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D. James Morré and Dorothy M. Morré
Mor-NuCo, LLC
Purdue University Research Park
West Lafayette, Indiana 47906 USA

Научная программа
Sci Program

«LOW AND SUPERLOW FIELDS AND RADIATIONS IN BIOLOGY AND MEDICINE»
ECTO-NOX PROTEINS LOCATED ON EXTERNAL SURFACE OF THE PLASMA MEMBRANE

- Oxidize NADH (non-physiological substrate)
- Oxidize plasma membrane (hydroquinones physiological substrate)
- Essential growth function (protein disulfide-thiol interchange)
ECTO-NOX PROTEINS

Metalocatalysts with binuclear copper centers that oscillate

Protein substrates

ECTO-NOX protein

Plasma membrane electron transport

2(NAD(P)H) → 2QH₂ → 2Q → 2(NAD(P)⁺)

PROTEIN DISULFIDE-THIOL INTERCHANGE

12 min

QUINOL (NAD(P)H) OXIDATION

Time Keeping Function

12 min
2 + 3 PATTERN OF RECOMBINANT ECTO-NOX ACTIVITY OSCILLATIONS
SCHEMATIC OF ENOX CYCLE

DATA AVERAGED OVER 1 MIN EVERY 1.5 MIN
The ENOX Cycle is:

- Autoentrainable
- Phased by blue light (blue and red in plants)
- Phased by very low frequency EMF
- Phased by melatonin and valerian
- Period length is independent of temperature
- Period length is increased in D$_2$O by 20%
HYPOTHESIS AND EVIDENCE

Primary Oscillator
- 1.2 to 36 sec

Ultradian Oscillator
- 24 min
- ENOX Proteins
  - mutation
- Cells
  - Transfection
- Copper Hexahydrate
- EMF

Circadian Oscillator
- 24 h
- Organisms
  - Heavy water
- ENOX1 inhibitor

*Balance of a mechanical time piece

*Morré, D. J. and Morré, D.M. 2012. ECTO-NOX proteins. Springer
S. Pershin

Wave Research Center
Prokhorov General Physics Institute
Russian Academy of Sciences
Moscow
Presentation on

New Concept:
The origin of superweak field interaction
with water and bioobjects
is
ortho-para $H_2^0$ quantum differences
Principal Reference

W. M. Pershin. *Phys. Wave Phenomena*

17(4), 241 (2009)
OSCILLATIONS IN ORTHO-PARA HYDROGEN SPIN RATIOS WATER BY RAMAN SPECTROSCOPY

From S.M. Pershin. 2005
Physics of Wave Phenomena
13:192-208

Period length 35 ± 13 seconds
Pershin observed
*Ortho-para* spin-isomers $\text{H}_2\text{O}$ in water with non-equilibrium ratio 1:1

Pershin concluded
Water is non-equilibrium liquid and very sensitive to any weak perturbation
MODEL BASED ON CONCEPT OF LIMIT OSCILLATIONS

![Graph showing energy thresholds with terms like Ortho enriched, Para enriched, spontaneously polarized, upstroke, and depolarized.](image)
Andrey Drozdov

The Institute for Analytical Instrumentation of the Russian Academy of Sciences
Moscow
Presentation on

The dynamics of intermolecular interactions in water

with S. Masukevich and T. Nagorskaya

Periodic structural rearrangements
WATER LUMINESSENCE INDUCED BY LASER RADIATION

MODEL BASED ON CONCEPT OF LIMIT OSCILLATIONS
FOURIER ANALYSIS OF LUMINESENCE DATA
FIT TO 36 SEC PERIOD
SUMMATION OF CARRIER WAVE

(1.0, 96), (0.25, 72), (0.7, 48), (0.4, 36), (0.4, 24) and (0.3, 12).
CARRIER WAVE ANALYZED OVER 1 MIN EVERY 1.5 MIN
DATA COLLECTED AT 1 SEC INTERVALS OF PREVIOUS SLIDE AVERAGED OVER 10 SEC

AVERAGE PERIOD LENGTH 37.5 SEC
10 SEC AVERAGES AVERAGED OVER 1 MIN EVERY 1.5 MIN

![Graph showing luminescence over time](image)
DECOMPOSITION FIT OF AVERAGED DATA

Accuracy Measures
- MAPE: 4.21
- MAD: 0.81
- MSD: 1.02

Time, min: 0 3 6 9 12 15 18 21
Relative Amplitude: 17 18 19 20 21

- 6 min
- 18 min
V. L. Voeikov and E. Del Giudice

Exclusion zone and coherence domains

“LIKE LIKE LIKE”

E. E. Fesenko  R. Sarimov and V. Binhi

EMF
Cu (II) OSCILLATIONS IN REDOX POTENTIAL

Energy

Fermi level

Species in solution

Metal electrode

highest occupied orbital

e

lowest unoccupied orbital

A

REDOX POTENTIAL

0 6 12 18 24 30 36 42

-0.8 0.0 0.2 0.4 0.6 0.8

B

NADH OXIDATION

0 6 12 18 24 30 36 42

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

NADH OXIDATION, nmoles/min

TIME, min
PAN-OCEANIC SYNCHRONY OF ORTHO-PARA WATER OSCILLATIONS
Summary

1. Water exhibits oscillations in redox potential sufficient to catalyze oxidation of NADH – 18 min period length

2. Addition of ions changes period length-Cu$^{++}$ to 24 min Na$^{+}$ to 30 min

3. Asymmetric repeating pattern (2 + 3)

4. Oscillations attributed to ortho-para disequilibrium (Pershin/Drozdov)

5. Characteristics of a limit oscillator (Pershin)
6. Based on luminescence data – Fundamental period length some multiple of 1.2 (?) sec (Zaharov)

7. Algebraic summation yields “carrier wave” with 18 min period (Morré, Morré and Zaharov)

8. Synchrony is achieved by communication among adjacent water molecules by low frequency EMF (Fesenko/Binhi)

9. Water molecules form contiguous systems (Del Giudice/Voeikov)

10. Also oscillatory (Pollack?)
TAKE HOME LESSON

Because of synchronous ortho-para disequilibrium and oscillatory electromagnetic fields thus generated contiguous water molecules are able to communicate with each other over extremely long distances (Pan oceanic)
The book chronicles the discovery of the ECTO-NOX proteins that serve as biological oscillators of the cell’s biological clock.

A chapter is devoted to derivation of oscillations from highly synchronized alternations in the ratios of ortho and para spin pairs of water hydrogens on an ENOX-associated copper hexahydrate.

Implicated in maintenance of coherent water.

Now available at a pre-publication tax-deductible price of $100.