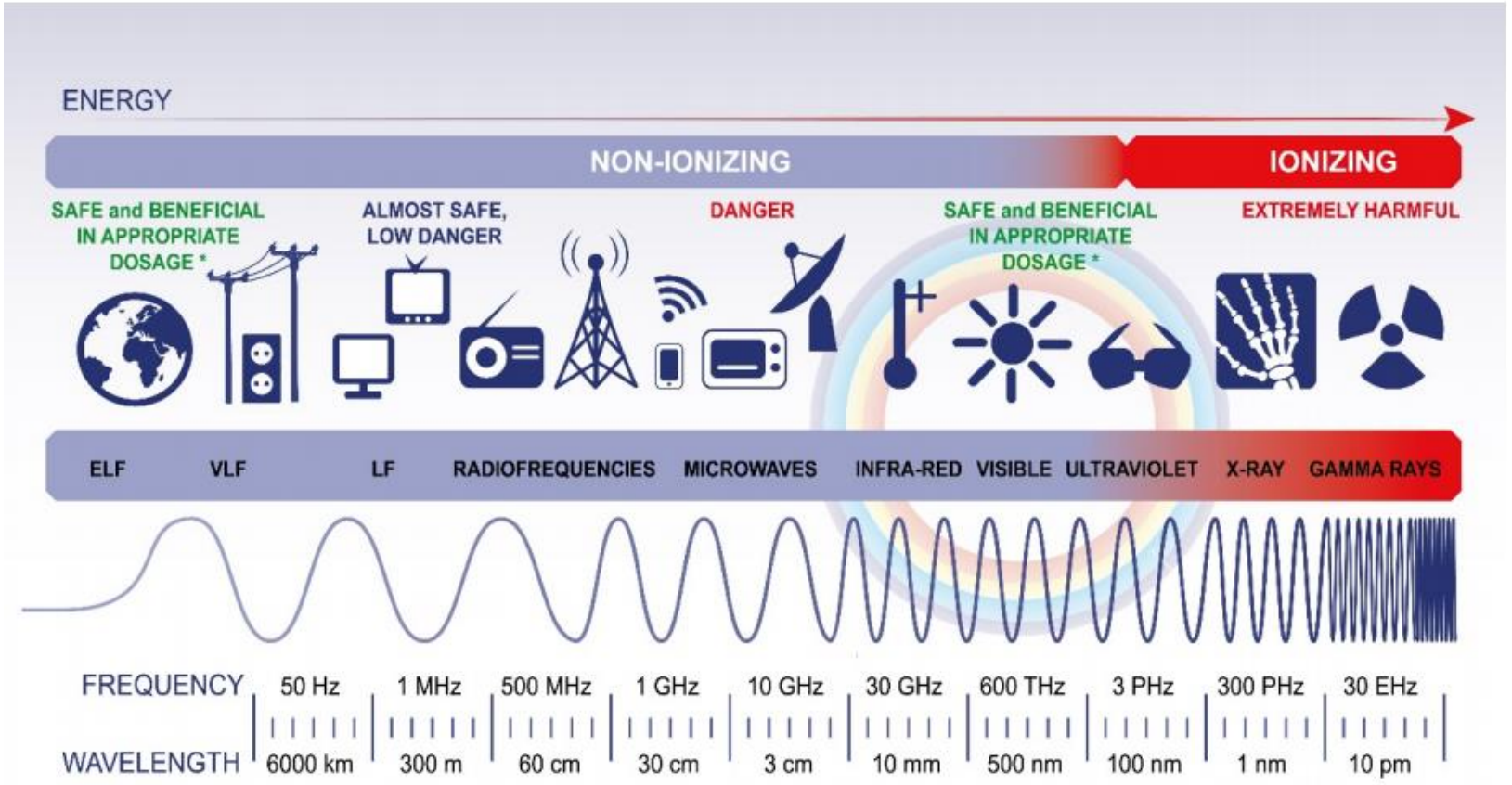
Le **rayonnement électro-magnétique**



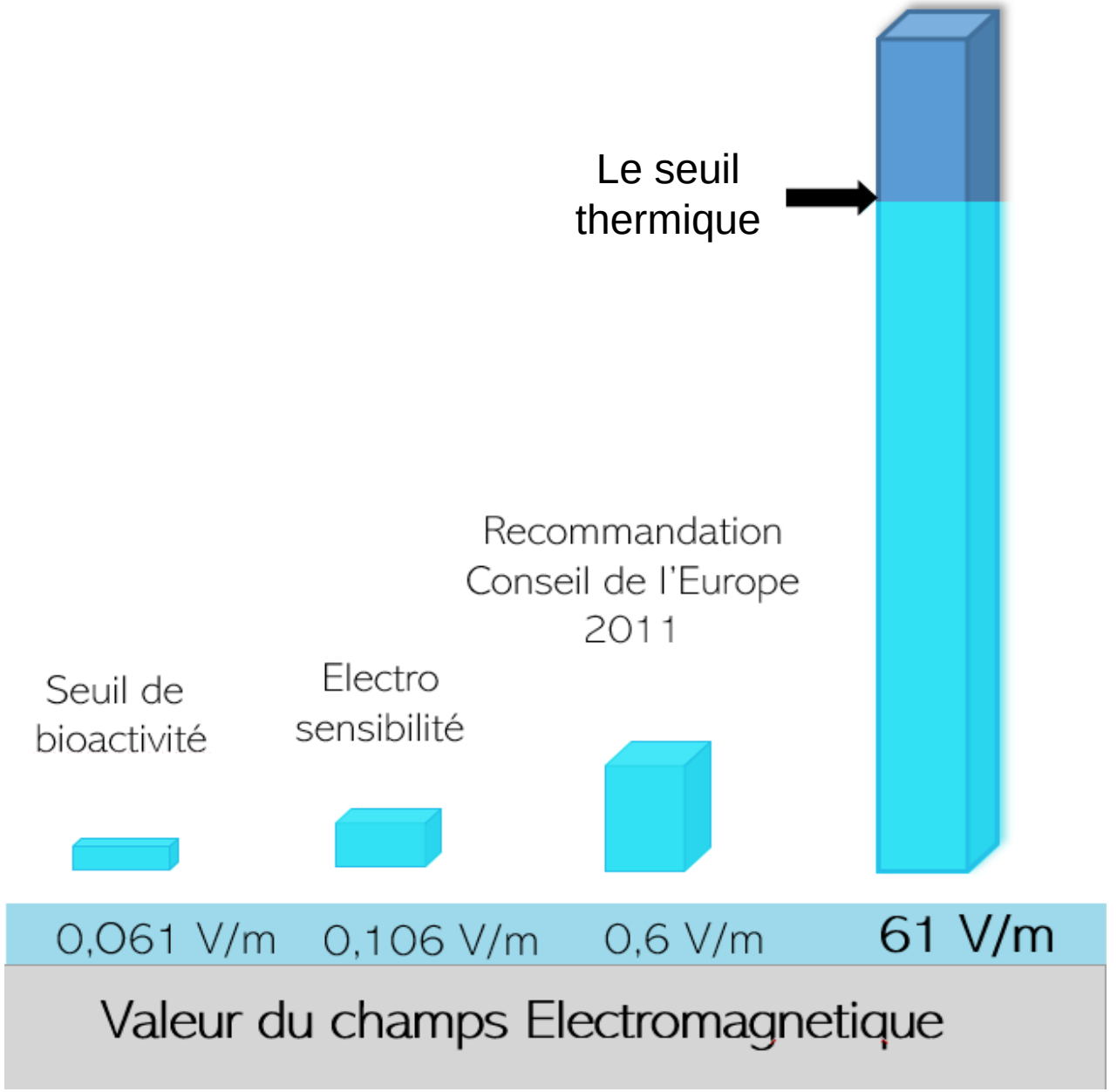
$\vec{E}$	champ électrique
$\vec{B}$	champ magnétique
c	célérité (m/s)
λ	longueur d'onde (m)
T	période = λ / c (s)
f	fréquence = 1 / T (Hz)

- **Transfert d'énergie.**
- **Propagation de photons.**
- **Onde électromagnétique.**

Le **rayonnement électro-magnétique**



Le seuil thermique



Les bactéries

Evaluation of Wi-Fi Radiation Effects on Antibiotic Susceptibility, Metabolic Activity and Biofilm Formation by Escherichia *Coli* 0157H7, *Staphylococcus Aureus* and *Staphylococcus Epidermis*

Said-Salman I. H.[1,2], Jebaii F. A.[3*], Yusef H. H.[4], Moustafa M. E.[5]

ABSTRACT

Background: The radiation emitted from electromagnetic fields (EMF) can cause biological effects on prokaryotic and eukaryotic cells, including non-thermal effects.

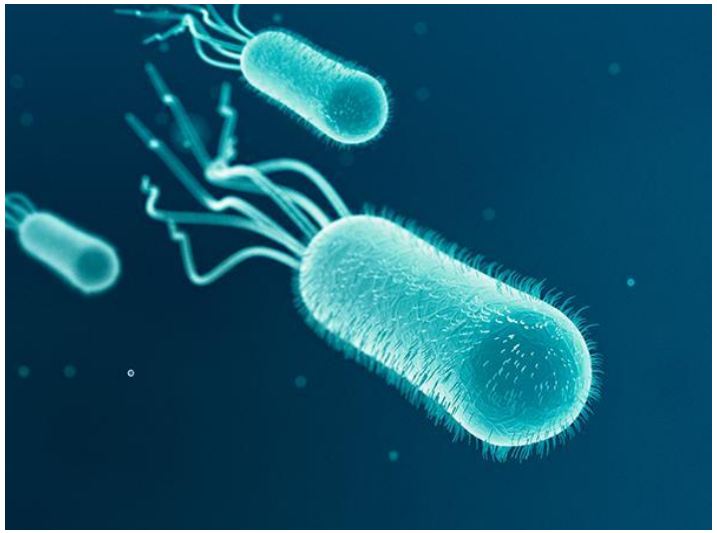
Objective: The present study evaluated the non-thermal effects of wireless fidelity (Wi-Fi) operating at 2.4 GHz part of non-ionizing EMF on different pathogenic bacterial strains (*Escherichia coli* 0157H7, *Staphylococcus aureus, and Staphylococcus epidermis*). Antibiotic resistance, motility, metabolic activity and biofilm formation were examined.

Material and Methods: In this case-control study, a Wi-Fi router was used as a source of microwaves and also bacterial cells were exposed to Wi-Fi radiation continuously for 24 and 48 hours. The antibiotic susceptibility was carried out using a disc diffusion method on Müller Hinton agar plates. Motility of *Escherichia coli* 0157H7 was conducted on motility agar plates. Cell metabolic activity and biofilm formation were performed using 3-(4, 5-Dimethylthiazol-2yl)-2, 5-diphenyltetrazolium bromide (MTT) assay and crystal violet quantification, respectively.

Results: The exposure to Wi-Fi radiation altered motility and antibiotic susceptibility of *Escherichia coli* 0157H7. However, there was no effect Wi-Fi radiation on antibiotic susceptibility of *Staphylococcus aureus and Staphylococcus epidermis*. On the other hand, the exposed cells, as compared to the unexposed control, showed an increased metabolic activity and biofilm formation ability in *Escherichia coli* 0157H7, *Staphylococcus aureus and Staphylococcus epidermis*.

Conclusion: These results proposed that Wi-Fi exposure acted on bacteria in stressful manner by increasing antibiotic resistance and motility of *Escherichia coli* 0157H7, as well as enhancing biofilm formation by *Escherichia coli* 0157H7, *Staphylococcus aureus and Staphylococcus epidermis*. The findings may have implications for the management of serious diseases caused by these infectious bacteria.

Citation: Said-Salman I. H, Jebaii F. A, Yusef H. H, Moustafa M. E. Evaluation of Wi-Fi Radiation Effects on Antibiotic Susceptibility, Metabolic Activity and Biofilm Formation by Escherichia Coli 0157H7, Staphylococcus Aureus and Staphylococcus Epidermis. *J Biomed Phys Eng* 2019;9(5):579-586. https://doi.org/10.31661/jbpe.v0i0.1106.



Les cellules

Pulsed Electromagnetic Field Therapy Improves Osseous Consolidation after High Tibial Osteotomy in Elderly Patients—A Randomized, Placebo-Controlled, Double-Blind Trial

Patrick Ziegler [1,†], Andreas K. Nussler [1,*,†], Benjamin Wilbrand [1], Karsten Falldorf [2], Fabian Springer [3], Anne-Kristin Fentz [2], Georg Eschenburg [2], Andreas Ziegler [4,5], Ulrich Stöckle [6], Elke Maurer [1], Atesch Ateschrang [1], Steffen Schröter [1] and Sabrina Ehnert [1]

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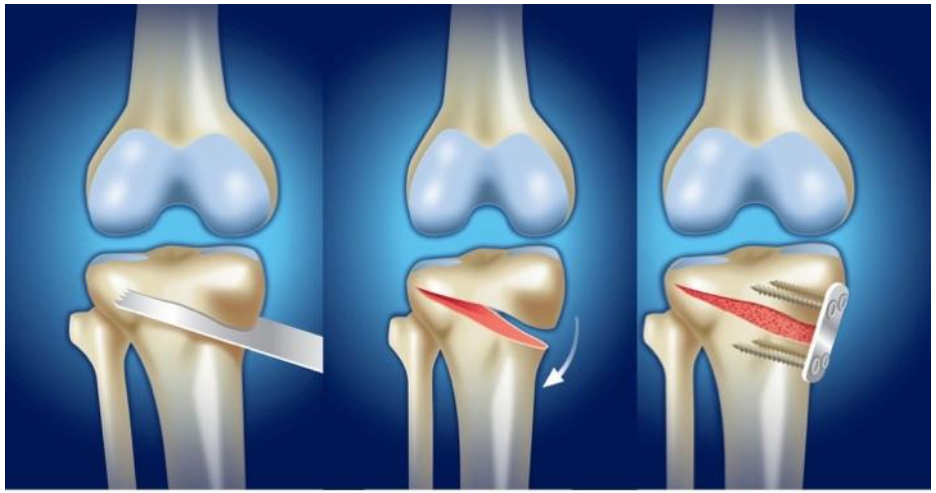
Abstract: Extremely low-frequency pulsed electromagnetic field (ELF-PEMF) therapy is proposed to support bone healing after injuries and surgical procedures, being of special interest for elderly patients. This study aimed at investigating the effect of a specific ELF-PEMF, recently identified to support osteoblast function in vitro, on bone healing after high tibial osteotomy (HTO). Patients who underwent HTO were randomized to ELF-PEMF or placebo treatment, both applied by optically identical external devices 7 min per day for 30 days following surgery. Osseous consolidation was evaluated by post-surgical X-rays (7 and 14 weeks). Serum markers were quantified by ELISA. Data were compared by a two-sided t-test ($\alpha = 0.05$). Device readouts showed excellent therapy compliance. Baseline parameters, including age, sex, body mass index, wedge height and blood cell count, were comparable between both groups. X-rays revealed faster osseous consolidation for ELF-PEMF compared to placebo treatment, which was significant in patients ≥50 years ($\Delta_{mean} = 0.68\%$/week; $p = 0.003$). Findings are supported by post-surgically increased bone-specific alkaline phosphatase serum levels following ELF-PEMF, compared to placebo ($\Delta_{mean} = 2.2$ µg/L; $p = 0.029$) treatment. Adverse device effects were not reported. ELF-PEMF treatment showed a tendency to accelerate osseous consolidation after HTO. This effect was stronger and more significant for patients ≥50 years. This ELF-PEMF treatment might represent a promising adjunct to conventional therapy supporting osseous consolidation in elderly patients. Level of Evidence: I.



Principes de l'ostéotomie

Les plantes

Plant Responses to High Frequency Electromagnetic Fields

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High frequency nonionizing electromagnetic fields (HF-EMF) that are increasingly present in the environment constitute a genuine environmental stimulus able to evoke specific responses in plants that share many similarities with those observed after a stressful treatment. Plants constitute an outstanding model to study such interactions since their architecture (high surface area to volume ratio) optimizes their interaction with the environment. In the present review, after identifying the main exposure devices (transverse and gigahertz electromagnetic cells, wave guide, and mode stirred reverberating chamber) and general physics laws that govern EMF interactions with plants, we illustrate some of the observed responses after exposure to HF-EMF at the cellular, molecular, and whole plant scale. Indeed, numerous metabolic activities (reactive oxygen species metabolism, α- and β-amylase, Krebs cycle, pentose phosphate pathway, chlorophyll content, terpene emission, etc.) are modified, gene expression altered (calmodulin, calcium-dependent protein kinase, and proteinase inhibitor), and growth reduced (stem elongation and dry weight) after low power (i.e., nonthermal) HF-EMF exposure. These changes occur not only in the tissues directly exposed but also systemically in distant tissues. While the long-term impact of these metabolic changes remains largely unknown, we propose to consider nonionizing HF-EMF radiation as a noninjurious, genuine environmental factor that readily evokes changes in plant metabolism.

Les animaux

Anses – Les Cahiers de la Recherche N° 9 - Santé, Environnement, Travail – mai 2017

L'exposition aux radiofréquences considérée comme une astreinte

Réponses physiologiques d'adaptation ou d'évitement du rat juvénile exposé aux ondes radiofréquences type antenne relais

Véronique BACH et Amandine PELLETIER

Les hommes

Contents lists available at ScienceDirect

Environment International

journal homepage: www.elsevier.com/locate/envint

Individual variation in temporal relationships between exposure to radiofrequency electromagnetic fields and non-specific physical symptoms: A new approach in studying 'electrosensitivity'

R.P. Bogers[a,*], A. van Gils[b], S.C.S. Clahsen[a], W. Vercruijsse[a,1], I. van Kamp[a], C. Baliatsas[a,2], J.G.M. Rosmalen[b], J.F.B. Bolte[a,c]

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ARTICLE INFO

Handling Editor: Olga-Ioanna Kalantzi

Keywords:
Electromagnetic sensitivity
Idiopathic environmental intolerance (IEI-EMF)
Non-specific physical symptoms (NSPS)
Electromagnetic fields
EMF
Personal exposure measurements

ABSTRACT

Background: Everyday exposure to radiofrequency electromagnetic fields (RF-EMF) emitted from wireless devices such as mobile phones and base stations, radio and television transmitters is ubiquitous. Some people attribute non-specific physical symptoms (NSPS) such as headache and fatigue to exposure to RF-EMF. Most previous laboratory studies or studies that analyzed populations at a group level did not find evidence of an association between RF-EMF exposure and NSPS.

Objectives: We explored the association between exposure to RF-EMF in daily life and the occurrence of NSPS in individual self-declared electrohypersensitive persons using body worn exposimeters and electronic diaries.

Methods: We selected seven individuals who attributed their NSPS to RF-EMF exposure. The level of and variability in personal RF-EMF exposure and NSPS were determined during a three-week period. Data were analyzed using time series analysis in which exposure as measured and recorded in the diary was correlated with NSPS.

Results: We found statistically significant correlations between perceived and actual exposure to wireless internet (WiFi - rate of change and number of peaks above threshold) and base stations for mobile telecommunications (GSM + UMTS downlink, rate of change) and NSPS scores in four of the seven participants. In two persons a higher EMF exposure was associated with higher symptom scores, and in two other persons it was associated with lower scores. Remarkably, we found no significant correlations between NSPS and time-weighted average power density, the most commonly used exposure metric.

Conclusions: RF-EMF exposure was associated either positively or negatively with NSPS in some but not all of the selected self-declared electrohypersensitive persons.

ELECTROSENSIBILITÉ

en pratique clinique

THE

BOSTON MEDICAL AND SURGICAL JOURNAL.

NEW SERIES.] THURSDAY, APRIL 29, 1869. [VOL. III.—No. 13.

Original Communications.

NEURASTHENIA, OR NERVOUS EXHAUSTION.

By GEORGE BEARD, M.D., Lecturer on Nervous Diseases in the University of New York.

I AM to speak to-night of a *condition* of the system that is, perhaps, more frequently than any other, in our time at least, the cause and effect of disease.

I refer to *neurasthenia*, or exhaustion of the nervous system.

in the habit of employing the term *neurasthenia* to express the morbid state that is commonly indicated by the indefinite phrase nervous exhaustion.

This nomenclature would seem to be justified by philological analogy, by scientific convenience, and by actual necessity.

The derivation of the term *neurasthenia* is sufficiently obvious. It comes from the Greek νευρον, "a nerve," *a*, privative, and σθενος, "strength;" and, therefore, being literally interpreted signifies want of strength in the nerve.

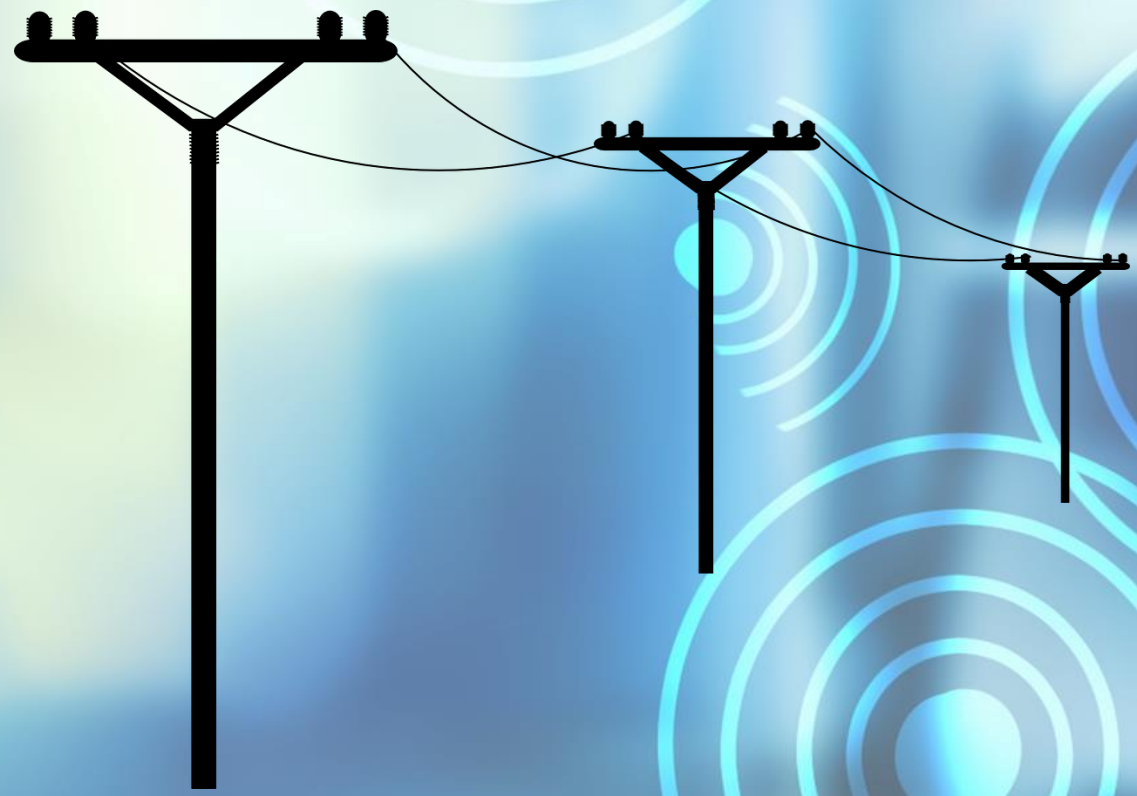
The character of this malady, if I be al-

Première description de la maladie par Georges Miller Beard un neurologue américain en 1869.

ELECTROSENSIBILITÉ

en pratique clinique

- Pathologie des pays développés
- Pathologie ancienne dans les années 50 : « Maladie des ondes Radio »
- Prévalence 3%-5% de la population soit 3 à 5 millions de Français.
- 0,65% de la population inapte au travail soit 465 000 personnes (TOULOUSE)



L’électro-sensibilité en pratique clinique

LE TERRAIN

- 2/3 de femme
- Pathologie avérée vers la Quarantaine
- La fratrie peut être touchée
- Les enfants d’un parent atteint peuvent être électrosensibles

L’électro-sensibilité en pratique clinique

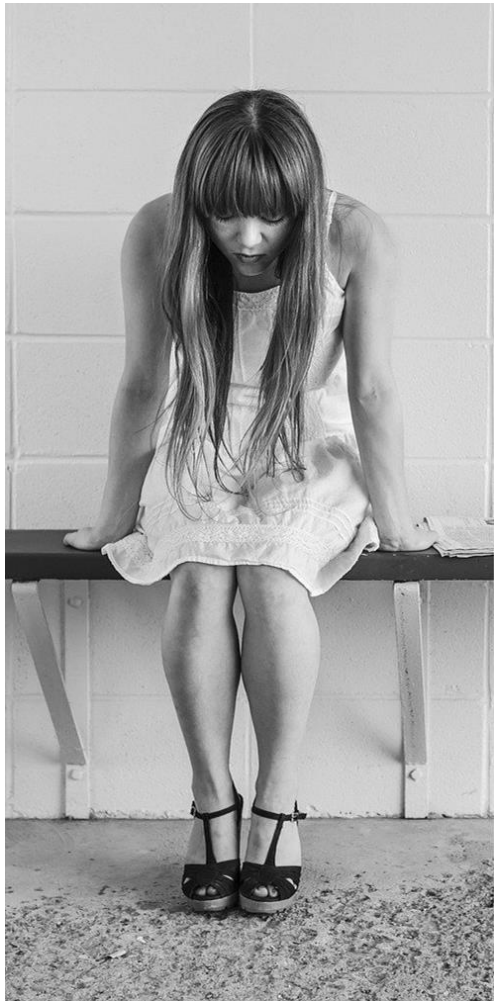
LE DÉBUT

- Début brutal
- un stress intense
- exposition importante à une source de rayonnement électromagnétique
- une infection (LYME)
- Soins dentaires avec mise en place de matériel.
- OU progressif sur plusieurs années

L’électro-sensibilité en pratique clinique

LES SYMPTOMES

- Non spécifiques peuvent toucher tous les organes
- Système nerveux : maux de têtes
- Le cœur : douleur thoracique, trouble du rythme
- La peau : brulure, eczéma, acné
- Musculo squelettique : douleur articulaire, douleurs musculaire, raideur cervicale
- Pulmonaire et digestif : asthme, douleur thoracique, toux, douleurs abdominales
- Tout cela constitue le SICEM: Syndrome d’intolérance aux champs électromagnétiques



L’électro-sensibilité en pratique clinique

DÉFINITION PRATIQUE

l’électrosensibilité :

- Les symptômes sont chroniques
- Les symptômes sont non spécifiques et peuvent toucher plusieurs organes
- Les symptômes apparaissent lors d’une exposition à une source de rayonnement électromagnétiques et cessent après l’arrêt de l’exposition
- Les symptômes sont reproductibles

l’Hyper électrosensibilité (ou électro hyper sensibilité (EHS)) :

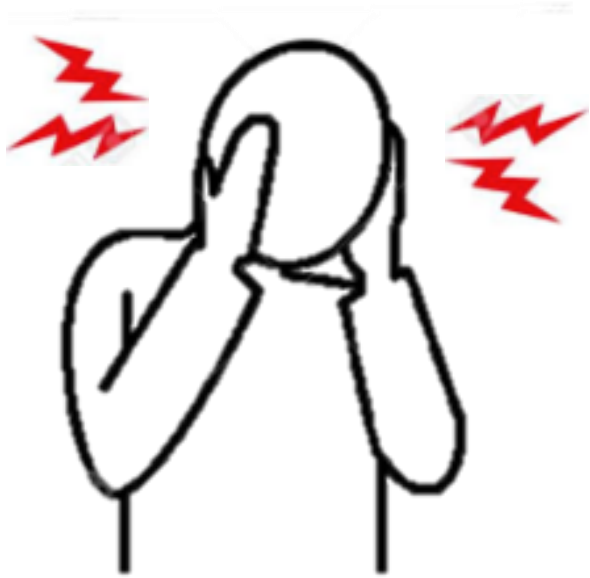
- Les symptômes sont déclenchés par des expositions de faibles intensités, inférieures à celles supportées auparavant ou habituellement supportés
- Les symptômes apparaissent pour de multiples sources de rayonnement électromagnétiques de nature différentes

L’électro-sensibilité en pratique clinique

CLASSIFICATION

On distingue 3 stades :

- Le stade 1 présence de symptômes lors de l’exposition à une source de rayonnement électromagnétique mais sans retentissement sur la vie quotidienne
- Le stade 2 présence de symptômes avec mise en place de procédure d’évitement pour continuer à vivre normalement
- Le stade 3 présence de symptômes empêchant ou limitant fortement toute vie sociale



L’électro-sensibilité en pratique clinique

PATHOLOGIES ASSOCIÉES

- Un syndrome de sensibilité chimique multiple
- Asthme
- Allergie
- Syndrome de l’intestin irritable
- Un syndrome de fatigue Chronique
- Une anxiété
- Un syndrome dépressif réactionnel

L’électro-sensibilité

EXAMEN CLINIQUE

- L’examen classique est normal et à pour but d’éliminer une autre pathologie.
- Tests du tonus musculaire peuvent mettre en évidence des réponses anormales.
- Examen dentaire dans tous les cas.

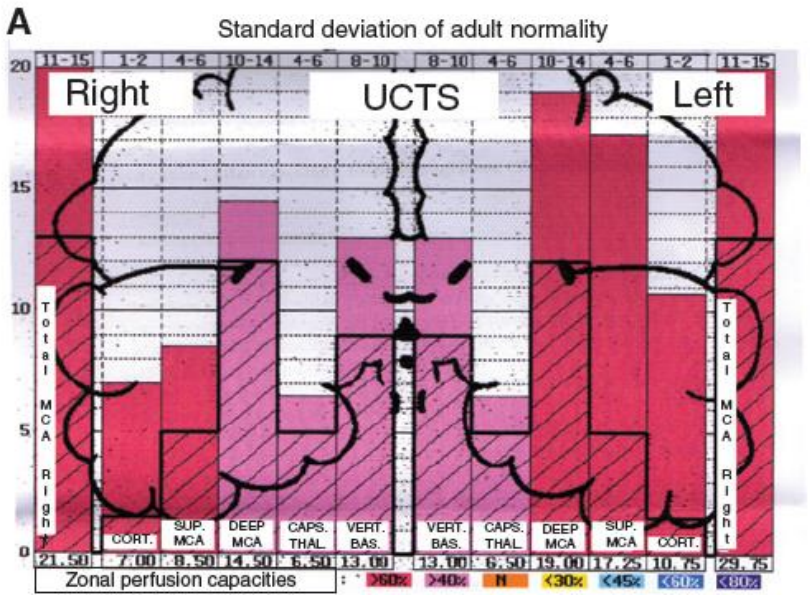
L’électro-sensibilité

EXAMENS BIOLOGIQUES

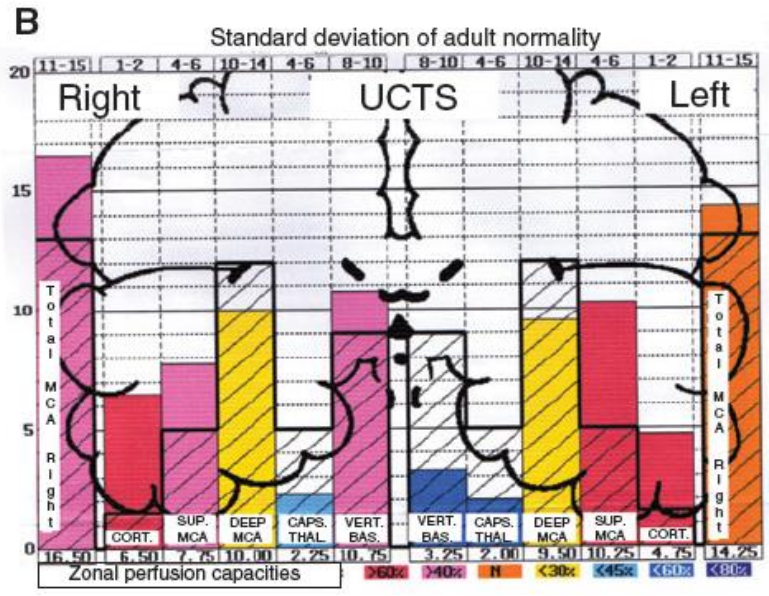
- Les examens de routine sont normaux
- Examens faits pour éliminer une autre pathologie
- Examens spécialisés : élévation de l’histamine, de la S100 béta et de la Nytrotirosine
- Génétique: mutation de la glutathione S-transferase

L’électro-sensibilité

EXAMEN RADIOLOGIQUE : Encéphaloscan



Patient Normal



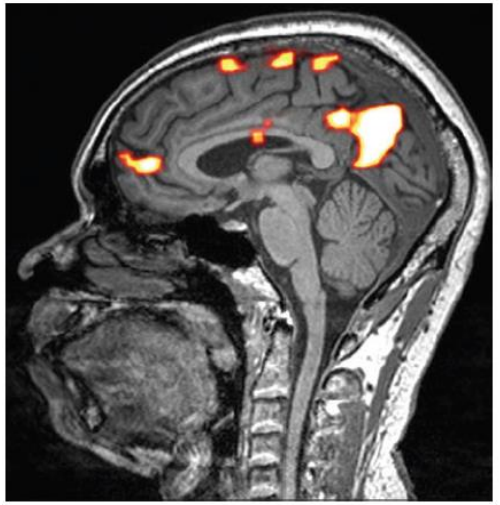
Patient EHS

EXAMEN RADIOLOGIQUE :

L’électro-sensibilité

- Le scanner cérébral est normal
- L’IRM cérébrale classique est normale
- L’IRM fonctionnelle montre des anomalies d'hyper connectivité au niveau du cortex préfrontal

Patient EHS



Patient normal

L’électro-sensibilité

DIAGNOSTIC

- Le diagnostic est clinique et repose sur l’interrogatoire du patient
- Les examens paracliniques ont pour but d’éliminer une autre pathologie

PHYSIOPATHOLOGIE

Activation des canaux calciques voltage dépendant

La Bioactivité dépend de :

- Polarisation: Induction d'oscillations forcées dans des tissus vivants
- Pulsatilité
- Puissance
- Fréquence
- Variabilité

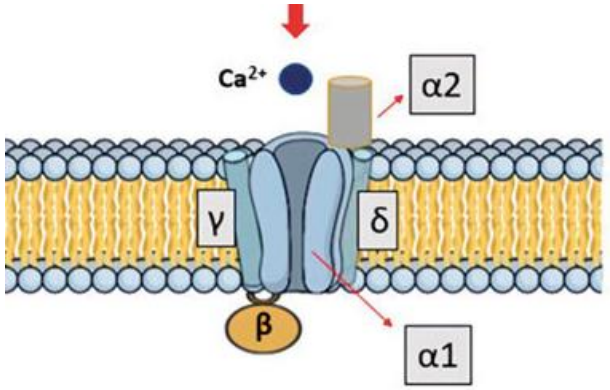
SCIENTIFIC REPORTS

OPEN

Polarization: A Key Difference between Man-made and Natural Electromagnetic Fields, in regard to Biological Activity

Received: 24 February 2015
Accepted: 07 September 2015
Published: 12 October 2015

Dimitris J. Panagopoulos[1,2,3], Olle Johansson[4] & George L. Carlo[5]

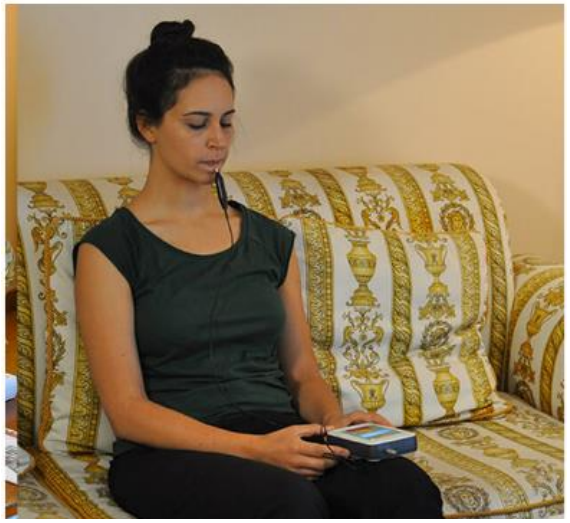


Calcium channel subtypes:

L-type	$Ca_v1.1$, $Ca_v1.2$, $Ca_v1.3$, $Ca_v1.4$
P/Q-type	$Ca_v2.1$
N-type	$Ca_v2.2$
R-type	$Ca_v2.3$
T-type	$Ca_v3.1$, $Ca_v3.2$, $Ca_v3.3$

Physio-pathologie

THERABIONIC



EBioMedicine 44 (2019) 209–224

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journal homepage: www.ebiomedicine.com

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Published by THE LANCET

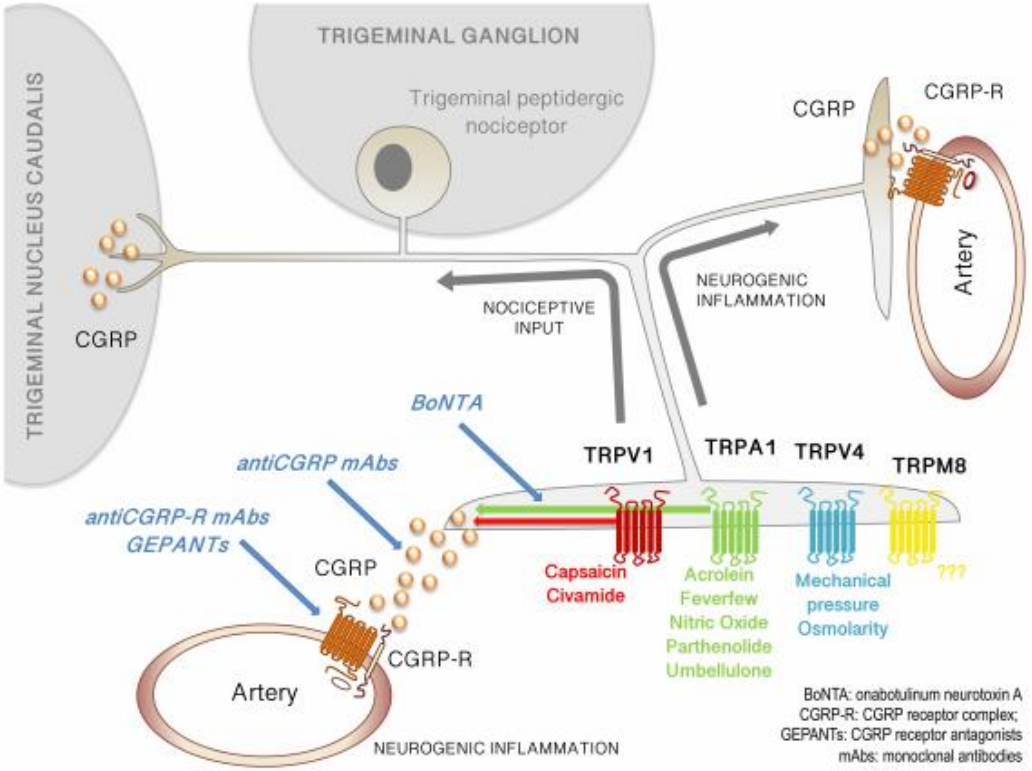
Tumour-specific amplitude-modulated radiofrequency electromagnetic fields induce differentiation of hepatocellular carcinoma via targeting $Ca_v3.2$ T-type voltage-gated calcium channels and Ca^{2+} influx

Hugo Jimenez [a], Minghui Wang [a], Jacquelyn W. Zimmerman [b,c], Michael J. Pennison [a], Sambad Sharma [a], Trevor Surratt [a], Zhi-Xiang Xu [c], Ivan Brezovich [d], Devin Absher [e], Richard M. Myers [e], Barry DeYoung [f], David L. Caudell [f], Dongquan Chen [g], Hui-Wen Lo [a], Hui-Kuan Lin [a], Dwayne W. Godwin [h], Michael Olivier [i], Anand Ghanekar [j], Kui Chen [k], Lance D. Miller [a], Yijian Gong [l], Myles Capstick [l], Ralph B. D'Agostino Jr [m], Reginald Munden [n], Philippe Merle [o], Alexandre Barbault [p], Arthur W. Blackstock [q], Herbert L. Bonkovsky [r], Guang-Yu Yang [s], Guangxu Jin [a], Liang Liu [a], Wei Zhang [a], Kounosuke Watabe [a], Carl F. Blackman [a,*], Boris C. Pasche [a,*]

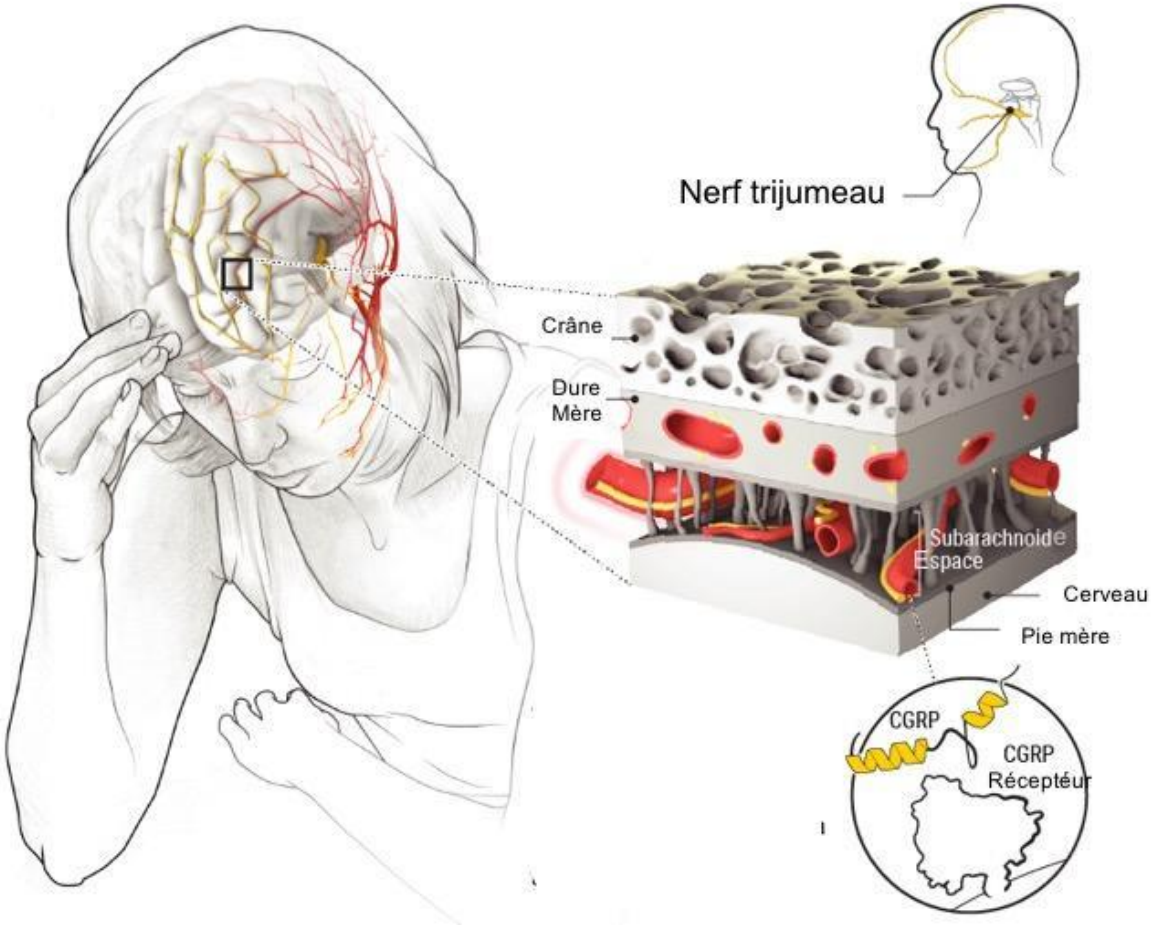
PHYSIOPATHOLOGIE

Physio-pathologie

- Activation des canaux calciques voltage dépendant
- Augmentation des Radicaux libres
- Activation des récepteur TRPA1
- Libération de CGRP



Physio-pathologie



- Embrasement cérébral
- Sensibilisation centrale
- Symptômes
- Efficacité des traitements de la migraine

C’est une nouvelle maladie neurologique

PRISE EN CHARGE THERAPEUTIQUE

Prise en charge thérapeutique

- Recommandations de l'European Academy for Environmental Medicine 2016
- Ecoute et bienveillance du personnel soignant sont la première étape du chemin de la récupération
- Récupération possible avec le temps

EUROPEAN ACADEMY FOR ENVIRONMENTAL MEDICINE

Prise en charge thérapeutique

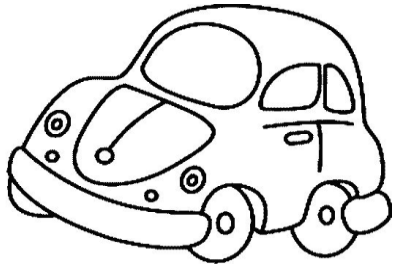
Pour le stade 1 la Prévention est essentielle

- Information sur l'effet des rayonnements électromagnétique
- Réduction de l'exposition
- Une hygiène de vie
- Soin particulier à l'entretien de ses dents

Prise en charge thérapeutique

Pour le stade 2 et 3 repose sur 5 points:

1. Hygiène électromagnétique
2. Hygiène de vie
3. Compléments alimentaires
4. Traitement symptomatique
5. Prise en charge sociale



Hygiène électro-magnétique

1. Réduction de l’exposition au rayonnement électromagnétique au maximum possible
2. Avec dépollution de l’environnement du patient
3. Avis dentiste spécialisé en matériaux compatibilité

HYGIÈNE DE VIE

Hygiène de vie

1. AIR PUR
2. EAU PURE
3. ALIMENTS SAINS
4. ACTIVITÉ PHYSIQUE
5. RELAXATION
6. **DORMIR**

COMPLÉMENTS ALIMENTAIRES

Complément Alimentaire

-Vitamine B2
-Coenzyme Q10
-Magnésium
Antioxydant:
-Vitamine C
-Vitamine D
- Spiruline
- Ginko Biloba
- Papaye...

TRAITEMENTS SYMPTOMATIQUES

Traitement des symptômes

1. Prise en charge des symptômes en particulier par l'utilisation de traitements antimigraineux et d'antalgiques : avis du Neurologue
2. Une prise en charge psychologique et l'utilisation des thérapies comportementales: Avis d'un psychologue ou d'un psychiatre
3. Les thérapies complémentaires selon habitude

Prise en charge

SOCIALE

1. BUT éviter l'exclusion sociale :
2. Assistante Sociale
3. Au niveau familial
4. Au niveau de la vie locale
5. Au plan scolaire: Médecin scolaire
6. Au plan professionnel : Médecin du Travail, rédaction d'un certificat, demande de RTQH, centre de pathologie professionnelle

DE LA SOUFFRANCE D'UN PATIENT ÉLECTROSENSIBLE

Prise en charge

1. Est un travail d'équipe.
2. Le but est de montrer le chemin
3. D'accompagner le patient et sa famille
4. Avec bienveillance et patience.
5. Pour un retour à la vie

Je vous remercie