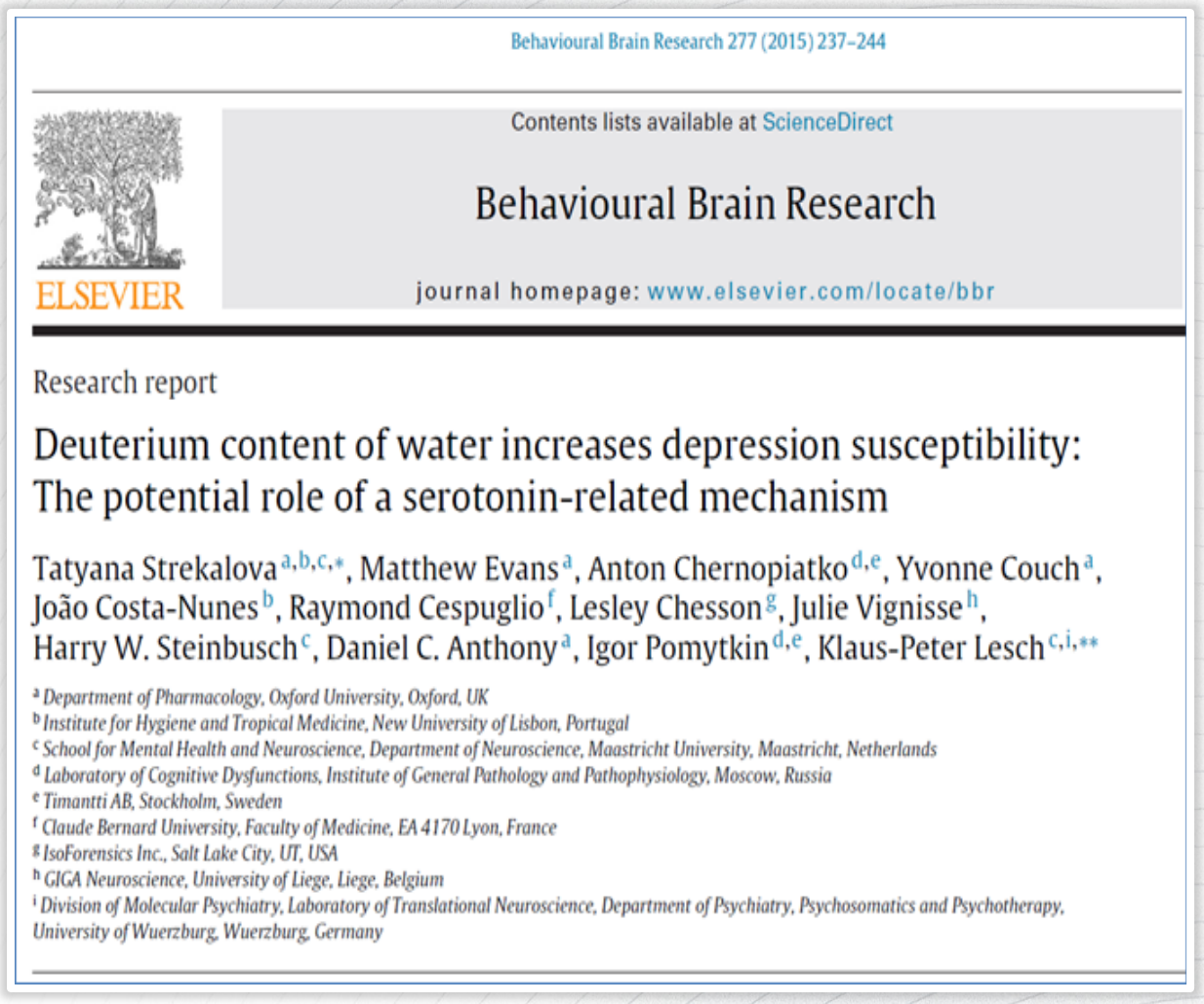
Deuterium as a risk factor for mental disorders

I. Pomytkin
A. Chernopiatko
T. Strekalova
D.C. Anthony

Budapest, May 8, 2015

Does deuterium is a risk factor for mental disorders?



Behavioural Brain Research 277 (2015) 237–244

Contents lists available at ScienceDirect

Behavioural Brain Research

journal homepage: www.elsevier.com/locate/bbr

Research report

Deuterium content of water increases depression susceptibility: The potential role of a serotonin-related mechanism

Tatyana Strekalova[a,b,c,*], Matthew Evans[a], Anton Chernopiatko[d,e], Yvonne Couch[a], João Costa-Nunes[b], Raymond Cespuglio[f], Lesley Chesson[g], Julie Vignisse[h], Harry W. Steinbusch[c], Daniel C. Anthony[a], Igor Pomytkin[d,e], Klaus-Peter Lesch[c,i,**]

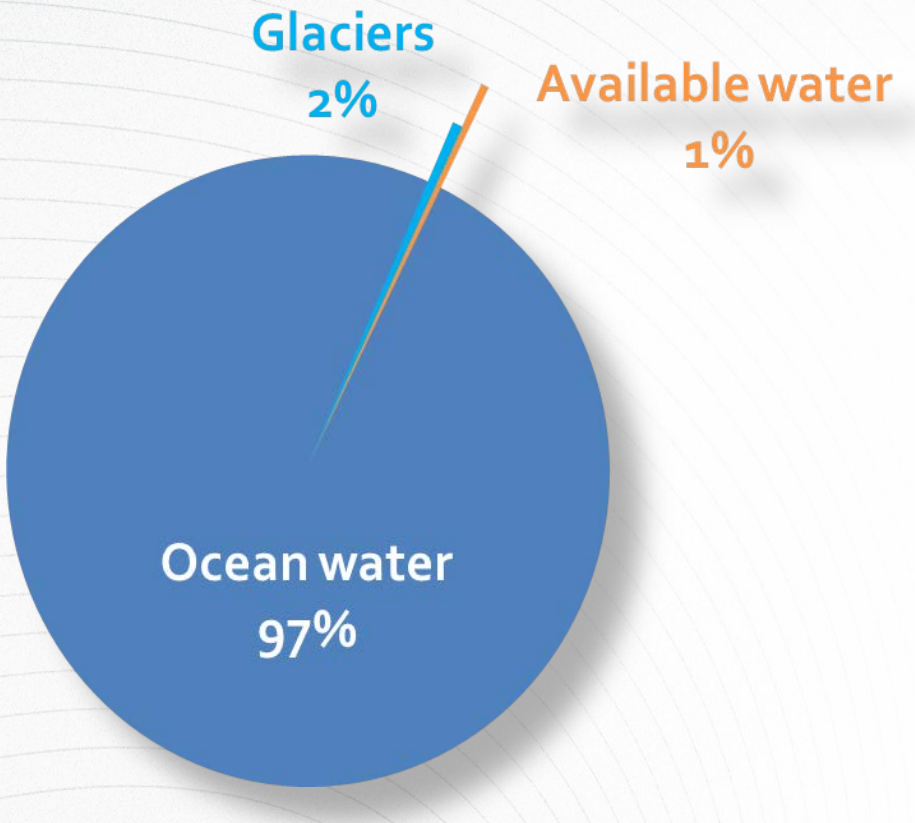
[a] Department of Pharmacology, Oxford University, Oxford, UK
[b] Institute for Hygiene and Tropical Medicine, New University of Lisbon, Portugal
[c] School for Mental Health and Neuroscience, Department of Neuroscience, Maastricht University, Maastricht, Netherlands
[d] Laboratory of Cognitive Dysfunctions, Institute of General Pathology and Pathophysiology, Moscow, Russia
[e] Timantti AB, Stockholm, Sweden
[f] Claude Bernard University, Faculty of Medicine, EA 4170 Lyon, France
[g] IsoForensics Inc., Salt Lake City, UT, USA
[h] GIGA Neuroscience, University of Liege, Liege, Belgium
[i] Division of Molecular Psychiatry, Laboratory of Translational Neuroscience, Department of Psychiatry, Psychosomatics and Psychotherapy, University of Wuerzburg, Wuerzburg, Germany

The presentation is aimed to show that

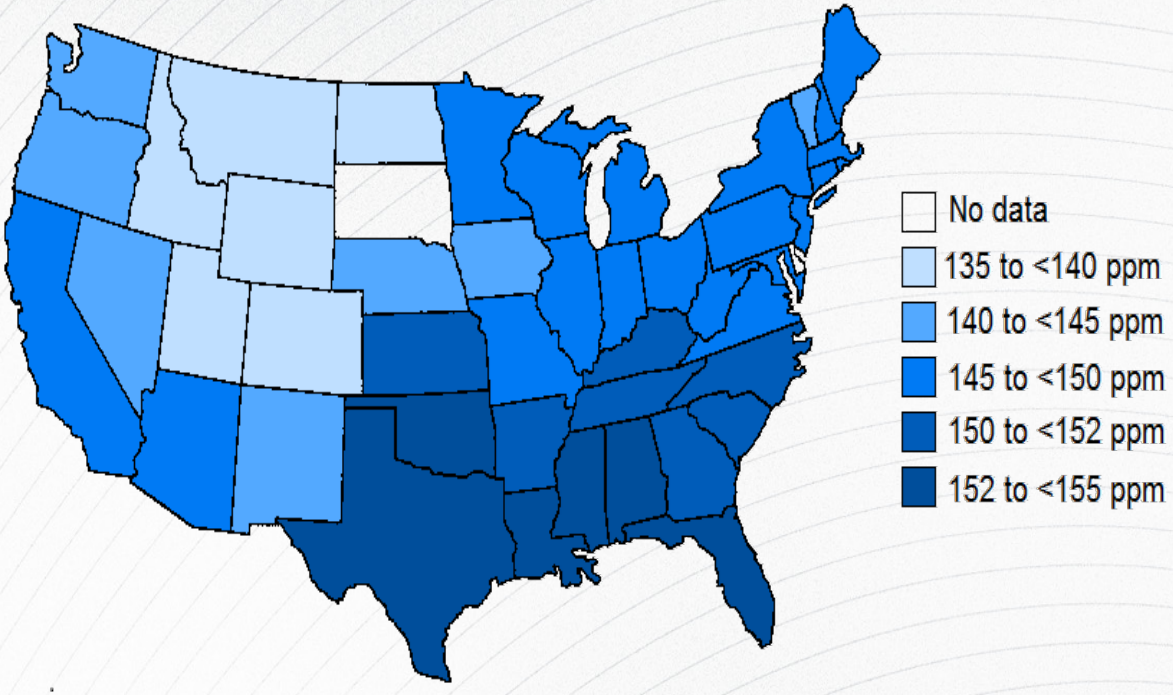
- Deuterium content in natural water seems to be a risk factor for mental disorders.
- Replacement of plain water with deuterium depleted water may reduce this risk.

Fresh waters may differ by 50%
in content of deuterium

- **97%** of Earth's water is Ocean water (D/H 155 pm).
- **2%** are glaciers, e.g. Antarctica (D/H 85-135 ppm).
- **1%** is <u>available water</u>, i.e. water that can be easily tapped for human use (D/H **135-155 ppm**).



Deuterium content in a tap water is particular feature of the place

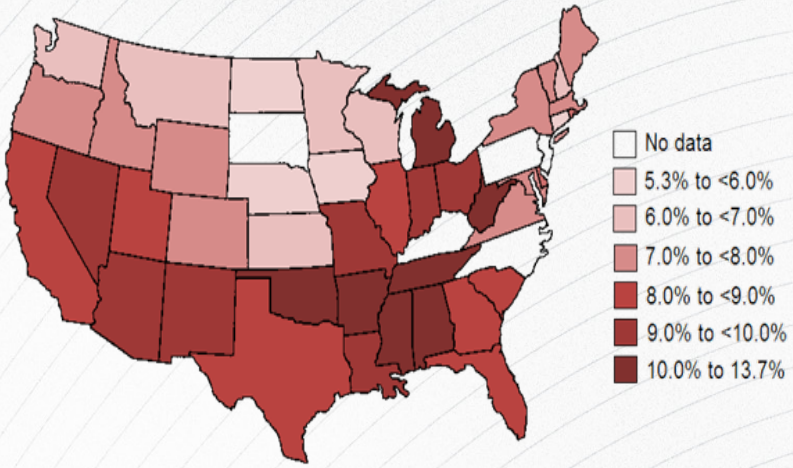


Note: **Deuterium content in tap water is a chronic factor that may affect health.**

The map is made based on survey data on D/H ratios in tap water in the continental USA. Bowen et al, *Water Resour Res* 2007: 2007.

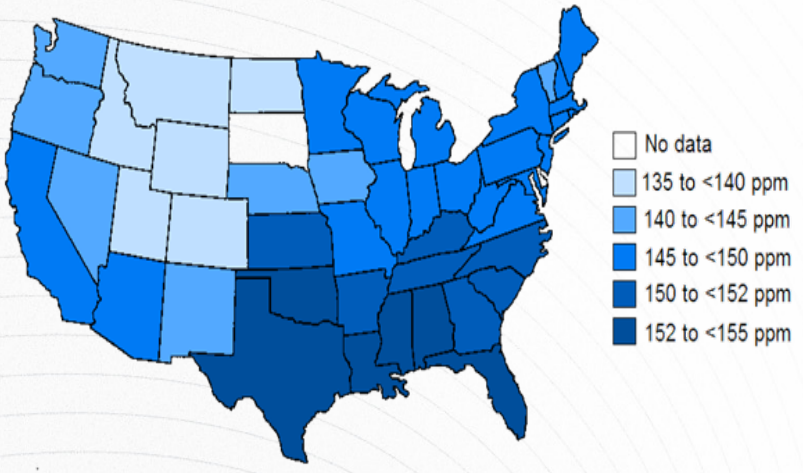
Pearson's correlation: Disorder prevalence vs. Deuterium content in tap water

Disorder prevalence (example)
expressed in %



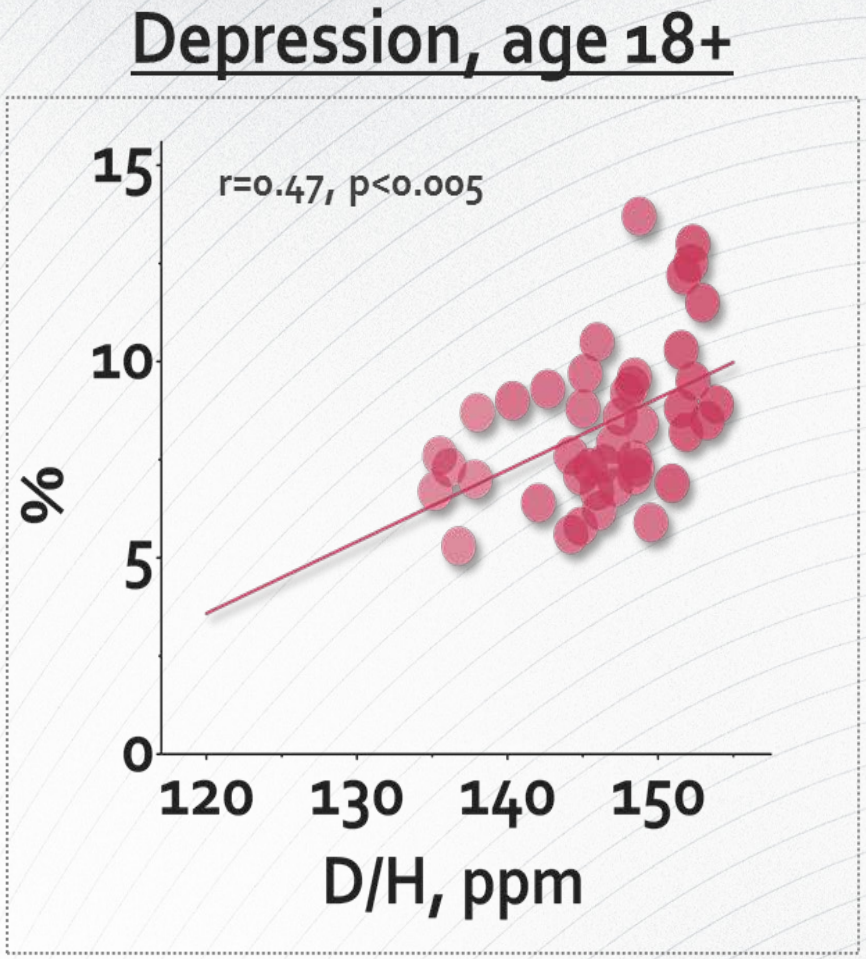
The map is made based on survey data on prevalence of a disorder in the continental U.S.A. Source: Centers for Disease Control and Prevention.

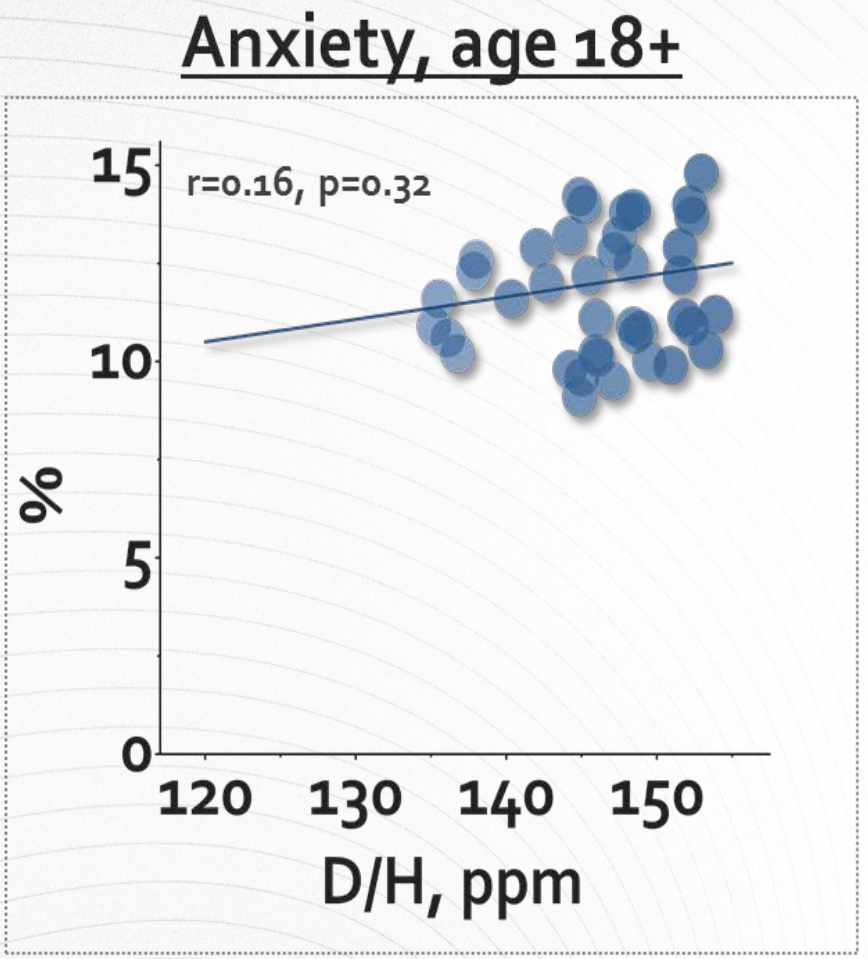
Deuterium in Tap Water
expressed as D/H ratio, in ppm



The map is made based on survey data on D/H ratios in tap water in the continental U.S.A. Bowen et al, Water Resour Res 2007: 2007. Strekalova et al, *Behavioural Brain Res* 2015, 277: 237-244 (Suppl data).

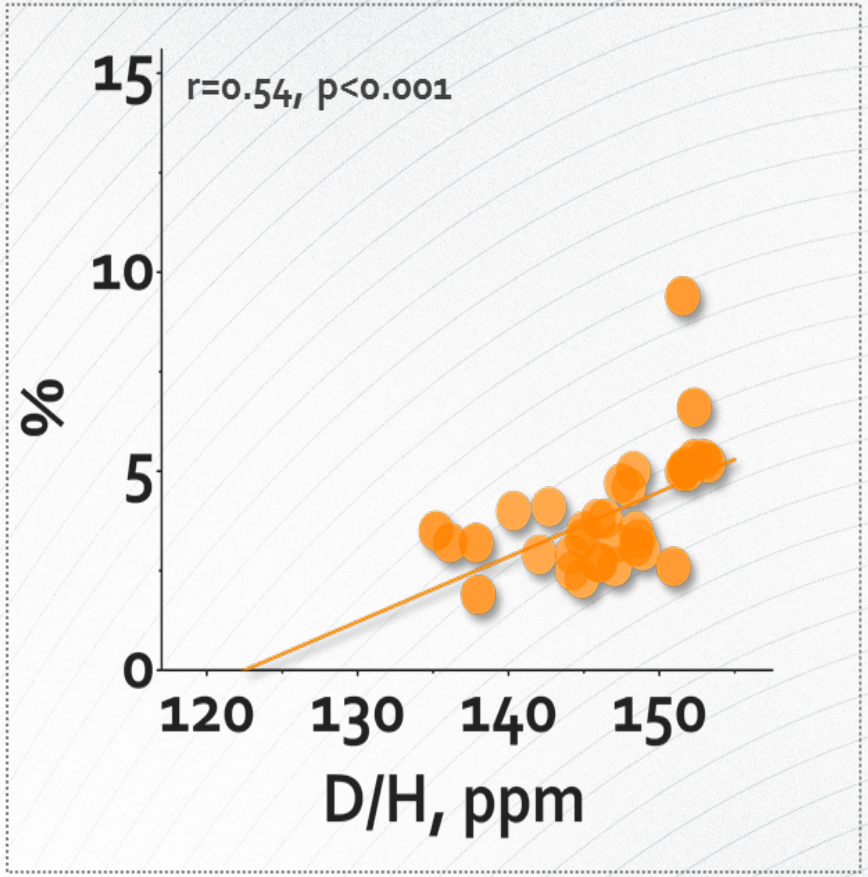
Prevalence vs. Deuterium in tap water



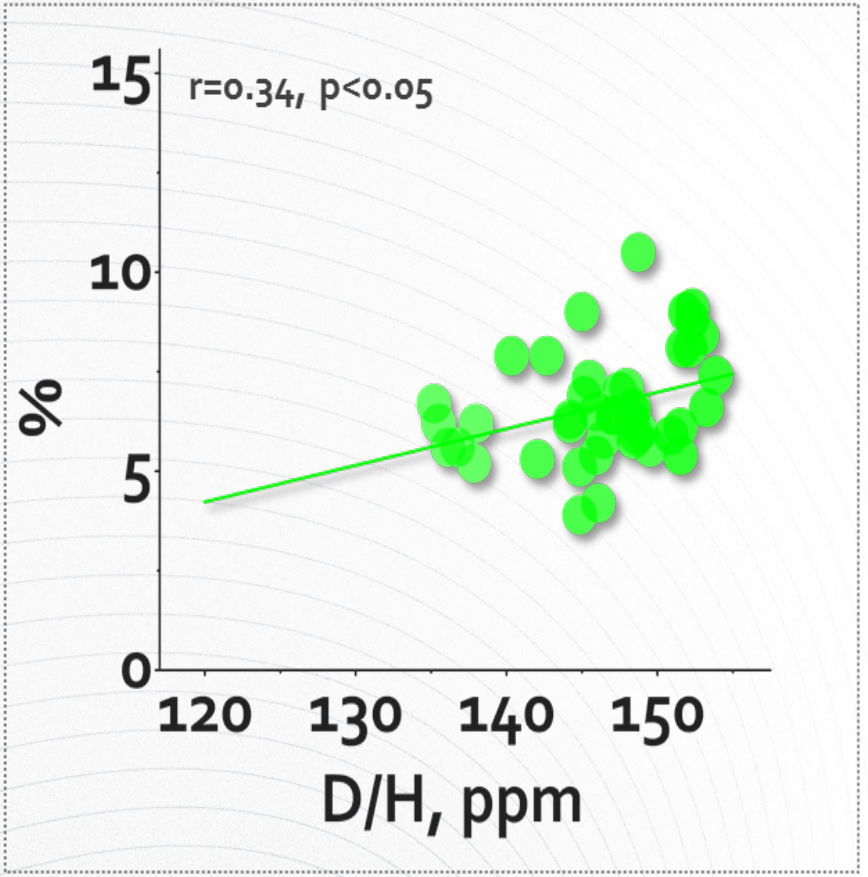


Strekalova et al, *Behavioural Brain Res*, 2015

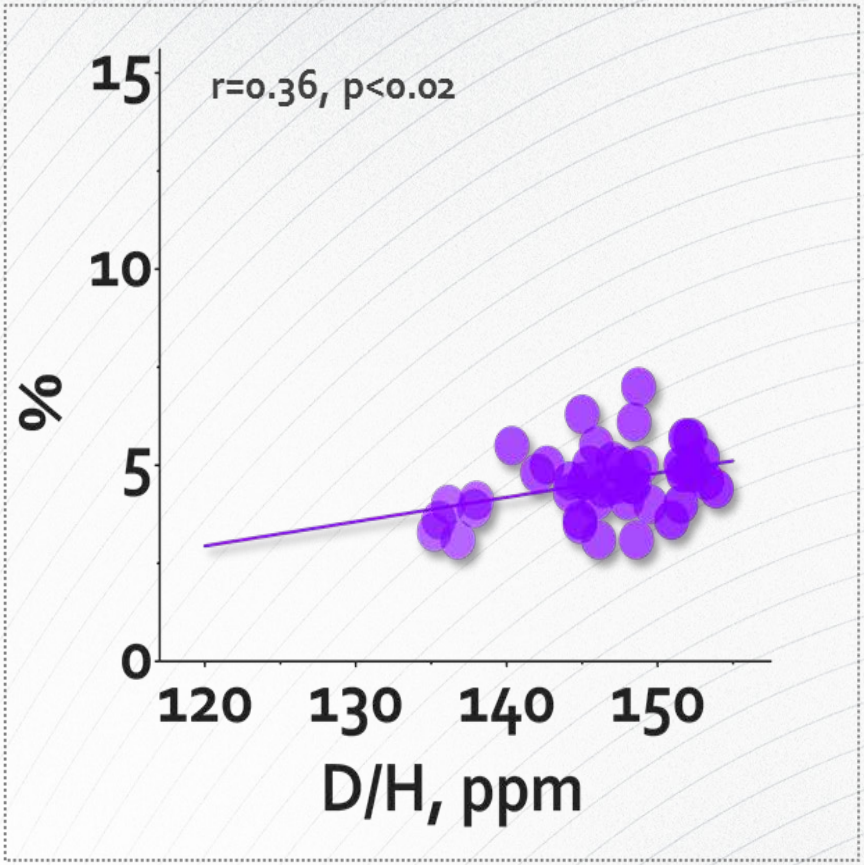
Psychosocial Distress
age 18+



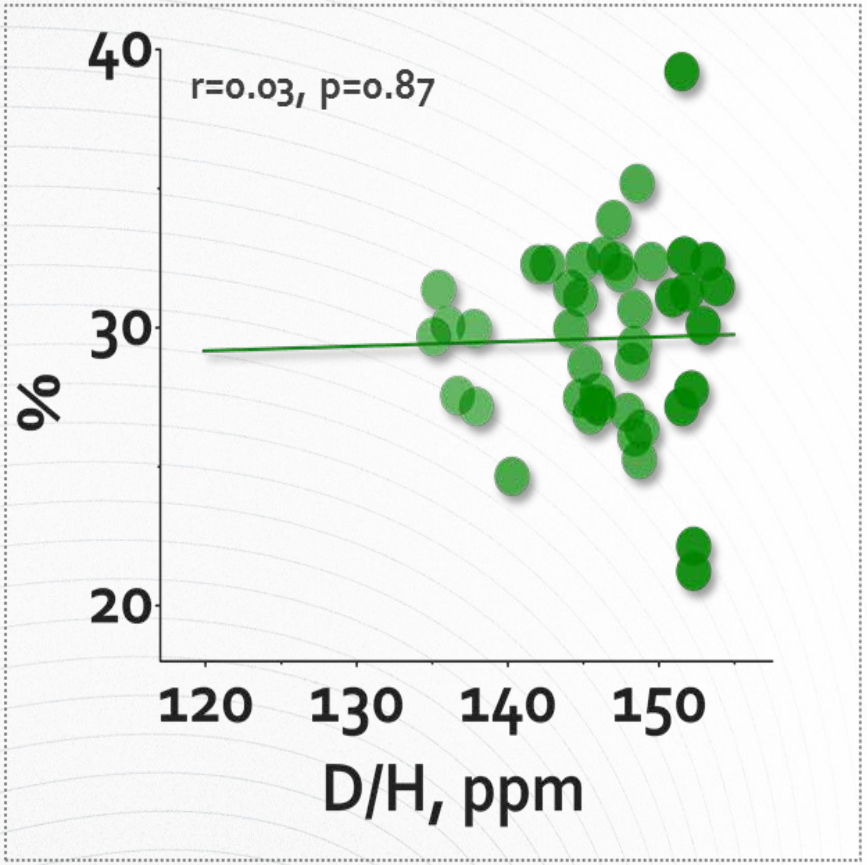
Frequent Mental Distress
age 65+



Dissatisfied in their lives age 50+



Eating Vegetables (3 or more), age 65+

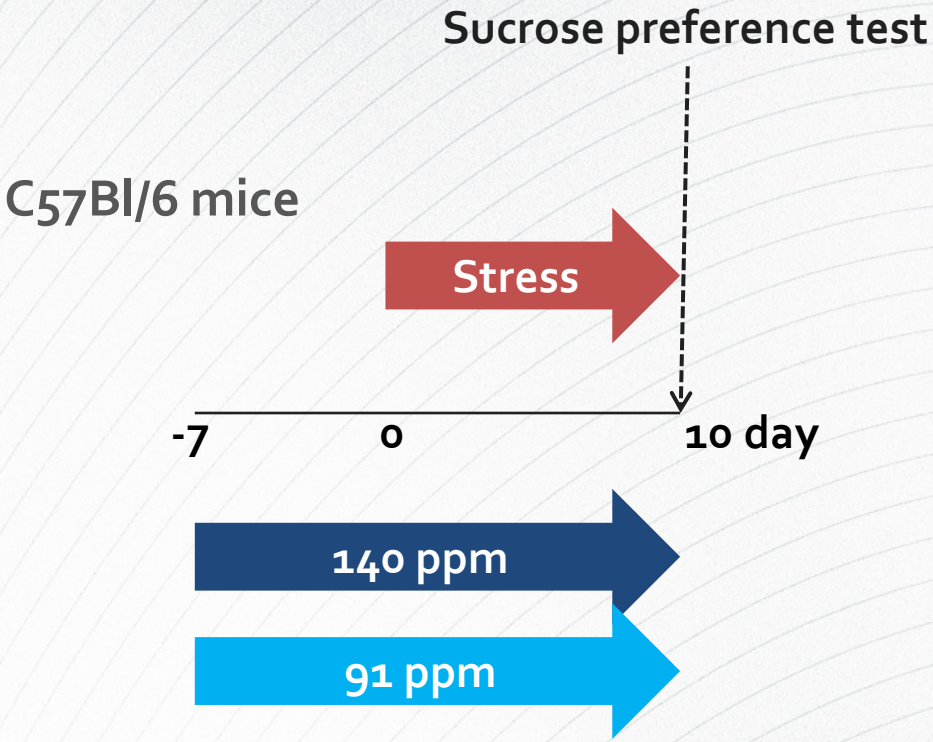


Change of disorder prevalence vs. decrease of deuterium content in tap water

Mental Disorder	Pearson's *r* *$p<0.05$	Absolute change vs. 10 ppm decrease	Relative change vs. 10 ppm decrease
Psychosocial distress	0.54*	-1.6%	-30%
Depression	0.47*	-1.8%	-18%
Dissatisfied in their lives	0.36*	-0.6%	-12%
Frequent Mental Distress	0.34*	-0.9%	-12%
Anxiety	0.16	-0.6%	-5%

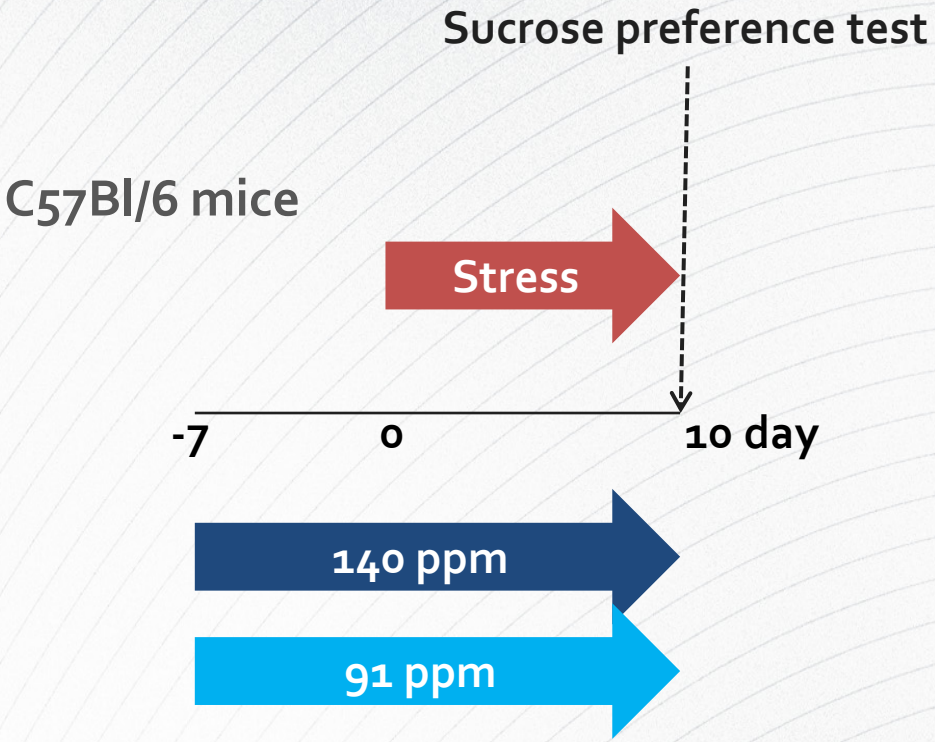
Stress-related conditions such as psychosocial stress and depression are sensitive to deuterium levels in tap water.

Experiment: whether DDW intake may reduce risk of depression



Sucrose preference paradigm. Mice prefer sweet water. Chronic stress results in anhedonia, the inability to experience pleasure from consumption of sweet water.

Experiment: whether DDW intake may reduce risk of depression



Outcome rates (mice become anhedonic):

37% for 91 ppm

80% for 140 ppm

Relative risk for anhedonia in stressful conditions was

0.46 (95% CI 0.25-0.86, p=0.014)

for mice who receive 91 ppm vs. 140 ppm water.

Conclusion: Replacement of plain water with DDW may reduce risk of depression.

Raw data were obtained from study published in Strekalova et al, *Behavioural Brain Res*, 2015.

Conclusions

- **Deuterium seems to be a risk factor for development of mental disorders, where chronic stress is a causal factor.**
- **Replacement of plain water with deuterium depleted water may reduce this risk of psychosocial distress and depression.**

Acknowledgements

I would like to thank authors of study published in *Behavioural Brain Res*, 2015, 277:237 for raw data that were used in the risk calculation.

Thank you!