Published in the Slovak Republic
European Journal of Molecular Biotechnology
Has been issued since 2013.
E-ISSN: 2409-1332
2018, 6(1): 41-52

DOI: 10.13187/ejmb.2018.1.41
www.ejournal8.com

ZEOLITH Detox for Detoxification of Human Body. Proofs for Anti Inflammatory Effects of Zeolite and Detoxification

Ignat Ignatov [a, *], Yuliana Pesheva [a]

[a] Scientific Research Center of Medical Biophysics, Sofia, Bulgaria

Abstract

We studied the mathematical model of interaction with water of natural mineral and microporous crystalline mineral ZEOLITH detox of LavaVitae Company (Austria). In this report are submitted data about the interaction of ZEOLITH detox with water, obtained by non-equilibrium (NES) and differential-equilibrium energy spectrum (DNES) of water. The average energy ($\Delta E_{H...O}$) of hydrogen H...O-bonds among individual molecules H_2O after treatment of ZEOLITH detox with water measured by NES- and DNES-methods is ΔE=-0.0034±0.0011 eV for ZEOLITH detox. The average energy ($\Delta E_{H...O}$) of hydrogen H...O-bonds among individual molecules H_2O after treatment of ZEOLITH detox with water measured by NES- and DNES-methods is ΔE=-0.0034±0.0011 eV for ZEOLITH detox. The average energy ($\Delta E_{H...O}$) of hydrogen H...O-bonds among individual molecules H_2O after treatment of ZEOLITH detox with water measured by NES- and DNES-methods. These results suggest the restructuring of $\Delta E_{H...O}$ values among H_2O molecules with a statistically reliable increase of local extremums in DNES-spectra. The research is performed for ZEOLITH detox with study of pH and oxidative reduction potential (ORP).

The report shows the effects of zeolite for the detoxification of human body. The inflammations are one of the basic reasons for aging process. In this research we show anti inflammatory effects from ZEOLITH detox.

Keywords: ZEOLITH detox, anti inflammatory effects, detoxification, mathematical model, NES, DNES.

1. Introduction

The ZEOLITH detox is mineral refers to new generation of natural mineral sorbents (NMS). Zeolites are the alumosilicate members of the family of microporous solids known as "molecular sieves", named by their ability to selectively sort molecules based primarily on a size exclusion process. Natural zeolites form when volcanic rocks and ash layers react with alkaline groundwater. Zeolites also crystallize in post-depositional environments over periods ranging from thousands to millions of years in shallow marine basins. Naturally occurring zeolites are rarely pure and are contaminated to varying degrees by other minerals, metals, quarts, or other zeolites. For this reason, naturally occurring zeolites are excluded from many important commercial applications where uniformity and purity are essentials.

As natural mineral zeolite has unusually broad scope of application in industry. Adsorption, catalytic, and reduction-oxidation Zeolites is widely used in industry as a desiccant of gases and liquids, for treatment of drinking and sewage water from heavy metals, ammonia, phosphorus, as

* Corresponding author
E-mail addresses: mbioph@dir.bg (I. Ignatov)

catalyst in petrochemical industry for benzene extraction, for production of detergents and for extracting of radionuclides in nuclear reprocessing. It is also used in medicine as nutritional supplements having antioxidant properties. Some authors make qualifications of zeolites as nano materials.

A wide range of properties of zeolite defines the search for new areas of industrial application of these minerals in science and nano technology that contributes to a deeper study the mechanism of interaction of these minerals with water. The company LavaVitae produces ZEOLITH detox with results for detoxification. This paper deals with evaluating of mathematical models of interaction of ZEOLITH detox with water with proofs for anti inflammatory effects and inhibition of development of tumor cells.

2. Materials and Methods

2.1. Materials

The study is performed with samples of ZEOLITH detox from LavaVitae Company (Austria).

There are valid the following methods for research of zeolite.

2.2. Analytical Methods

The analytical methods were accredited by the Institute of Geology of Ore Deposits. Petrography, Mineralogy, and Geochemistry (Russian Academy of Sciences). Samples were treated by various methods as ICP-OES, GC, and SEM.

2.3. Gas-Chromatography

Gas-chromatography (GC) is performed at Main Testing Centre of Drinking Water (Moscow, the Russian Federation) on Kristall 4000 LUX M using Chromaton AW-DMCS and Inerton-DMCS columns (stationary phases 5 % SE-30 and 5 % OV-17), equipped with flame ionization detector (FID) and using helium (He) as a carrier gas.

2.4. Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES)

The mineral composition is studied by inductively coupled plasma optical emission spectrometry (ICP-OES) on Agilent ICP 710-OES (Agilent Technologies, USA) spectrometer, equipped with plasma atomizer (under argon stream), MegaPixel CCD detector, and 40 MHz free-running, air-cooled RF generator, and Computer-optimized exhale system: the spectral range at 167–785 nm; plasma gas: 0–22.5 l/min in 1.5 l/min; power output: 700–1500 W in 50 W increments.

2.5. Transmission Electron Microscopy (TEM)

The structural studies were carried out with using JSM 35 CF (JEOL Ltd., Korea) device, equiped with X-ray microanalyzer "Tracor Northern TN", SE detector, thermomolecular pump, and tungsten electron gun (Harpin type W filament, DC heating); working pressure: 10^{-4} Pa (10^{-6} Torr); magnification: 300.000, resolution: 3.0 nm, accelerating voltage: 1–30 kV; sample size: 60–130 mm.

2.6. IR-Spectrospopy

IR-spectra of water samples, obtained after being contacted 3 days with shungite and zeolite, are registered on Fourier-IR spectrometer Brucker Vertex ("Brucker", Germany) (a spectral range: average IR – 370–7800 cm^{-1}; visible – 2500–8000 cm^{-1}; the permission – 0.5 cm^{-1}; accuracy of wave number – 0.1 cm^{-1} on 2000 cm^{-1});

For the research of ZEOLITH detox the methods are:

2.7. Non-equilibrium Spectrum (NES) and Differential Non-equilibrium Spectrum (DNES)

The energy spectrum of water is characterized by a non-equilibrium process of water droplets evaporation, therefore, the term non-equilibrium spectrum (NES) of water is used. The difference

Δf(E) = f (samples of water) – f (control sample of water) – is called the "differential non-equilibrium energy spectrum of water" (DNES).

2.8. Measurement of pH and ORP (oxidative-redox potential)

The research is performed from Georgi Gluhchev with device from Hanna Instruments.

3. Results and Discussion

In comparison with zeolite comprises a microporous crystalline aluminosilicate mineral commonly used as commercial adsorbents, three-dimensional framework of which is formed by linking via the vertices the tetrahedral $[AlO_4]^{2-}$ and $[SiO_4]^{2-}$ (Panayotova, Velikov, 2002). Each

tetrahedron $[AlO_4]^{2-}$ creates a negative charge of the carcasses compensated by cations (H^+, Na^+, K^+, Ca^{2+}, NH_4^+, etc.), in most cases, capable of cation exchange in solutions. Tetrahedrons formed the secondary structural units, such as six-membered rings, five-membered rings, truncated octahedra, etc. Zeolites framework comprise interacting channels and cavities forming a porous structure with a pore size of 0.3–1.0 nm. Average crystal size of the zeolites may range from 0.5 to 30 μm.

By the measurement of IR spectra in the range of vibrations in the crystal mineral framework one can obtain the information: a) on the structure of the framework, particularly type lattice ratio SiO_2/Al_2O_3, nature and location of cations and changes in the structure in the process of the thermal treatment; b) on the nature of the surface of the structural groups, which often serve as adsorption and catalytically active sites.

Other method for obtaining information about the average energy of hydrogen bonds in an aqueous sample is measuring of the spectrum of the water state. It was established experimentally that at evaporation of water droplet the contact angle θ decreases discretely to zero, whereas the diameter of the droplet changes insignificantly (Antonov, 1995). By measuring this angle within a regular time intervals a functional dependence f(θ) can be determined, which is designated by the spectrum of the water state (Ignatov, 2005; Ignatov, 2012; Ignatov, Mosin, 2013). For practical purposes by registering the spectrum of water state it is possible to obtain information about the averaged energy of hydrogen bonds in an aqueous sample. For this purpose the model of W. Luck was used, which consider water as an associated liquid, consisted of O–H...O–H groups (Luck et al., 1980). The major part of these groups is designated by the energy of hydrogen bonds (-E), while the others are free (E = 0). The energy distribution function f(E) is measured in electron-volts (eV^{-1}) and may be varied under the influence of various external factors on water as temperature and pressure.

For calculation of the function f(E) experimental dependence between the water surface tension measured by the wetting angle (θ) and the energy of hydrogen bonds (E) is established:

$$f(E) = b\, f(\theta) / 1 - (1 + b\, E)^2)^{1/2},$$
where $b = 14.33\ eV^{-1}$; $\theta = \arccos(-1 - b\, E)$

The energy of hydrogen bonds (E) measured in electron-volts (eV) is designated by the spectrum of energy distribution. This spectrum is characterized by non-equilibrium process of water droplets evaporation, thus the term “non-equilibrium energy spectrum of water” (NES) is applied.

The difference Δf(E) = f (samples of water) – f (control sample of water) – is designated the “differential non-equilibrium energy spectrum of water” (DNES).

DNES is calculated in milli-electron volts (0.001 eV or meV) is a measure of changes in the structure of water as a result of external factors. The cumulative effect of all other factors is the same for the control sample of water and the water sample, which is under the influence of this impact. The research with NES method of water drops received after 3 days stay with zeolite in deionized water may also give valuable information on the possible number of hydrogen bonds as percent of water molecules with different values of distribution of energies. These distributions are basically connected with restructuring of H_2O molecules with the same energies.

3.1. Results with spectral analysis of 1% solution of ZEOLITH detox

The average energy ($E_{H...O}$) of hydrogen H...O-bonds among individual H_2O molecules in 1 % solution of ZEOLITH detox is measured at E=-0.1219 eV. The result for the control sample (deionized water) is E=-0.1185 eV. The results obtained with the NES method are recalculated with the DNES method as a difference of the NES (1% solution of ZEOLITH detox) minus the NES (control sample with deionized water) equaled the DNES spectrum of 1% solution of ZEOLITH detox. Thus, the result for 1% solution of ZEOLITH detox recalculated with the DNES method is ΔE=-0.0034±0.0011 eV. The result shows the increasing of the values of the energy of hydrogen bonds in 1% solution of ZEOLITH detox regarding the deionized water. The result is effect of stimulation on human body. This shows restructuring of water molecules in configurations of clusters, which influence usefully on human health on molecular and cellular level. The effects are describing with mathematical model of 1% solution of ZEOLITH detox.

3.2. Mathematical model of ZEOLITH detox

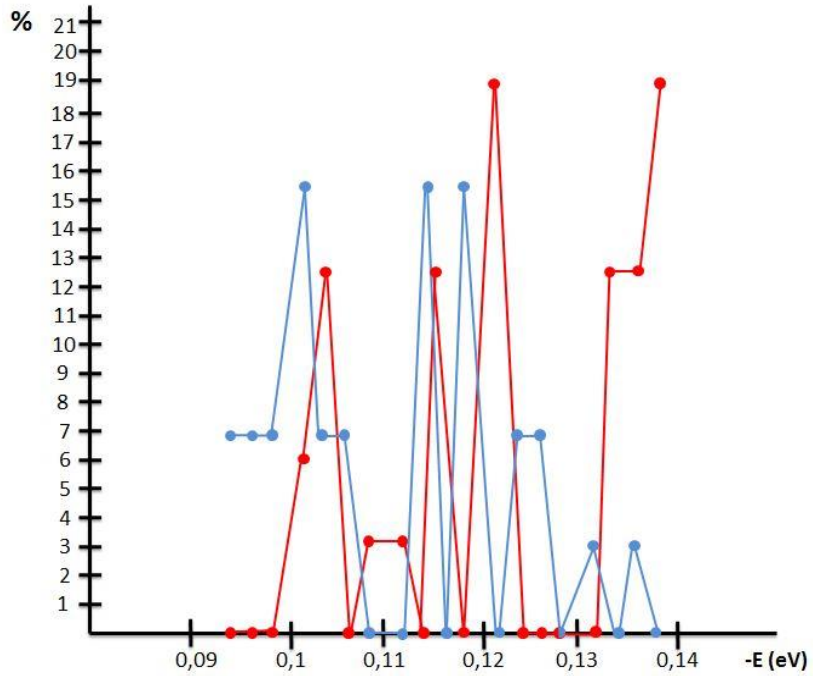
The research with the NES method of water drops is received with 1% solution ZEOLITH detox, and deionized water as control sample. The mathematical models of 1% solution ZEOLITH detox gives the valuable information for the possible number of hydrogen bonds as percent of H_2O molecules with different values of distribution of energies (Table 1 and Figure 1). These distributions are basically connected with the restructuring of H_2O molecules having the same energies.

Table 1. The distribution (%, $(-E_{value})/(-E_{total\ value})$ of H_2O molecules in 1% water solution of ZEOLITH detox (product of LavaVitae, Austria) and control deionized water

-E(eV) x-axis	1 % water solution ZEOLITH detox (LavaVitae) y-axis (%((-E_{value}) */ (-$E_{total\ value}$)**	Control Sample Deionized water y-axis (%((-E_{value})*/ (-$E_{total\ value}$)**	-E(eV) x-axis	1 % water solution ZEOLITH detox (LavaVitae) y-axis (%((-E_{value}) */ (-$E_{total\ value}$)**	Control Sample Deionized water y-axis (%((-E_{value})*/ (-$E_{total\ value}$)**
0.0937	0	6.7	0.1187	0	15.5
0.0962	0	6.7	0.1212	**18.9**[2]	0
0.0987	0	6.7	0.1237	0	6.7
0.1012	6.0	15.5	0.1262	0	6.7
0.1037	12.5	6.7	0.1287	0	0
0.1062	0	6.7	0.1312	0	3.3
0.1087	3.1	0	0.1337	12.5	0
0.1112	**3.1**[1]	0	0.1362	12.5	3.3
0.1137	0	15.5	0.1387	**18.9**[3]	0
0.1162	12.5	0	–	–	–

Notes:
E=-0.1212 eV is the local extremum for anti inflammatory effect
E= -0.1387 eV is the local extremum for inhibition of development of tumor cells of molecular level
Notes:
* The result ($-E_{value}$) is the result of hydrogen bonds energy for one parameter of (-E)
** The result ($-E_{value}$) is the total result of hydrogen bonds energy

Figure 1 shows the distribution (%, $(-E_{value})/(-E_{total\ value})$ of H_2O molecules in and 1 % of water solution of ZEOLITH detox (product of LavaVitae, Austria) (red line) and control sample deionized water (blue line).



Notes:
E=-0.1212 eV is the local extremum for anti-inflammatory effect
E= -0.1387 eV is the local extremum for inhibition of development of tumor cells of molecular level

Fig. 1. Mathematical model (Ignatov, Mosin, 2013) of 1% water solution of ZEOLITH detox (product of LavaVitae, Austria).

The experimental data obtained testified the following conclusions from the mathematical model of in 1 % water solution of ZEOLITH detox (product of LavaVitae, Austria) and control deionized water. The distribution (%, $(-E_{value})/(-E_{total\ value})$ of water molecules in mathematical model of in 1 % water solution of ZEOLITH detox (product of LavaVitae, Austria) and control deionized water. The distribution (%, $(-E_{value})/(-E_{total\ value})$ of water molecules in ZEOLITH detox (product of LavaVitae, Austria) according control sample is different. However, for the value E = -0.1387 eV or λ = 8.95 μm there is the biggest local extremum (18.9 (%, $(-E_{value})/(-E_{total\ value})$) corresponding to the re-structuring of hydrogen bonds among H_2O molecules for inhibition of development of tumor cells of molecular level. This difference may indicate on the different number of hydrogen bonds in water samples, as well as their physical parameters (pH, ORP), resulting in different distribution of H_2O molecules and different values of H_2O molecules with ratios of $(-E_{value})/(-E_{total\ value})$. Particularly it was observed the statistical re-structuring of H_2O molecules in water samples according to the energies. The experimental data may prove that stipulates the restructuring of H_2O molecules on molecular level and may be used for the prophylaxis of development of tumor cells. For the value E=-0.1212 eV or λ=10.23 μm there is the bigger local extremum (18.9 (%, $(-E_{value})/(-E_{total\ value})$) corresponding to the re-structuring of hydrogen bonds among H_2O molecules for anti inflammatory effect. The experimental data for ZEOLITH detox may prove that stipulates the restructuring of H_2O molecules on molecular level and the biophysical effects are:

E=-0.1212 eV is the local extremum for anti inflammatory effect

E= -0.1387 eV is the local extremum for inhibition of development of tumor cells of molecular level

4. Results with pH and ORP

There are valid the following results of pH as indicator for acid alkaline medium of the products of Lava Vitae. There are the results also of ORP or Oxidation-reduction potential.

The results are for 1 % of solutions of products, which are made from deionized water. This research is performed with Georgi Gluhchev from Bulgarian Academy of Science. The results of pH of deionized water is 6.05 and of ORP is 119.7. Table 2 shows the results of pH and ORP.

Table 2. Results of products of company LavaVitae for pH and ORP

Product	pH	ORP (mV)	Coordinates Fig. 2
VITA intense	4.07±0.02	- 104.5	Point 1 (4,07; -104.5)
BOOST	3.60±0.02	+113.6	Point 2 (3,90;113.6)
ZEOLITH detox	8.01±0.02	+109.5	Point 3 (8,01;103.3)
Deionized water	6.05±0.02	+119.7	

Figure 2 shows the dependence between the acidity and basicity (pH) of electrochemically activated solutions and the oxidation-reduction potential (ORP). The pH value within the interval from 3 to 10 units and the ORP within the interval from -400 mV to +900 mV characterize the area of the biosphere of microorganisms. Outside these ranges of pH and ORP the microorganisms will hardly survive.

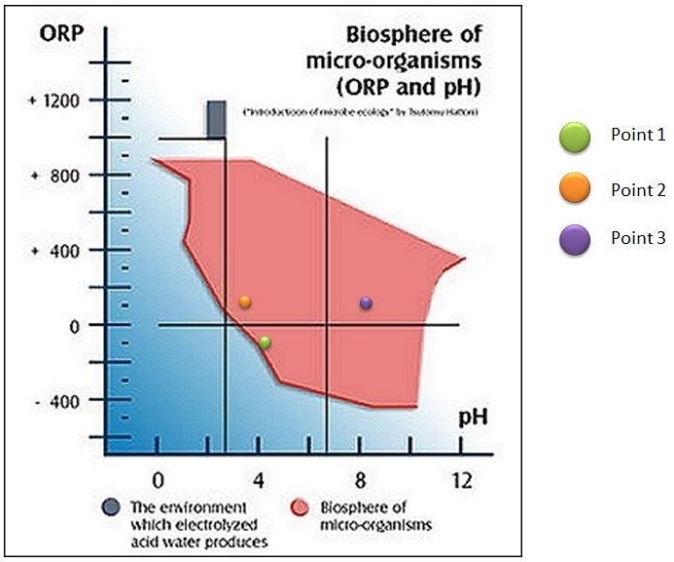


Fig. 3. The dependence between acidity and basicity (pH) of solutions and the ORP on the biosphere of micro-organisms (point 1; VITA intense), (point 2; BOOST), point 3; ZEOLITH detox)

Owing to the unique porous structure the mineral Zeolites are ideal absorbents and fillers (Gorshteyn *et al*., 1979), and as sorbents have a number of positive characteristics:

- High adsorption capacity, characterized by low resistance to water pressure;
- Mechanical strength and low abrasion resistance;
- Corrosion-resistance;
- Absorption capacity relatives to many substances, both organic (oil, benzene, phenol, pesticides, etc.) and inorganic (chlorine, ammonia, heavy metals);
- Catalytic activity;
- Relatively low cost;
- Environmental friendliness and ecological safety.
-

5. Detoxification of zeolite. Proofs for anti inflammatory effects as base for detoxification of zeolite.

There are proofs for anti inflammatory effects in process of detoxification.

Resolvin-E1 (RvE1) has been demonstrated to promote inflammatory resolution in numerous disease models. Given the importance of epithelial cells to coordination of mucosal inflammation, we hypothesized that RvE1 elicits an epithelial resolution signature. Notably, RvE1 induced intestinal alkaline phosphatase (ALPI) expression and significantly enhanced epithelial ALPI enzyme activity. One role recently attributed to ALPI is the detoxification of bacterial LPS. In studies, RvE1-exposed epithelia detoxified LPS (assessed by attenuation of NF-κB signaling). (Campbell et al., 2010).

The research shows hypothesize that susceptibility to persistent airway inflammation in atopic individuals is characterized by an inherited deficiency in the effectiveness of detoxification of inhaled irritants and products of oxidative stress such as reactive oxygen species (ROS). The case-control studies show that polymorphisms at the glutathione S-transferase, GSTP1, locus on chromosome 11q13 may account for variation in host response to oxidative stress, a key component of airway inflammation. Frequency of the GSTP1 Val/Val genotype is reduced in atopic subjects compared with nonatopic subjects. Trend analysis also shows a significant decrease of GSTP1 Val/Val (with parallel increase of GSTP1 Ile/Ile) genotype frequency with increasing severity of airflow obstruction/bronchial hyperresponsiveness. The implication of specific polymorphisms at the GSTP1 locus in airway inflammation is entirely novel: however, GST are recognized as a supergene family of enzymes critical in 1) cell protection from the toxic products of ROS-mediated reactions, 2) modulation of eicosanoid synthesis (Spiteri et al., 2000).

Severe hemolysis or myolysis occurring during pathological states, such as sickle cell disease, ischemia reperfusion, and malaria results in high levels of free heme, causing undesirable toxicity leading to organ, tissue, and cellular injury. Free heme catalyzes the oxidation, covalent cross-linking and aggregate formation of protein and its degradation to small peptides. It also catalyzes the formation of cytotoxic lipid peroxide via lipid peroxidation and damages DNA through oxidative stress. Heme being a lipophilic molecule intercalates in the membrane and impairs lipid bilayers and organelles, such as mitochondria and nuclei, and destabilizes the cytoskeleton. Heme is a potent hemolytic agent and alters the conformation of cytoskeletal protein in red cells. Free heme causes endothelial cell injury, leading to vascular inflammatory disorders and stimulates the expression of intracellular adhesion molecules. Heme acts as a pro-inflammatory molecule and heme-induced inflammation is involved in the pathology of diverse conditions; such as renal failure, arteriosclerosis, and complications after artificial blood transfusion, peritoneal endometriosis, and heart transplant failure. Heme offers severe toxic effects to kidney, liver, central nervous system and cardiac tissue. Although heme oxygenase is primarily responsible to detoxify free heme but other extra heme oxygenase systems also play a significant role to detoxify heme. A brief account of free heme toxicity and its detoxification systems along with mechanistic details are presented (Kumar, Bandyopadhyay, 2005).

Rheumatoid arthritis (RA) is characterised by migration of activated phagocytes and other leukocytes into synovial and periarticular tissue. Activated oxygen species and other mediating substances from triggered phagocytes appear to exacerbate and perpetuate the rheumatoid condition. Iron excesses are capable of aggravating the arthritic inflammation, probably through their pro-oxidant potentials. In contrast, therapeutically given gold salts, through a lysosomal loading of the metal, inhibit the triggered cells, thereby reducing the toxic oxygen production. Pharmacological doses of zinc also may immobilise macrophages. Furthermore, the copper–zinc-containing enzyme SOD (superoxide dismutase) can act as a scavenger of toxic oxygen in the tissues. Therapeutic remission of RA has been obtained following intraarticular administration of SOD. Intramuscular administration of copper complexes has induced remission in about 60 % of RA patients in open studies. Another drug, penicillamine, that protects cellular membranes against toxic oxygen in vitro, is presumed to act as an antirheumatic via the SOD mimetic activity of its copper complex. Thiomalate and other thiols may possess similar activities. Selenium compounds also may act as oxygen radical scavengers. A significant alleviation of articular pain and morning stiffness was obtained following selenium and vitamin E supplementation in a double-blind study on RA patients. The observations reviewed here indicate that metal compounds and other antioxidants can reduce the rheumatic inflammation by reducing the cellular production and/or concentration of toxic oxygen species (Aaseth et al., 1998).

Zeolite$^-$ creates a negative charge of the carcasses compensated by cations (H^+, Na^+, K^+, Ca^{2+}, NH_4^+, etc.), in most cases, capable of cations exchange in solutions. Efficiency of using zeolite is

stipulated by the high range of valuable properties (absorption, catalytic, antioxidant, regenerative, antibacterial). There is permanent antioxidant activity of zeolite on enzymes (Dogliotti et al., 2012; Ignatov, Mosin, 2015).

There has been no proven method thus far to accelerate the clearance of potentially toxic perfluorinated compounds (PFCs) in humans. PFCs are a family of commonly used synthetic compounds with many applications, including repelling oil and stains on furniture, clothing, carpets and food packaging, as well as in the manufacturing of polytetrafluoroethylene – a non-stick surfacing often used in cookware (e.g. Teflon(r)). Some PFCs remain persistent within the environment due to their inherent chemical stability, and are very slowly eliminated from the human body due, in part, to enterohepatic recirculation. Exposure to PFCs is widespread and some subpopulations, living in proximity to or working in fluorochemical manufacturing plants, are highly contaminated. PFC bioaccumulation has become an increasing public health concern as emerging evidence suggests reproductive toxicity, neurotoxicity and hepatotoxicity, and some PFCs are considered to be likely human carcinogens. A case history is presented where an individual with high concentrations of PFCs in serum provided: sweat samples after use of a sauna; and stool samples before and after oral administration of each of two bile acid sequestrants – cholestyramine (CSM) and saponin compounds (SPCs). Stool samples before and after use of a cation-exchange zeolite compound were also examined. PFCs found in serum were not detected in substantial quantities in sweat or in stool prior to treatment. Minimal amounts of perfluorooctanoic acid, but no other PFCs, were detected in stool after SPC use; minimal amounts of perfluorooctanesulfonate, but no other PFCs, were detected in stool after zeolite use. All PFC congeners found in serum were detected in stool after CSM use. Serum levels of all PFCs subsequently declined after regular use of CSM. Further study is required but this report suggests that CSM therapy may facilitate gastrointestinal elimination of some PFCs from the human body (Genuis et al., 2010).

As a result of different energies of hydrogen bonds, the surface tension 1 % water solution of ZEOLITH detox is increasing. The increasing of surface tension is regarding the control sample. This effect is connected with preservation of the energy in human body as result of biochemical process among water molecules and bio molecules. As effect of big increasing of surface tension and the spectrum is begging from E= -0.1162 eV and this shows effects with detoxification (Ignatov, 2016).

Our study shows anti inflammatory effect of zeolite. For the value E=-0.1212 eV or λ=10.23 μm. there is the bigger local extremum (18.9 (%, $(-E_{value})/(-E_{total\ value})$) corresponding to the re-structuring of hydrogen bonds among H_2O molecules for anti inflammatory effect of ZEOLITH detox. Anti inflammatory effect is part of process of detoxification of zeolite with the following effects - absorption, catalytic, antioxidant, regenerative, antibacterial. $Zeolite^-$ creates a negative charge by cations (H^+, Na^+, K^+, Ca^{2+}, NH_4^+, etc.), in most cases, capable of cations exchange in solutions. There is permanent antioxidant activity of zeolite on enzymes (Dogliotti et al., 2012; Ignatov, Mosin, 2015).

Our study shows connection between pH and ORP and that water solution of ZEOLITH detox has positive role for microorganisms. Inhibition of development of tumor cells is influenced from anti inflammatory effects. Our proofs are for the value E = -0.1387 eV or λ = 8.95 μm there is the biggest local extremum (18.9 (%, $(-E_{value})/(-E_{total\ value})$) corresponding to the re-structuring of hydrogen bonds among H_2O molecules for inhibition of development of tumor cells of molecular level.

6. Discussion and Conclusions

ZEOLITH detox (product of LavaVitae company)

The interaction of ZEOLITH detox with water is quiet complex and results the restructuring of energy values among H_2O molecules with a statistically reliable increase of local extremums in DNES-spectra after treatment of ZEOLITH detox with water. These values are measured at -0.1219 eV for ZEOLITH detox. The result for control sample (deionized water) is -0.1185 eV. The results with NES method were recalculated by the DNES method. The result of ZEOLITH detox with DNES method is 0.0034±0.0011 eV.

From the NES and DNES spectrum and mathematical model of 1 % solution of ZEOLITH detox and deionized water as control sample are valid the following conclusions for biophysical effects for ZEOLITH detox (LavaVitae Company)

- Anti-inflammatory effect;
- inhibition of development of tumor cells of molecular level;

Naturally occurring zeolites are rarely pure and are contaminated to varying degrees by other minerals, metals, quarts, or other zeolites. For this reason, naturally occurring zeolites are excluded from many important commercial applications where uniformity and purity are essential. In comparison with zeolite comprises a microporous crystalline aluminosilicate mineral commonly used as adsorbent.

Our study shows anti inflammatory effect of zeolite. For the value E=-0.1212 eV or λ=10.23 μm. there is the bigger local extremum (18.9 (%, $(-E_{value})/(-E_{total\ value})$) corresponding to the re-structuring of hydrogen bonds among H_2O molecules for anti inflammatory effect of ZEOLITH detox. Anti inflammatory effect is part of process of detoxification of zeolite with the following effects – absorption, catalytic, antioxidant, regenerative, antibacterial. Zeolite$^-$ creates a negative charge by cations (H^+, Na^+, K^+, Ca^{2+}, NH_4^+, etc.), in most cases, capable of cations exchange in solutions. There is permanent antioxidant activity of zeolite on enzymes (Dogliotti et al., 2012; Ignatov, Mosin, 2015).

Our study shows connection between pH and ORP and that water solution of ZEOLITH detox has positive role for microorganisms. Inhibition of development of tumor cells is influenced from anti inflammatory effects. Our proofs are for the value E = -0.1387 eV or λ = 8.95 μm there is the biggest local extremum (18.9 (%, $(-E_{value})/(-E_{total\ value})$) corresponding to the re-structuring of hydrogen bonds among H_2O molecules for inhibition of development of tumor cells of molecular level.

7. Acknowledgements

The author wish to thank to Georgi Gluhchev for the research of pH and ORP. The author express thankful to Teodora Todorova for the preparation of the figures.

References

Aaseth et al., 1998 – *Aaseth, J., Haugen, M., Førre, O.* (1998). Rheumatoid arthritis and metal compounds – perspectives on the role of oxygen radical detoxification, *Analyst*, 1.

Antonov, 1995 – *Antonov, A.* (1995). Research of the Nonequilibrium Processes in the Area in Allocated Systems., Diss. Thesis Doctor of Physical Sciences. Sofia: Blagoev.

Campbell et al., 2010 – *Campbell et al.* (2010). Resolvin E1-induced Intestinal Alkaline Phosphatase Promotes Resolution of Inflammation through LPS Detoxification. *Proceeding of National Academy of Sciences,* 107 (32) 14298-14303.

Genius et al., 2010 – Genius, S. et al. (2010). Human Detoxification of Perfluorinated Compounds. *Public Health*, 124 (7) 367–375.

Gluhchev et al., 2015 – *Gluhchev, G., Ignatov, I., Karadzhov, S., Miloshev, G., Ivanov, I., Mosin, O.V.* (2015). Biocidal Effects of Electrochemically Activated Water. *Journal of Health, Medicine and Nursing*, 11, 67-83.

Gluhchev et al., 2015 – *Gluhchev, G., Ignatov, I., Karadzhov, S., Miloshev, G., Ivanov, N., Mosin, O.V.* (2015). Electrochemically Activited Water: Biophysical and Biological Effects of Anolyte and Catholyte Types of Water. *European Journal of Molecular Biotechnology*, 1, 12-26.

Gluhchev et al., 2015 – *Gluhchev, G., Ignatov, I., Karadzhov, S., Miloshev, G., Ivanov, N., Mosin, O.V.* (2015). Studying the Antimicrobial and Antiviral Effects of Electrochemically Activated Nacl Solutions of Anolyte and Catholyte on a Strain of E. Coli DH5 and Classical Swine Fever (CSF) Virus. *European Journal of Medicine*, 9 (3), 124-138.

Gluhchev et al., 2015 – *Gluhchev, G., Ignatov, I., Karadzhov, S., Miloshev, G., Ivanov, I., Mosin, O.V.* (2015). Electrochemically Activated Water. Biophysical and Biological Effects of Anolyte and Catholyte as Types of Water. *Journal of Medicine, Physiology and Biophysics*, 10, 1-17.

Gluhchev et al., 2018 – *Gluhchev, G., Mehandjiev, D., Ignatov, I., Karadzhov, S., Pesheva, Y., Atanasov, A.* (2018). Water Electrolysis-Processes in Catholyte and Anolyte Results with Differential Non-Equilibrium Water Spectrum. *European Journal of Medicine*, 6(1): 3-12.

Ignatov, 2005 – *Ignatov, I.* (2005). Energy Biomedicine, *Gea-Libris*, Sofia, 1–88.

Ignatov, 2010 – *Ignatov, I.* (2010). Which Water is Optimal for the Origin (Generation) of Life?*Euromedica*, Hanover, 34-35.

Ignatov, 2011 – *Ignatov, I.* (2011). Entropy and Time in Living Matter, *Euromedica,* 74.

Ignatov, 2012 – *Ignatov, I.* (2012). Origin of Life and Living Matter in Hot Mineral Water, Conference on the Physics, Chemistry and Biology of Water. *Vermont Photonics*, USA.

Ignatov, Mosin, 2013 – *Ignatov I., Mosin O.V.* (2013). Possible Processes for Origin of Life and Living Matter with Modeling of Physiological Processes of Bacterium *Bacillus Subtilis* in Heavy

Water as Model System. *Journal of Natural Sciences Research*, 3(9), 65-76.

Ignatov, Mosin, 2013 – *Ignatov, I., Mosin, O. V.* (2013). Modeling of Possible Processes for Origin of Life and Living Matter in Hot Mineral and Seawater with Deuterium. *Journal of Environment and Earth Science*, 3(14), 103-118.

Ignatov, Mosin, 2013 – *Ignatov, I., Mosin, O.V.* (2013). Structural Mathematical Models Describing Water Clusters. *Journal of Mathematical Theory and Modeling*, 3 (11), 72-87.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin, O. V.* (2014). The Structure and Composition of Carbonaceous Fullerene Containing Mineral Shungite and Microporous Crystalline Aluminosilicate Mineral Zeolite. Mathematical Model of Interaction of Shungite and Zeolite with Water Molecules. *Advances in Physics Theories and Applications*, 28, 10-21.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin, O.V.* (2014). The Structure and Composition of Shungite and Zeolite.Mathematical Model of Distribution of Hydrogen Bonds of Water Molecules in Solution of Shungite and Zeolite. *Journal of Medicine, Physiology and Biophysics*, 2, 20-36.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin, O.V.* (2014). Mathematical Models of Distribution of Water Molecules Regarding Energies of Hydrogen Bonds. *Journal of Medicine, Physiology and Biophysics*, 2, 71-94.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin,O.V.* (2014). Mathematical Model of Interaction of Carbonaceous Fullerene Containing Mineral Shungite and Aluminosilicate Mineral Zeolite with Water. *Journal of Medicine, Physiology and Biophysics*, 3, 15-29.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin, O. V., Bauer, E.* (2014). Carbonaceous Fullerene Mineral Shungite and Aluminosilicate Mineral Zeolite. Mathematical Model ans Practical Application of Water Solution of Water Shungite and Zeolite. *Journal of Medicine, Physiology and Biophysics*, 4, 27-44.

Ignatov, Mosin, 2016 – *Ignatov, I., Mosin, O.V.* (2016). Water for Origin of Life. *Altaspera Publishing & Literary Agency Inc*, 1-616. [in Russian]

Ignatov, Mosin, 2016 – *Ignatov, I., Mosin, O.V.* (2016). Deuterium, Heavy Water and Origin of Life, *LAP LAMBERT Academic Publishing*, 1-500.

Ignatovet al., 2016– *Ignatov, I.et al.* (2016). Results of Biophysical and Nano Technological Research of ZEOLITH Detox of LavaVitae Company. *Journal of Health, Medicine and Nursing*, 30, 44-49.

Ignatovet al., 2016– *Ignatov, I.* (2016). Product of LavaVitae BOOST is Increasing of Energy of Hydrogen Bonds among Water Molecules in Human Body. *Journal of Medicine, Physiology and Biophysics*, 27, 30-42.

Ignatov, 2016 – *Ignatov, I.* (2016). VITA intense – Proofs for Anti-inflammatory, Antioxidant and Inhibition Growth of Tumor Cells Effects. Relaxing Effect of Nervous System, Anti Aging Influence. *Journal of Medicine, Physiology and Biophysics*, 27, 43-61.

Ignatov, 2017 – *Ignatov, I.* (2017). VITA intense and BOOST – Products with Natural Vitamins and Minerals for Health. *Journal of Medicine, Physiology and Biophysics*, 31, 58-78.

Ignatov, 2017 –*Ignatov, I.* (2017). ZEOLITH detox for Detoxification and ZELOLITH Creme for Skin Effects as Products of LavaVitae Company. *Journal of Medicine, Physiology and Biophysics*, 31, 79-86.

Ignatov, 2017 – *Ignatov, I.* (2017). Distribution of Molecules of ZEOLITH detox and ZEOLITH Creme in Water as Factor for Health. *European Journal of Molecular Biotechnology*, 5, (1), 11-22.

Ignatov, 2017 – *Ignatov, I.* (2017). Biophysical Research of ZEOLITH detox and ZEOLITH Crème. *European Journal of Medicine*, 5 (2), 31-42.

Ignatov, 2017 –*Ignatov, I.* (2017). VITA intense –Antioxidant and Inhibition Growth of Tumor Cells Effects. Anti Aging Influence. Negative Oxidation-reduction Potential (ORP) Has Important Role in These Effects. *Journal of Medicine, Physiology and Biophysics*, 39, 20-42.

Ignatov et al., 2014 – *Ignatov, I., Karadzhov, S., Atanasov, A., Ivanova, E., Mosin, O.V.* (2014). Electrochemical Aqueous Sodium Chloride Solution (Anolyte and Catholyte) as Types of Water. Mathematical Models. Study of Effects of Anolyte on the Virus of Classical Swine Fever Virus. *Journal of Health, Medicine and Nursing*, 8,1-28.

Ignatov et al., 2015 – *Ignatov, I., Gluhchev, G., Karadzhov, S., Miloshev, G., Ivanov, I., Mosin, O.V.* (2015). Preparation of Electrochemically Activated Water Solutions

(Catholyte/Anolyte) and Studying Their Physical-Chemical Properties. *Journal of Medicine, Physiology and Biophysics*, 11, pp. 1-21.

Ignatov et al., 2015 – *Ignatov, I., Gluhchev, G., Karadzhov, S., Miloshev, G., Ivanov, I., Mosin, O.V.* (2015). Preparation of Electrochemically Activated Water Solutions (Catholyte/Anolyte) and Studying of their Physical-Chemical Properties. *Journal of Medicine, Physiology and Biophysics*, 13, 18-38.

Ignatov et al., 2015 – *Ignatov, I., Gluhchev, G., Karadzhov, S., Miloshev, G., Ivanov, I., Mosin, O.V.* (2015). Preparation of Electrochemically Activated Water Solutions (Catholyte/Anolyte) and Studying of their Physical-Chemical Properties. *Journal of Health, Medicine and Nursing*, 13, 64-78.

Ignatov et al., 2015 – *Ignatov, I., Mosin, O. V. , Gluhchev, G., Karadzhov, S., Miloshev, G., Ivanov, I.* (2015). Studying Electrochemically Activated NaCl Solutions of Anolyte and Catholyte by Methods of Non-Equilibrium Energy Spectrum (NES) and Differential Non-Equilibrium Energy Spectrum (DNES). *Journal of Medicine, Physiology and Biophysics*, 14, 6-18.

Ignatov et al., 2015 – *Ignatov, I, Gluhchev, G., Karadzhov, S., Ivanov, N., Mosin, O.V.* (2015).Preparation of Electrochemically Activated Water Solutions (Catholyte/Anolyte) and Studying Their Physical-Chemical Properties. *Journal of Medicine, Physiology and Biophysics*, 16, 1-14.

Ignatov et al., 2016 – *Ignatov, I., Mosin, O.V., Gluhchev, G., Karadzhov, S., Miloshev, G., Ivanov, I.* (2016). Studying Electrochemically Activated NaCl Solutions of Anolyte and Catholyte by Methods of Non-Equilibrium Energy Spectrum (NES) and Differential Non-Equilibrium Energy Spectrum (DNES). *Journal of Medicine, Physiology and Biophysics*, 20, 13-23.

Ignatov et al., 2015 –*Ignatov, I., Mosin, O.V., Gluhchev, G., Karadzhov, S., Miloshev, G., Ivanov, N.* (2015). The Evaluation of Mathematical Model of Interaction of Electrochemically Activated Water Solutions (Anolyte and Catholyte) with Water. *European Reviews of Chemical Research*, 2 (4|),72-86.

Ignatovet al., 2016 – *Ignatov, I., Mosin, O.V., Kirov, P.* (2016). Matematical Model of Kangen Water® Biophysical and Biochemical Effects of Catholyte. *Advances in Physics Theories and Applications*, 51, 33-55.

Ignatov, 2017 – *Ignatov, I.* (2017) Aluminosilicate Mineral Zeolite. Interaction of Water Molecules in Zeolite Table and Mountain Water Sevtopolis from Bulgaria. *Journal of Medicine, Physiology and Biophysics*, 31, 41-45.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin, O.V.* (2014). Methods for Measurements of Water Spectrum. Differential Non-equilibrium Energy Spectrum Method (DNES). *Journal of Health, Medicine and Nursing,* 6, 50-72.

Ignatov, Mosin, 2015 – *Ignatov, I., O.V.Mosin.* (2015). Origin of Life and Living Matter in Hot Mineral Water. *Advances in Physics Theories and Applications*, 39, 1-22.

Ignatov, Mosin, 2014a – *Ignatov, I., Mosin, O.V.* (2014). Mathematical Models of Distribution of Water Molecules Regarding Energies of Hydrogen Bonds. *Journal of Medicine, Physiology and Biophysics,* 6, 50-72.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin, O.V.* (2014). Structural Models of Water and Ice Regarding the Energy of Hydrogen Bonding. *Nanotechnology Research and Practice*, 7 (3), 96-117.

Ignatov, Mosin, 2014 – *Ignatov, I., Mosin, O.V.* (2014). Nano Mix of Shungite and Zeolite for Cleaning of Toxins and Increasing of Energy of Hydrogen Bonds among Water Molecules in Human Body. *Journal of Medicine, Physiology and Biophysics,* 27, 1-10.

Ignatov, 2016 – *Ignatov, I.* (2016). VITA intense – Proofs for Anti-inflammatory, Antioxidant and Inhibition Growth of Tumor Cells Effects. Relaxing Effect of Nervous System, Anti Aging Influence. *Journal of Medicine, Physiology and Biophysics*, 27, 43-61.

Ignatov, Pesheva, 2018 – *Ignatov, I., Pesheva, Y.* (2018). VITA Intense – Product with Negative Oxidation-reduction Potential (ORP) as Important Quality for Antioxidant and Inhibition Growth of Tumor Cells Effects. Anti Aging Effects. *European Journal of Medicine*, 6(1): 20-42.

Kumar, Bandyopadhyay, 2005 – *Kumar, Bandyopadhyay* (2005). Free Heme Toxicity and its Detoxification Systems in Human. *Toxicology letters,* 157(3-4), 175-188.

Luck et al., 1980 – *Luck, W., Schiöberg, D., Ulrich, S.* (1980). Infrared Investigation of Water Structure in Desalination Membranes. *J. Chem. Soc. Faraday Trans.*, 2(76), 136–147.

Mehandjiev et al., 2017 – *Mehandjiev, D., Ignatov, I., Karadzhov, I., Gluhchev, G., Atanasov, A.* (2017) On the Mechanism of Water Electrolysis. *Journal of Medicine, Physiology and*

Biophysics, 31, 23-26.

Mosin, Ignatov, 2013 – *Mosin, O.V., Ignatov, I.* (2013). The Structure and Composition of Natural Carbonaceous Fullerene Containing Mineral Shungite. *International Journal of Advanced Scientific and Technical Research*, 6(11–12), 9–21.

Mosin, Ignatov, 2012 – *Mosin, O.V., Ignatov, I.* (2012). The Composition and Structural Properties of Fullerene Natural Mineral Shungite. *Nanoengineering*, 18 (12), 17–24. [in Russian]

Mosin, Ignatov, 2012 – *Mosin, O.V., Ignatov, I.* (2012). Composition and Structural Properties of Fullerene Natural Mineral Shungite. *Nanomaterials and Nanotechnologies,* 2, 25-36.

Mosin, Ignatov, 2015 – *Mosin, O.V., Ignatov, I.* (2015). An Overview of Methods and Approaches for Magnetic Treatment of Water. *Water: Hygiene and Ecology*, 3-4 (4), 113-130.

Panayotova, Velikov, 2002 – *Panayotova, M., Velikov, B.* (2002) Kinetics of Heavy Metal Ions Removal by Use of Natural Zeolite. *Journal of Environmental Science and Health*, *Vol.* 37(2), 139–147.

Parfen'eva, 1994 – *Parfen'eva, L.S.* (1994). Electrical Conductivity of Shungite Carbon. *Solid State Physics*, 36(1), 234–236.

Podchaynov, 2007 – *Podchaynov, S.F.* (2007). Mineral Zeolite – a Multiplier of Useful Properties Shungite. Shungites and human safety. *Proceedings of the First All-Russian scientific-practical conference* (3–5 October 2006), ed. J.K Kalinin (Petrozavodsk: Karelian Research Centre of Russian Academy of Sciences), 6–74. [in Russian]

Spiteri al., 2000 – *Spiteri, M., Bianco, A., Strange, R., Fryer, A.* (2000). Polymorphisms at the Glutathione S-transferase, GSTP1 locus: a Novel Mechanism for Susceptibility and Development of Atopic Airway Inflammation. *Allergy*, 55 (s61), 5-66.