

UNESCO/UNITWIN Interregional Network on “Biophysics, Biotechnology and Environmental Health control” SKYPE conference on 20.03.2020 “The mechanism of COVID-19 virus protein spikes interaction with host cell membrane and its age-dependency”.

“Some biophysical perspectives on the COVID-19 health challenge.”

Alberto Foletti, MD¹⁻²

¹-Clinical Biophysics International Research Group, Lugano, Switzerland.

²-Institute of Translational Pharmacology, National Research Council-C.N.R., Rome, Italy.

Biophysical paradigm is rapidly evolving encompassing new perspectives in understanding health and disease dynamics [1]. According to the biophysical paradigm, it is possible to combine biochemical knowledge on the dynamics of health and disease with new insights and new clinical applications [2-6]. If we consider, as a working hypothesis, that every living activity, at every molecular, cellular, tissue and systemic level is related to the incessant emission of electromagnetic signals, then it is possible to interact with living systems, at every level, with adequate electromagnetic signals [7]. This interaction can take place on the basis of the universal principle of information transmission which is the phenomenon of resonance which must take place within the so-called Adey windows [8, 9]. Among others, solitons [4-6] may play a relevant role in the synchronization of biological activities requested to maintain allostasis and contribute, very likely to the maintenance or restore of health [10]. In this perspective health and disease has to be considered as two unavoidable expression of ceaselessly adaptive dynamics: we need health to recover from disease, and we need disease to strengthen health [6]. This interaction by resonance [11] can allow to extract information on the functioning state of living systems for cognitive or diagnostic purposes. The same interaction by resonance can transmit information to living systems to remodel altered functions during disease or strengthen their resilience to increase their robustness [12].

This means that we can both mitigate pathogenesis and promote salutogenesis [6].

Now what are the opportunities that the biophysical paradigm can offer in relation to viral epidemic infections as in the current case of COVID-19?

As shown in previous studies, biophysical methodologies can offer direct and indirect support in the management of specific diseases, as well as in stress management [13], a factor well known for its negative effect on the immune system. In particular, it has been shown how a biophysical therapy could be useful in recurring infections and resistant to anti-infective drug therapy [14].

The study of the specific resonance frequencies of infectious agents has led some groups of researchers to develop direct treatment systems for infections with specific electromagnetic signals pattern in the case of different bacterial pathogens [15,16]. A similar treatment could consequently be applied to Coronavirus.

Furthermore, the electromagnetic vaccination concept has been previously suggested [17] based on the working hypothesis that each infectious agent has its own electromagnetic identity [18]. Now, if we transfer the signal pattern that characterizes an infectious agent to an animal or man, we can stimulate its antigenic response by inducing a specific immunity as if it were a vaccine [19]. This hypothesis is, however, still to be investigated and adequately verified before being applicable on a large scale, as it would require in the current situation. S

ome biophysical treatment protocols such as those of the Radio Electric Asymmetric Conveyor, REAC therapy, have already shown in over a dozen published works the possibility of reducing the stress load and promoting the mechanisms of self-regulation and self-regeneration. This methodology has been proven to have anti-senescence effect, a fundamental resource to reduce frailty due to aging [20].

References:

1. Funk RHW. (2018) “Biophysical mechanisms complementing "classical" cell biology.” Front

- Biosci (Landmark Ed), 23: 921-939.
2. Pokorný J., Hašek J., Jelínek F. (2005) "Endogenous electric field and organization of living matter". *Electromagn Biol Med.*, 24(3): 185-197.
 3. Pokorný J., Pokorný J., Kobilková J. (2013) "Postulates on electromagnetic activity in biological system and cancer." *Integr Biol (Camb)*, 5(12): 1439-46.
 4. Brizhik L.S., Eremko A.A. (2003) "Nonlinear model of the origin of endogenous alternating electromagnetic fields and selfregulation of metabolic processes in biosystems". *Electromagn Biol Med.*, 22(1): 31-39.
 5. Brizhik L.S., Del Giudice E., Popp F.A., Maric-Oeler W., Schlebusch K. P. (2009) "On the dynamics of self-organization in living organisms.", *Electromagn. Biol. Med.*, 28(1): 28-40.
 6. Foletti A., Brizhik L. (2017) "Nonlinearity, coherence and complexity: Biophysical aspects related to health and disease." *Electromagn Biol Med.*, 36(4): 315-324.
 7. Funk RH. (2018) "Coupling of pulsed electromagnetic fields (PEMF) therapy to molecular grounds of the cell." *Am J Transl Res.*,10(5):1260-1272. eCollection 2018. Review
 8. Adey W.R. (1980) "Frequency and power windowing in tissue interactions with weak electromagnetic fields.", *Proc IEEE.*, 68(1): 119-125.
 9. Adey W.R. (1981) "Tissue interactions with non-ionizing electromagnetic fields." *Physiol.Rev.*, 61: 435-514.
 10. De Ninno A, Pregolato M. (2017) "Electromagnetic homeostasis and the role of low-amplitude electromagnetic fields on life organization." *Electromagn Biol Med.*, *Electromagn Biol Med.*, 36(2): 115-122.
 11. Foletti A., Grimaldi S., Lisi A., Ledda M., Liboff A.R. (2013) "Bioelectromagnetic medicine: The role of resonance signaling". *Electromagn Biol Med.*, 32(4): 484-499.
 12. Geesink J.H., Meijer D.K.F. (2017) "Bio-soliton model that predicts non-thermal electromagnetic frequency bands, that either stabilize or destabilize living cells." *Electromagn Biol Med.*, 36(4): 357-378.
 13. Ferrara I., Egan C.G., Foletti A. (2020) "Pilot study on the effect of biophysical therapy on salivary alpha-amylase as a surrogate measure of anxiety/stress: in search of a novel noninvasive molecular approach for the management of stress". *Int J Mol Sci.*, 21(2): 415.
 14. Ferrara I., Foletti A. (2015) "Steps towards a biophysical approach to refractory gynecological infections." *PIERS Proceedings*, Prague, Czech Republic, July 6–9 2015, pp. 175–178.
 15. Fadel M.A., Mohamed S.A., Abdelbacki A.M., El-Sharkawy A.H. (2014) "Inhibition of Salmonella typhi growth using extremely low frequency electromagnetic (ELF-EM) waves at resonance frequency." *J Appl Microbiol.*, 117(2): 358-65.
 16. Al-Harbi FF, Alkhalifah DHM, Elqahtani ZM, Ali FM, Mohamed SA, Abdelbacki AMM. (2018) "Nonthermal control of Escherichia coli growth using extremely low frequency electromagnetic (ELF-EM) waves." *Biomed Mater Eng.*, 29(6):809–820.
 17. Liboff A.R. (2012) "Electromagnetic vaccination". *Med Hypotheses.*, 79(3): 331-333.
 18. Reguera G. (2011) "When microbial conversations get physical." *Trends Microbiol.*, 19(3): 105-113.
 19. Liboff A.R., Grimaldi S., Foletti A. (2012) "Bacterial emissions as electromagnetic antigens.", In: *Proceedings of the 2nd International Symposium "Biophysical Aspects of Complexity in Health and Disease."*, Lugano, Switzerland, May 18-19 2012, pp.12
 20. Maioli M, Rinaldi S, Santaniello S, et al. (2014) "Anti-senescence efficacy of radio-electric asymmetric conveyer technology." *Age (Dordr)*, 36(1):9–20.