The formation of coherence domains for aerosolized water molecules at alpine waterfalls – Part-2

P.Madl[1], P.Kolarž[2], E.Del Giudice[5], A.Tedeschi[4], A.Hartl[3], M.Gaisberger[3], W.Hofmann[1]

[1]Dep. of Material Research & Physics , University of Salzburg (AUT);
[2]Institute of Physics, Pregrevica 118, RS-11080 Belgrade (SR);
[3]Paracelsus Medical University, Institute for Physiology & Pathophysiology, A-5020 Salzburg (AUT);
[4]4WHITE Holographic Bioresonance, Milan I-20103 (ITA);
[5]Istituto Nazionale di Fisica Nucleare, Via Giovanni Celoria, 16, Milan, I-20133, (ITA) & International Institute of Biophysics, D-41472 Neuss, (FRG);

Universität Salzburg

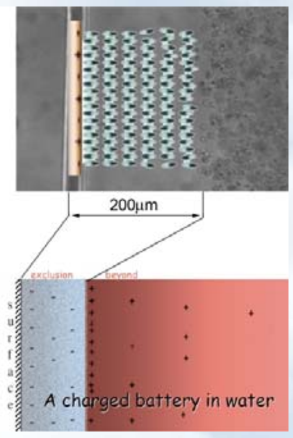
Department of Materials Engineering and Physics – Division of Physics and Biophysics
Radiation and Environmental Biophysics Working Group

Abstract

Based on the field study and the results presented in Part-1, we are able to postulate a very plausible link between coherence domains (CDs) and their biological significance. For organisms exposed to the falls, this special kind of aerosolized water bridges the gap between the observed charge separation and the beneficial documented biological effects (Moser, 2008). In addition the effects demonstrated in Part-1 enables the formation of CDs that reveal peculiar properties and include a density anomaly, an altered viscosity, surface tension as well as a different specific heat capacity with respect to bulk water. Furthermore, any molecule that finds itself at the boundaries of a CD gets stretched, thereby acquiring an electric dipole that is directed inward – a fact that has biological significance (Del Giudice & Preparata, 1994). The above makes it clear that the (i) negative charges of the waterfall-related aerosols are a by-product of the formation of CDs goes far beyond the classical understanding as outlined in the introduction of Part-1, and as will be shown in combination with the formation of Exclusion Zone (EZ) Water, these features are of (ii) crucial importance when interacting with biological membranes.

CDs & EZ-Water

The biological relevance of CDs becomes evident when looking at the membrane potential of cells. Since extracellular solutes can be dissolved in the non-coherent fraction only, they cannot be present within interfacial water (synonymous with EZ water, Del Giudice, 2008). A particle-free zone is created (Fig. 1), leaving a stable ~250 µm-wide particle-free zone (Zheng et al., 2006). Deposition of CDs in the form or aerosolized water augments the EZ-forming potential.



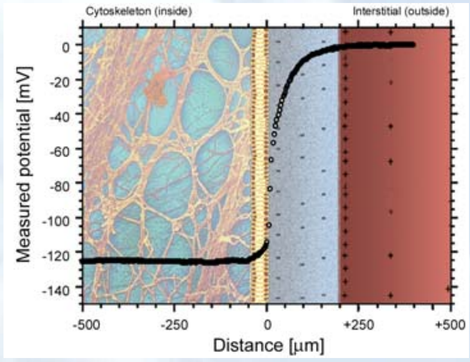


Fig. 2: Potential profile as a function of distance from a synthetic membrane-like surface (located at "0" on the abscissa) imitating membrane properties (Zheng et al., 2006).

Fig. 1: Formation of the exclusion zone (EZ) and its concomitant orientation of water dipoles stretching out for several 100s of µm. EZ acts like a filter, pushing solutes out of this zone so much so that solutes can only crowd at the outer EZ surface (Pollack, 2010).

Once formed and left undisturbed, this EZ is stable for days and weeks and is so enormous that at least 100s of 1000s of H_2O-moelcular layers are involved. Since this particular organization is untypical for gases and liquids, some have even termed this particular state as the 4[th] state of matter (Pollack, 2001). On the boundary of this thick layer, the potential difference typically amounts to a negative potential equivalent to $55<\Delta V<110$mV (Fig. 2). This value is in surprising agreement with the membrane potential (Marchettini et al., 2010).

Within the EZ and at room temperature, water molecules are as tightly packed together as possible, which implies that this extracellular water is also in a coherent state. Since coherent molecules are spatially wider than non-coherent molecules, the density of coherent water is lower than that of normal water - approx. 0.97g/cm³ (Pollack, 2001). The coherently resonating ensemble gives rise to two main consequences (Del Guidice et al., 2010):

#**1. Formation of excited cold vortices**. Vortices oscillate in the kHz-range and are coupled with the lifetime of the CDs (i.e. cannot decay thermodynamically), which in turn lead to subsequent excitations, to drive even more of these vortices with the result that the overall energy becomes higher and higher. In this way, the CDs can be considered a device able to collect low-grade energy ($\propto k\cdot T$, high entropy) from its environment and transform it into high-grade (low entropy) energy in turn able to induce electronic excitations in biomolecules surrounding the CDs.

#**2. RedOx-pile formation due to electron release out of CDs**. Release of electrons from CDs can either occur via a quantum tunnelling (Josephson effect) or via a mild external perturbation. Thus the interface between fully coherent interfacial water and normal bulk water turns into a RedOx pile, with the former acting as the reducing and the latter as the oxidizing agent. Thus, water organization around charged surfaces seems to be a key attribute underlying biological autopoiesis.

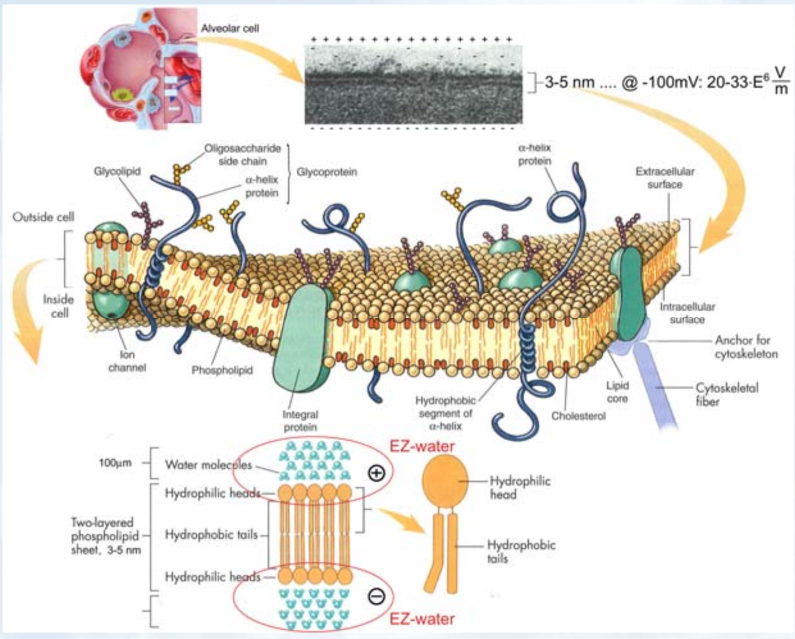


Fig. 3: The composite image above portrays the potential interaction mechanism of inhaled CDs on the surfactant of the pulmonary region including type I (squamous pulmonary epithelial) and type II (septal) alveolar cells. The plasma membrane of theses cells -as in any cell with capacitance properties - is a lipid bilayer consisting of two tiers of phospho-lipid molecules with hydrophilic heads on the membrane's surface, and hydrophobic tails oriented inward toward the middle of the membrane.

Biological significance

As demonstrated in Part-1, oscillations are strongly coupled to the extended EMF evanescenting from the CDs and make adjacent molecules resonate on the same frequency. Since the oscillation frequency of water-CDs at room temperature is about 0.2eV, such a molecule is attracted into the CD if its resonance spectrum is within $|n\ -0.2\text{eV}| \leq k\cdot T$. For a given temperature this equation suggests that molecules are able to co-resonate with the CDs. The energy of a CD can be approximated to -0.54eV + X (with X ranging from $55<\Delta V<110$mV). By assuming that X ~ 0.1eV, E_{el} attains a value of ~0.44eV that coincides with the electro-negativity of O_2. Thus $(H_2O)COH + O_2 \rightarrow H_2O^+ + O_2^- + COH$ is the first hub of the chain reaction that in theory ends with the splitting of the water molecule itself (just as in photosynthesis). This loop in turn feeds energy back into the formation of cold vortices (see #1). Since these "guest molecules" are coherently embedded, they are no longer independent and can receive energy only in a collective way just as the resonating ensemble in a multimode laser (see Part-1). This favours the production of certain bio-molecules, including AA-chains and their conformative folding patterns (Voeikov & Del Giudice, 2006).

Since water within a living organism accounts for about 70% of the total mass and 99% of the total number of molecules, rather then just "water entrapped within and among cells", organismic water must be considered as fully interfacial water since each molecule is always closer than a fraction of a micron from some surface or macromolecular backbone (Del Giudice et al., 2010). Furthermore, the fact that the observed depth of EZ water by far exceeds these spatial dimensions (Fig.3), biologically organized matter (e.g. life) taps resources that can't be accounted for by biochemistry alone (see see #1). This implies that the entire concept of homeostasis must be viewed from a different angle by which the exposure of ailing cells to an environment that favours the maintenance of CDs – such as is the case of CD-formation near the waterfall, cell recovery would be boosted as the cell's vitality is enhanced by enforcing the robustness of its own EZ, thus tapping an energy rich resource that is provided from within, but induced from outside and shifting the metabolic focus to tasks that maintains a cell's viability in the long run.

UWPE & CD-EZ-Interaction

Based on consequence #2, the EZ-CD interface can be regarded as a stress-relief agent turning a stress potential from a distress into a eustress mode. Consequence #1 has much wider implication for the diagnostics part and brings us back to the UWPED-measurements mentioned in Part-1. As shock-freezing abiotic samples with liquid N_2 is needed to conserve coherent structures in aerosolized water clusters, such treatment is not necessary in biological samples. Here, coherence is achieved by the complex and intrinsically interwoven network of membranes (in the cytosol by organelles, cytoskeleton etc.), and in the interstitial via fibrous protein structures, thereby establishing EZ-water. In comparison, the UWPED count-rate of the same colony treated with vinegar collapsed by almost two orders of magnitudes to about 100cts/sec. The coherent structures within the organism have been significantly disturbed, if not destroyed all together.

Medical relevance:

The beneficial effects of charged particles (in the order of 10·E³ particles/cm³) to the respiratory system are known (Voikev, 2006). Yet the endocrine system, the autonomic nervous system, rheumatism, high blood pressure and nervous disorders of the intestinal tract are also positively affected (Goldstein, 2002; Takahashi et al., 2008; Krueger & Reed, 1976). Pathophysiologically, it is known that chronic inflammatory processes in the bronchi and lungs play an important role in the genesis of bronchial asthma. Especially the reduction of bronchial hypersensitivity and the increase in mucus transport could be documented as well, as less common asthma attacks as a result of inhalation of negative air ions (Finogenov, 1961; Goldstein et al. 1997). Yamadaa et al. (2006) even repeated the inhibitive effects of carcinogenesis and tumor growth..

Conclusion

The investigation carried out at several waterfalls in Central Europe opened up some new and interesting aspects in waterspray electrification, its formation principles and the potential effects on biological tissues. The reservoir of almost free electrons tunnel out from CDs and are able to pick up low-grade energy from outside to produce coherent cold vortices where electrons move almost collision-free. CDs thus are devices able to transform low-grade energy (high entropy) collected from the environment into high-grade energy (low entropy), which in turn is able to induce electronic excitations into the "guest molecules" that are embedded or in the vicinity of CDs. Furthermore, the possibility of water-reorganization impacted by surfaces raises the question of long-range recognition of complementary entities such as enzymes–substrates, antigens–antibodies, etc. (Zheng et al., 2006). Water-CDs can thus get excited by collecting ambient energy and get de-excited by activating "guest molecules" producing so a CD-oscillation. The output energy of chemical reactions in turn is used to reload CDs, changing their oscillation frequency, which facilitate other specific biochemical reactions.

References

- Del Giudice E. (2008). Quantum Electrodynamical (QED) Coherence and Interfacial Water. 3rd Annual Conference on the Physics, Chemistry and Biology of Water, Mt. Snow, Vt. USA 16-19 October.
- Del Giudice E, Spinetti P.R., Tedeschi A. (2010). Water Dynamics at the Roots of the Metamorphosis in Living Organisms. Water 2: 566-586.
- Del Giudice E., Preparata G. (1994). Coherent Dynamics in Water as a Possible Explanation of Biological Membranes Formation. J. Biological Physics 20: 105-116.
- Finogenov SN. (1961). Therapeutic Properties of Ionized Air. Zdorov'e, Kiev (in Russian).
- Goldstein N., Rehberg G., Klefisch F.R. (1997).Superoxide inhalation as adjuvant therapy in children with bronchial asthma. Probl. Tuberk 6: 54-58.
- Krueger A.P., Reed E.J. (1976). Biological impact of small air ions. Science 193: 1209-1213.
- Marchettini N., Del Giudice E., Voeikov V.L., Tiezzi E. (2010). Water: A medium where dissipative structures are produced by a coherent dynamics. J. Theo. Bio. 265: 511-516.
- Moser M. (2008). Projekt Krimmler Wasserfälle. Joanneum Research, Institut für nicht-invasive Diagnostik, Weiz - AUT (in German), p.8.
- Pollack G.H. (2001). Cells, gels and the engines of life - a new, unifying approach to cell function. Ebner & Sons Publishers, Seattle, Washington - USA.
- Pollack G.H. (2010). Water, energy and life: Fresh views from the water's edge. Int. J. Design & Ecodynamics 5(1): 27-29.
- Takahashi K., Otsuki T., Mase A., Kawado T., Kotani M., Ami K., Matsushima H., Nishimura Y., Miura Y., Murakami S., Maeda M., Hayashi H., Kumagai N., Shirahama T., Yoshimatsu M., Morimoto K. (2008) Negatively-charged air conditions and responses of the human psycho-neuroendocrino-immune network. Environ Int. 34(6): 765-72.
- Voeikov V.L. (2006) Reactive oxygen species – pathogens or sources of vital energy? Part 1. ROS in Normal and Pathological Physiology of Living Systems. J. Alternative and Complementary Medicine 12(2): 111-118.
- Voeikov V.L., Del Giudice E. (2009) Water respiration: the base of the living state. Water 1: 52-57.
- Yamadaa R.,Yanomac S., Akaikeb M., Tsuburayab A., Sugimasab Y., Takemiyab S., Motohashib H., Rinoa Y., Takanashia Y., Imadaa Y. (2006) Water-generated negative air ions activate NK cell and inhibit carcinogenesis in mice. Cancer Letters 239: 190-197.
- Zheng J.M., Chin W.C., Khijniak E., Pollack G.H. (2006) Surfaces and interfacial water - evidence that hydrophilic surfaces have long-range impact. Adv. Colloid Interface Sci. 127: 19-27.