Low Deuterium Water

Opportunity for people all around the world to take a step towards vigorous and healthy life

Abstract

This presentation provides an opportunity to evaluate the potentials of Discovery in the fields of health care, improvement of one's working capacity and new possibilities in human life extension.

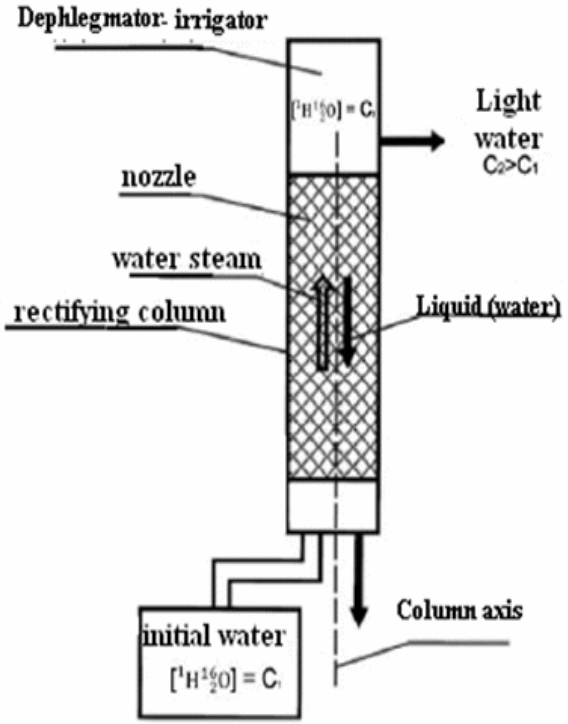
Our industrial technology of Low Deuterium Water (LDW) manufacturing is supported by fundamental scientific studies, protected by intellectual property rights, and is now ready for international commercial use – by private investment, or state investment in the project.

Natural water has a complex composition

Except H2O, natural water contains:

Mechanical, chemical and biological impurities. City tap water usually contains no more than 0.5 g / l.

Mechanical, biological and chemical purification methods are applied to extract the impurities.

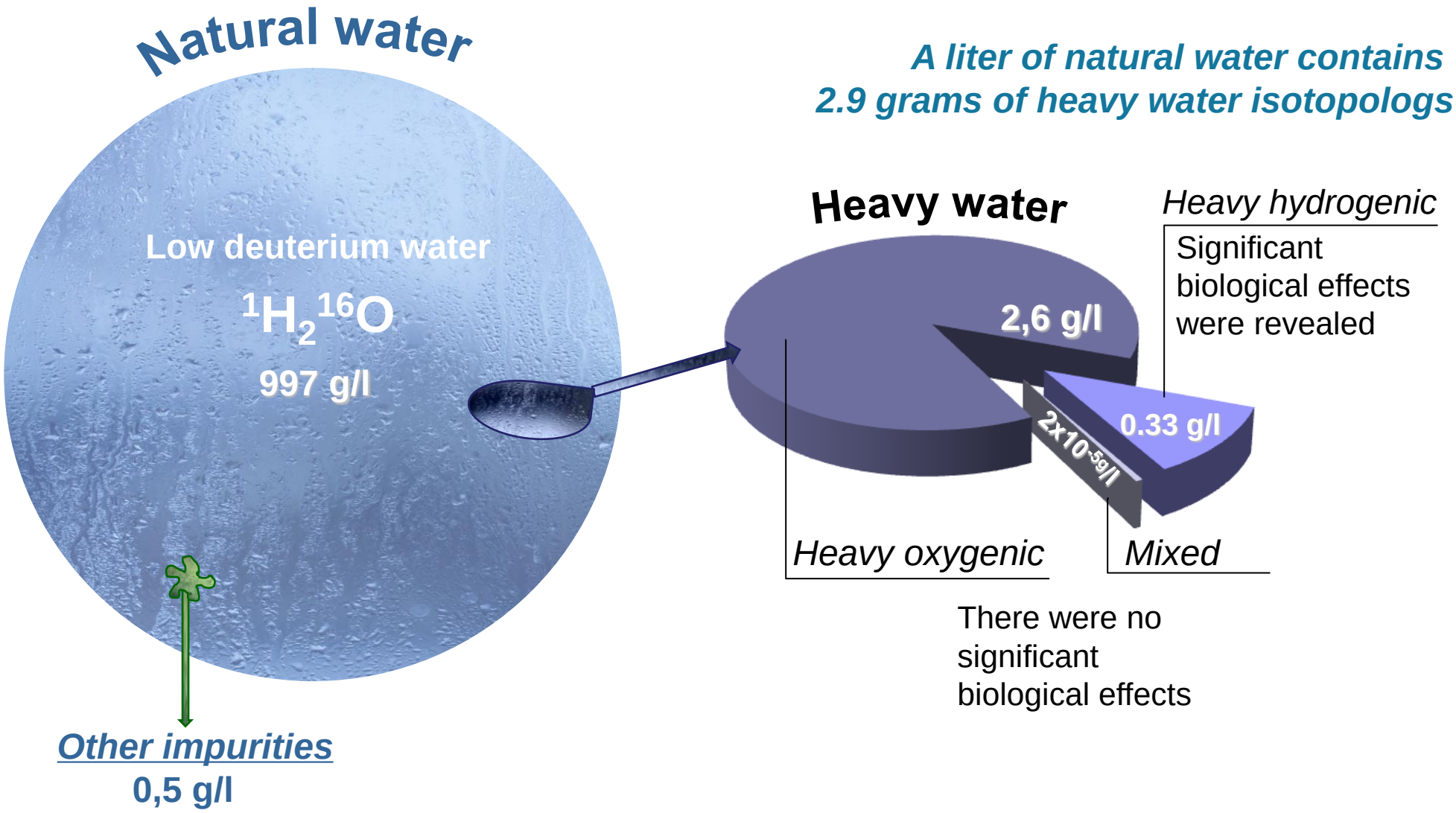


Isotopic "impurities" are heavy molecules of water.

Ordinary water contains about 2.9g / l.

For industrial removal of heavy molecules we apply low-temperature vacuum rectification.

Molecular composition of natural water



A liter of natural water contains 2.9 grams of heavy water isotopologs

LDW = Natural water minus Heavy hydrogenic water

Low deuterium water is physically different water

Parameters	**Low deuterium water** D/H = 4 ppm O^{18}/O^{16}=757 ppm	**Water with natural isotopic composition** D/H = 140 ppm O^{18}/O^{16}=1966 ppm	**Heavy water** 99% D_2O
Density, g/cm^3	0,99692	0,99820	1,10424
Kinematical viscosity, mm^2/s	0,987	1,012	1,2742
Surface tension, mN/m	75,172	72,860	67,800
Melting point, ^oC	-1,5	0	+ 3,8
Time of spin-spin protons' relaxation - T_2, c	0,347 $\pm$ 0,024	2,000 $\pm$ 0,140	-
Contribution to the overall self-diffusion coefficient from collective motions (D_l x10^9), м^{2}s^{-1}	0,63	0,46	0,528
Lifetime of molecules in an oscillating condition around the center of balance (τ_o x10^{12}), s	2,08	2,80	2,79

V. Goncharuk, et al. Physicochemical Properties and Biological Activity of the Water Depleted of Heavy Isotopes // Journal of Water Chemistry and Technology, 2011, Vol. 33, No. 1, pp. 8–13.

Physical properties of water differ in dependence from density (lightness)

Isotopic composition of water on Earth

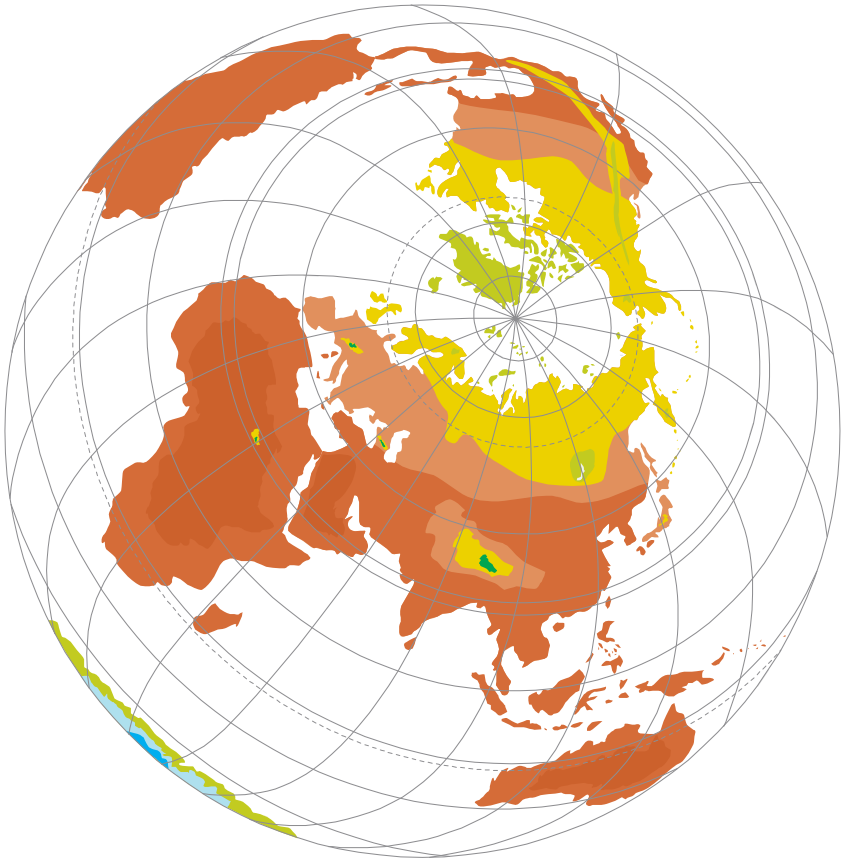
Natural water differs in it's lightness around the globe

Source of water	Relative lighting, mg/kg
Equatorial water (VSMOW)	0
Tap water - Moscow	-20
Thawed (snowy) water from the top of Elbrus	-80
Water from the Greenlandic ice (GISP)	-130
Water from the Antarctic ice (SLAP)	-290

heavier

lighter

VSMOW and SLAP — international (Vienna) standards of isotopic composition of natural water



Lightness of water increases in proportion to:
- increasing of distance from the ocean
- increasing of the height of the terrain (mountains)
- increasing of the geographical latitude.

Mountain thawed water is significantlly lighter than oceanic water

Heavy water is used:

In nuclear industry

In diagnostic medicine

We haven't found any scientific proof indicating that heavy water plays any essential role in the biochemistry of living beings – on the opposite, there is plenty of evidence that heavy water is harmful for any live subjects.

Biological properties of heavy water

Tested objects	Concentration D_2O, %	Effect
Ounicellular algae (Scenedesmus)	38,5	cessation of growth and development
Higher plants (sunflower and wheat)	100 (watering)	seeds do not germinate
Lower animals: - paramecea - flat worms	 92 90	 - death in 48 hours - loss of activity after 2 hours, death after 3 weeks
Higher animals (mice)	99,5 (D2O parenterally)	Death on the 5th day

Y. Sinyak, D. Rakov, B. Fedorenko Institute of bio-medical studies, Russian academy of Science

Heavy water is an inhibitor (decelerator, reducer) of biochemical reactions

Tobacco plants grown on various concentrations of heavy water

Tobacco plant (*Nicotiana tobacum*)
Katz and Krespi:
"*Isotope Effects in Biological Sysytems*"

Heavy water is an inhibitor of biochemical processes

Chemical reaction: A ⟶ B

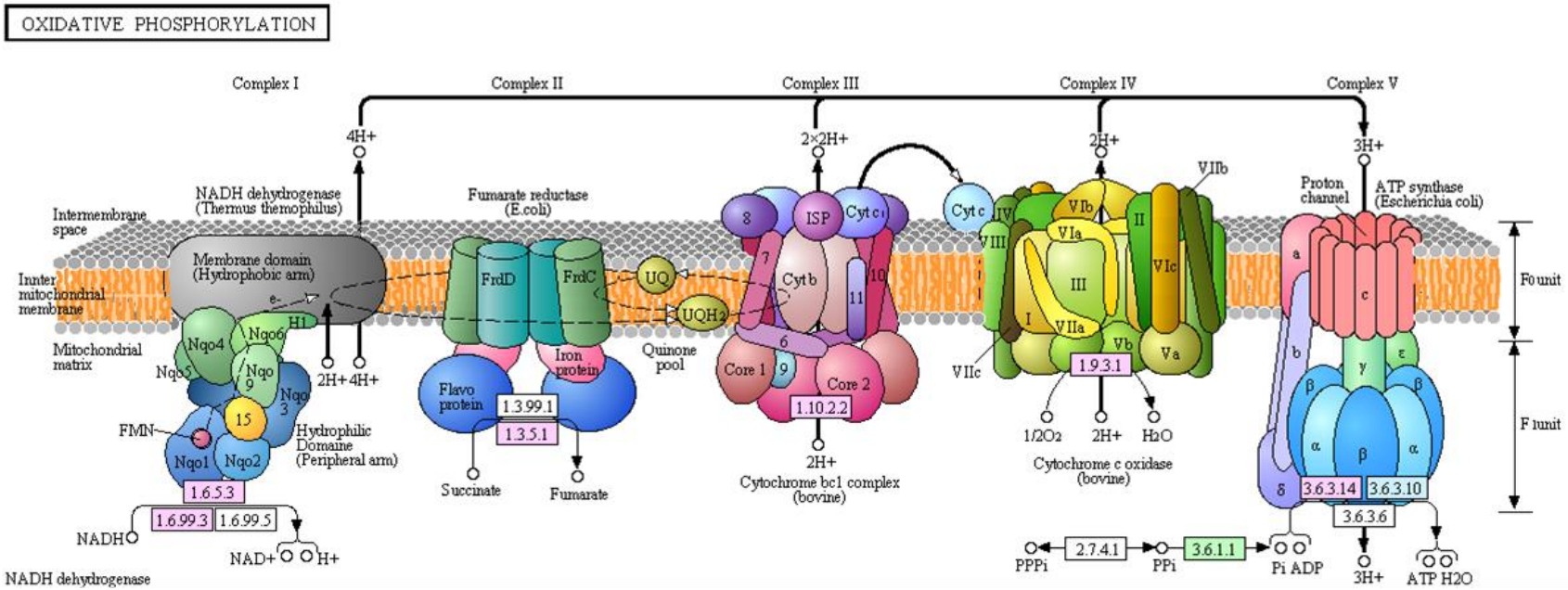
Isotope effect = $k(H_2O)/k(D_2O)$

Reaction	Isotope effect
Enzyme catalysis	≈ 2
Oxidation-reduction reaction* (Transfer pair H+ - e)	30 ÷ 455

* My Hang V. Huynh, Thomas J. Meyer Colossal kinetic isotope effects in proton-coupled electron transfer // PNAS. 2004 V. 101 no. 36. PP. 13138-13141

Solvent isotope effect in the biochemical reactions

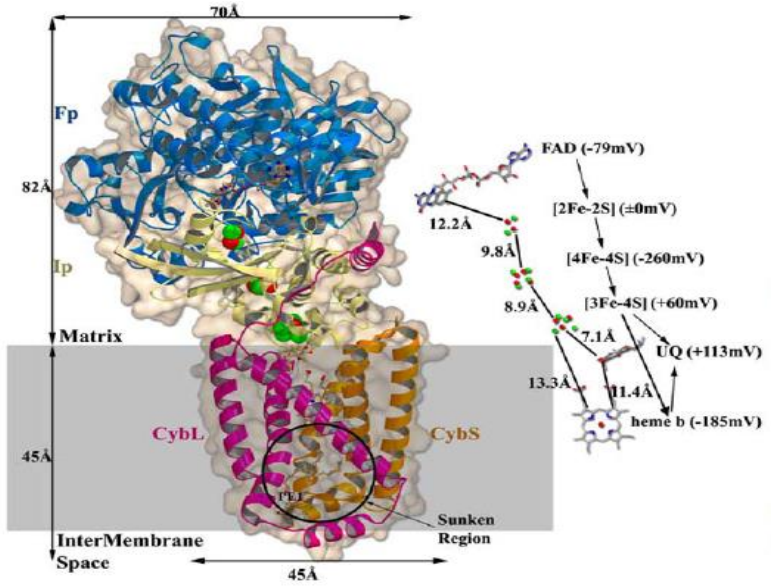
RESPIRATORY CHAIN OF MITOCHONDRIA



In biological systems with long sequences of reactions and cooperative effects usually insignificant 0.27% of heavy water considerably slows down these processes

Solvent isotope effect in the biochemical reactions

Complex II
Part of respiratory chain of mitochondria



Cooperative transfer of pair proton(H+) electron(- e) in a complex II:

Succinate → [FAD] → [2Fe-2S] → [4Fe-4S] → [3Fe-4S] → heme b → UQ

Complex II

The molecules of heavy water inhibit the reactions of the mitochondrial respiratory chain - main energy reactions of the organism

Reduction of deuterium gives additional energy

With each liter of usual drinking water we receive 3 grams of heavy water
Heavy molecules in natural water, as well as various toxicants, inhibit cell respiration, which is responsible for the energy supply of the organism.
This can be compared with the action of sand if it sticks into the watch.

Low deuterium water facilitates mitochondrial respiration due to the de-inhibition of proton-coupled electron transfer.

The de-inhibition of proton-coupled electron transfer provides involvement previously arrested mitochondrial “facilities” in energy production in cells.

The organisms can use these additional resources for better resolution of complications during it's living activity.

The mechanism of LDW action was discovered by Russian scientists

Low deuterium water is harmless

Prolonged use of low deuterium water in the Antarctic, Greenland and high altitude areas showed no adverse effects on human health.

Embryological study on the development of the grass frog (Rana Temporaria) in waters with different isotopic composition showed that all organ and tissue systems developed in accordance with the normal development of embryos and tadpoles of Rana temporaria - both in low deuterium water, and in control water.

The results of such pilot studies demonstrate the absence of negative (pathogenic) effects of low deuterium water on the growth and development of the grass frog.

S. Soloviev, S. Saveliev, A. Proshina

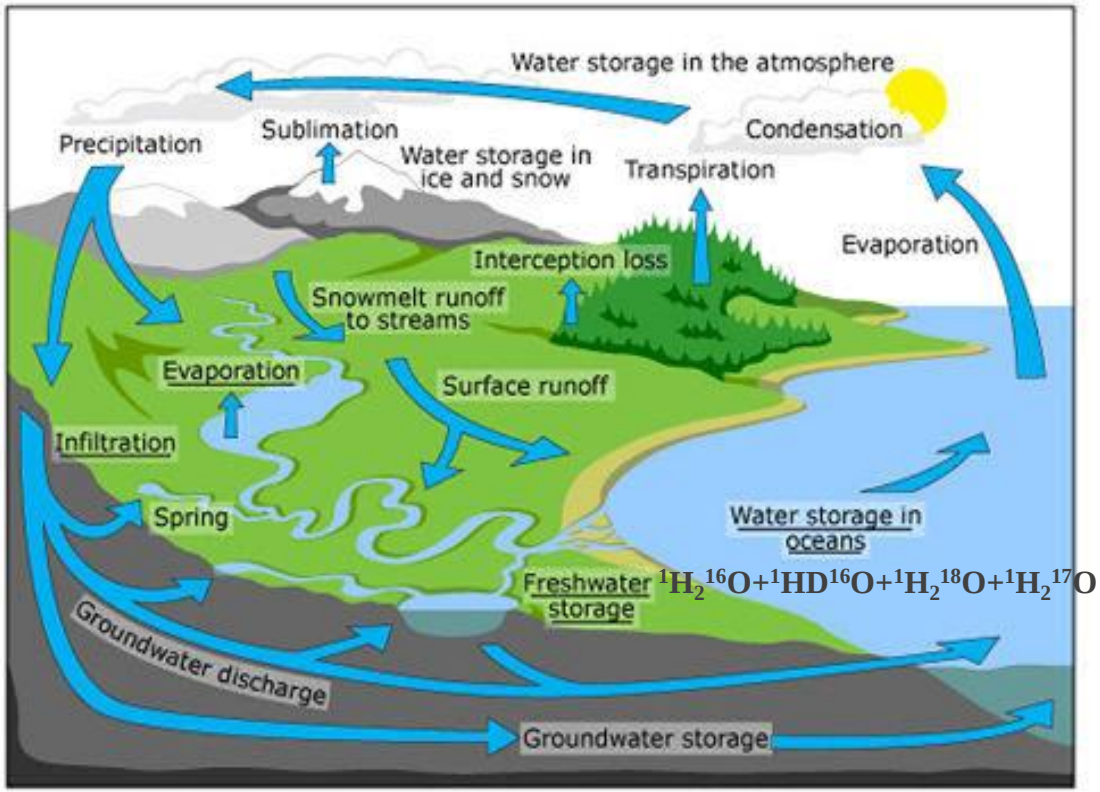
Institute of human morphology. Russian Academy of medical science

Low deuterium water is harmless

Almost all the water, we drink, is by 99.7% the low deuterium water

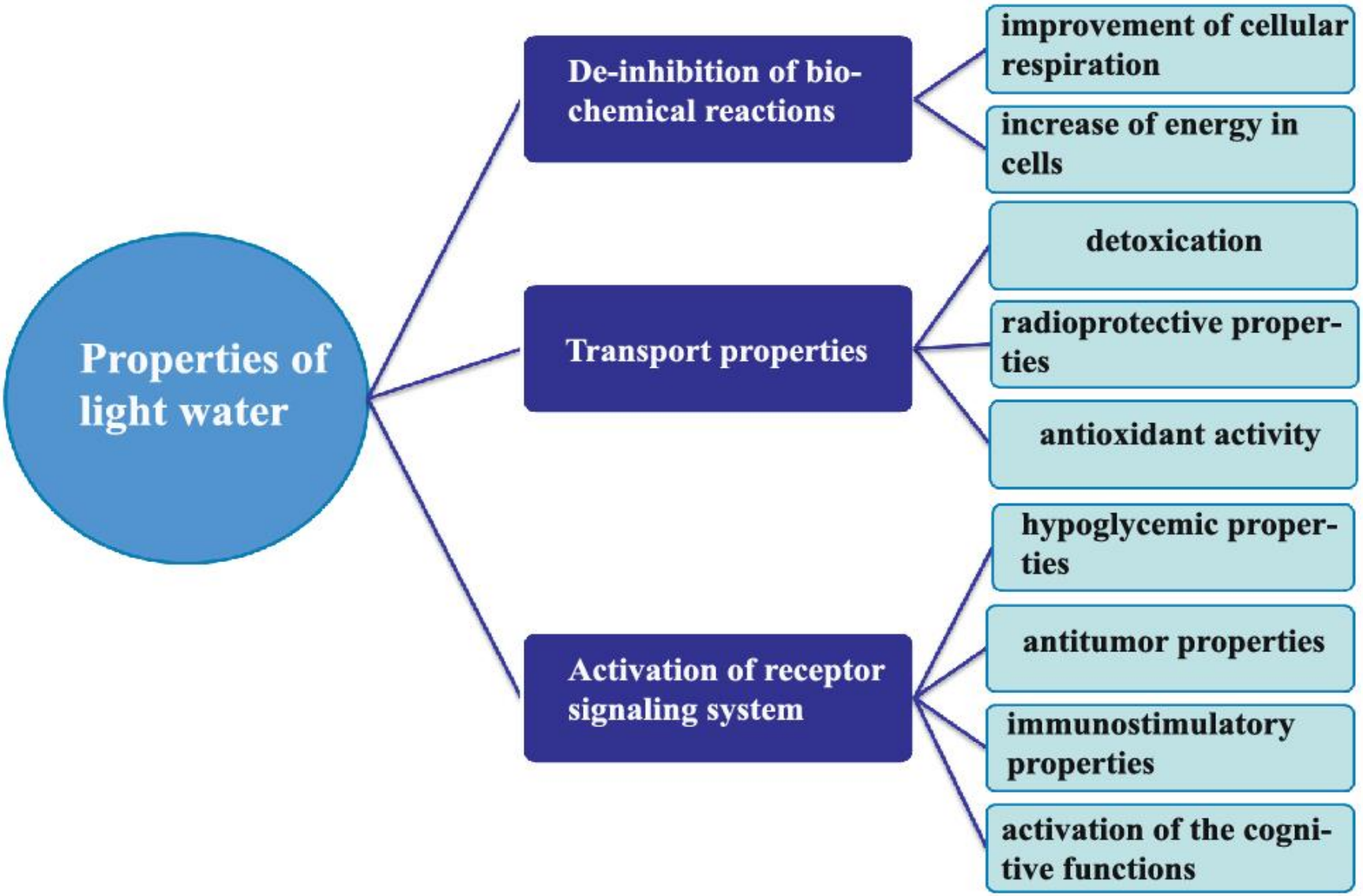
The technology of low deuterium water production by means of low-temperature multiple vacuum distillation simulates the natural water cycle.

We do not create or add any new chemical components to the water. Only "impurities" of heavy water are removed.



All living beings thrive in lighter and cleaner environment

The proven properties of low deuterium water

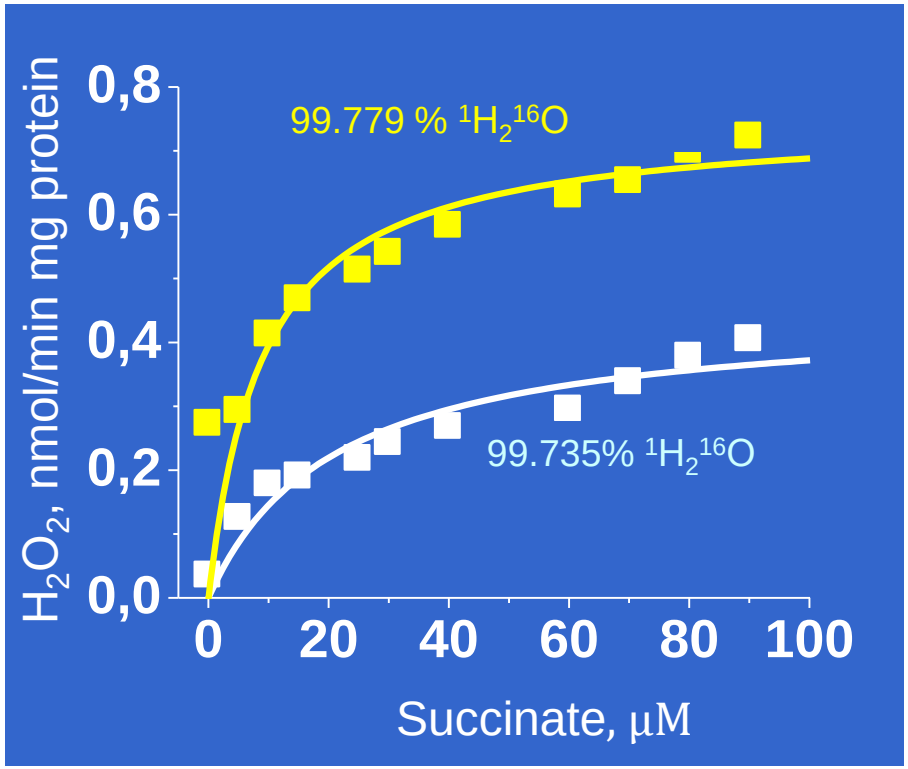


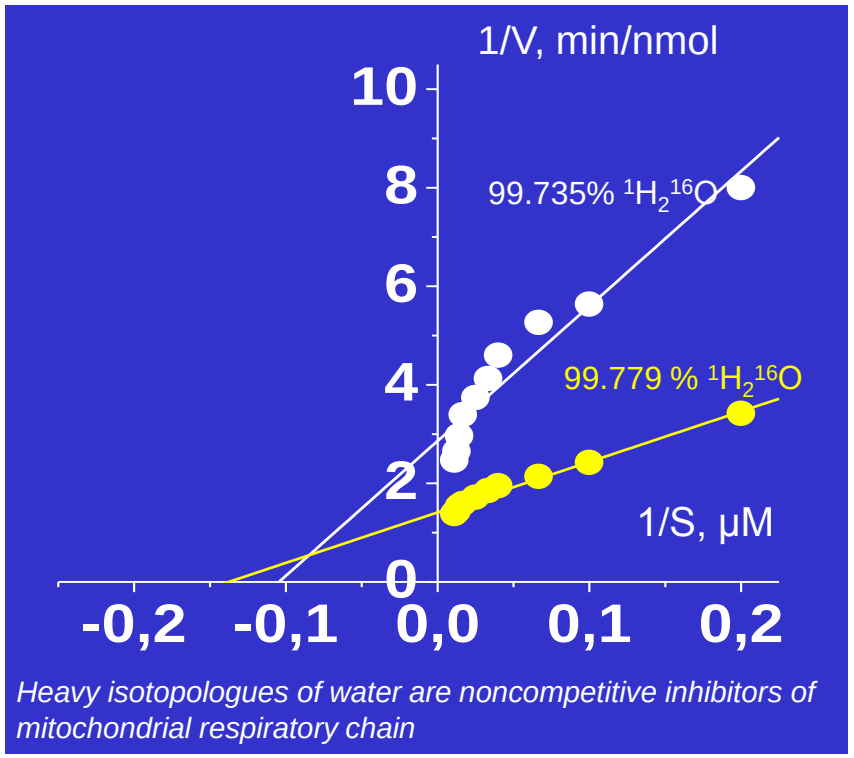
De-inhibition of biochemical reactions

Unlocking the reactions of the mitochondrial respiratory chain

Increase of all energy recources of the whole organism

Kinetics of hydrogen peroxide generation as a marker of cell energy





Model - isolated rat liver mitochondria in the presence of succinic acid (succinate) as a substrate.
I.A. Pomytkin, O.E. Kolesova // Bulletin of Experimental Biology and Medicine. 2006. V.142. N 5. - P.570-572

Low deuterium water deinhibits (unlocks) the enzymatic reaction during generation of hydrogen peroxide and improves cellular respiration

Investigation of the physiological aspects of the influence of low deuterium water on living organisms

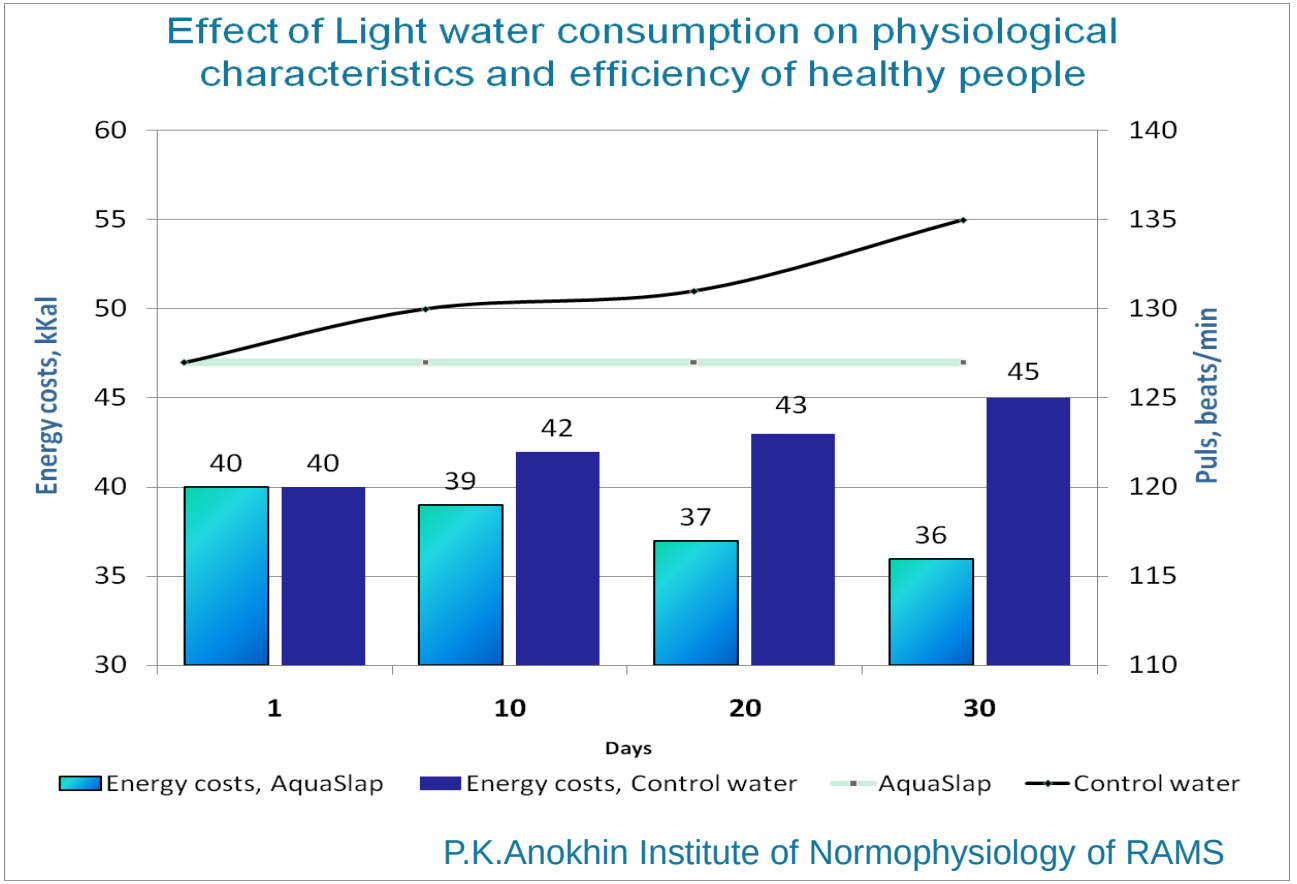
Improving physical performance

Protection from environmental hazards

Protection from the negative effects of alcohol

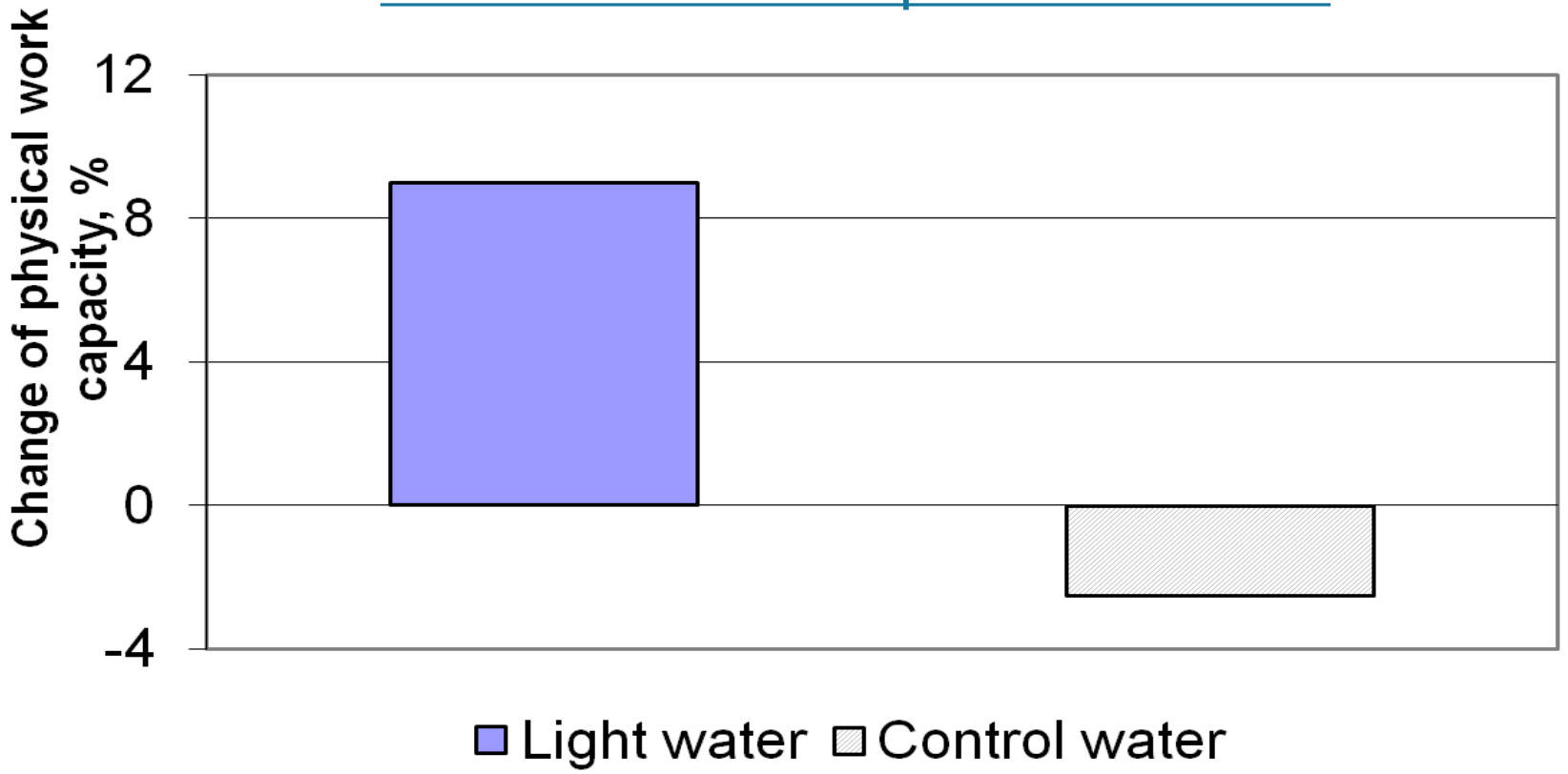
Protection from the impact and effects of stress

The study of gas exchange parameters during standard physical performance on veloergometer



Values of energy costs on standard physical performance on veloergometer after low deuterium water consumption were decreased, but in control group increased

Change of physical performance after water consumption in humans



P.K.Anokhin Institute of Normophysiology of RAMS

The indicators of physical working capacity (data of Harvard's Step test) after low deuterium water consumption were increased while in control group decreased

Conclusions

Drinking the low deuterium water improves functional performance in healthy people during aerobic exercises, a physiological state with high demand on energy production

Transport properties of low deuterium water

- Effective delivery of different substances and media
- Accelerated withdrawal of harmful substances from the body
- Radioprotective properties
- Antioxidant properties

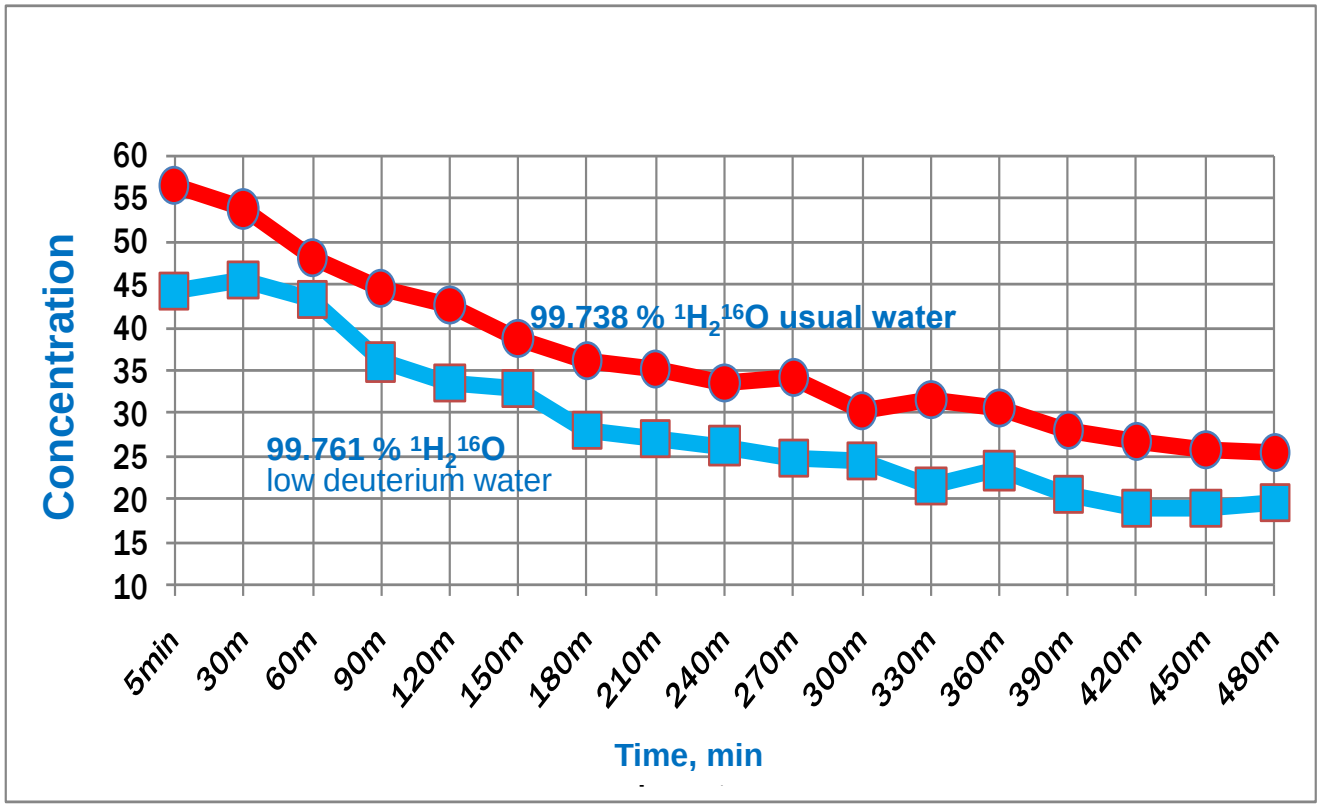
The effectiveness of preparation delivery

Recombinant interferon-alpha		
Method of delivery	**Control water**	**low deuterium water**
	The concentration of interferon in the plasma, mg/ml	
Transdermally (through the skin)	0,4	3,6
Transmucosal (through the mucosa)	3,7	15,0

Recombinant insulin		
Method of delivery	**Control water**	**low deuterium water**
	Blood glucose level, mmol / l	
Transdermally (through the skin)	10,7	8,3
Transmucosal (through the mucosa)	9,7	7,3

Low deuterium water provides a more efficient biological delivery of various substances and media

The elimination rate of "methylene blue", dissolved in the low deuterium and control water



Model - the olfactory paired organ of albino clawed frog larvae

T. Burdeynaya, A. Chernopyatko, E. Grygoryan. The effects of low deuterium water on elimination of marked dye from olfactory system of Xenopus laevis larvae. Water: chemistry and ecology, 2011. - №9 - C.86-91

Low deuterium water provides a rapid withdrawal of harmful substances from the living organism

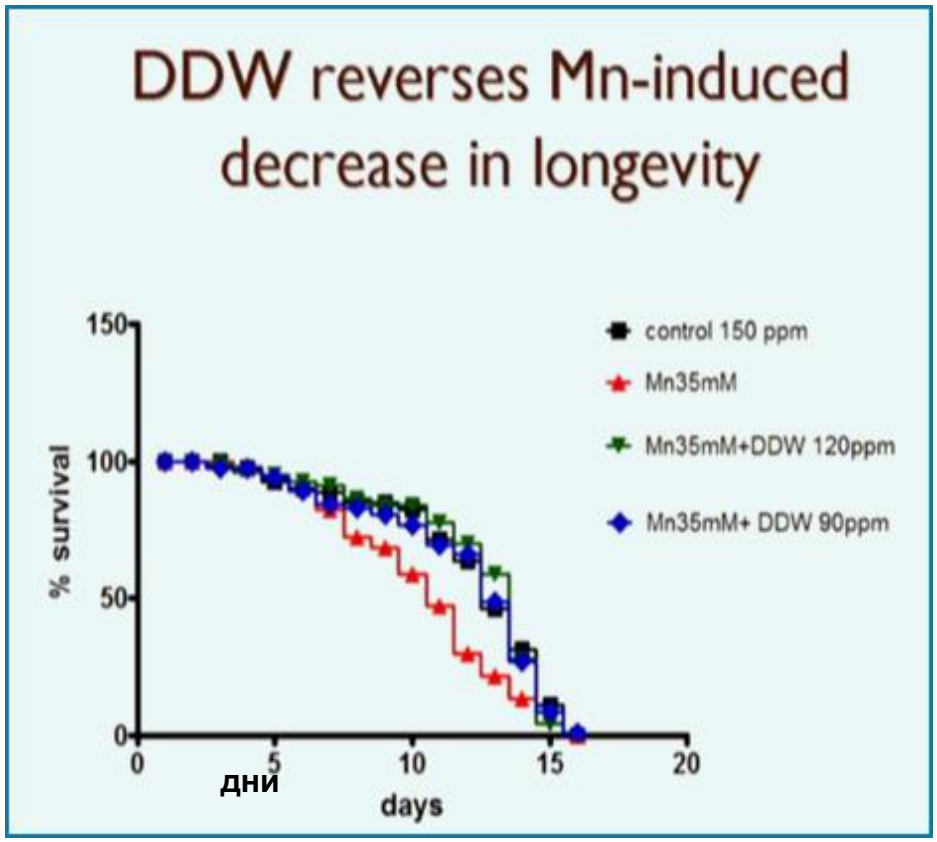
Protection from environmental hazards

Concentration of cadmium in rat liver after intoxication

Terms of protocol	Cd mkg/g in liver
Control	0.020±0.006
Intoxication with cadmium using control water as an ingestion and detoxifying media	45.65±5.34
Intoxication with cadmium, using low deuterium water as a detoxifying media	17.46±3.48
Intoxication with cadmium, using control water as an ingestion and detoxifying media	2.09±0.59

Olariu L., Petcu M.D., et al.
The influence of deuterium depleted water in the experimental cadmium chloride intoxication on liver function in rats. Lucrări Ştiinţifice Medicină Veterrinară Vol. XL, 2007, P.270-274.

Life expectancy of flatworms after manganese intoxication



Avila D.S., Aschner M (Vanderbilt Medical Center, Nashville TN, USA)
Protective Effects of DDW in a C.elegans model
1st International Symposium on Deuterium Depletion
13-14 May 2010, Budapest, Hungary

Low deuterium water helps to increase life expectancy in organisms living in dangerous environments by neutralising the negative effects of ecopollutants

Radioprotective properties of low deuterium water

In an experiment with mice (line Balb/c), which were irradiated by a 1000 rad dose, and then drank the low deuterium water, it was observed:

- increase in life expectancy
- less dramatic decrease in body weight compared with control animals

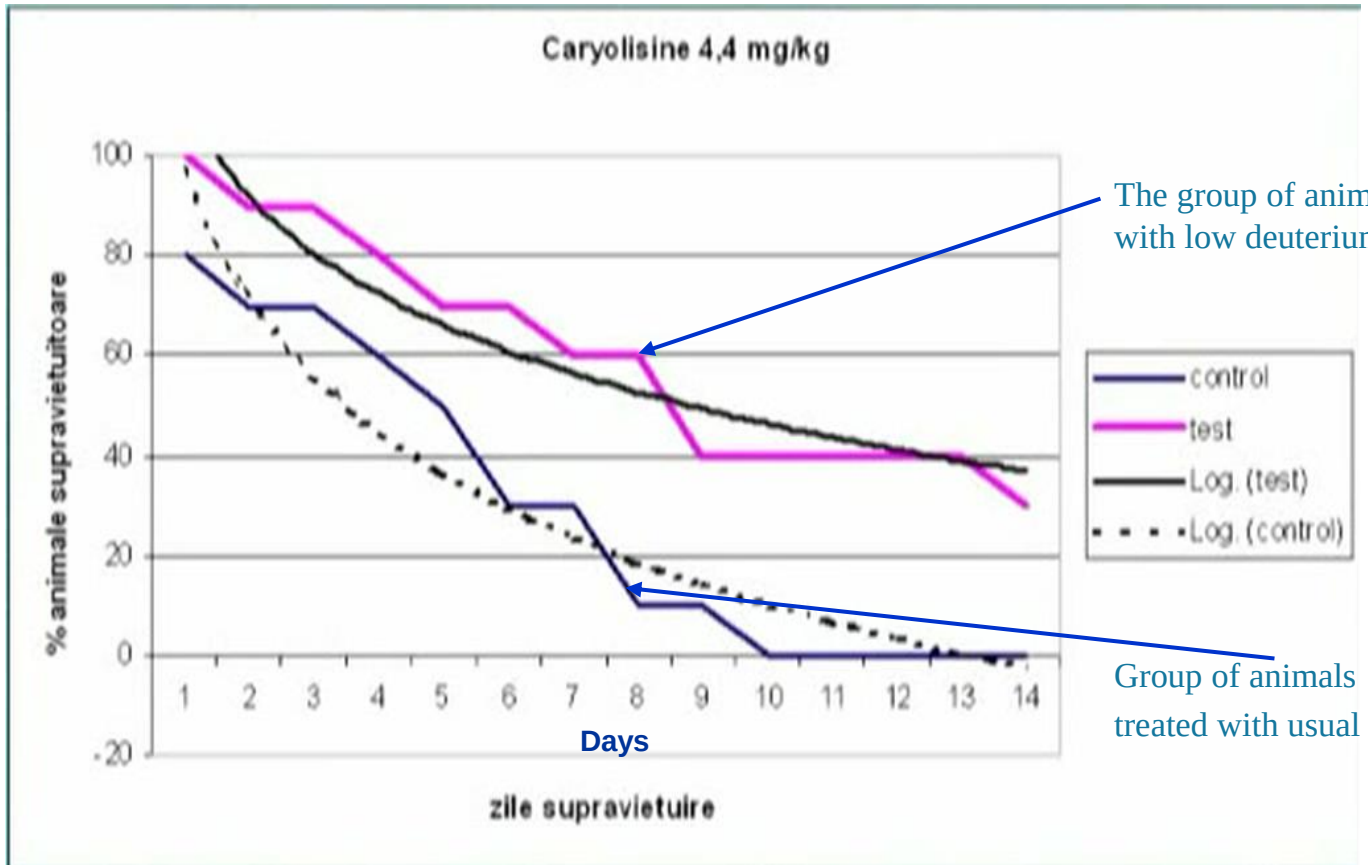
In mice (line Balb/c), which were irradiated by a dose of 550 rad and then drank the low deuterium water it was observed:

- increase in life expectancy
- increase in thymus weight compared with control animals
- decrease in mortality percentage in comparison with control group

Institute of medico-biological research in cooperation with Research institute of cancerogenesis Russian Academy of Science.

Radioprotective properties of low deuterium water

Survival of test animals after sublethal doses of radiation

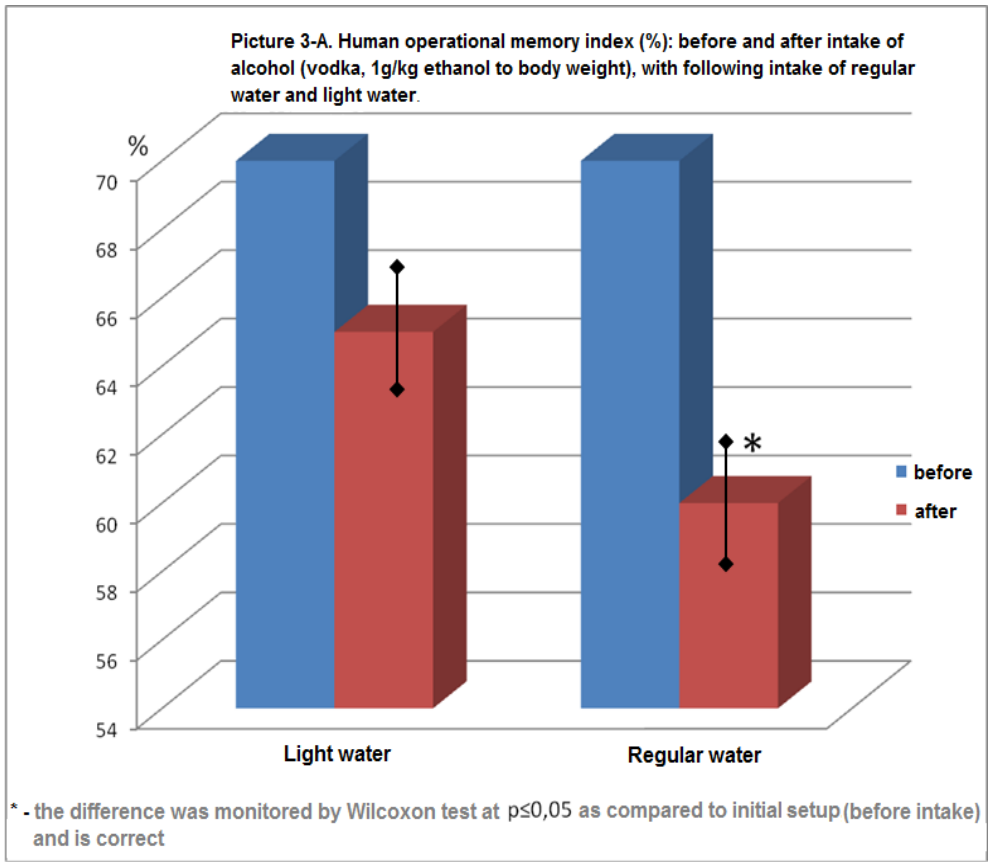


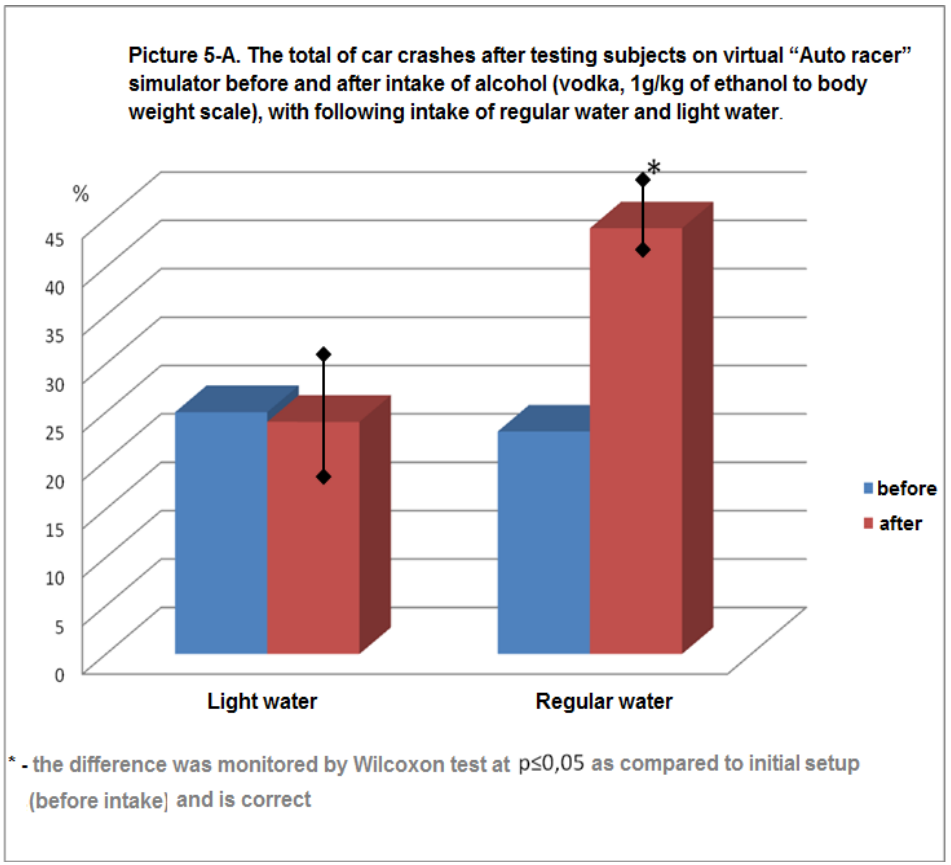
W. Bild, V. Bild, I. Haulica Environmental deuterium and cell proliferation: implications in radiobiology. 1st International Symposium on Deuterium Depletion 13-14 May 2010, Budapest, Hungary

Low deuterium water shows its radioprotective properties by reducing the damage caused from radiation exposure

Protection from the negative effects of alcohol

Human reaction adequacy after ingestion alcohol and drinking low deuterium water afterwards





Russian NHS narcology research center. Laboratory of toxicology.

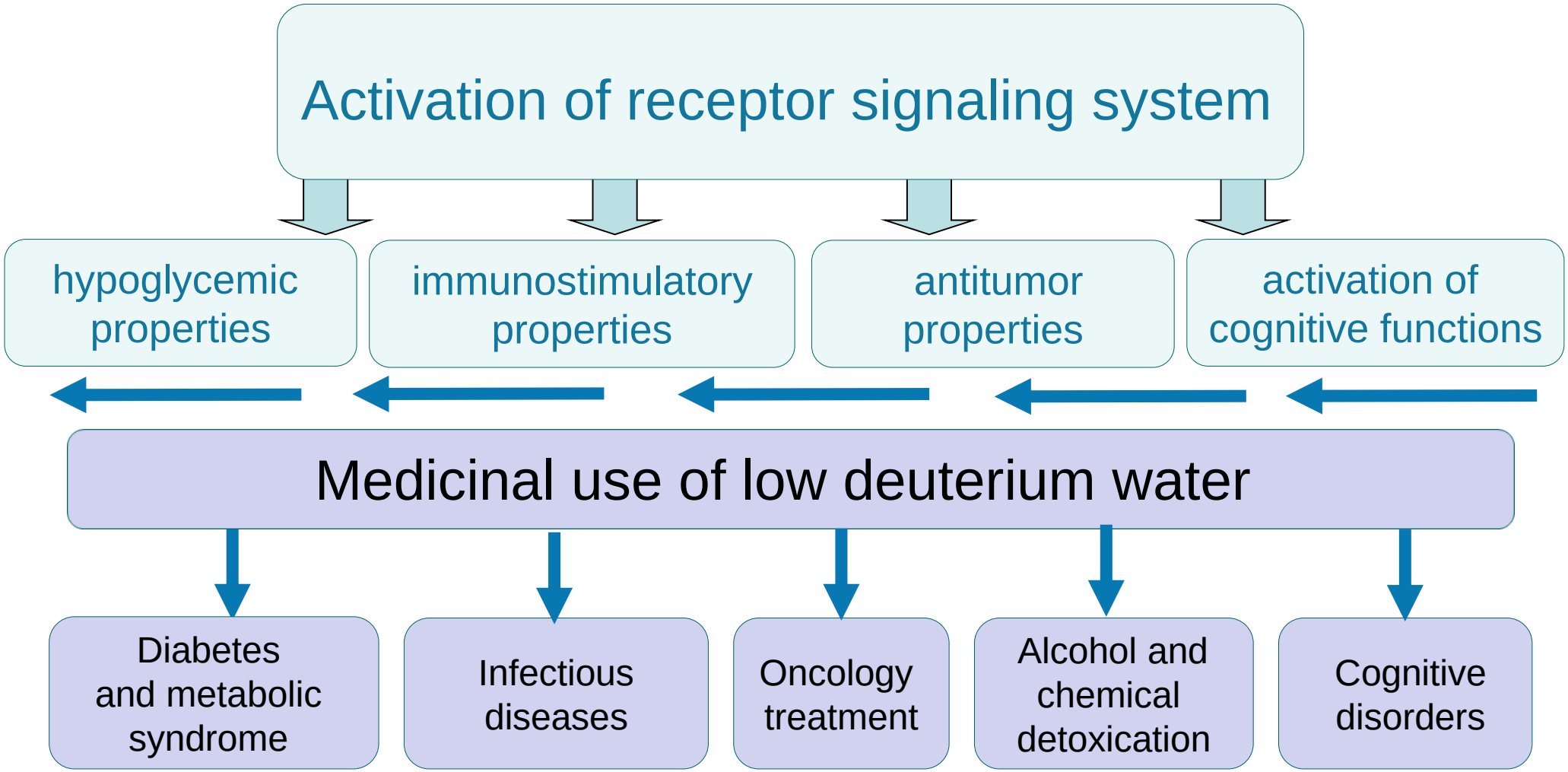
All tested subjects reported little or no hangover at all when taking low deuterium water after drinking alcohol

Low deuterium water seemingly normalises psycho-physiological functions during post-intoxication period

Conclusions

Drinking the low deuterium water can significantly reduce the impact of toxic factors such as the environment, including radioactive contaminants and alcohol

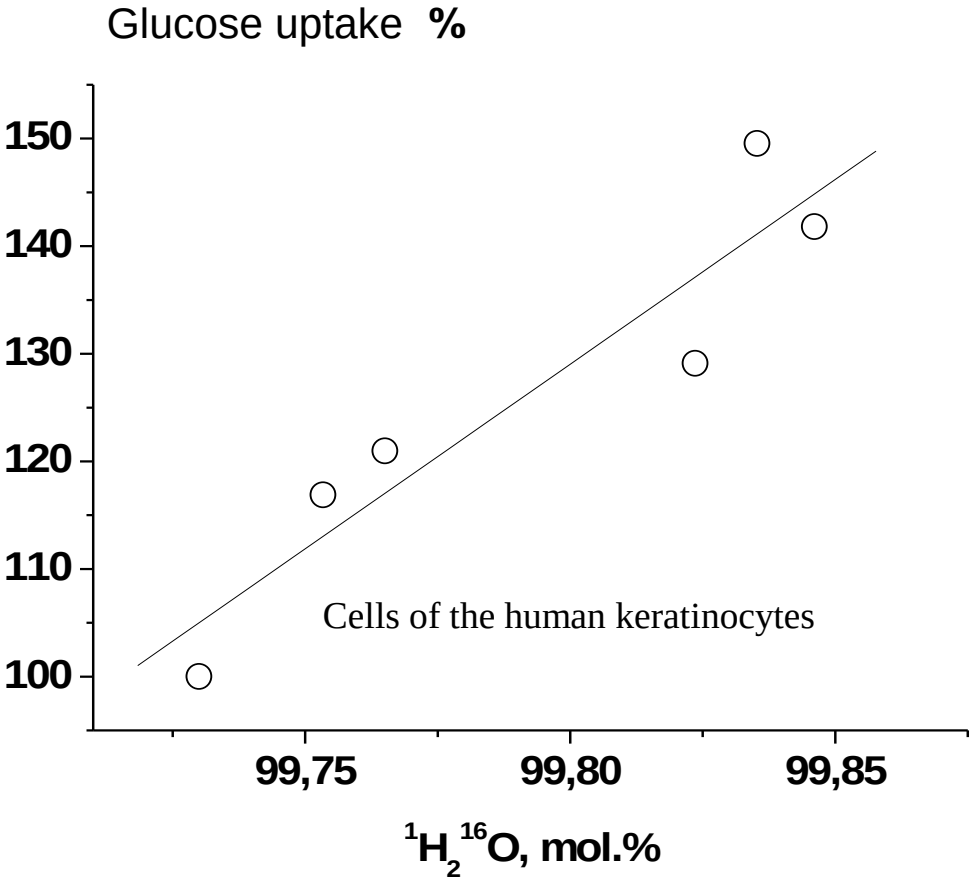
Properties of low deuterium water



Low deuterium water can be used as an additive to medical nutrition and help potentiate the curative effect in complex treatment of various disorders

Hypoglycemic properties

The dependancy rate of glucose uptake by cells with different measures of "lightness" of water

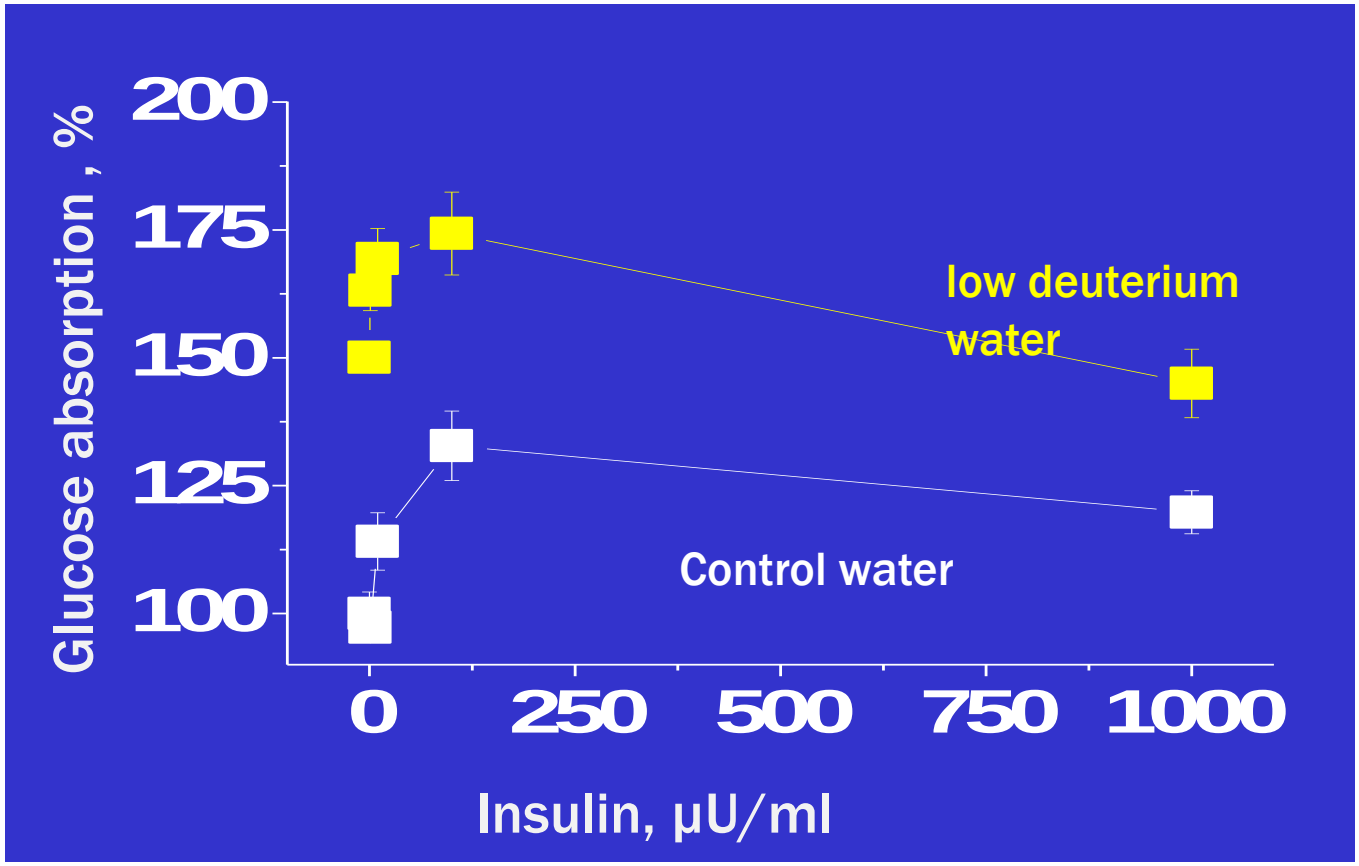


FMBA Russia

Reduced glucose uptake in cells is an indicator of metabolic disorders - such as diabetes, metabolic syndrome, increased insulin resistance.

Low deuterium water increases the metabolism of glucose

Glucose absorption by cells in presence of insulin

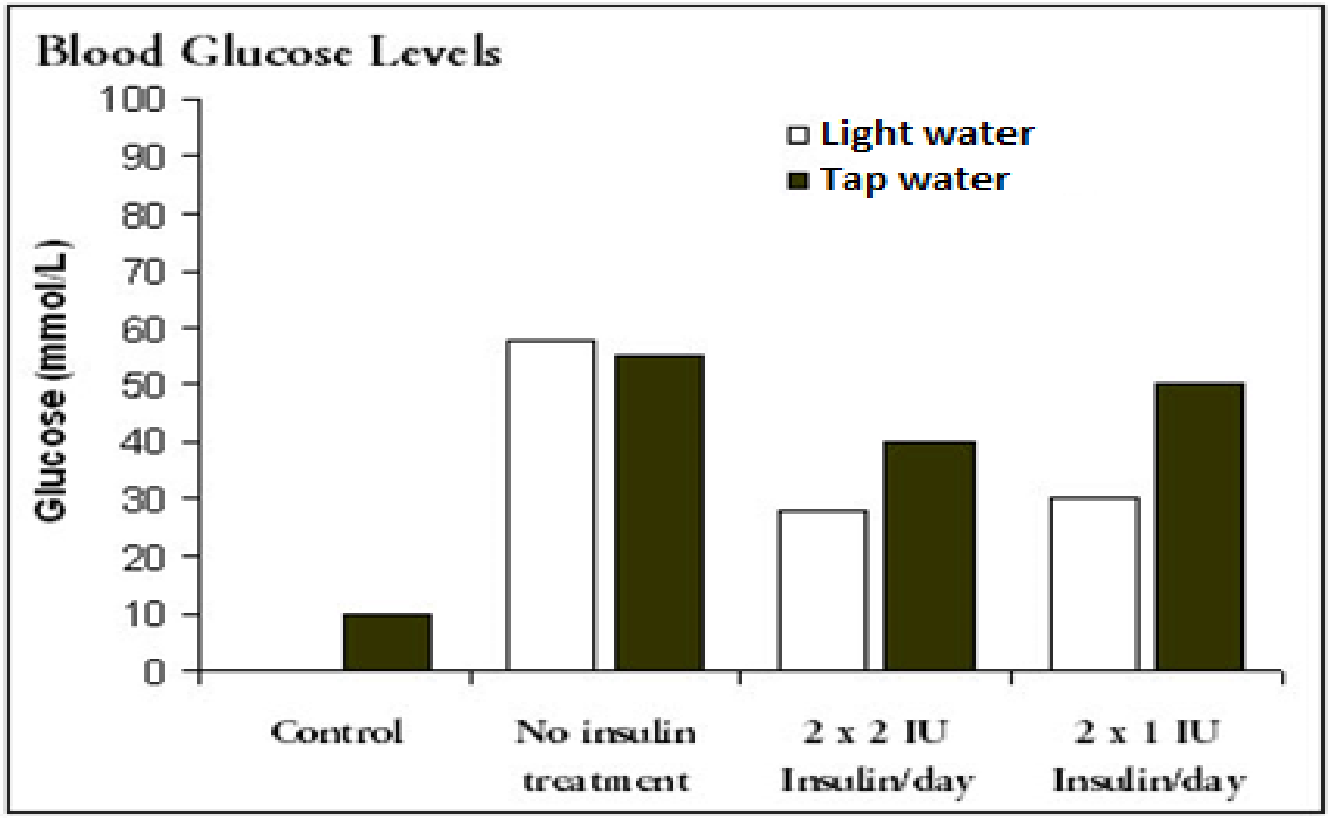


Cells of human cardiomicytes

FMBA Russia

Low deuterium water enhances the perfomance of insulin

Effect of low deuterium water on the metabolism of glucose



M. Molnár, K. Horváth, T. Dankó, G. Somlyai Effect of deuterium oxide (D_2O) content of drinking water on glucose metabolism in STZ-induced diabetic rats
1st International Symposium on Deuterium Depletion13-14 May 2010, Budapest, Hungary

Low deuterium water enhances the perfomance of insulin

Immunostimulatory properties

Protection against infectious diseases

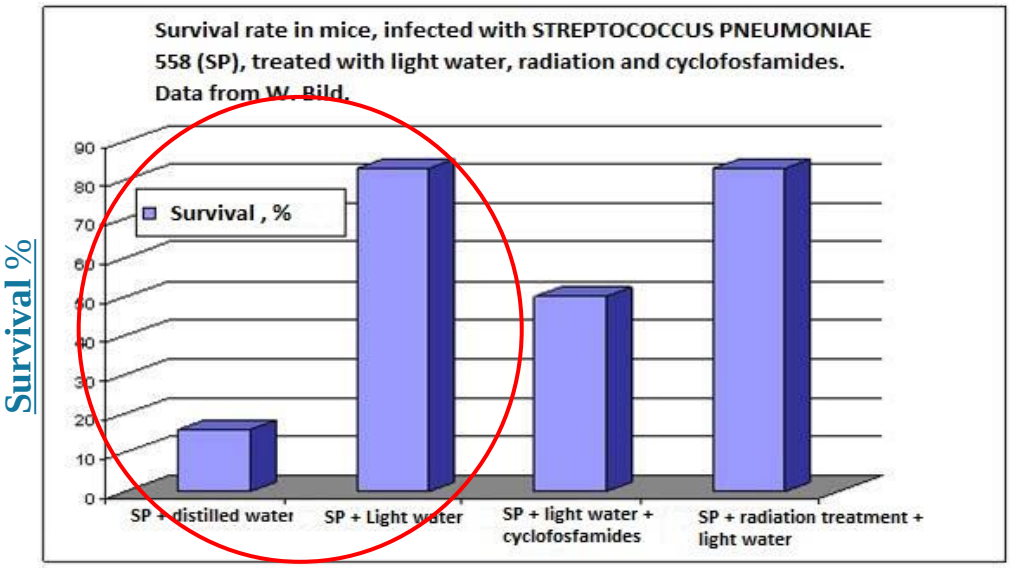
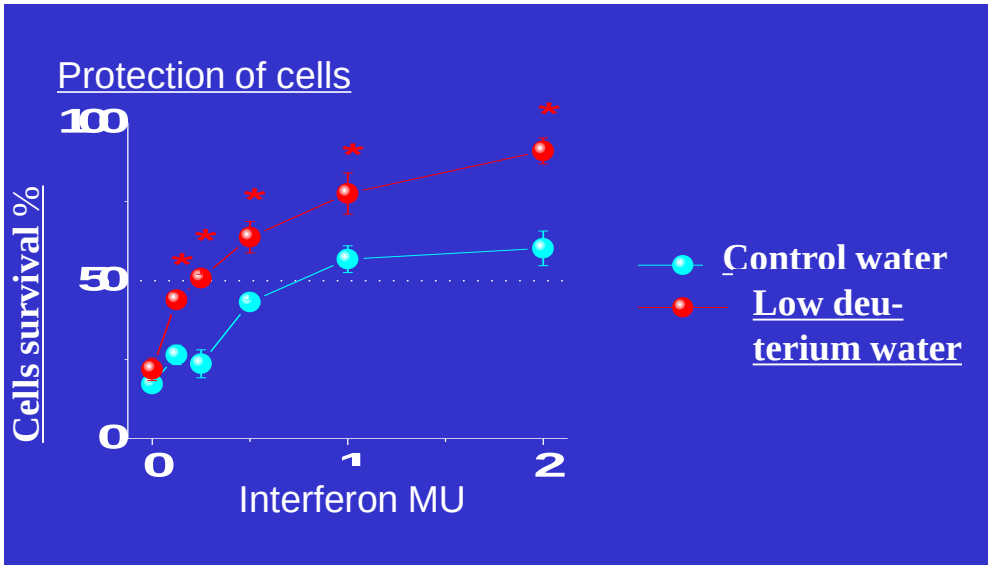


Bild W, Stefanescu I, Haulica I, et al.
Research Concerning the Radioprotective and Immunostimulating Effects of Deuterium-depleted Water.
Romanian Journal of Physiology, 1999 Jul-Dec; 36(3-4): 205-18

The antiviral effect of interferon-alpha



Human epithelial cells

FMBA Russia

Low deuterium water improves immunal activity and enhances the effect of antiviral drugs

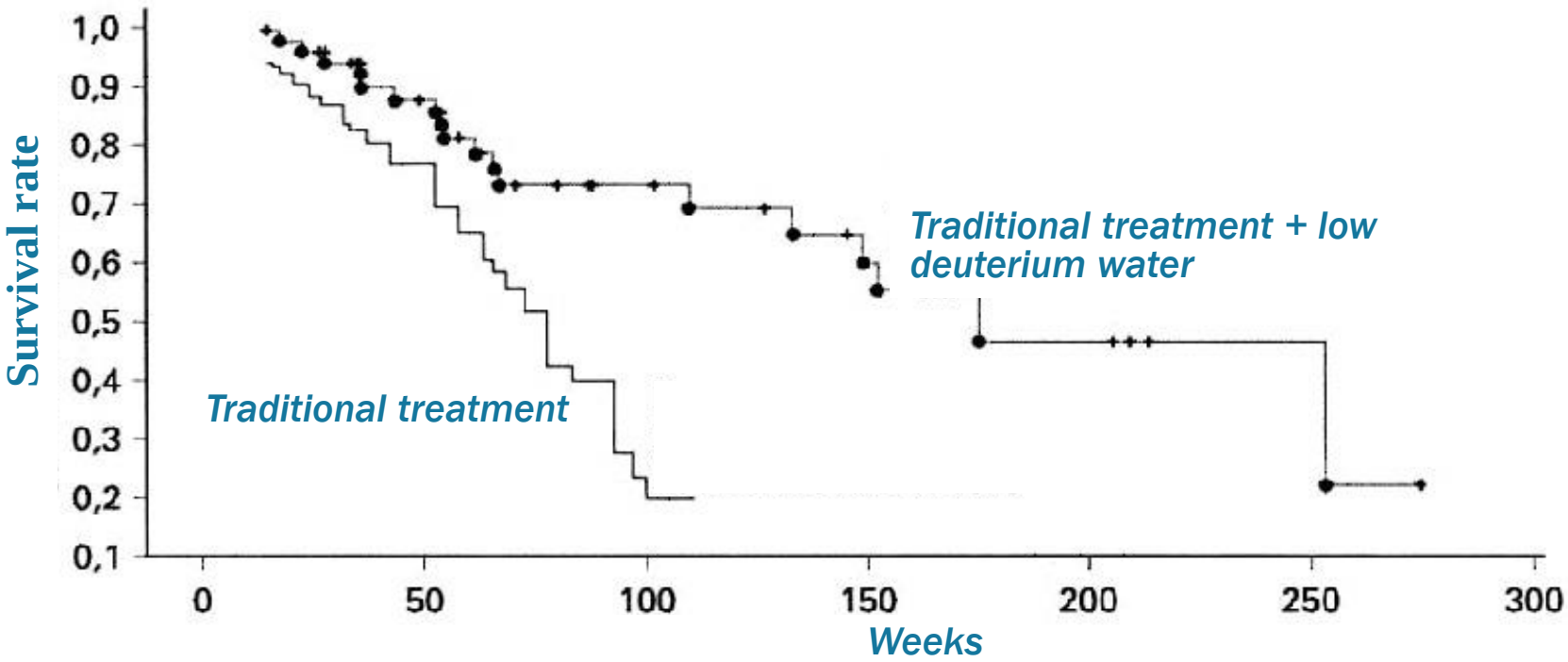
Condition of patients with prostate adenoma (after 4 months of low deuterium water intake, as compared to the placebo group)

Changes in condition of patients	Low deuterium water	Placebo
The decrease in prostate volume (number of patients)	18	11
No change in prostate volume (number of patients)	1	5
The increase in prostate volume (number of patients)	2	5
The overall decrease in prostate volume, cm3	171,6	108,1
The overall increase in prostate volume, cm^3	11,3	54,1

A.Kovács, et al.
Deuterium Depletion May Delay the Progression of Prostate Cancer
Journal of Cancer Therapy, 2011, 2, 548-556

Low deuterium water is an effective tool in supporting therapy of prostatic hyperplasia and prostatitis

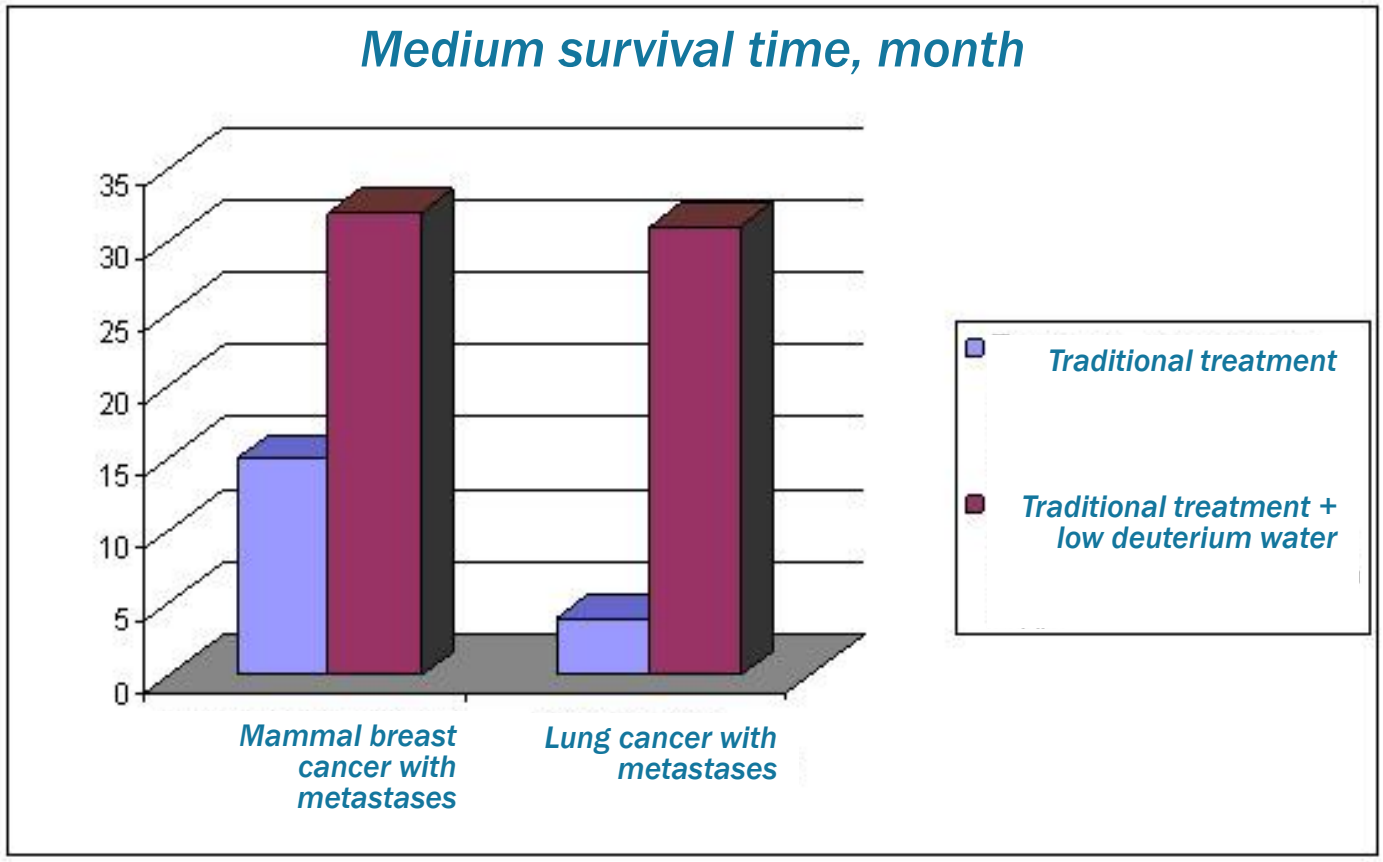
Effect of low deuterium water consumption on the level of survival of cancer patients



Gabor Somlyai, The Biological Effects of Deuterium Depletion, HYD Ltd., 2001

Low deuterium water is an effective additional tool in the complex antitumor therapy

Results of the clinical tests carried out in Hungary

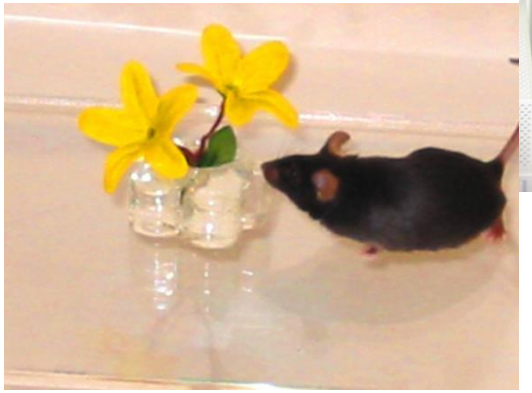


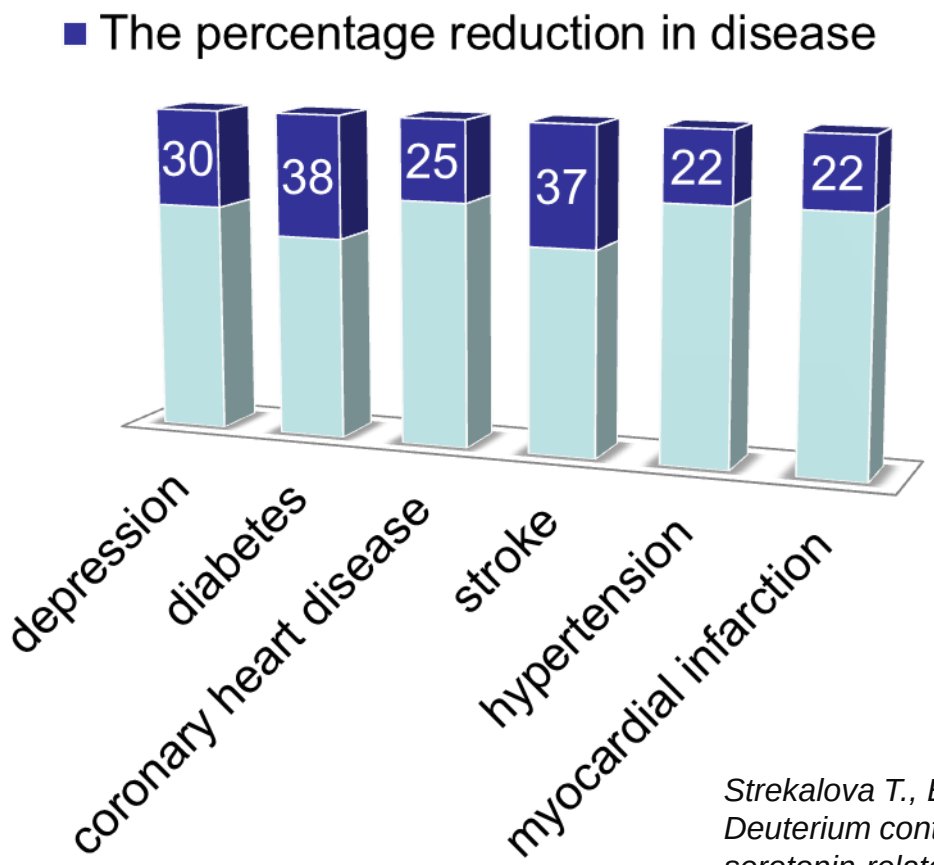
From October 1992 to August 2004 more than 1500 patients with various types of cancer took part in clinical and pre-clinical studies in Hungary

Low deuterium water is an effective additional tool in the complex antitumor therapy

Deuterium content in drinking water and health

Federal epidemiological statistics of the USA, supported by animal studies performed by leading European institutions, shows that reduction of half-heavy water by 10% in drinking water leads to a significant reduction in the incidence of diseases.



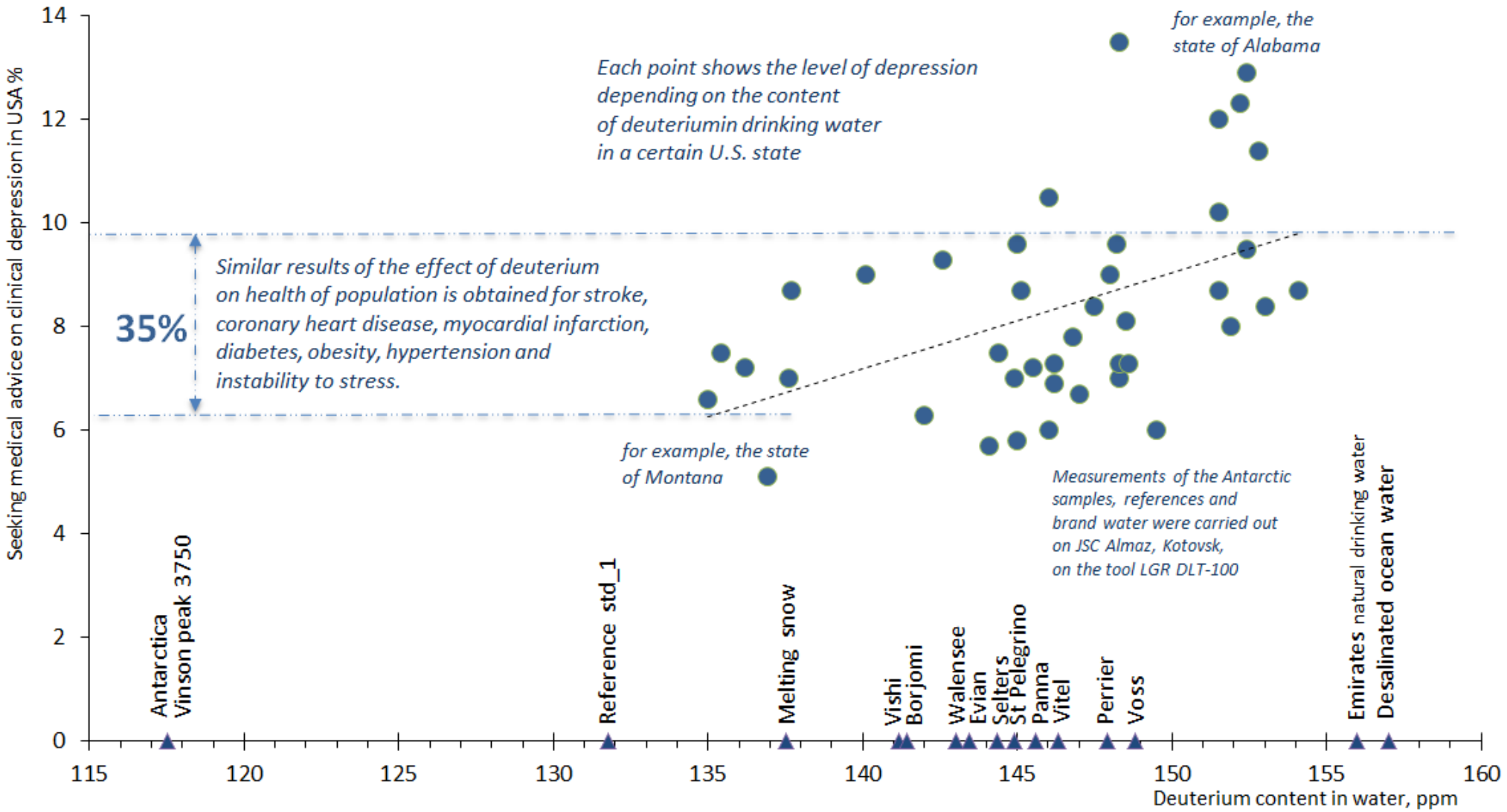


According to the latest published data, reliable correlation between the content of deuterium in tap water and incidence of depression in certain district was established.

Strekalova T., Evans M., Chernopiatko A. et al.
Deuterium content of water increases depression susceptibility: The potential role of a serotonin-related mechanism. // Behav. Brain Res. 2015. V. 277. PP. 237–244.

Hundreds of millions of Americans have formed a basis for reliable statistics

Dependence of the level of depression on deuterium concentrations in drinking water



A causal relationship between the content of deuterium in drinking water and depression is confirmed by results of large-scale experiments on animals carried out under the supervision of the Department of pharmacology, University of Oxford

According to materials of *"Deuterium content of water increases depression susceptibility: The potential role of a serotonin-related mechanism." Behav. Brain Res. 01-2015* and government site for disease control and prevention in USA www.cdc.gov

Conclusions

Substitution of normal drinking water with low deuterium water sharply increases the survival rate and vitality during chronic stress and counteracts a development of a depressive-like syndrome

The effect of low deuterium water is similar antidepressant action or exceeds its

Conclusions

Drinking the low deuterium water offers a promising approach in improvement of human life quality and life span in general

Scientific centers, engaged in researches of properties of LDW

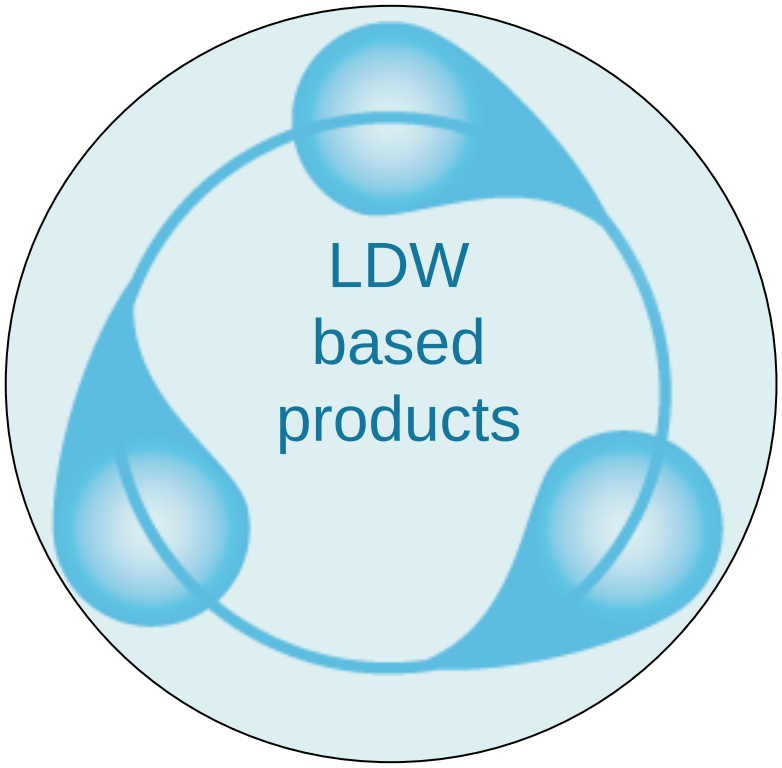
USA	Vanderbilt Medical Center, Nashville TN University of California, SiDMAP LLC., Los Angeles
Hungary	HYD Ltd. for Research and Development, Budapest HYD LLC for Cancer Research and Drug Development, Budapest Semmelweis University Medical School, Budapest University of Szeged, Department of Plant Biology, Szeged Biological Research Center of the Hungarian Academy of Sciences, Laboratory of Functional Genomics, Szeged KFKI Atomic Energy Research Institute, Budapest Alpha-Vet Veterinary Hospital, Székesfehérvár University of Pécs, Department of Public Health & Preventive Medicine, Pécs
China	Shanghai Jiaotong University, Department of Biotechnology, College of Life Sciences and Technology
India	Bhabha Atomic Research Centre, Radiation Biology and Health Sciences Division, Mumbai
Romania	University of Oradea, Faculty of Science, Biology Department University of Medicine and Pharmacy Iaşi, Department of Physiology National R-D Institute for Cryogenics and Isotopic Technologies – ICIT Rm. Vâlcea Oncology Institute “Prof. Dr. Alex. Trestioreanu” University of Medicine and Farmacie „Victor Babes”, Faculty of Veterinary Medicine, Faculty of Animal Sciences and Biotechnologies, Timisoara National Institute of Research-Development for Isotopic and Molecular Technologies, Cluj-Napoca Laboratory of Experimental and Applied Physiology of the Romanian Academy, Iasi S.C. Mecro System S.R.L. Bucharest
Iran	Molecular Research Lab, Department of Pharmacology and Toxicology, Faculty of Pharmacy, Department of Medical Biotechnology, School of Advanced Medical Sciences, Tehran University of Medical Sciences Research Center, Atomic Energy Organization (AEO) Office of Pharmaceutical Research and Development, Food and Drug Administration, Ministry of Health and Medical Education (MOHME), Tehran

Everyday use, and professional spheres

Manual workers

Drivers and pilots

Employess of hazardous industries



Rescue services

Military

Sport

Removal of alcoholand drug addiction

After alcohol and drug detoxication

Production of low depleted water in Russia

LDW is produced by special technology of low-temperature vacuum rectification in columns up to 17 meters high.

Columns for production

Control of isotopic composition

The bottling line

Water storage tanks

The world's only production of LDW was created in Russia.

The manufacturer of LDW is JSC Almaz (Russia, Tambovskaya district, Kotovsk)

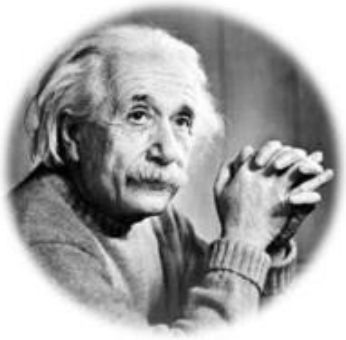
Accomplished by our team

- We came up with a scientific definition of low deuterium water and it's properties, both exact and expanded definition were given
- We brought up the concept of low deuterium water as a product of universal value
- Systematic collection and evaluation of information about the effects of low deuterium water with different isotopic compositions is an achievement of our team
- We created our own research unit for studies of physical and biological properties of low deuterium water
- We put together a package of international intellectual property rights
- Went all the way from experimental prototype to full scale industrial technology for low deuterium water manufacturing
- We own a unified, standardised and certified low deuterium water manufacturing factory (with no world analogues), fully assembled and operational
- For the first time in the world, we used the method of laser absorption spectroscopy for measurement of isotope-modified water
- New certificated products for humans and animals with low deuterium water are already introduced to the market by our team

It works
even if you don't
believe in it

Niels Bohr

A view on different discoveries by absolute opinion leaders



«There are no indications at all than atomic energy will one day be available to the humanity»

Albert Einstein, 1932

«Cinematograph possesses no commercial value»

Auguste Lumiere, 1895

«A rocket will never be able to reach the moon»

Nikola Tesla, 1932

«One should not waste time on developing the ideas of television»

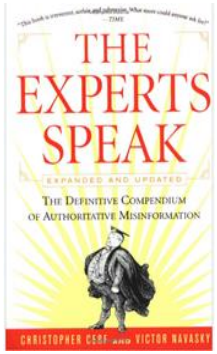
L. Forrest, vacuum tube inventor, 1926

«I get annoyed by the people who write about rockets that can fly from one continent to another.»

USA presidential advisor on technology and science V. Bush, 1945

«There can't be any reasons for a man to have a personal computer at home»

President of Digital Equipment Corporation, 1977



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