

Treating ships' ballast water: filtration preferable to disinfection

July 30 2015



The disinfection of ballast water generates a multitude of by-products. Credit: Evren Kalinbacak / Fotolia

Untreated ballast water discharge from ships can spread living organisms and even pathogens across the world thereby introducing non-native or invasive species into the local environment. Scientists at Helmholtz Zentrum München therefore recommend using physical treatment processes such as filtration rather than electrochemical disinfection, which creates countless potentially toxic compounds. These are the findings of a recent study published in the journal *Environmental Science and Technology*.

In order to prevent the transfer of harmful organisms, ships' [ballast water](#)

is often subjected to electrochemical disinfection. "However, our analyses show that electrochemical disinfection creates numerous so-called disinfection by-products (DBPs)," explains Prof. Philippe Schmitt-Kopplin, who led the study. He and his team at the Analytical BioGeoChemistry (BGC) research unit at the Helmholtz Zentrum München, working in close collaboration with colleagues in the US, compared samples of treated and untreated ballast water. Using high-resolution mass spectrometry, they discovered that treatment led to the formation of 450 new, diverse compounds, some of which had not previously been described as disinfection products or been structurally categorized.

Using alternative methods

"Until the toxicological features of these compounds are fully clarified, we recommend a cautious approach to disinfecting ballast water," Schmitt-Kopplin notes. According to the scientists, the study – the first in-depth analysis of DBPs in ballast water – first and foremost revealed the high degree of complexity of the resulting products. As an alternative, Philippe Schmitt-Kopplin recommends the use of physical processes such as filtration or adsorption.

Growing significance due to global trade

In addition, the Helmholtz researchers point out the broader significance of their findings: as a result of the increasing dissemination of goods around the world, a growing number of ever-larger ships are being used. These vessels take on correspondingly large and increasing amounts of ballast water in order to stabilize their position in the water and to balance out any changes in the weight of goods or fuel during the journey. Experts worldwide are now discussing ways of dealing with this water, as discharging untreated ballast water will be prohibited in the

future. The alternative method of choice at present is electrochemical disinfection.

"Large volumes of disinfected ballast water are distributed daily in coastal waters, but as yet their impact on the environment cannot be foreseen," says first author Michael Gonsior of the University of Maryland's Center for Environmental Science. "In future studies, we want to find out what influence the DPSs have on coastal ecosystems." Now the researchers hope that their data will help to shift the focus more towards alternative methods.

More information: Gonsior, M. et al. (2015). Bromination of Marine Dissolved Organic Matter Following Full Scale Electrochemical Ballast Water Disinfection. *Environmental Science & Technology*, [DOI: 10.1021/acs.est.5b01474](https://doi.org/10.1021/acs.est.5b01474)

Provided by Helmholtz Association of German Research Centres

Citation: Treating ships' ballast water: filtration preferable to disinfection (2015, July 30)
retrieved 9 May 2024 from
<https://phys.org/news/2015-07-ships-ballast-filtration-disinfection.html>

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