5th International Congress on Deuterium Depletion

April 22-23, 2026, Budapest

Welcome

Dear Colleagues,

It is a great pleasure to welcome you to the 5th International Congress on Deuterium Depletion, taking place in Budapest on April 22-23, 2026.

After the success of the four previous conferences, this fifth congress gives the researchers and medical practitioners another unique opportunity to get acquainted with this expanding field of science and share their results and experience about the research of the biological and physiological importance of the naturally occurring deuterium, and also about the medical and therapeutic relevance of deuterium depletion. In this context, our goal is to provide a comprehensive and global update on the latest results and developments in deuterium depletion research. We encourage scientists and medical experts worldwide to submit papers on deuterium depletion research in the fields of cancer research, oncotherapy, diabetes research, physical performance, health preservation, and anti-aging, and share their knowledge and experience with the broader scientific community.

I am pleased to see that more and more scientists from leading universities and institutes have joined our scientific work worldwide, and many companies have become involved in the research and development of deuterium-depleted nutritional and pharmaceutical products. There is a massive demand for these types of development and treatment modalities because our world, even the most developed countries, is struggling with the continuously increasing number of patients suffering from tumorous and metabolic diseases, and with their health care. Being members of this scientific community, we are all partners in this endeavour. In my view, nothing is more important in the present world than the striving for finding a sustainable, effective, and harmless way of prevention and treatment, because cancer burden is rising globally, exerting a significant strain on populations and health systems. To avert this situation, we require the collaboration of as many scientists and medical experts as possible worldwide. Let us imagine that and build a better future for the next generations!

Gábor Somlyai PhD
HYD LLC for Cancer Research and Drug Development
Chair of the Scientific Committee
5th International Congress on Deuterium Depletion

Congress Overview

General information

After the success of the previous four congresses on deuterium depletion, which took place in 2010, 2012, 2015 and 2019, this fifth congress wishes to give the researchers and medical practitioners a unique opportunity to get acquainted with this expanding new field of science and share their results and experience. We invite applicants to submit papers about their research of deuterium depletion in the main fields of cancer research, oncotherapy, diabetes and anti-aging research. Participants are expected to give a 10-20 minutes presentation on their work and take part in a group discussion/ Question & Answer period following their presentation

Scientific Committee:

Gábor Somlyai PhD
HYD LLC for Cancer Research and Drug Development, Hungary

Roman Zubarev PhD, Professor
Karolinska Institutet, Department of Medical Biochemistry and Biophysics, Sweden

Daniel Anthony PhD, Professor
University of Oxford, Department of Pharmacology, UK

László G. Boros MD, PhD
Retired Professor of Pediatrics, University of California Los Angeles,
School of Medicine, USA

FengSong Cong PhD
School of Life Sciences and Biotechnology, Shanghai Jiao Tong University, China

Valentin Lobyshev DSc, Professor
Lomonosov Moscow State University, Department of Biophysics
at the Faculty of Physics, Russia

Gábor Jancsó DSc
Centre for Energy Research, Hungarian Academy of Sciences, Hungary

Gábor I. Csonka DSc, Professor
Budapest University of Technology and Economics, Hungary

András Papp PhD
Department of Public Health, Faculty of Medicine, University of Szeged, Hungary

Main Topics of the Congress

Deuterium Depletion in Cancer Research and Oncotherapy
Deuterium Depletion in the Research of Metabolic Diseases including Diabetes
Deuterium Depletion in Anti-Aging Research and in Physical and Mental Health

Organisation

Organizer of the Congress:

HYD LLC FOR CANCER RESEARCH AND DRUG DEVELOPMENT
postal address: H-1119 Budapest, Fehérvári út 79.

WEB: www.hyd.hu, www.preventa.hu, www.vetera.hu

Phone: +36 1 365 1660, +36 1 381 0765

Organizing Committee:

Ildikó Somlyai, MSc, HYD LLC
Beáta Zs. Kovács, PhD, HYD LLC
Dóra Somlyai, BSc, HYD LLC
Noémi Túri, BBA, HYD LLC
Csaba Varga, BSc, HYD LLC
Zsuzsanna Sári, HYD LLC

Thought Partner of the Congress:

LUZHOU YU QUAN DEUTERIUM DEPLETED WATER CO., LTD

Professional Congress Organiser of the Congress

ALTAGRA BUSINESS SERVICES AND TRAVEL AGENCY LTD.

Postal address: H-1118 Budapest, Csukló utca 6/a., HUNGARY
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E-mail: icdd2026@altagra.hu
WEB https://www.altagra.hu/

Conference secretariat:

Éva Prieszol
Cintia Pintér

General information

Venue of the congress:

Novotel Budapest Danube

Address: H-1027 Budapest, Bem Rakpart 33-34., Hungary

Tel: +36 1 458 4900

Parking at the venue- EUR 15/day

Free WIFI is available at the Hotel. The network name is ‘NOVOTEL’. After connecting, a new page will open. Please scroll down and select the ‘Wi-Fi Standard: 24H Pass’ option.

Registration & Hospitality Desk

The Registration desk will operate throughout the meeting in front of the conference room in the Novotel Budapest Danube at the following hours:

- 22, April 2026 - 11:00-19:00 hrs
- 23, April 2026 - 8:00-17:30 hrs

The organizers kindly ask the participants to please come to the registration desk first. They are also kindly requested to wear their name badges until the end of the congress.

Congress room

Parliament- Europa- meeting room located on the 1st floor

Public transportation in BUDAPEST- MOBIL APP: BUDAPEST GO

IOS

ANDROID

The nearest metro station from the venue is at Batthyány square on line M2, just 250 m away. GPS: 47.508529, 19.039137

Budapest Airport – Flights and travel info: https://www.bud.hu/en

IOS

ANDROID

Emergency Number: 112

Banking and Exchange

The Hungarian currency is HUF. Foreign currency may be changed at banks during normal banking hours, at hotels, at the airport and in exchange offices. All major credit cards are accepted in hotels, shops, restaurants

Language: The official language of the Congress is English.

Insurance

The organisers accept no responsibility for any injury, damage, or loss sustained by participants or to their personal belongings during the Congress. Participants are strongly advised to obtain appropriate travel and health insurance**.**

The event will be recorded on video, audio and video in accordance with the provisions of the Civil Code on public participation and public recording. The purpose of the recordings is to record the organizers' events and to verify that the events have taken place. The recordings may also be published on the organisers' websites, publications and social media platforms.

Scientific Program

April 22, 2026, Wednesday, 14:00-18:20

12:00-		REGISTRATION, WELCOME LUNCH
14:00-15:30		**SESSION 1. Session chair: Gábor Somlyai**
14:00-14:10		OPENING REMARKS
14:10-15:00	1	Roman A. Zubarev Karolinska Institutet, Stockholm, Sweden ACTIVE ROLE OF STABLE ISOTOPES IN BIOLOGICAL PROCESSES – DEUTERIUM AND BEYOND
15:00-15:30	2	Gábor I. Csonka Department of Physics and Engineering Physics, Tulane University New Orleans, LA 70118 GENE EXPRESSION IN A549 LUNG ADENOCARCINOMA CELLS IN RESPONSE TO CHANGES IN DEUTERIUM CONCENTRATION
15.30-16.00		COFFEE BREAK
16:00-18:20		**SESSION 2. Session chair: Roman Zubarev**
16:00-16:30	3	István Fórizs Institute for Geological and Geochemical Research, HUN-REN Research Centre for Astronomy and Earth Sciences, Budapest, Hungary AN OVERVIEW OF DEUTERIUM VARIABILITY IN THE GLOBAL WATER CYCLE AND IN SOME RELATED NATURAL MATERIALS
16:30-17:00	4	Valentin I. Lobyshev Faculty of Physics, Lomonosov Moscow State University, Moscow, Russia THE BASIC PRINCIPLES FOR ISOTOPIC EFFECTS OF DEUTERIUM, CONTAINING IN WATER ON BIOLOGICAL SYSTEMS
17:00-17:50	5	Gábor Somlyai HYD LLC for Cancer Research and Drug Development Budapest, Hungary THE IMPACT OF DEUTERIUM ON CELL CYCLE REGULATION, GENE EXPRESSION, AND METABOLISM
17:50-18:20		OPEN DISCUSSION WITH PRESENTERS
19:00-		CONFERENCE DINNER

April 23, 2026, Thursday, 9:00-16:30

09:00-11:00		**SESSION 1. Session chair: Gábor Jancsó**
09:00-09:40	1	Anton Chernopyatko Light Water LLC, Moscow, Russia EFFECT OF DEUTERIUM DEPLETION WATER ON INTRACELLULAR PARAMETERS OF CORTICAL NEURONS DURING GLUTAMATE EXCITOTOXICITY
09:40-10:20	2	Tatyana Strekalova Faculty of Sciences, University of Lisbon, Portugal THE STUDY OF MOLECULAR MECHANISMS UNDERLYING LATE-LIFE DEPRESSION AND THE EFFECT OF DEUTERIUM-DEPLETED WATER
10:20-11:00	3	Yuting Liu Luzhou Yu Quan Deuterium Depleted Water Co., Ltd., Luzhou city, Sichuan Province, China RESEARCH PROGRESS AND INDUSTRIAL EXPLORATION OF LUZHOU YU QUAN DEUTERIUM DEPLETED WATER ACROSS MULTIPLE FIELDS
11:00-11:30		COFFEE BREAK
11:30-13:00		**SESSION 2. Session chair: Tatyana Strekalova**
11:30-12:00	4	Zoltán Gyöngyi Department of Public Health Medicine, Medical School, University of Pécs, Pécs, Hungary DEUTERIUM DEPLETED WATER (DDW) AS A NOVEL ADJUVANT THERAPY IN THE SMALL CELL AND NON-SMALL CELL LUNG CANCER
12:00-12:40	5	László G. Boros Department of Pediatrics, Harbor-UCLA Medical Center, UCLA School of Medicine, Los Angeles, USA MEDICAL DEUTENOMICS: HOW FAR WE'VE COME AND THE ROAD AHEAD
13:00-14:00		LUNCH

April 23, 2026, Thursday, 9:00-16:30

14:00-16:30		**SESSION 3. Session chair: László G. Boros**
14:00-14:30	6	Stephanie Seneff Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology, Cambridge MA USA 02139 ARE SMALL HYDROGEN-CONTAINING GAS MOLECULES ESSENTIAL FOR MAINTAINING LOW DEUTERIUM IN MITOCHONDRIAL WATER?
14:30-15:00	7	Jackoline Milne Independent Researcher, Canada PRAIRIE POLYCULTURE FERMENTED FEED SYSTEMS FOR LOW-DEUTERIUM ANIMAL FOOD PRODUCTION
15:00-15:30	8	Joel Gould Private Practice, Manhattan Beach, California, USA FASTING-MIMICKING DIET AS A METABOLIC FRAMEWORK FOR ENDOGENOUS DEUTERIUM FRACTIONATION
15:30-16:10	9	Gábor Somlyai HYD LLC for Cancer Research and Drug Development, Budapest, Hungary CLINICAL EVIDENCE FOR THE ANTICANCER EFFECT OF DEUTERIUM DEPLETION AND PRINCIPLES FOR ITS INTEGRATION INTO STANDARD CANCER THERAPY
16:10-16:30		OPEN DISCUSSION WITH PRESENTERS, CLOSING REMARKS

Biographies of the Lecturers

Roman Zubarev

Karolinska Institute in Stockholm, Sweden.

Roman Zubarev has from 2009 to present been serving as Professor of Medicinal Proteomics at Karolinska Institute in Stockholm, Sweden. His expertise (i) advanced mass spectrometry; (ii) proteomics-based drug target identification and mechanism-of-action studies; (iii) neurodegenerative disease pathology and biomarker development; (iv) cancer cell biology and anticancer drug mechanisms; (v) single-cell analysis proteomics technologies; (vi) antibody characterization and immunoproteomics; (vii) isotopic effects in biology and biochemistry. After receiving PhD from the Uppsala University, Sweden, Dr. Zubarev, as a post-doctoral fellow at Cornell University (1997-1998), co-discovered electron-capture dissociation in Fred McLafferty's laboratory. Dr. Zubarev has authored nearly 400 peer-reviewed scientific publications, he holds twevle patents. His contributions have been recognized with numerous prestigious international awards, including the Curt Brunnée Award (2006) from the International Mass Spectrometry Society for outstanding contributions to mass spectrometry instrumentation, the Klaus Biemann Medal (2007) from the American Society for Mass Spectrometry for significant early-career achievements, the Gold Medal (2013) from the Russian Mass Spectrometry Society, and the Berzelius Medal in Gold (2024) from the Swedish Chemical Society.

Gábor I. Csonka

Tulane University (USA) and a former Professor of Inorganic and Analytical Chemistry at the Budapest University of Technology and Economics

Gábor I. Csonka is an Adjunct Professor at Tulane University (USA) and a former Professor of Inorganic and Analytical Chemistry at the Budapest University of Technology and Economics, where he served for several decades. He graduated as a pharmaceutical chemist and gained a brief industrial experience at SanofiChinoin and Sandoz. He earned his PhD in computational quantum chemistry at the Budapest University of Technology and, six years later, was awarded the title of Doctor of the Hungarian Academy of Sciences in the same research field. His research has contributed to the development of density functional theory, biomolecular structural studies, and electron density analysis.

Professor Csonka has authored more than 130 scientific publications and has received over 24,000 citations (Google Scholar, 2026). His teaching covers computational chemistry, computing, databases, quantum chemistry, physical chemistry, and general chemistry. His research interests include the development of density functional theory, its applications to inorganic systems and biomolecules, computational chemistry and physics

of solids and molecules, the molecular basis of cancer, and transcriptional (mRNA) studies. He has held visiting and invited academic positions at universities in Austria (Graz), France (Marseille, Montpellier at ENSCM, Lyon at INSA, and Nancy at UHP as PAST Professor), and the United States (Temple University and Tulane University).

István Fórizs

Institute for Geological and Geochemical Research, HUN-REN Research Centre for Astronomy and Earth Sciences, Budapest, Hungary

Graduated as a physicist in 1983 from Lajos Kossuth University (now the University of Debrecen). In the same year, he began his research career at the predecessor of the Institute for Geological and Geochemical Research (HUN-REN Research Centre for Astronomy and Earth Sciences, Budapest, Hungary), where he continues to work today. In 1990, he participated in the establishment of the Stable Isotope Laboratory and began his research in isotope hydrology. He has studied the stable isotopes of hydrogen and oxygen throughout the entire water cycle, from precipitation through surface waters to groundwater, including thermal waters. His research has focused mainly on the Carpathian Basin, but has also extended to regions such as Anatolia (Türkiye) and the Caucasus (Georgia). In addition to isotope hydrology, he has been involved in determining the deuterium content of deuterium-depleted water and organic materials in experiments conducted by HYD Ltd. He received his Ph.D. in isotope hydrology in 1996.

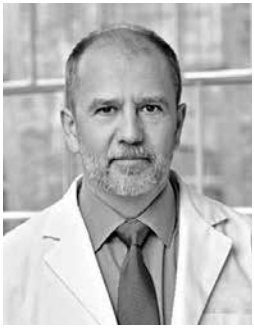
Valentin Lobyshev

Faculty of Physics, Lomonosov Moscow State University, Moscow, Russian Federation

Valentin Lobyshev is a distinguish professor of Lomonosov Moscow State University. He was graduated in 1988uated at Faculty of Physics (MSU) in 1966, PhD in 1974 and Dr. of Sci. in 1988. The title of doctor's dissertation is "Mechanisms of thermodynamic and kinetic isotopic effects of deuterium oxide on biological systems». The results obtained clearly show that deuterium content variation in water including deep deuterium depletion produce various nonlinear isotopic effects on key processes in a cell enzyme activity, activity of mitochondria, regeneration, motility, fertilizing effectiveness an embryo developing.

Gábor Somlyai

HYD LLC for Cancer Research and Drug Development, Budapest, HUNGARY



Gábor Somlyai graduated as a biologist at the University of Szeged in 1982. Between 1982 és 1990 he worked for the Department of Plant Pathology, Plant Protection Institute of the Hungarian Academy of Sciences. From 1983 to 1986 he had a scholarship of the Hungarian Academy of Sciences as a postgraduate student for obtaining PhD. In 1988 he defended his thesis in molecular biology. In the same year dr. Somlyai spent six months at the Georg-August University in Göttingen with a DFG scholarship and from the end of 1988 he held a postdoctoral fellowship at the University of Missouri (Columbia, Missouri, USA), where he worked in the field of genetic engineering and gene mapping. In the wake of the Hungarian Nobel-prize winning scientist Albert Szent-Györgyi - who said that the true cause of cancer should be looked for at the sub-molecular level - dr. Somlyai began his investigations in 1990 as a senior research fellow at the Hungarian Institute of Oncology, examining the biological importance of naturally occurring deuterium. In 1993 he established HYD LLC. for Cancer Research and Drug Development to carry out anticancer research and drug development based on the proprietary procedure, deuterium depletion and to start drug registration. Between 1993 and 1997 he was the scientific director of HYD Ltd., from 1997 he became the CEO of the company. In 2012, he also began serving as the General Director of HYD's mother company, HYD Pharma Inc. In 2000, his book „Defeating Cancer!" appeared in Hungary. Since then, it has been published in Romania, Japan, the USA, South Korea and China. In 2021, his second book, „Deuterium Depletion – A New Way in Curing Cancer and Preserving Health" appeared in print and ebook format in Hungary. Since then, the book has been published in English, German, Chinese, and Japanese. Gábor Somlyai is the inventor of numerous international patents, an author of more than 50 scientific publications, and is a highly sought-after speaker at international conferences.

Anton Chernopiatko

Light Water LLC, Moscow, RUSSIA

Anton Chernopiatko was born in 1965, Moscow, USSR. Graduated from the Moscow Aviation Institute with a degree in Control Systems Engineer.

Since 2003: co-founder of the Center for Biomedical Technologies (CBMT), Moscow, Russia. In collaboration with the Moscow Academy of Medical Sciences CBMT took part in fundamental research on autologous stem cells as well as in clinical trials using biotechnological models for the treatment of lateral myotrophic sclerosis (ALS) and clinical trials using biotechnological models in spinal cord injuries. Studies on the effect of leukocyte depletion on the human immune status are being conducted.

From 2007 to 2013: co-founder of the Center for Innovative Veterinary Medicine. In collaboration with the Moscow State Academy of Veterinary Medicine and Biotechnology this Center participated in scientific and clinical studies of Ittrium-90 radionuclide models for the treatment of cancer (humans and animals, a full working cycle). Since 2012: co-founder of biological cryobank, the largest specialized cryobank in Russia, specializing in preserving fertility cells for cancer patients with more than 15000 samples in the cryogenic storage. Since 2007: founder and Executive Director of the unique factory in Russia producing of Deuterium Depleted Water (DDW). Conducts research on the physical and biological properties of DDW and heavy oxygen-depleted water. In cooperation with Moscow Institute of General Pathology and Pathophysiology various properties of DDW have been examined, including:

- safety of DDW for living organism.

- the impact of DDW on overall productivity in adults, including an increase in the physical effectiveness of professional athletes involved in sports requiring increased endurance (high-stamina sports);

- transport and delivery properties of DDW.

Numerous articles were published on the abovementioned topics while recently discovered properties of DDW on human behavior and mental (conscious) performance are now considered as innovative.

Since 2007 actively has been promoting DDW as a source of natural human well-being.

Tatyana Strekalova

Visiting Fellow in Neuropsychopharmacology

Clinician Scientist at the Department of Psychiatry and Neuropsychology, Annadal Maastricht Medical Center

The research interests of Tatyana Strekalova concern the neurobiology and neuropharmacology of affective disorders resulting from stress, aging, and inflammatory disease. She is also interested in the impact of diet on behaviour and how genetic susceptibilities to affective disorders may be triggered. In particular, she is interested in the behaviours associated with deficiencies in 5-HT synthesis and transporter function. She described the first animal model that identified the existence and molecular basis of individual resilience to stress-induced anhedonia. In addition, Tatyana Strekalova has worked with animal models of neurodegenerative pathologies, such as amyotrophic lateral sclerosis, Alzheimer's disease, and models of ganglioside deficiency, to identify the causes of the subtle early behavioural changes. In a course of these studies, she has investigated the impact of new pharmacological interventions that target glutamatergic systems, insulin receptors, ROS generation and inflammatory pathways. Tatyana Strekalova's discoveries in the field of the inflammatory mechanisms of stress resilience and substantially has led to a substantial improvement and efficacy of translational and screening methods in the field of modeling depression and the discovery of new antidepressants. Tatyana Strekalova's research has led to major advances in the neurobiology of stress resilience and related disease mechanisms in biological psychiatry, and, based on these mechanisms, to the discovery of several new experimental therapies for these conditions.

In 2003, Tatyana Strekalova received funding from the Deutsche Forschungsgemeinschaft (DFG) to build her own group. Over the years her research has been supported by Deutsche Akademische Austausch Dienst (DAAD), Federation of European Biochemical Society (FEBS, European Molecular Biology Organization (EMBO), Tempus/Erasmus European foundation, Russian Foundation of Basic Research, Portuguese Foundation of Science and Technology (FCT), Internationale Stichting Alzheimer Onderzoek (ISAO): International Foundation on Alzheimer's disease research, the Netherlands, NARSAD The Brain and Behavior Research Fund, USA. Recently, she coordinated and led the FP7 and Horizon 2020 work packages of "Aggressotype" (2013-2018), "Eat2beNice" (2018-2023), "PhytoAPP" (2020-2025) and "AquaSynapse" (2022- 2026) Consortia. She has also served as a reviewer for numerous European Research Foundations and Scientific journals.

Over the years Tatyana Strekalova has supervised many PhD students. From 2009-2015, she led a programme of International Exchange and training at Lisbon University that was supported by NENS. She currently runs an international PhD exchange and training programme at Sechenov University and a number of these students have spent time working at the Department of Pharmacology in Oxford.

Yuting Liu

Luzhou Yu Quan Deuterium Depleted Water Co., Ltd., and Master's candidate in Public Administration at Southwest Medical University

She specializes in DDW brand strategy and industrial planning, leading corporate DDW initiatives and coordinating research collaborations with Shanghai Jiao Tong University, The west China hospital, Tea Research Institute of CAAS and other institutions. She was recognized as an Outstanding Individual in Luzhou City Brand Building in 2023. She attends the congress to engage with global experts on cutting-edge DDW research and explore international cooperation.

Zoltán Gyöngyi

Department of Public Health Medicine, Medical School, University of Pécs, Pécs, Hungary

Zoltán Gyöngyi graduated from the University of Debrecen in 1996 with a degree in biology, specialising in molecular biology and genetics. He began his doctoral studies in genetics at the University of Szeged and completed them at the University of Pécs, where he conducted research on tumour biomarkers. His first publication in the field of deuterium-depletion was published in 2000. Between 2003 and 2006, he was a postdoctoral researcher at the CNRS in France, supported by a Marie Curie Fellowship in genetics. Upon returning to Hungary, he resumed his biomarker research at the University of Pécs, where he has been employed since 2001, primarily focusing on cancer prevention. He obtained his habilitation at the University of Pécs in 2017. He has been actively involved in teaching, research, and mentoring the next generation.

Laszlo G. Boros

University of California Los Angeles (UCLA) School of Medicine

Dr. Boros holds the Doctor of Medicine (M.D.) degree from the Albert Szent-Györgyi School of Medicine in Szeged, Hungary and is a retired Professor of Pediatrics, Endocrinology and Metabolism at the University of California Los Angeles (UCLA) School of Medicine. He served as an investigator at the UCLA Clinical & Translational Science (CTSI) Institute, the Lundquist Institute for Biomedical Innovation and the Institute for Women's and Children's Health at UCLA. He was the Chief Scientific Advisor of SiDMAP, LLC, a company involved in metabolic profiling that served various academic, pharmaceutical and government related projects. Dr. Boros is the co-inventor of the stable isotope-based dynamic metabolic profiling (SIDMAP) technology, which is a functional biochemistry tool used for detailed biochemical and deutenomics related drug testing, library screening, lead optimization and in vitro and in vivo phenotype profiling. The core technology involves studying natural and disease/drug-induced variations in stable (non-radiating) isotope distribution patterns and cross talk among metabolites in living systems using 2H- and 13C-labeled glucose and fatty acids as tracer substrates. Dr. Boros co-invented the targeted tracer fate association study (TTFAS) platform to study the oncoisotope role of deuterium and its depletion (deupletion) via mitochondrial matrix water exchange reactions, which prevents oncoisotopic cell transformation by deuterium. He also established the mitochondrial quantum vacuum as the prime driving force for all life-related, energy-producing biochemical events. This occurs via the quantum destabilization of hydrogen ions (protons) in water and gas that are compromised by deuterium, therefore, deuterium depletion is a critical process for maintaining health and longevity.

Dr. Boros trained as a house staff in his medical school in gastroenterology after receiving a research training fellowship from the Hungarian Academy of Sciences. Dr. Boros was a visiting Scholar at the Essen School of Medicine in Germany and also worked as a Research Scientist at the Ohio State University, Department of Surgery. Dr. Boros is the recipient of the C. Williams Hall Outstanding Publication Award from the Academy of Surgical Research of the United States (1997), the Richard E. Weitzman Memorial Research Award from the University of California (2001), the Excellence in Clinical Research Award from the General Clinical Research Center at the Harbor-UCLA Medical Center (2004) and Public Health Impact Investigator Award of the United States Food and Drug Administration (2011). Dr. Boros serves as an associate editor for Springer Nature's journals: Scientific Reports, Scientific Reviews and Metabolomics.

Stephanie Seneff

MIT's Computer Science and Artificial Intelligence Laboratory in Cambridge, Massachusetts, USA.

Dr. Stephanie Seneff is a Senior Research Scientist at MIT's Computer Science and Artificial Intelligence Laboratory in Cambridge, Massachusetts, USA. She has a BS degree from MIT in biology and MS, EE and PhD degrees from MIT in electrical engineering and computer science. Her interests for the past two decades have focused on the role of toxic chemicals and micronutrient deficiencies in health and disease, with a special emphasis on the pervasive herbicide, glyphosate, and the mineral, sulfur. She has authored over 50 peer-reviewed journal papers on these topics. Her book on glyphosate, titled "Toxic Legacy: How the Weedkiller Glyphosate Is Destroying Our Health and the Environment," was released by Chelsea Green publishers on July 1, 2021. This book was selected by Kirkus Reviews as one of the best non-fiction books of 2021.

Since 2019, she has become fascinated with the role of deuterium (heavy

hydrogen) in health and disease, and the potential benefits of deuterium-depleted water to healing. Together with collaborators, she has published several peer-reviewed papers on deuterium's potential role in disease processes.

Jackoline Milne

Independent Researcher, Canada

Jackoline Milne, M.S.M., is an independent researcher, ecological farmer, and practitioner of regenerative livestock management based in the foothills of the Rocky Mountains in British Columbia, Canada. She manages a mixed herd of sheep, goats, and cattle on a 160-acre farm where she develops and experiments with ecological feeding systems designed to restore soil health while producing metabolically supportive animal foods.

Milne was the founder of the Northern Farm Training Institute, an educationa initiative focused on regenerative agriculture, ecological livestock systems, and northern food security. The institute and its facilities were tragically lost during a major forest fire that threatened the community of Hay River in Canada's Northwest Territories. Her work integrates perennial polyculture agriculture, silvopasture, fermentation-based livestock feed systems, and emerging research on deuterium biology and mitochondrial metabolism. Milne was personally trained by Allan Savory at the African Centre for Holistic Management near Victoria Falls, Zimbabwe, where she studied holistic grazing and ecosystem restoration.Her current research explores the intersection of prairie polyculture forage systems, fermented livestock feeds, and the potential influence of ecological feeding strategies on isotopic composition and metabolic quality of animal foods, as outlined in her proposed Prairie Polyculture Fermented Feed Systems framework.

Joel Gould

Private Practice, Manhattan Beach, California, USA

Dr. Joel Gould is a Canadian-trained dentist with over three decades of clinical experience and a background in pediatric and public health dentistry. His clinical work has focused on pediatric craniofacial development, airway health, and sleep physiology, with particular interest in how fat-soluble vitamin signaling and foundational nutrient sufficiency influence dental formation, jaw growth, and upper airway development through epigenetic mechanisms.

His current work integrates mitochondrial biology, fasting physiology, metabolic signaling, epigenetics, and sleep restoration, with an emphasis on fasting-mimicking diets, deuterium handling in metabolism, and mitochondrial efficiency. Dr. Gould is also known for translating complex biological concepts into accessible formats through original visual art, animation, and music, using creative media to communicate foundational science beyond traditional academic settings.

Scientific Abstracts

ACTIVE ROLE OF STABLE ISOTOPES IN BIOLOGICAL PROCESSES – DEUTERIUM AND BEYOND

Xuepei Zhang, Hassan Gharibi, Cameron Borg, **Roman A. Zubarev**

Karolinska Institutet, Stockholm, Sweden

Why is the broad scientific community so stubbornly resistant to the idea that deuterium variations in food and water have significant biological effects? The main culprit of that stubbornness is the dominance of the 1970s paradigm that tissue isotope composition is that of the diet plus a fixed discrimination factor (Δ). This Δ-based model is based on the presumption that isotopes are passive tracers of metabolic processes and that the diet-tissue offset is small and constant across conditions. However, reanalysis of dozens of high-quality datasets from controlled feeding trials and wild populations reveals systematic deviations from this assumption. Rather than displaying a constant offset, tissue isotope ratios converge toward a stable equilibrium (δ_{eq}), as evidenced by consistent sub-unity slopes in δ_{tissue} vs. δ_{diet} regressions. This pattern − confirmed across species, tissues, and isotopes ($\delta^{13}C$, $\delta^{15}N$) − suggests a buffering mechanism intrinsic to metabolic processes.

Instead of the discredited pseudo-constant Δ, we propose a general assimilation model:

$$\delta_{tissue} = a \cdot \delta_{diet} + b,$$

where *a* quantifies physiological resistance to isotopic perturbation. Monte Carlo simulations support this behavior as non-random and systemic. These findings challenge the core assumption of isotope neutrality and demand a paradigm shift to a dynamic model that reflects active metabolic regulation by stable isotopes. This new perspective also redefines how stable isotope data should be interpreted in biological systems [1].

Experimentally, we found that commensurable to natural enrichment and especially depletion of ^{2}H, ^{13}C, ^{15}N and ^{18}O in *E. coli* bacteria growth media significantly affected the phenotype and longevity of *C. elegans* worms feeding on them. Upending the long-standing paradigm of stable isotopes' passive role, ultralight worms grown on isotopically depleted media matured and moved faster, grew bigger but lived markedly shorter lives, while isotopically heavier worms became smaller but lived somewhat longer. These findings provide a new modality of affecting organism phenotypes and confirm active role stable isotopes play in life circle and longevity [2].

Therefore, both the reexamination of published datasets and new experimental evidence reject the passive isotope model and give credence to the biological role of deuterium-modulated diet. The broad scientific community is thus on a brink of a dramatic paradigm shift.

1. Zubarev, R. A. *Is it time to retire Δ? BioRxiv,* https://doi.org/10.1101/2025.06.13.659563

2. Zhang, X.; Gharibi, H.; Beusch, C. M.; Meng, Z.; Saei Dibavar, A.; Gaetani, M.; Zubarev, R. A. *Do light eaters live shorter lives? The case of ultralight Caenorhabditis elegans*, BioRxiv, https://doi.org/10.1101/2024.02.13.580069

GENE EXPRESSION IN A549 LUNG ADENOCARCINOMA CELLS IN RESPONSE TO CHANGES IN DEUTERIUM CONCENTRATION

[1] **Gábor I. Csonka**, [2] András Papp, [3] Ildikó Somlyai, [3] Gábor Somlyai

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While deuterium-depleted water (DDW) has shown anticancer effects in preclinical and clinical studies, its influence on cancer-associated gene expression networks remains incompletely characterized. We analyzed A549 lung adenocarcinoma cells cultured across four deuterium concentrations (40, 80, 150, and 300 ppm) using NanoString nCounter profiling [1]. Expression data were processed through multistep filtering, symbolic trajectory encoding, densitybased spatial clustering (DBSCAN) to identify extreme expression responders, and Gaussian mixture modeling (GMM6) to resolve coordinated geneexpression modules [2].

Our results identify deuterium concentration as a distinct modulator of the oncogenic transcriptome in A549 cells. Deuterium enrichment amplifies gene expression signatures linked to inflammation and invasion, whereas moderate depletion correlates with the systematic downregulation of key survival networks. Specifically, the suppression of *ABCB1, FGFR4*, and *MMP9* under depletion uncovers a potential transcriptomic vulnerability in the multidrug resistance and invasive machinery driven by the *KRAS/STK11/KEAP1* genotype. By resolving these dynamics through GMM 6 clustering and DBSCAN outlier detection, we have found an expression window where metabolic constraints appear to counteract constitutive oncogenic drivers. Consequently, these data support a model in which deuterium depletion functions not merely as a general stressor, but as a candidate metabolic intervention, offering a transcriptomic rationale for re-sensitizing aggressive, drug-resistant tumors [2].

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AN OVERVIEW OF DEUTERIUM VARIABILITY IN THE GLOBAL WATER CYCLE AND IN SOME RELATED NATURAL SUBSTANCES

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This paper provides an overview of the deuterium content of naturally occurring substances, with a particular focus on water, the most important deuterium source for living organisms. The deuterium content of terrestrial waters ranges from approximately 90 ppm to 160 ppm. The most deuteriumdepleted waters occur in polar regions where they are present primarily in frozen form, such as the ice sheets of Greenland, Antarctica. In contrast, lakes highly affected by evaporation (e.g. Chad, Van) and the world's oceans contain the highest deuterium concentrations.

The deuterium content of precipitation follows a wellestablished global pattern: Dcontent decreases from the Equator toward the poles and from sea level to highelevation mountain regions. Air temperature is the primary driver of this variation. As a result, the seasonality of deuterium content in precipitation is also considerable. For example, in Hungary, precipitation ranges from about 127 ppm in the cold winter months to approximately 153 ppm during the hot summer.

The deuterium content of subsurface waters generally reflects the global patterns observed in precipitation, with the exception of certain largescale regional groundwater flow systems and groundwaters older than 10,000 years that infiltrated during the last Ice Age.

Other natural substances: Both marine and terrestrial plants contain several percent less deuterium than the water on which they grow. Common fuels—such as natural gas and crude oil—are further depleted in deuterium relative to plant material. The most deuteriumdepleted natural substance is geological hydrogen gas.

THE BASIC PRINCIPLES FOR ISOTOPIC EFFECTS OF DEUTERIUM, CONTAINING IN WATER ON BIOLOGICAL SYSTEMS

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Water containing large amounts of deuterium is a strong inhibitor of many biochemical and physiological reactions in living organisms. Water containing 30% deuterium is considered incompatible with mammalian life. However, it cannot be considered a poison, as the observed effects are generally reversible, and simple single-celled organisms can survive in concentrated heavy water after a period of adaptation. Unexpectedly large bi-

ological isotope effects in water with slightly enriched deuterium content were observed as early as 1933-1936. Both inhibition and activation of various functions were observed in different samples. We have shown that, due to natural fractionation of water isotopes in Arctic ice, an increase in growth is observed with both increasing and decreasing deuterium content in ice relative to its content in ancient ocean water [1]. The first attempts to use deuterium-enriched water as an antitumor drug, which showed encouraging results, were made as early as 1938. Renewed work 19 years later confirmed an increase in the lifespan of sick animals when they consumed water with an increased concentration of deuterium [2]. The use of water with a reduced concentration of deuterium as an antitumor drug was initiated by G. Somlyai [3] and is currently actively developing in various fields of biology

The first task to explain isotopic effects of deuterium in water is to understand biopolymer transformations, which may occur during variation of deuterium content in water. The average amount of deuterium in ordinary water is about 150 ppm. In the range of threefold variation of deuterium (50-450 ppm) all water molecules are in HOD form. The amount of D_2O molecules is about 200 times lower, and they can be neglected. H-D exchange reactions between water and functional groups of biopolymers as OH, NH, SH happen quickly. On contrary, CH groups of biopolymers can change protium for deuterium by biosynthesis including enzyme catalysis. The fractionation coefficients for these groups are as follows: OH – 1.0, NH – 0.92-0.97, SH – 0.40-0.46, and CH (sp^3) – 0.84-1.18. At this stage, we can already see the diversity of isotopic effects, as the SH groups are “lightened” and the CH groups are predominantly enriched during H-D exchange in water. Next, it is necessary to consider the primary and secondary kinetic isotope effects, which will also be different for different classes of enzymes. Promising results in the complex system of biochemical processes in the cell can be expected in proteomics technology using analytical methods of NMR and mass spectroscopy to identify the location of deuterium in biopolymers.

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THE IMPACT OF DEUTERIUM ON CELL CYCLE REGULATION, GENE EXPRESSION, AND METABOLISM

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Deuterium (D), the stable heavy isotope of hydrogen, is present in natural waters at approximately 150 ppm and at slightly lower concentrations in living organisms. Experimental studies with deuterium-depleted water (DDW) indicate that the intracellular deuterium-to-hydrogen (D/H) ratio may function as a sub-molecular regulatory factor influencing cell growth, gene expression, and metabolism.

In vitro experiments demonstrated that DDW inhibits cell proliferation, whereas deuterium-enriched water (DEW) stimulates it. Membrane transport systems, including the Na^+/H^+ exchanger and H^+-ATPase, exhibit isotopic selectivity and may influence intracellular D/H ratios. In healthy cells, mitochondrial metabolism likely produces deuterium-depleted metabolic water, helping maintain a low intracellular D/H ratio. In contrast, mitochondrial dysfunction in cancer cells may disrupt this regulation and contribute to uncontrolled proliferation. Gene expression analysis of 236 cancer-related genes and 536 kinase genes revealed that more than 97% showed increased activation in DEW conditions.

The regulatory role of deuterium was also demonstrated in metabolic studies. In streptozotocin-induced diabetic rats, DDW enhanced the metabolic effects of insulin, significantly increasing membrane-associated GLUT-4 and improving glucose uptake. In a 90-day open-label human study involving 30 patients with insulin resistance or impaired glucose tolerance, DDW consumption reduced fasting glucose levels, increased HDL concentrations, and improved early markers of insulin sensitivity.

Together, preclinical and clinical findings support the concept that the naturally occurring concentration of deuterium plays an important regulatory role in biological systems, influencing cell proliferation and metabolic homeostasis.

EFFECT OF DEUTERIUM DEPLETION WATER ON INTRACELLULAR PARAMETERS OF CORTICAL NEURONS DURING GLUTAMATE EXCITOTOXICITY

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The chemical element hydrogen occurs in nature as two stable isotopes: protium and deuterium (D), which differ in their atomic masses. On our planet, the deuterium content in water is on the average one atom of D per 6400 atoms of hydrogen, or 156 parts per million. D is present in the molecules semi-heavy water (DHO) and heavy water (D_2O), occurring in small amounts in natural water. Despite its very low presence , changes in D content in drinking water can affect some processes in biological systems. On the other hand, many central nervous system diseases involve prolonged exposure of the neurons to the primary excitatory neurotransmitter glutamate (Glu), causing hyperstimulation of glutamate receptors. This results in excessive Ca^{2+} ion influx into the cytosol, which can lead to brain damage.

The aim of this study was to investigate the effects of deuterium-depleted (5 ppm, DDW) or deuterium-enriched (300 ppm, DRW) water on neuronal viability, development of Ca^{2+} overload, and mitochondrial depolarization in primary cultures of rat cortical neurons (10-12 DIV) exposed to Glu toxicity. Besides, an analysis of the glutamate-induced decrease in intracellular NADH ([NADH]i) content was performed. Fluorescence microscopic measurements were performed using an inverted microscope Nikon Ti2 (Japan). The saline buffer was prepared in water containing 142 ppm D (control group) and 5 or 300 ppm D. To measure intracellular Ca^{2+} concentration ($[Ca^{2+}]_i$), the cells were loaded with Fura-FF/AM probe, and to measure mitochondrial potential (ΔΨm), Rhodamine123. $[NADH]_i$ was measured using NADH-dependent autofluorescence (Ex 365 ± 5; Em 460 ± 25 nM).

The effect of Glu (100 μM) for 15 min on cortical neurons led to a massive entry of Ca^{2+} into the cells. Delayed calcium dysregulation (DCD, a 2-phase increase in Ca^{2+} in response to Glu) is considered as a process associated with neuronal death. Preincubation of neurons in DDW increased the number of living cells by 20% and decreased those with DCD by 12%, compared to the control group. The lag period (from the onset of Glu action to the secondary rise in Ca^{2+}) was increased by DDW almost twofold. In contrast, the proportion of cells with DCD was increased by 11.5%, and lag period was decreased, in the DRW group. Addition of Glu led to synchronous changes in ΔΨm, and in DRW, the drop in ΔΨm under the action of Glu was significantly, ca.1.5 times sharper than in the control. Thus, a decrease in the D content in the incubation medium protects primary cultured cortical neurons from death under conditions of glutamate excitotoxicity. The neuroprotective effect of DDW (5 ppm) is due to decreased accumulation of calcium in the cytosol and an increase in NADH levels in neurons. In contrast, DRW (300 ppm) promotes intracellular accumulation of Ca^{2+} ions under prolonged action of high dose Glu.

THE STUDY OF MOLECULAR MECHANISMS UNDERLYING LATE-LIFE DEPRESSION AND THE EFFECT OF DEUTERIUM DEPLETED WATER

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Environmental factors, including climate change and geographical factors, can play a role in the development of various diseases, such as late-life depression (LLD). One often overlooked element is deuterium, a stable isotope of hydrogen, whose concentration in drinking water can vary by location (approximately 90–155ppm) and may impact the prevalence of mood disorders. However, the potential effects of natural variations in deuterium levels in drinking water on LLD symptoms and brain gene expression are still unknown. In 18-month-old C57BL/6J mice, serving as a model for LLD, Illumina gene expression profiling on the hippocampus and prefrontal cortex was preformed.. The mice consumed either regular water (~140ppm) or deuterium-depleted water (DDW, ~90ppm) for 21 days. The mice were then examined for LLD-like behaviors, and RT PCR gene expression in the brain was done. Mice consuming DDW showed increased hedonic sensitivity and novelty exploration, reduced helplessness, improved memory, and significant changes in the brain expression of genes such as Egr1, Per2, Homer1, Gadd45a, and Prdx4, among others. These genes exhibited notable changes in several GO-BP and KEGG pathways related to inflammation, cellular stress, synaptic plasticity, emotionality, and regeneration. In an in vitro study, we discovered that incubating primary neuronal cultures in a DDW-containing buffer improved Ca2+ influx and mitochondrial potential in a toxicity model, indicating that mitochondrial mechanisms might be involved in the effects of reduced deuterium levels. Conclusion: a decrease in deuterium intake had modest but significant effects on LLD-related behaviors in older mice, which can be attributed to, though not limited by, improved mitochondrial function and alterations in brain gene expression.

RESEARCH PROGRESS AND INDUSTRIAL EXPLORATION OF LUZHOU YU QUAN DEUTERIUM DEPLETED WATER ACROSS MULTIPLE FIELDS

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This presentation reports the systematic research progress and industrial application achievements of Luzhou Yu Quan Deuterium Depleted Water Co., Ltd. in the multi-field development of deuterium depleted water (DDW), based on the company's proprietary hydrogen isotope separation technology originally developed for national defense purposes.

In the field of oncology, in vitro experiments conducted in collaboration with Shanghai Jiao Tong University and other institutions demonstrated that DDW at concentrations of 25–100 ppm significantly inhibited the proliferation of lung, liver, and gastric cancer cell lines, induced G0/G1 cell cycle arrest, and increased apoptosis rates. Mechanistic investigations suggested that these effects may involve reduced intracellular reactive

oxygen species (ROS) levels and regulation of the p53 signaling pathway. Preclinical safety evaluations completed with West China Hospital of Sichuan University confirmed that long-term DDW consumption had no adverse effects on body weight, organ coefficients, or blood biochemical parameters in animal models. A randomized controlled trial in cancer patients is currently being planned to explore DDW's potential in mitigating radiotherapy and chemotherapy side effects and improving quality of life.

In metabolic disease research, an exploratory clinical study conducted with the Affiliated Hospital of Southwest Medical University enrolled 32 volunteers with metabolic syndrome. After 12 weeks of consuming 1.5 liters of DDW (50 ppm) daily, systolic blood pressure decreased from a baseline average of 126 mmHg to 117 mmHg, and diastolic pressure decreased from 78 mmHg to 73 mmHg. Greater reductions were observed in participants with higher baseline blood pressure. Body weight decreased by an average of 1.2 kg, and waist circumference decreased by 2.1 cm. A 24-week follow-up indicated that blood pressure gradually returned to baseline levels after discontinuation, suggesting that continued DDW intake is required to maintain the effect. A larger-scale, randomized, double-blind, placebo-controlled trial is currently being designed with Sichuan Provincial People's Hospital to further validate these findings.

In skin health research, an internationally validated 3D full-thickness skin model was employed in collaboration with West China Hospital to evaluate DDW's efficacy. After 33 days of treatment with DDW at dilutions of 0.005% and 0.0132%, the following results were observed: epidermal thickness increased by 234.2% ($p < 0.001$) and 79.8%, respectively, showing a dose-dependent effect; Ki-67 positive cell proportion increased by 73.4% and 49.5%, indicating enhanced basal layer proliferation; filaggrin expression surged by 455.8% and 138.8%, demonstrating significant strengthening of skin barrier function; laminin 332 expression increased by 167.1%, reinforcing dermal-epidermal adhesion; and key dermal extracellular matrix components increased, including type I collagen (20.3%), elastin (219.8%), and hyaluronic acid (100.6%). These results demonstrate DDW's multi-target mechanism for skin regeneration, barrier repair, and anti-aging. A filing for DDW as a new cosmetic ingredient has been initiated, and human efficacy studies are underway.

In food processing applications, our research first identified deuterium enrichment in processed foods: analysis of 86 food items across 12 categories showed that fresh ingredients averaged approximately 142 ppm, fried foods averaged 165 ppm, and condiments such as soy sauce and vinegar reached up to 186 ppm. A mouse model fed a high-deuterium diet (200 ppm drinking water plus high-deuterium feed) for three months exhibited 12% lower weight gain, 27% increased blood glucose fluctuation, and 32% decreased hepatic SOD activity, indicating negative metabolic and antioxidant effects. Subsequent industrial applications demonstrated that using 50 ppm DDW in baijiu (Chinese liquor) brewing increased yield by 10%, increased premium product rate by 20%, shortened fermentation by 10 days, increased total ester content by 15%, and reduced fusel oils by 22%. In condiment fermentation, DDW shortened soy sauce fermentation by 15 days and increased amino acid nitrogen content by 25%, while total acid in vinegar increased by 24%. In tea processing, collaboration with the Tea Research Institute of the Chinese Academy of Agricultural Sciences showed that brewing with DDW increased tea polyphenol extraction by 20%, enhanced aromatic compounds, and extended shelf life. A technical standard for DDW application in tea brewing is scheduled for release in 2026.

Taken together, these findings demonstrate that DDW holds significant promise across multiple domains, including cancer supportive care, metabolic health, skin regeneration, and food quality enhancement. Our work covers the complete chain from fundamental research to industrial application. We invite international collaboration to advance multi-center clinical trials, mechanistic studies, and the establishment of international standards, contributing to the broader application of DDW science for human health.

DEUTERIUM DEPLETED WATER (DDW) AS A NOVEL ADJUVANT THERAPY IN THE SMALL CELL AND NON-SMALL CELL LUNG CANCER

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Despite significant advancements in oncological interventions, the overall survival rate for lung cancer patients remains critically low, necessitating the exploration of innovative adjuvant strategies. Recent molecular research indicates that deuterium depletion effectively inhibits tumour cell proliferation and modulates gene expression. This study evaluates the clinical outcomes of 129 patients with small cell lung cancer (SCLC) and non-small cell lung cancer (NSCLC) who received deuterium-depleted water (DDW) as a non-toxic adjuvant to standard-of-care chemotherapy and radiotherapy.

Our results demonstrate a substantial extension in survival metrics. The median survival time (MST) was 25.9 months for male patients and 74.1 months for female patients, indicating a statistically significant sex difference ($p < 0.05$). Notably, patients with brain metastases achieved an MST of 27.1 months, a figure that significantly exceeds historical controls for late-stage metastatic disease. The cumulative 5-year survival probabilities were 19% for males, 52% for females, and 33% for the subgroup with brain metastases. These findings suggest that sub-therapeutic deuterium levels may enhance the efficacy of conventional treatment and provide a potent, non-invasive tool for lung cancer management. Further prospective randomised trials are warranted to validate the role of deuterium depletion in standardised oncological protocols.

MEDICAL DEUTENOMICS: HOW FAR WE'VE COME AND THE ROAD AHEAD

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Deuterium homeostasis in the human body, studied under medical deutenomics, is the new flagship of medical biochemistry, diagnostics and medicine for the 2025 US Health Administration led by Robert F. Kennedy. Significant new developments have occurred with nutritional updates regarding deutenomics, the science of deuterium distribution in living cells and its impact on cellular functions, adaptation, disease and health. Influential scoping reviews and high-profile clinical papers in prime medical and scientific journals

address the direct role of protium-deuterium ratios in disease mechanisms, population disease epidemics (diabetes, Alzheimer's, obesity and more), diagnostics and therapy. The 2026 US food pyramid has been turned upside down to include a deuterium-depleting natural (pastured) ketogenic animal-based nutritional protocol to address severe chronic disease epidemics worldwide. Deutenomics is an anthropological journey into our bone marrow eating carnivore ancestry, proposing an estimated daily deuterium threshold of 105 to 130 ppm for maintaining mitochondrial ATPase function and health in temperate climates. This talk will discuss all the above principles between international academic and US led governmental agencies to establish lead laboratories as part of national deutenomics science research programs and institutes, where Patras University of Greece takes a leading role. This presentation reviews the last 5 to 7 years of medical deutenomics history, editorial processes, reviews and future goals to advance medicine.

Although deuterium-depleted water remains the most efficient and rapid way to initiate deupletion interventions in the human body, nutritional (food-based deutenome) approaches are joining the entire deuterium homeostasis-related scientific, translational and clinical research arsenal to address severe, population-scale disease processes worldwide.

ARE SMALL HYDROGEN-CONTAINING GAS MOLECULES ESSENTIAL FOR MAINTAINING LOW DEUTERIUM IN MITOCHONDRIAL WATER?

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Deuterium is a natural heavy isotope of hydrogen, containing a neutron as well as a proton, making it twice as heavy. Human mitochondrial ATP synthase pumps are highly sensitive to deuterium, causing them to release reactive oxygen species (ROS) and reducing ATP synthesis capacity. Metabolic processes have evolved to devise ways to reduce the deuterium load in the mitochondria, in part, we argue, by exploiting several small hydrogen-containing molecular gases. When a gas is produced, deuterium, due to its extra weight, tends to remain dissolved in the aqueous phase, so the gas becomes deuterium depleted (deupleted). Furthermore, many of the enzymes that synthesize these small gas molecules are designed to exclude deuterium by exploiting proton tunneling. The gut microbes play a crucial role in producing deupleted gas molecules, such as hydrogen gas (H_2), methane (CH_4), ammonia (NH_3) hydrogen peroxide (H_2O_2), and hydrogen sulfide (H_2S). During inflammatory bowel disease (IBD), activated immune cells upregulate NADPH oxidase (NOX) to produce hydrogen peroxide (H_2O_2) in the extracellular space. While this H_2O_2 is viewed primarily as an antimicrobial defence, I argue that it serves a more important purpose through its ability to preferentially carry protons rather than deuterons back across the plasma membrane to deliver them to the cytoplasm of host cells. H_2O_2 readily crosses the mitochondrial membrane as well, and mitochondrial glutathione peroxidase can then convert H2O2 to deupleted water, sourcing another proton rather than a deuteron from NADPH.

In this talk, I will present available evidence from the research literature to argue that gut microbes collaborate with the host cells to produce deupleted gas molecules which then either diffuse across the plasma membrane of human cells or are actively transported into the cytoplasm, and from there into the mitochondria, where they critically supply protons to the ATPase pumps. Furthermore, gut microbes produce deupleted methane gas which is converted to formaldehyde and ultimately becomes methyl groups in the host methylation pathways. This suggests that a singular role of methylation pathways is to distribute deupleted nutrients (the methyl groups) to the mitochondria, systemically. Short chain fatty acids synthesized by the gut microbes, utilizing molecular hydrogen as a reducing agent, can also be expected to be deupleted.

Ammonia is also a potential source of protons rather than deuterons. Gut microbes convert urea produce by the liver into ammonia, which is actively imported into the epithelial cells lining the gut wall and then delivered to the liver for conversion back to urea. Notably, the kidneys excrete the ammonium cation (NH4+) but preferentially retain ammonia as a gas (NH3) and circulate it back to the tissues via the blood stream. The glutamate-glutamine exchange that takes place between astrocytes and neurons plausibly capitalizes on NH3 to preferentially deliver protons to neuronal mitochondria.

PRAIRIE POLYCULTURE FERMENTED FEED SYSTEMS FOR LOW-DEUTERIUM ANIMAL FOOD PRODUCTION

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This work proposes a conceptual framework for experimental investigation into ecological livestock feeding systems designed to support the production of lower-deuterium animal foods while restoring soil health and reducing fossil fuel inputs. Deuterium concentration in food and water has been proposed as a factor influencing mitochondrial metabolism and long-term metabolic health. Observations that wild grazing animals often exhibit lower deuterium levels than animals raised on grain-based feeding systems suggest that ecological feeding strategies may influence isotopic composition in animal products.

The proposed system recreates key ecological functions of historic tallgrass prairie ecosystems through diversified perennial polycultures. High-biomass prairie forbs, nitrogen-fixing legumes, mineral-accumulating herbs, prairie grasses, root crops, and silvopasture tree leaves are combined to produce a grain-free whole-ration livestock feed. Harvested biomass is compressed and preserved through lactic fermentation to form stable fermented feed blocks capable of supporting ruminant nutrition without reliance on annual grain production.

Plant species may include perennial forbs such as Sida hermaphrodita, Silphium perfoliatum, and Helianthus maximiliani; nitrogen-fixing legumes including Desmanthus illinoensis, Galega orientalis, prairie clovers, and sainfoin; mineral-rich herbs such as chicory and plantain; prairie grasses; seasonal root crops including beets, rutabagas,

pumpkins, and Jerusalem artichokes; and silvopasture tree leaves from species such as birch, alder, poplar, and willow.

Two hypotheses are proposed. First, perennial prairie polyculture feeding systems may contribute to lower deuterium concentrations in animal products compared with conventional grain-based feeding regimes. Second, fermentation of diverse prairie biomass may further reduce deuterium concentrations through isotope fractionation.

Lactic fermentation is widely used to preserve forage biomass and has been reported to alter isotopic ratios in certain fermented plant foods, suggesting a possible mechanism for deuterium fractionation within fermented prairie-derived feeds. Future evaluation could include direct measurement of deuterium concentrations in fermented feed, animal tissues, and resulting food products, alongside analysis of soil carbon dynamics and fossil energy inputs within perennial feed production systems.

By integrating perennial agriculture, fermentation, and isotopic biology, this model explores a potential pathway toward livestock systems that simultaneously restore soil ecosystems, reduce fossil energy dependence, and support metabolically favorable food production.

FASTING-MIMICKING DIET AS A METABOLIC FRAMEWORK FOR ENDOGENOUS DEUTERIUM FRACTIONATION

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Accumulating evidence suggests that the deuterium content of metabolic substrates influences mitochondrial bioenergetics, redox balance, and cellular growth dynamics. While deuterium depletion has been explored in oncology and metabolic disease, its relevance within structured dietary paradigms remains incompletely examined.

This presentation proposes the fasting-mimicking diet (FMD) as a metabolic framework in which endogenous deuterium fractionation may occur through shifts in substrate utilization. During fasting states, increased reliance on fatty acid oxidation and ketogenesis favors the generation of metabolic water with a lower deuterium burden relative to glycolytic metabolism.

Concurrently, reductive biosynthetic pathways linked to pentose phosphate pathway–derived NADPH preferentially incorporate protium (^{1}H), resulting in the synthesis of relatively deuterium-depleted lipids as demonstrated in rapidly proliferating eukaryotic systems. It is hypothesized that these lipid pools may later serve as metabolic substrates during fasting, potentially altering intracellular hydrogen isotope ratios during periods of enhanced mitochondrial respiration.

Strategic use of deuterium-depleted water during fasting phases is discussed as an adjunct variable capable of further lowering isotopic input. In this context, reduced deuterium availability may increase selective pressure on metabolically unstable cells with

impaired mitochondrial function while favoring survival of energetically efficient cells.

Rather than altering the established logic of the fasting-mimicking diet, substrate selection and isotopic input during fasting and refeeding phases are presented as modifiable variables influencing metabolic water composition and intracellular hydrogen isotope handling. This hypothesis-driven framework is intended to stimulate discussion regarding deuterium fractionation, mitochondrial function, metabolic flexibility, and apoptosis within established fasting physiology.

CLINICAL EVIDENCE FOR THE ANTICANCER EFFECT OF DEUTERIUM DEPLETION AND PRINCIPLES FOR ITS INTEGRATION INTO STANDARD CANCER THERAPY

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Clinical observations suggest that deuterium depletion, achieved through the consumption of deuterium-depleted water (DDW), may serve as a complementary approach in oncology. Both prospective and retrospective studies have evaluated its use alongside conventional cancer therapies.

In a randomized, double-blind Phase II clinical trial in prostate cancer patients (n = 44), the DDW-treated group showed significantly better outcomes than controls. Prostate volume reduction was approximately threefold greater (160.3 vs. 54.0 cm^3; p = 0.0019), urinary complaints resolved more frequently (8 vs. 0 patients; p = 0.0041), and one-year survival was higher (2 vs. 9 deaths; p = 0.034).

In 74 patients with stage IV metastatic breast cancer, the DDW-treated group demonstrated a median survival time (MST) of 4.3 years compared with ~2.0 years in controls. Treatment efficacy correlated with the degree of deuterium depletion expressed as Deuterium Depletion Unit (DdU), with significantly higher CR and PR rates above 1 DdU (p = 0.0028). Among 48 patients who began DDW consumption during remission, only one death occurred during a cumulative 221 patient-years of follow-up.

Analysis of 2,649 cancer patients consuming DDW identified key factors influencing efficacy. In patients with an initial life expectancy >3–4 months who began DDW within 9 months of diagnosis and consumed it for >3–4 months, MST reached 11.6 years, compared with 2.4 years in the general Hungarian cancer population. These findings suggest that integrating deuterium depletion into conventional oncological treatment strategies may substantially improve clinical outcomes. The potential reduction in cancer-related mortality is estimated to reach 75–80% under optimal conditions of administration.

These findings suggest that integrating deuterium depletion into standard oncological therapies may significantly improve survival outcomes. Practical aspects of DDW administration, including dosing principles and potential side effects, will also be discussed.

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