

## Aquaphotomics for weak signals quantification in water

Roumiana Tsenkova

Kobe University, Japan

[rtsen@kobe-u.ac.jp](mailto:rtsen@kobe-u.ac.jp)

Aquaphotomics<sup>1</sup> is a field of study which aims at exploring water – light interaction for collective characterization and quantification of water molecular conformations that translate into structure, function, and dynamics of biological and aqueous systems. Understanding that the smallest amount of substance affects the organism led Benveniste<sup>2</sup> to explore the meaning of weak signals in water.

According to Aquaphotomics, near infrared light at specific frequencies turns water hydrogen bonded network into dynamic molecular mirror. The background of Aquaphotomics and a few examples of measurement of weak signals as response to scanning spectral acquisition and low concentrations of biomolecules including DNA<sup>3</sup>, nano particles and bacterial cells<sup>4</sup> in water will be presented. In these works, near infrared spectroscopy and multivariate analysis define water spectral signature as a system's biomarker and spectral model for quantification of weak signals and low concentrations measurement. Some changes in water spectral signature caused by weak signals were at new absorbance bands and some were at already known ones that allowed assignment of the water molecular structures activated by respective perturbation. Characteristic water spectral signatures of the fourth phase of water<sup>5</sup> were obtained with scanning monochromator and consecutive illuminations of various aqueous samples.

Key words: weak signals, near infrared, multivariate analysis, fourth phase of water

### Reference

1. Tsenkova, R., (2009) Introduction Aquaphotomics: dynamic spectroscopy of aqueous and biological systems describes peculiarities of water, *J. Near Infrared Spectroscopy* 17 pp303-313.
2. Yolene Thomas, Larbi Kahhak and Jamal Aissa (2006) The physical nature of the biological signal, a puzzling phenomenon: the critical contribution of Jacques Benveniste, In "Water and the Cell", 325-340, Ed. Gerald Polack, Springer.
3. Montagnier, L. Aissa J. , Del Giudice, E. Lavallee, C. Tedeschi, A. and G. Vitiello (2011) DNA waves and water, *J. Phys.: Conf. Ser.* **306** 012007.
4. Katsir, Y., Miller, L., Aharonov, Y., Ben Jacob, E (2007) The Effect of rf-irradiation on electrochemical deposition and its stabilization by nano particle doping.", *Journal of the Electrochemical Society*, Vol.,**154**(4), pp. D249-D259.
5. Polack, G. (2013) *The Fourth Phase of Water: Beyond, Solid Liquid, and Vapor*. By Gerald H. Pollack, Ebner & Sons Publishers; 357 Pages, ISBN 978-0-9626895-4-