

Are chemical pollutants altering the behavior of wildlife and humans?

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International scientists from around the world are warning that chemical pollutants in the environment have the potential to alter animal and human behavior.

A scientific forum of 30 experts formed a united agreement of concern about [chemical](#) pollutants and set up a roadmap to help protect the environment from behavior altering chemicals. The conclusions of their work have been published today in a paper led by Professor Alex Ford, Professor of Biology at the University of Portsmouth, in *Environmental Science and Technology*. Until now the effect of [chemical pollutants](#) on wildlife has been studied and risk assessed in relation to species mortality, reproduction and growth. The effect on behavior has been suspected but never formally tested or assessed—the scientists say this needs to change.

The world leading experts came from a variety of relevant disciplines including environmental toxicology, [regulatory authorities](#) and chemicals risk assessors. Professor Alex Ford explains: "The group were in no doubt that pollution can impact the behavior of humans and wildlife. However, our ability to regulate chemicals for these risks, and therefore safeguard the environment, is rarely used. For example, chemicals that are deliberately designed as [pharmaceutical drugs](#) to alter behavior, such as antidepressants and anti-anxiety medications, have been shown to alter the behaviors of fish and invertebrates during laboratory experiments. These medications like many prescribed drugs enter the environment through wastewaters."

History shows us there are other examples of behavioral alterations from chemicals. During the 19th century, the phrases "Mad as a hatter" and "Crazy as a painter" were coined when those in these trades were found to have changed behavior, from the use of lead and mercury. In more recent times concerns over metal toxicity resulted in the enforcement of unleaded fuels.

The scientists are not just concerned about the obvious pollutants such as pharmaceutical drugs leaking into the environment but they also warn about the potential unknowns such as chemicals in plastics, washing

agents, fabrics and personal care products.

The forum have come up with a roadmap they are urging policy makers, regulatory authorities, environmental leaders to act upon.

The recommendations are:

- Improve the mechanisms of how science studies contaminated-induced behavioral changes.
- Develop new and adapt existing standard toxicity tests to include behavior.
- Develop an integrative approach to environmental risk assessment, which includes behavior. Not just mortality, growth and reproduction.
- Improve the reliability of behavioral tests, which need to allow for variation in behavioral reactions.
- Develop guidance and training on the evaluation of reporting of behavioral studies.
- Better integration of human and wildlife behavioral toxicology.

Professor Ford said: "We know from human toxicology and pharmaceutical drug development that regulatory authorities and industry have advanced with confidence in the use of behavioral endpoints, either in chemical risk assessment and drug development. We are yet to see this used fully when addressing the health of the environment and the impacts chemicals may have on wildlife behaviors. There is real concern around our lack of knowledge of how pollutants affect wildlife and human behavior and our current processes for assessing this are not fit for purpose."

Dr. Gerd Maack, from the German Environment Agency (UBA) and host of the forum, added: "We know that chemicals affect human and wildlife behaviors, especially hormones are affecting the mating

behavior of vertebrates. However, this knowledge is still not reflected in the regulation of chemicals in Europe, partly due to a lack of standardized methods, but also due to a non-understanding of the more complex study designs by many regulators. As one of the first of its kind, this workshop brought together behavioral scientists and regulators underpinning the importance of behavioral studies for the regulation. The results of this paper will serve a road map for a better acceptance and integration of behavior studies in regulatory practices."

Joel Allen, from the U.S. Environmental Protection Agency said: "Along with my U.S. EPA colleagues, Jim Lazorchak and Stephanie Padilla, and as participants in the workshop and the preparation of this manuscript, we are excited about being part of a ground-breaking area in the potential use of behavioral responses to chemicals in chemical risk assessments as well as being co-authors on this topic in the prestigious *Environmental Science and Technology Journal*."

Dr. Marlene Agerstrand, an expert of chemicals risk assessment from the University of Stockholm said: "The regulation of chemicals is constantly evolving, as the scientific basis improves. A workshop like this, where researchers and regulators meet, could be the starting point for a change in how behavioral studies are viewed upon in the regulatory sphere. In this paper, we have identified knowledge gaps and regulatory needs with the purpose to continue the discussion with a wider stakeholder group."

The forum took place at the German Environment Agency (UBA).

More information: Alex T. Ford et al. The Role of Behavioral Ecotoxicology in Environmental Protection. *Environ. Sci. Technol.* April 14, 2021 doi.org/10.1021/acs.est.0c06493

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