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Applications of EVODROP Water as Drinking Water of Highest Quality. Antibacterial and Antiviral Effects of EVOhygiene Colloidal Silver and Cooper Nano Water

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Abstract

Scientific evidence of Ignat Ignatov and Oleg Mosin show that in the mountain areas in Bulgaria, where the scientific and practical project "Nature, Ecology, Longevity" is held, one can meet 104 years old centenarians. In the field areas at a distance of only about 50-70 km, the oldest person is 97 years old. We have reasons to give these facts some thought. The difference is in the water, the air and the physical activity. In the mountains people drink water from springs. This water is "active". When you drink water from the source itself, the water molecules are more dynamic and it is "tastier, more energy-filled and more alive". In biophysics it is known that movement is life. Therefore, people who are active, live longer. They also feel the water more strongly, a water that is like an elixir even after the first sips from the spring. Everyone should ask themselves: "How can we have such water in our homes?" The research shows that tap water has low level of energy of hydrogen bonds among water molecules.

Keywords: EVOhygiene Colloidal Silver and Cooper, microbiological parameters, spectral analyses NES and DNES.

1. Introduction

Studies reveal that in cases of longevity, the water consumed by long-living people is with high energies of hydrogen bonds from one water molecule and oxygen from another one. Mountain and glacier waters are of high quality. With the highest possible quality is EVODROP Water gained from a device with author Fabio Huether, which can easily be acquired in everybody's home. EVODROP Water is water of highest quality that provides in your home the energy and freshness of the mountain and glacier waters.

The research of water clusters $(H_2O)_n$ are with the following methods ^{1}H-NMR, neurons diffraction, X-Ray, EXAFS-spectroscopy, IR spectroscopy, NES and DNES spectral methods. There ionic clusters $[(H_2O)_n]^+$ and $[(H_2O)_n]^-$.

In this research two of the authors Ignatov and Gluhchev have performed mathematical models of water molecules of EVODROP water and tap water.

The following parameters of EVODROP water – spectral parameters, hardness, oxidation reduction potential (ORP) and pH are studied.

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There are proofs for the effects of different types of drinking wates on human longevity (Ignatov et al., 2014–2018), antitumor effects (Toshkova et al., 2019), anti-bacterial and anti-viral effects (Valcheva et al., 2014–2020; Karadzhov et al., 2014–2015).

The aim of research is to show the Applications of EVODROP Water as Drinking Water of Highest Quality. The Antibacterial and Antiviral Effects of EVOhygiene Colloidal Silver and Cooper Nano Water were studied.

2. Methods

2.1. NES and DNES Spectral Analyses

The device invented by A. Antonov, based on an optical principle and methods NES and DNES for spectral analysis are used. The evaporation of water drops is in hermetic camera with a glass plate and water-proof transparent pad which consists of thin maylar folio.

The parameters are:

– monochromatic filter with wavelength λ = 580±7 nm (yellow color in visible spectrum);

– angle of evaporation of water drops from 72.3° to 0°;

– temperature (+22–24 °C);

– range of energy of hydrogen bonds among water molecules is λ = 8.9–13.8 μm or E=-0.08– -0.1387 eV.;

The energy ($E_{H...O}$) of hydrogen O...H-bonds among H_2O molecules in water sample is measured in eV. The function f(E) is called a spectrum of energues distribution. The energy spectrum of water is characterized by a non-equilibrium process of water droplets evaporation and this is a non-equilibrium energy spectrum (NES), measured in eV^{-1}. DNES is defined as the difference

$\Delta f(E) = f$ *(samples of water)* $- f$ *(control sample of water)*,

where $f(*)$ denotes the evaluated energy.

DNES is measured in eV^{-1} as well.

2.2. Electrical measurements

The device – HANNA Instruments HI221 meter equipped with Sensorex sensors was used for the measurement of Oxidation Reductin Potental (ORP) in mV, and pH.

The Range of HANNA Instruments HI221 meter is:

pH - (2.00-16.00 ±0.01)

ORP (±699.9±0.01 – ±2000±0.1) mV

2.3. Concentration of EVODROP Silver Nanoparticle in sample with bacteria

The concentration is 500 mL EVODROP Silver Nanoparticle with 30 ppm and 500 mL control sample with bacteria.

In the materials and methods are including nutrient media and methods for determination of microbiological indicators.

2.4. Nutrient media

1. Nutrient agar (MPA) with contents (in %) – meat water, peptone – 1%, agar –agar – 2 % . Endo's Medium (for defining of *Escherichia coli* and *coliform* bacteria) with contents (g/dm^3) – peptone– 5,0 ;triptone– 5,0; lactose – 10,0; Na_2SO_3 – 1,4; K_2HPO_4– 3,0; fuchsine– 0,14; agar – agar– 12,0 pH 7,5 – 7,7 .

2. Nutrient gelatine (MPD) (for defining of *Pseudomonas aeruginosa*) with contents (in %) – Peptic digest of animal tissue; 25 % gelatin ;pH = 7, 0 – 7, 2.

3. Medium for defining of enterococci (esculin – bile agar).

4. Medium for defining of sulphite reducing bacteria (Iron Sulfite Modified Agar).

5. Wilson-Bleer medium (for defining of sulphite reducing spore anaerobes (*Clostridium perfringens*) with contents(g/dm^3) – 3 % Nutrient agar; 100 $cm^3$20% solution Na_2SO_3; 50 cm^3 20 % glucose solution; 10 cm^3 8 % solution ofFe_2SO_4.

2.5. Methods for determination of microbiological indicators

1. Methods for evaluation of microbiological indicators according to Ordinance № 9/2001, Official State Gazette, issue 30, and decree № 178 / 23.07.2004 about the quality of water, intended for drinking purposes.

2. Method for determination of *Escherichia coli* and coliform bacteria –BDSEN ISO 9308 – 1: 2004;

3. Method for determination of enterococci – BDS EN ISO 7899 – 2;

4. Method for determination of sulphite reducing spore anaerobes – BDS EN 26461 – 2: 2004;

5. Method for determination of total number of aerobic and facultative anaerobic bacteria – BDS EN ISO 6222: 2002;

6. Method for determination of *Pseudomonas aeruginosa* – BDS EN ISO 16266: 2008.

7. Determination of coli – titre by fermentation method – Ginchev's method

Determination of coli – bacteria over Endo's medium – membrane method.

8. Determination of sulphite reducing anaerobic bacteria (*Clostridium perfringens*) – membrane method.

3. Results

3.1. Results with spectral methods NES and DNES

The Table 1 shows the local extremum at 8.95 μm. Such a local extremum is connected to the state of water molecules in longevity. It is decreasing in tumor diseases.

Table 1. Comparative analyses between EVODROP water and other waters

Type of Water	Value eV $^{-1}$ of Local Extremum at (-0.1362– -0.1387)	(%((-Evalue) */ (-Etotal value)**
Deionized water	18.2±1.2	4.5
Mountain water from Vasiliovska mountain, Bulgaria	44.9±2.2	11.2
Northern Rhodope	59.3±3.0	18.5
Glasier Rosenlaui, Switzerland	70.1±3.5	19.4
Glasier Mappa, Chile	81.3±4.1	20.1
Tap water from Zurich before EVODROP device	38.3±1.9	16.0
EVODROP drinking water	89.9±4.5	25.5

* The result ($-E_{value}$) is the result of hydrogen bonds energy for one parameterof (-E)
** The result ($-E_{total\ value}$) is the total result of hydrogen bonds energy

The mathematical model of the EVODROP water gives us information about the structuring of water clusters with sizes of up to 3 nanometers. Those clusters are with larger and with higher energies than the clusters of tap water. The analysis is based on a mathematical model established in 2013 by Ignatov and Mosin. The model was adopted in modern science, together with the evidence of Richard Saykally of Berkeley College of Chemistry.

A mathematical model of the number of water molecules according to the energy of hydrogen bonds in EVODROP water has been developed (Ignatov, Gluhchev, 2020) (Table 2; Figure 1).

The definition of the author of Nano clusters of EVODROP Fabio Huether is EVODROP® Water.

The mathematical model of EVODROP water show stable clusters between 3 and 25 water molecules.

Table 2. Distribution of the number of water (H_2O) molecules in EVODROP water according to the energy of hydrogen bonds

-E(eV)x-axis	EVODROP® Water Number of water molecules	Tap water (Control Sample) Number of water molecules	-E(eV)x-axis	EVODROP® Water Number of water molecules	Tap water (Control Sample) Number of water molecules
0.0912	0	7	0.1162	0	0
0.0937	0	0	0.1187	3	8
0.0962	5	8	0.1212	15	0
0.0987	3	0	0.1237	0	5

0.1012	0	8	0.1262	0	5
0.1037	0	6	0.1287	9	7
0.1062	9	8	0.1312	2	4
0.1087	0	7	0.1337	0	5
0.1112	12	0	0.1362	17	8
0.1137	0	5	0.1387	25	14

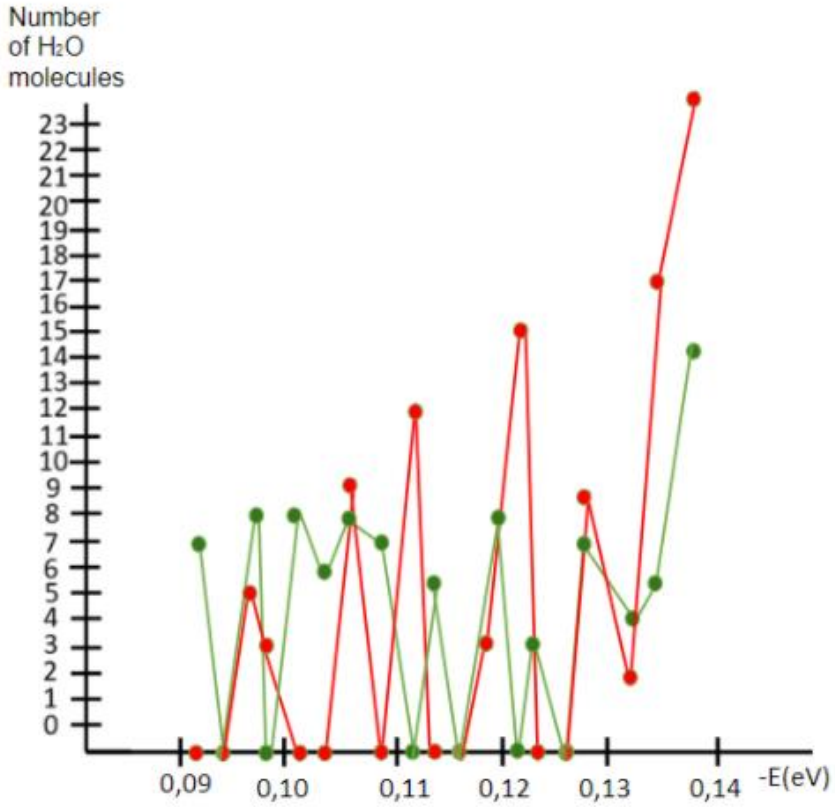

Fig. 1. Distribution of the number of water (H_2O) molecules in EVODROP water (red color) and tap water as control sample (green color) according to the energy of hydrogen bonds

3.2. Properties of EVODROP water

The water created by EVODROP water can be defined as nano-water or water of the future. It is has even better properties than mountain and glacier waters, and everyone can have it in their home. Tables 1 and 2 show that EVODROP water achieves by far the best values. EVODROP water even beats renowned glacier water, which we know to be of the best quality, as confirmed by numerous scientists such as Gerald Pollack, Mu Shik Jhon, Emilio Del Giudice and many others. The evidence-based and scientific proof is that EVODROP water is much better than natural glacier or spring water. It is the best water we have ever tested worldwide!

Ignatov proves that mountain water is unique to longevity, but can we always have this water in our homes?

The new chance in today's world is EVODROP water.

It is important that the EVODROP water is alkaline, and the alkalinity of the medium inhibits the development of tumor cells. EVODROP water activates free electrons with antioxidant activity. It is an elixir of youth as the antioxidant activity is one of the secrets for health and longevity, vitality, and energy. How can we describe longevity? In DNA replication we have doubling of the cells. This is obtained from one mother to two daughter cells. Errors are accumulated in the copy process. The fewer the mistakes, the longer the person lives. With the accumulation of a large number of errors, the number of tumor cells is activated. Essential is the impact on DNA replication on free radicals and the environment in which the replication is performed – water.

3.3. Study of pH and ORP of samples of EVODROP water

The research was performed from one of co-authors Georgi Gluhchev
The obtained results are shown in the following Table 3.

Table 3. Values of pH and ORP for EVODROP water

EVODROP water values	ORP (mV) Sample EVODROP water	ORP (mV) Control Sample Tap water	ORP (mV) Sample minus Control Sample	pH Sample EVODROP water	pH Control Sample Tap water	pH Sample minus Control Sample
	+80	+320	-240	6.54	7.78	-1.24

3.4. Research of hardness of EVODROP water

The parameter of hardness of tap water from Zurich is 7.82±0.39 mgeqv/l. The hardness of EVODROP water is 7.02±0.35 mgeqv/l. The difference 7.82-7.02=0.8±0.04 shows effect of decreasing of hardness of tap water from the device for EVODROP water.

This effect is ecential for human health for cardio vascular system.

3.5. Antibacterial properties of the EVOhygiene

Tests were performed of the antibacterial effects of the EVOhygiene by Nedyalka Valcheva, Trakia University, Stara Zagora, Bulgaria. The control sample water is in Table 4 (after 24 hours) and Table 5 (after 48 hours).

Table 4. Control sample of water with pathogens. Results after 24 hours

Controlled parameter	Limit value, cfu/cm3	Result, cfu/cm^3
Coliforms	0/100	7/100
Escherichia coli	0/100	7/100
Enterococci	0/100	4/100
Sulphite reducing anaerobic bacteria (Clostridium perfringens)	0/100	0/100
Total number of microorganisms at 22 °C	100	110
Total number of microorganisms at 37 °C	20	30
Pseudomonas aeruginosa	0/250	0/250

Table 5. Control sample of water with pathogens. Results after 48 hours

Controlled parameter	Limit value, cfu/cm3	Result, cfu/ cm^3
Coliforms	0/100	15/100
Escherichia coli	0/100	15/100
Enterococci	0/100	10/100
Sulphite reducing anaerobic bacteria (Clostridium perfringens)	0/100	0/100
Total number of microorganisms at 22 °C	100	120
Total number of microorganisms at 37 °C	20	50
Pseudomonas aeruginosa	0/250	0/250

The results with EVOhygiene are in Table 6 (after 24 hours) and Table 7 (after 48 hours).

Table 6. Results with EVOhygiene. Results after 24 hours

Controlled parameter	Limit value, cfu/cm3	Result, cfu/cm^3
Coliforms	0/100	0/100
Escherichia coli	0/100	0/100
Enterococci	0/100	0/100
Sulphite reducing anaerobic bacteria (Clostridium perfringens)	0/100	0/100
Total number of microorganisms at 22 °C	100	0
Total number of microorganisms at 37 °C	20	0
Pseudomonas aeruginosa	0/250	0/250

Table 7. Results with EVOhygiene. Results after 24 hours

Controlled parameter	Limit value, cfu/cm3	Result, cfu/cm^3
Coliforms	0/100	0/100
Escherichia coli	0/100	0/100
Enterococci	0/100	0/100
Sulphite reducing anaerobic bacteria (Clostridium perfringens)	0/100	0/100
Total number of microorganisms at 22 °C	100	3
Total number of microorganisms at 37 °C	20	3
Pseudomonas aeruginosa	0/250	0/250

The research shows anti-bacterial effects of EVOhygiene with Coliforms, Escherichia coli, Sulphite reducing anaerobic bacteria (*Clostridium perfringens*) and Pseudomonas aeruginosa.

3.6. Antiviral effects of the EVOhygiene Nanoparticle Water.

The nano colloidal silver with size of 5-20 nm of Ag^+ has got inhibiting effect over respiratory enzymes of the micro-organisms by building into the reaction center of the enzymes. Thus, it prevents the further alteration of the enzymes (Dondysh, 1964). Colloidal silver from the EVOhygiene makes physical changes in the bacterial membrane, like the membrane damage, which can lead to cellular contents leakage and bacterial death in interact with, and potentially disturb the functioning of bio molecules such as proteins and enzymes (Mosin, Ignatov, 2013). The coronavirus replicase was recently predicted to employ a variety of RNA processing enzymes. The colloidal silver Ag^+ inhibits such copying of the enzyme RNA-dependent RNA polymerase. In, and in this way are neutralized the effects of SARS-CoV-2, and thereby the effects of COVID-2019 are counteracted.

The colloidal silver of EVOhygiene is therefore absolutely safe for humans, animals and the environment. It does not harm, but supports humans, animals and even plants of all kinds in cell activation, immune system, stem cell formation, inflammation inhibition and much more. EVOhygiene colloidal silver is by far the safest, purest, and most effective for universal protection.

4. Conclusion

The basic conclusion from the research is that EVODROP water increases the average energy of hydrogen bonds among water molecules treatment compared to the average energy of hydrogen bonds among water molecules in control sample of tap water.

The mathematical models of EVODROP water give significant information about the possible number of hydrogen bonds as a percent of H_2O molecules with different distribution of energy relative to the same number in control sample of tap water.

As a result of different energies of hydrogen bonds, the surface tension of EVODROP water is increased after the treatment relative to the control sample. This effect is connected with the preservation and increase in the energy of the biochemical processes between water molecules and biomolecules.

The following effects from the analysis of the local extremums in spectrum are valid:

1. Stimulating effect on nervous system and improvement of nervous conductivity.
2. Anti inflammatory effect.
3. Inhibition of development of tumor cells of molecular level.

The research was performed of EVOhygiene Colloidal Silver and Cooper ppm 30 with author Fabio Huether of microbiological effects of the following bacteria – *Escherichia coli, Enterococci, Coliforms, Clostridium perfringens*.

References

Aider et al., 2012 – *Aider, M., Kastyuchik, A., Gnatko, E., Benali, M., Plutakhin, G.* (2012) Electro-activated Aqueous Solutions: Theory and Application in the Foodindustry and Biotechnology. *Innovative Food Science and Emerging Technologies*. 15: 38-49

Bakhir et al., 2001 – *Bakhir, V.M., Zadorozhnii, Y.G., Leonov, V.I., Panicheva, S.A., Prilutsky, V.I.* (2001). Electrochemical Activation; Water Purification and Production of Useful Solutions. *Moscow:VNIIIMT*. 1: 100-176.

Bachir, Pogorelov, 2018 – *Bachir, V.M., Pogorelov, A.G.* (2018). Universal Electrochemical Technology for Environmental Protection, *International Journal of Pharmaceutical Research & Allied Sciences*. 7(1): 41-57.

Cha, Chun-Nam et al., 2016 – *Cha, Chun-Nam et al.* (2016). Virucidal Efficacy of a Fumigant Containing Orth-phenylphenol Against Classical Swine Fever Virus and Porcine Reproductive and Respiratory Syndrome Virus. *Korean Journal of Veterinary Service*. 39(2): 117-124.

Fukuzaki, 2006 – *Fukuzaki, S.* (2006). Mechanisms of Actions of Sodium Hypochlorite in Cleaning and Disinfection Processes. *Biocontrol Sci*. 11(4): 147-57.

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 as Types of Water. *Journal of Medicine, Physiology and Biophysics*. 10: 1-17.

Hoeijmakers, 2009 – *Hoeijmakers, J.H.* (2009). DNA Damage, Aging, and Cancer, 361(15): 1475-85.

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 et al., 2019 – *Ignatov, I., Toshkova, R., Gluhchev, G., Drossinakis, Ch.* (2019). Results of Blood Serum from Cancer Treated Hamsters with Infrared Thermal Field and Electromagnetic Fields. *Journal of Health, Medicine and Nursing*. 58: 101-112.

Antonov, 1995 – *Antonov, A.* (1995). Research of Nonequilibrium Processes in the Area of Allocated Systems. *Diss. Thesis Doctor of Physical Sciences*, 1-255.

Ignatov et al., 1998 – *Ignatov, I., Antonov, A., Galabova, T.* (1998). Medical Biophysics – Biophysical Fields of Man. Gea Libris, Sofia.

Ignatov, 2010 – *Ignatov, I.* (2010). Which Water is Optimal for the Origin (Generation) of Life? *Euromedica, Hanover*. 34-37.

Ignatov, 2011 – *Ignatov, I.* (2011). Entropy and Time in Living Organisms. *ArchivEuromedica, Hanover, 1st & 2nd Edition*. 74-75.

Ignatov, 2011 – *Ignatov, I.* (2011). Entropy and Time in Living Organisms. *Euromedica, Hanover*. 60-62.

Ignatov, Tsvetkova, 2011 – *Ignatov, I., Tsvetkova, V.* (2011). Water for the Origin of Life and "Informationability" of Water, Kirlian (Electric Images) of Different Types of Water. *Euromedica, Hanover*. 62-65.

Ignatov, Tsvetkova, 2011 – *Mosin, O.V., Ignatov, I.* (2011). Water – Substance of Life, Consciousness and Physical Reality. *Natural Sciences, Moscow*. 17(11): 9-21.

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

Ignatov, 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.

Ignatov, Pesheva, 2018 – *Ignatov, I., Pesheva, Y.* (2018). Studying of the Factors of Longevity in Smolyan Municipality, Rhodope Mountains, Bulgaria as Area of Oxidant/Antioxidant Balance. *Journal of Natural Sciences Research*. 8(16): 29-42.

Ignatov et al., 2020 – *Ignatov, I., Gluhchev, G., Huether, F.* (2020). Dynamic Nano Clusters of Water on EVODROP Water. *Physical Science International Journal*. 24(7): 47-53.

Ignatov, 2020 – *Ignatov, I.* (2020). Applications of EVODROP Water as Drinking Water of Highest Quality and EVOhygiene Colloidal Silver and Cooper Nano Water. Antibacterial and Antiviral Effects that also Help to Combat SARS-CoV-2. *Scientific Research Center of Medical Biophysics*.

Ignatov et al., 2020 – *Ignatov, I., Valcheva, N., Huether, F.* (2020). Nano and Microbiological Effects of EVODROP Silver and Copper Nanoparticle. *Journal of Materials Science Research and Reviews*. 6(4): 63-71.

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 et al., 2014 – *Ignatov, I., Mosin, O. V., Velikov, B., Bauer, E. Tyminski, G.* (2014). Longevity Factors and Mountain Water as Factor. Research in Mountain and Fields Areas in Bulgaria. *Civil and Environmental Research*. 30(4): 51-60.

Ignatov et al., 2021 – *Ignatov, I., Valcheva, N., Mihaylova, S., Dinkov, G.* (2021). Physicochemical and Microbiological Results of Hyperthermal (Hot) Mineral Water in Rupite, Bulgaria as Model System for Origin of Life. *Uttar Pradesh Journal of Zoology*. 41(24): 16-22.

Ignatov, Valcheva, 2021 – *Ignatov, I, Valcheva, N.* (2021). Physiological and Molecular Characteristics of Bacillus Spp. from Warm Mineral Water in Varna, Bulgaria as model system for origin of life. *Uttar Pradesh Journal of Zoology*.

Ignatov et al., 2019 – *Ignatov, I., Mehandjiev, D., Vassileva, P., Voykova, D., Karadzhov, S., Gluhchev, G., Ivanov, N.* (2019). Research of Water Catholyte of Presence of Nascent (Atomic) Hydrogen (H*). Hydrogen and Nascent Hydrogen of the Reactions for Origin of Life in Hot Mineral Water. *European Journal of Medicine*. 7(2): 99-105.

Ignatov et al., 2020 – *Ignatov, I., Gluhchev, G., Karadzhov, G., Yaneva, I., Valcheva, N., Dinkov, G,, Popova, T., Petrova, T., Mehandjiev, D., Akszjonovich, I.* (2020). Dynamic Nano Clusters of Water on Waters Catholyte and Anolyte: Electrolysis with Nano Membranes. *Physical Science International Journal*. 24(1): 46-54.

Tumbarski et al., 2014 – *Tumbarski, T., Valcheva, N., Denkova, Z., Koleva, I.* (2014). Antimicrobial Activity against Some Saprophytic and Pathogenic Microorganisms of Bacillus species Strains Isolated from Natural Sping Waters in Bulgaria. *British Microbiology Research Journal*. 4(12): 1353-1369.

Valcheva, 2020 – *Valcheva, N., Ignatov, I., Huether, F.* (2020). Microbiological Research of the Effects of EVODROP Silver Nanoparticle on Escherichia coli, Enterococci and Coliforms. *Journal of Advances in Microbiology*. 20(11): 22-31.

Valcheva et al., 2013 – *Valcheva, N., Denkova, Z., Denkova, R.* (2013). Physicochemical and microbiological characteristics of spring waters in Haskovo. *Journal of Food and Packaging Science Technique and Technologies*. 2: 21-25.

Valcheva et al., 2014 – *Valcheva, N., Denkova, Z., Nikolova, R., Denkova, R.* (2014) Physiological, Biochemical, and Molecular – Genetic Characterization of Bacterial Strains Isolated From Sping and Healing Waters in Region of Haskovo. *Food, Sciense, Engineering and technologiest, Plovdiv*. *LX*: 940-946.

Valcheva et al., 2013 – *Valcheva, N., Denkova, Z. Nikolova, Denkova, R.* (2013). Physiological-Biochemical and Molecular – Genetic Characteristics of Bacterial Strains Isolated from Spring and Healing Waters in the Haskovo Region. *N.T. at UCT. Volume LX*.

Valcheva et al., 2014 – *Valcheva, N., Denkova, Z., Denkova, R., Nikolova, R.* (2014). Characterization of bacterial strains isolated from a thermal spring in Pavel Banya, Stara Zagora Region. *N.T. at UCT, Volume LXI*.

Valcheva, 2014 – *Valcheva, N.* (2014) The Microflora of Medicinal and Spring Waters in Haskovo and Stara Zagora Region. Dissertation, University of Food Technology, 1-142.

Valcheva, Ignatov, 2019 – *Valcheva, N., Ignatov, I.* (2019). Physicochemical and Microbiological Characteristics of Thermal Healing Spring Waters in the District of Varna. *Journal of Medicine, Physilogy and Biophysics*. 59: 10-16.

Valcheva et al., 2020 – *Valcheva, N., Ignatov, I., Dinkov, G.* (2020) Microbiological and Physicochemical Research of Thermal Spring and Mountain Spring Waters in the District of Sliven, Bulgaria. *Journal of Advances in Microbiology*. 20(2): 9-17.

Valcheva et al., 2020 – *Valcheva, N., Ignatov, I., Mihaylova, S.* (2020). Physiological and Molecular-genetic Characteristic of Bacteria Strains, Isolated from Mountain Spring and Mineral Waters in Plovdiv Region. *Bulgaria, International Journal of Pathogen Research*. 4(1): 44-55.

Valcheva, Ignatov, 2020 – *Valcheva, N., Ignatov, I.* (2020). Microbiological Research of the Effects of Electromagnetic Fields of the Bacteria Escherichia coli, Enterococci, Coliforms and Clostridium perfringens. *Microbiology Research Journal International*. 30(9): 39-44.

Vassileva et al., 2019 – *Vassileva, P., Voykova, D., Ignatov, I., Karadzhov, S., Gluhchev, S., Ivanov, N., Mehandjiev, D.* (2019). Results from the Research of Water Catholyte with Nascent (Atomic) Hydrogen. *Journal of Medicine, Physiology and Biophysics*. 52: 7-11.

Standards

Ordinance №9/2001, Official State Gazette. Is. 30.

Decree № 178/23.07.2004 about the quality of water, intended for drinking purposes.

BDS8451: 1977 – defining of colour according to Rublyovska Scale, determination of smell at 20 °C.

EN ISO 7027 – determination of turbidity.

BDS3424: 1981 – determination ofpH.

BDS3413: 1981 – determination of oxidisability.

BDS3414: 1980 – determination of chlorides.

BDS ISO 6058 – determination of calcium, determination of general hardness.

BDS EN 27888 – determination of electrical conductivity.

VLM – NH_4 –№ 1 – determination of ammonium ions.

VLM –NO_3 – № 2 – determination of nitrates.

VLM – NO_2 –№ 3 – determination of nitrites.

VLM– SO_4 –№ 4 – determination of sulphates.

VLM– PO_4 –№ 5 – determination of phosphates.

VLM– Fe –№ 6 – determination of iron.

VLM–Mn–№ 7 – determination of manganese.

VLM– F –№ 8 – determination of fluorides.

BDS 7211: 1982 – determination of magnesium.

BDSEN ISO 7899 – 2 –determination of nitrates.

BDSEN ISO 9308 – 1: 2004 – determination of *Escherichia coli*andcoliformbacteria.

BDSEN26461 – 2: 2004 – determination of sulphite reducing anaerobic bacteria *(Clostridiumperfringens)*.

BDSEN ISO 16266 – determination of*Pseudomonas aeruginosa*.

BDSEN ISO 7899 – 2 – determination of eneterococci.

BDS EN ISO 6222: 2002 – determination of total number of aerobic and facultative anaerobic bacteria.