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How and Why Epileptic Seizures Occur in Spontaneous Cycles and How to Dismantle Epileptic Electric Fields and Prevent Cyclicality with Cranial Electrical Stimulation (CES)?

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ABSTRACT

Today there is still no scientific answer to why and how epileptic seizures emerge and what determines the duration between two seizures. This article provides fundamental answers to these following conditions: 1) Outer etiological factors urge abnormal genes to produce a macro biophysical physiological distress by neuronal webs connectivity loop leading to; 2) Physical change in neuronal membrane in vulnerable ion channels sizes, blocking information flow through of extra- and intra-cellular liquids of neuronal membrane ceasing to function leading to; 3) Transform a given membrane into electrostatic templates, on which the ionic sedimentation rate (ISR) deposit ionic pileup due to speed-related body's physical ranges (BOR), to shift the membrane electric bio-impedance level, raising thereby the seizure threshold level leading to; 4) Extra accumulation of ISR reaching seizure threshold, to begin ionic leaking into non-specific neuronal routes leading to; 5) Single or combined sensory or motor arousal of an epileptogenic aura leading to; 6) accelerating ISR phenomenon with an avalanche-like electric-like discharge, to resemble an extra cranial ECT-like power source discharging the cortex under decerebration phenomena with loss of conscious leading to a tonic attack and after partial recovery by motor cortex to originate clonic attacks leading to; 7) The end of the ictal period to fall into short-term sleep with lucid post-ictal period thereafter. The interim periods hold personal predisposition to external stressors and internal physiological distresses with repeated epileptic cycles.

Keywords: Epileptic seizures, Pre-ictal, Post-ictal, Aura, Bio-impedance

Abbreviations: CES: Cranial Electrical Stimulation; ISR: Ionic Sedimentation Rate; BOR: Body's Physical Ranges; ECT: Electroshock Therapy; NEP's: Neuronal Electrical Pathways; THD: Transient Homeostatic De-regulation

BACKGROUND

Trauma, tumors, degeneration, infection, vascular changes, stress and others may originate a complex of macro biophysical physiological distress leading to a chain reaction of biophysical changes across affected neuronal webs connectivity to profoundly influence upon various cortical neuronal sites functional conditions. Epilepsy as a functional disorder may stay silently for whatever individual period in a pre-ictal state. Many years ago, the author made a pilot project based on three successive hypotheses: a) An electroshock therapy (ECT) and epilepsy share a common denominator. b) An external electrical current source feeds ECT producing an epileptic-like manifestation, and an equipotent electro-epileptogenic source of an inner electrostatic field gradually develop and induce real epileptic seizures and c. electrical bio-impedance level at electrostatic foci region fall beneath healthy and other morbidities measured non-invasively over scalp regions by an electrical bio-impedance analyzer. The latter adopted the International classification of EEG 10 to 20 montage of 24 EEG electrodes providing 276 points of measurements on the scalp with a harmless 5 mA current and of 80 kHz of high

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with schizophrenia with positive signs, another subgroup of frequency, injected during 10 ms for each pair of electrodes [1-3] The small research sample presented by 16 patients 21 patient with negative signs and the third group of 19 with epilepsy (post psychotic behavior) and a subgroup of 16 healthy volunteers. Together this small sample composed of 74 patients that evidenced the hypotheses, feasibility of the method and safety of the performance. Regretfully, for lack of finances the startup failed to keep on investigations. Research screening on epilepsy [4-6] had not advanced the answers on how and why epileptic seizures automatically run around cycles. The aim of this two-page article is to present an epileptic loop operating in seven successive stages from one post-ictal to the next ictal periods and to raise a highly probability that CES is capable monitoring epilepsy cycles with a portable device to be introduced in nearby future research.

Etiology of epilepsy

Inborn or acquired abnormal genetic mutation under macro neuro-biophysical physiological deregulated body operational ranges (BOR) rely on physical velocity law automatically navigating the uncontrollable ionic sedimentation rate (ISR) to piling-up within the epileptogenic foci to reach its seizure threshold level. An epileptic-induced neuronal algorithmic loop in operation empowers pre-and post-ictal intervals. The aim of this short presentation is to highlight all three stages: the aura, ictal and post-ictal periods.

Rational for an epileptic-induced neuronal algorithmic loop in operation

An abnormal neuronal loop must contain in parallel operating an array of neuronal electrical pathways (NEP's) composing of at least one row of ion channels physically getting deform under an ongoing exposure to stress-inducing macro biophysical physiological distress. This abnormal neuronal loop is presented below.

1. Mutated genes impair neuronal membrane lipids, ion channels, due to head traumas, vascular changes, infections, cerebral tumors or degeneration or stress-distress lead to: ↓ Yes No ↓	10. Personal excessive stress with unsuited life style under macro biophysical physiological information units affect ←
2. Genetic imprinting of given abnormal negative feedback mechanisms guide transient homeostatic de-regulation **(THD)** lead to: ↓ Yes No ↓	↑ Yes No ↑ 9. Incorrect food and liquid intake to sustain metabolism supply by abnormal numbers of bio-renewed and bio-energetic things to misfit the cerebral needs lead to
3. Consolidating ion channels physical misshape to misfit NEP's and mistuning the biophysical information-processing lead to: ↓ Yes No ↓	↑ Yes No ↑ 8. Some period of drowsiness and ictal end. Post-ictal state under clear conscious to preserve the inner conditions that finalized in prior seizure activity.
4. Complete arrest of ion fluxes via impaired ion channels in defected neuronal membrane zones and NEP's lead to: ↓ Yes No ↓	Yes No ↑ 7. An Instant discharge of ions across the cortex with loss of consciousness, tonic and clonic seizures lead to: ↑
5. Blocking up all ion channels with fluid and deposited ion charge **(ionic sedimentation rate-ISR)** particles in the impaired region creating big uncontrolled neuronal electrostatic templates lead to: ↓ Yes No →	↑ Yes No ↑ 6. Piling up **ISR** to seizure threshold level leaking out of extra ion charges into zones with low bio-impedance levels to non- specific neuronal sensory routes lead to an **'aura'** lead to:

Abnormal conditions preceding the aura

The electrical pre-epileptogenic sources appear in some neuronal ion membrane channels to raise their thresholds above action potentials, temporarily blocking up the ion channels leading the formation of ionic templates. A gradual raise in ISR reaches the pre-seizure level to begin with leaking into non-harmed NEP's conveying sensory information to an already established non specialized working memory centers to decode a give sensory informative aura (scent, parastesias, taste, vision, hearing, emotion or some combinations of them).

Abnormal conditions for an ictal period

Experience aura accelerates BOR velocity in a unit of time increasing thereby ISR deposit of ions arising to the threshold level creating an aura with a farther avalanche-like paroxysmal kindling. The last in its first phase resolute in tonic seizures and in the second phase in clonic seizures. Gradually to subside into some somnolence with a further full clear conscious awakening into a post-ictal state.

CONCLUSION

All stages, pre-ictal, aura, ictal and post-ictal hold individually defined periods. In order to control epilepsy, the expert must presently delay and sustain the ISR in a non-piling pattern. Our previous pilot project showed that our electrical bio-impedance analyzer with induced safe and noninvasive electrical units to the scalp of a patient's head of micro-milliamps', high frequency and during 60 ms was able to precisely dilute in the topographical brain region with the underlying electrostatic epileptogenic source to prevent and control epileptic seizures. Maybe it is possible with electrical bio-impedance portable devices to teach patients for self-control to prove it in the future.

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