Protecting the environment by re-thinking death

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Scientists first had to re-think death before they could develop a way of testing the potential harm to the environment caused by thousands of chemicals humankind uses each day.

Researchers led by Dr Roman Ashauer, of the Environment Department at the University of York, refined the technique of survival analysis used routinely by toxicologists, biologists, medical researchers and engineers. The research could pave the way for testing the estimated 15,000 substances discovered daily.

Survival analysis which helps to predict a huge range of functions such as the survival of patients after medical treatment and the endurance of engine components, is based on a consideration of death either as a random event or triggered when a threshold of stress is passed. In the latter case, an individual, or an engine part, is more likely to survive repeated episodes of toxicity or stress.

The research team included scientists from the Department of Environmental Toxicology in the Swiss Federal Institute of Aquatic Science and Technology, the Helmholtz Centre for Environmental Research in Leipzig and the Environmental Toxicology Center for Applied Geosciences at Eberhard Karls University, Tubingen.

They used ecotoxicology—the effect of toxic chemicals on biological organisms—as an example to demonstrate the impact of their proposed new model of survival. By considering death as a continuum between a

random event and individual tolerance, they studied processes such as toxicity and organism recovery.

The research, which is published in *Environmental Science & Technology*, showed that causes of death lie between the two extremes and are related to chemical class and mechanism of toxicity. In previous research, the scientists developed theoretical mathematical equations for the two assumptions but the new study is the first time they have been used on real data.

By using these computational tools, scientists could in theory analyse every chemical known to man using high throughput screening. Those whose chemical structures are found to potentially affect organisms and be harmful to the environment could be subject to further more rigorous testing.

Dr Ashauer said: "We advance the understanding and prediction of toxicity caused by chemicals, by re-thinking death. Our innovative approach to death can help translate in vitro test results into predictions of toxic effects on organisms and improve testing regimes for new chemicals.

"We are convinced that our work will also facilitate important new insights in other fields of science and engineering."

More information: *Environment Science & Technology*. pubs.acs.org/doi/abs/10.1021/acs.est.5b03079

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