

Old treatment and new curiosity: Lithium in drinking water

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Professor Kessing and his team completed a useful, elegant study that took advantage of the availability of national data in Denmark and the team's methodological sophistication.¹ No relationship was detected between bipolar disorder and the concentrations of lithium in the drinking water in Denmark. It's admirable how the Scandinavians utilize their comprehensive national statistics for large, first-class epidemiological studies.

We can extrapolate from their findings only to a degree because, in Denmark as compared to elsewhere, the lithium concentration in water (12 ng on the average) is at the low end of the variation range. Lithium concentrations in drinking water vary considerably by geographic region and correlate with natural lithium resources.

Those investigators who found a significant inverse correlation to suicide researched in the locations with a substantially higher lithium concentration.^{2,3} As Kessing et al. point out, it would be advisable to test their bipolar hypothesis in a country with a greater lithium content. Ideal for such testing would be a location such as Chile, where the lithium concentrations in water reach levels up to 50 times that of the Danish average. It would be useful to consider whether such research could be conducted in Chile.

However, before putting some more energy into exploring the association between lithium concentration in water and bipolar disorder, I wonder whether we should not focus more on exploring the relationship between lithium in drinking water and suicidal behavior. The evidence already collected does show that, under some circumstances, a significant inverse correlation is present. But under what circumstances? And by which mechanism?

One of the conditions is probably a range of higher lithium concentrations in drinking water. The importance of dilution is illustrated, for example, by a British investigation from an area with a relatively low lithium concentration in water, where the correlation to suicide was not found.⁴ Equally important is to discover the mechanism that leads to the significant associations with suicide. Understanding better the process involved in reducing suicide would

help greatly in designing additional studies, for example those in bipolar disorder.

When generating new hypotheses about the effects of lithium in drinking water, it is also essential to keep in mind that the anti-suicidal effects of lithium are qualitatively different from the stabilizing properties in manic-depressive illness. The suicide-reducing effect has been found not only in lithium responders but also in non-responders to lithium stabilization⁵ and suicidal patients without mood disorder.⁶ Thus, clinicians need to be careful in discontinuing lithium very slowly in patients who have failed lithium stabilization and are suicidal. Abruptly stopping lithium (without gradual titration) in such patients has in the past triggered suicidal attempts and suicides.

Furthermore, extending prematurely the findings related to suicide to issues as broad as bipolar disorder might bias such studies towards negative outcomes. After all, among bipolar disorders, suicidal behavior is distributed very unevenly; it is frequent in some families and absent in others.

As for the mechanism of anti-suicidal effect, speculations dominating the press – from the *New York Times* to leading psychiatric journals – assume that daily drinking of microdoses of lithium might be at work here. But even in the geographic areas where the inverse correlation with suicide has been shown (Japan, Austria and Texas), the daily microdoses would seem far below the threshold for some putative neurochemical action.

The other possible mechanism of anti-suicidal action to consider is the exposure of the brain to lithium during some critical developmental period. Lat has shown in experimental animals that a change in diet during the first 2 weeks of life may have a lifelong impact on central nervous system excitability.⁷ Could the anti-suicidal effect of lithium be related to the exposure of a newborn coming to life in an area with a higher lithium concentration in drinking water? In this respect, some pilot observations might originate from a follow-up that we provide to a cohort of children born to mothers who decided to continue on lithium while breastfeeding. The concentration of lithium in their milk

was monitored. However, to obtain a cohort sufficient for a conclusive answer, this approach would probably have to be undertaken in an international collaboration.

Needless to say, potential implications for national health policies concerning the reduction of suicidal behavior are substantial. National antisuicidal campaigns have not been particularly successful so far. Unfortunately, the World Health Organization (WHO) in their International Health Plan ranks highly the prevention of suicide without mentioning lithium – the only antisuicidal compound. This is all the more remarkable given that the evidence for lithium's neuroprotective effects is promising and growing. Adding lithium to drinking water remains only a fantasy of a few at present but, if we uncovered the mechanism for the link to suicidal behavior, such fiction may become a reality.

DISCLOSURE

The author has no conflict of interest to report in connection with this text.

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REFERENCES

1. Kessing LV, Gerds T, Knudsen N, et al. Lithium in drinking water and the incidence of bipolar disorder – a nation-wide population-based study. *Bipolar Disord*. 2017;1-5 <https://doi.org/10.1111/bdi.12524>.
2. Ohgami H, Terao T, Shiotsuki I, Ishii N, Iwata N. Lithium levels in drinking water and risk of suicide. *Br J Psychiatry*. 2009;194:464-465.
3. Kapusta N, Mossaheb N, Etzersdorfer E. Lithium in drinking water and suicide mortality. *Br J Psychiatry*. 2011;198:346-350.
4. Kabacs N, Memon N, Obinwa T, Stochl J, Perez J. Lithium in drinking water and suicide rates across the East of England. *Br J Psychiatry*. 2011;198:406-407.
5. Muller-Oerlinghausen B, Felber W, Berghoefer A, Lauterbach E, Ahrens B. The Impact of Lithium Long-Term Medication on Suicidal Behavior and Mortality of Bipolar Patients. *Arch Suicide Res*. 2005;9:307-319.
6. Lauterbach E, Felber W, Muller-Oerlinghausen B, et al. Adjunctive lithium treatment in the prevention of suicidal behavior in depressive disorders: a randomized, placebo-controlled 1 year trial. *Acta Psychiatr Scand*. 2008;118:469-479.
7. Lat J. The relationship of individual differences in regulation of food intake, growth and excitability level of the central nervous system. *Physiol Bohemoslov*. 1956;5(suppl.):38-42.

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