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Behavior of organophosphate esters in the aqueous solutions explained with mercury lamp and their impacts on biodiversity

Abdul Rashid Teli, Asrar Amin Khan, Abid Rashid and Sajad Hussain Dar

Abstract

Pollution by toxic chemicals that are resistant to biological degradation and have potential for accumulation in biological organisms is becoming world-wide problem. Organic phosphate esters (OPEs) are widely used plasticizers, industrial hydraulic fluids, and lubricant additives. Various OPEs have been detected in environmental samples and in industrial and domestic wastewaters. Ultraviolet (uv) irradiation is known as effective treatment for persistent chemicals in natural water or wastewater. In order to removal of OPEs in water, some fundamental experiments with UV irradiation were performed with a mercury lamp, and photochemical behaviors and photodecomposition products were examined for seven OPEs namely (tributyl phosphate (TBP), tris (chloropropyl) phosphate (TCPP), tris (chloroethyl) phosphate (TCEP), trioctyl phosphate (TOP), tris (dichloropropyl) phosphate (CRP), triphenyl phosphate (TPP), and Tricresyl phosphate (TCP).

Keywords: tributyl phosphate (TBP), tris (chloropropyl) phosphate (TCPP), tris (chloroethyl) phosphate (TCEP), trioctyl phosphate (TOP), etc.

Introduction: History

The term *conservation biology* was introduced as the title of a conference held at the University of California in La Jolla, California in 1978 organized by biologists Bruce Wilcox and Michael E. Soulé. The meeting was prompted by the concern among scientists over tropical deforestation, disappearing species, eroding genetic diversity within species. The conference and proceedings that resulted sought to bridge a gap existing at the time between theory in ecology and population biology on the one hand and conservation policy and practice on the other. Conservation biology and the concept of biological diversity (biodiversity) emerged together, helping crystallize the modern era of conservation science and policy.

The conservation of the Earth's remaining biodiversity is one of the most important challenges facing humanity. However, there are no easy solutions because biodiversity conservation has to operate in complex socio-economic, political, cultural and institutional environments.

Successful conservation practitioners must span academic disciplines and combine advanced social skills with intellectual rigor. They also need to work effectively in both a conventional office environment and some of the most inhospitable places on the planet. Problems of overexploitation of Natural Resources are a serious threat for the future of our planet and the quality of life of the people living there. Fortunately more and more people are aware of the fact that we are part of nature and not the ones to use it until nothing is left. We may realize now, that we have to maintain our biodiversity because we need it if we want mankind to survive.



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Degradation of TCP and TPP in wastewater

Degradation (TCP)			Degradation of (TPP)		
S.No.	Time of degradation in hours	Concentration degraded	S.No.	Time of degradation in hours	Concentration degraded
01	0	10 mg/l	01	5	8mg/l
02	25	9 mg/l	02	10	7 mg/l
03	50	6 mg/l	03	25	5 mg/l
04	80	4 mg/l	04	50	2 mg/l
05	100	2 mg/l	05	100	0 mg/l

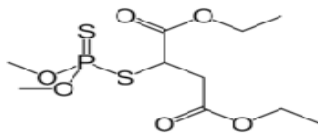
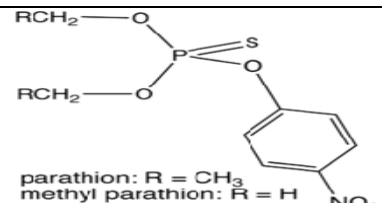
Threats to Biodiversity

Many of the threats to biodiversity, including disease and climate change, are reaching inside borders of protected areas, leaving them 'not-so protected' (e.g. Yellowstone National Park). Climate change, for example, is often cited as a serious threat in this regard, because there is a feedback loop between species extinction and the release of carbon dioxide into the atmosphere. Ecosystems store and cycle large amounts of carbon to regulate global conditions. The effects of global warming adds a catastrophic threat toward a mass extinction of global biological diversity. The extinction threat is estimated to range from 15 to 37 percent of all species by 2050, or 50 percent of all species over the next 50 years. Some of the most significant and insidious threats to

biodiversity and ecosystem processes include climate change, mass agriculture, deforestation, overgrazing, slash-and-burn agriculture, urban development, wildlife trade, light pollution and pesticide use. Habitat fragmentation poses one of the more difficult challenges, because the global network of protected areas only covers 11.5% of the Earth's surface a significant consequence of fragmentation and lack of linked protected areas is the reduction of animal migration on a global scale. Considering that billions of tones of biomass are responsible for nutrient cycling across the earth, the reduction of migration is a serious matter for conservation biology. Human activities are associated directly or indirectly with nearly every aspect of the current extinction spasm.

Some Pesticides which are Used Unlimited

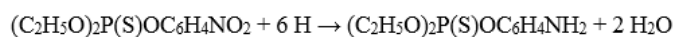
Organophosphates

Trade name	Formula	Uses	Permissible limit
Malation		Control some pests of fruits and vegetables, little hazards to the mammals	0.1µg/l
parathion	 parathion: R = CH ₃ methyl parathion: R = H	Larvicide for mosquito control, also broad spectrum insecticide for fruits and vegetable pests	0.001µg/l

According to the non-governmental organization Pesticide Action Network or PAN, parathion is one of the most dangerous pesticides. This organization lists parathion also as a 'bad actor chemical'. In the US alone more than 650 agricultural workers have been poisoned since 1966, of which 100 died. In underdeveloped countries many more people have suffered fatal and nonfatal intoxications. The World Health Organization, PAN and numerous environmental organizations propose a general and global ban. Its use is banned or restricted in 23 countries and its import is illegal in a total of 50 countries.

Degradation

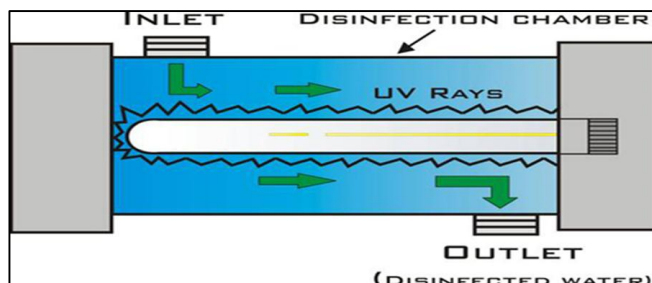
Degradation of parathion leads to more water soluble products. Hydrolysis, which deactivates the molecule, occurs at the aryl ester bond resulting in diethyl thiophosphate and 4-nitrophenol.



Treatment

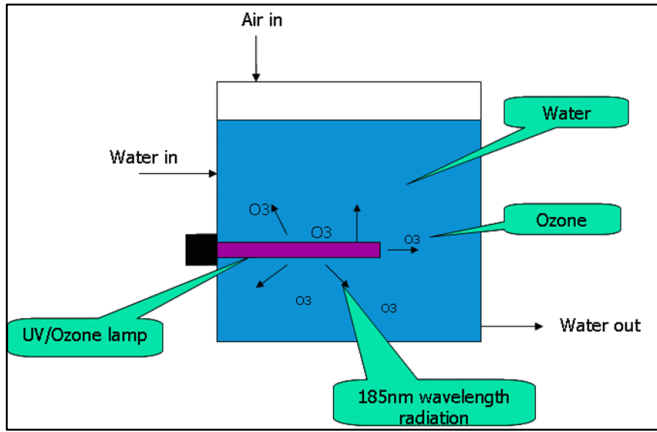
Atropine can be used as an antidote in conjunction with pralidoxime or other pyridinium oximes (such as trimedoxime

or obidoxime), though the use of "-oximes" has been found to be of no benefit, or possibly harmful, in at least two meta-analyses. Atropine is a muscarinic antagonist, and thus blocks the action of acetylcholine peripherally.



Discussion

UV irradiation is a technique by which we deactivate photosensitive phosphate esters and make them un harmful and can save biodiversity. This technique is limited up to photosensitive phosphate esters. Phosphate ester chemicals are mainly shown in water and by the help of this we make water safe for drinking.



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