Isaac Julius Asiedu-Gyekye, J Clin Toxicol 2014, 4:4
http://dx.doi.org/10.4172/2161-0495.S1.012

OMICS Group Conferences
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3rd International Summit on
Toxicology & Applied Pharmacology
October 20-22, 2014 DoubleTree by Hilton Hotel Chicago-North Shore, USA

Toxicological study of new molecules in treating raw water to make it potable

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Background: Polyhexamethylene guanidine (PHMGH) and polyhexamethylenebiguanide (PHMB) are antiseptics with antiviral and antibacterial properties of multipurpose used worldwide and also for treating pool water. Safety concerns have been raised by regulatory authorities about the use of these products for treatment of raw water to make it potable. This non-GLP preliminary study aims at investigating in a subchronic toxicity study possible effects at supra-optimal doses of these biocides.

Methods: In both acute and 90- day subchronic toxicity studies, 0.006 mg/kg, 0.012 mg/kg and 0.036 mg/kg PHMGH and 2 mg/kg, 8 mg/kg, 32 mg/kg and 40 mg/kg PHMB in Sprague-Dawley rats were administered orally. Haematological, biochemical and histopathological studies were conducted in both the acute and subchronic toxicity studies.

Results: LD_{50} for PHMGH and PHMB were estimated to be 600 mg/kg (ie LC_{50} 2ml of 7.5% solution) and 16 mg/kg (LC50 1.6 ml of 0.4%) respectively when administered as a single dose by gavage via a stomach tube in accordance with the expected route of administration. The median lethal doses (LD_{50}) were both accompanied by signs of neurotoxicity. Haematological and biochemical parameters in subchronic toxicity studies were non-significantin both the PHMGH and PHMB treated animals as compared to the controls which received deionized water. 20% of the animals at different doses showed various degrees of hydropic changes in proximal tubules while 10% of animals had theirliver tissues showing local areas of mild pericentral hepatocytes degeneration. PHMGH and PHMB did not produce any major organ defect with regard to the kidney, heart, and liver.

Conclusion: The recommended residual concentrations of both PHMGH and PHMB after water treatment as well as their recommended doses for water treatment are far below the LD_{50}. These results could serve as basis for investigating the full toxicological profile of these biocides and also for the treatment of raw water to make it potable.

Biography

Isaac Julius Asiedu-Gyekye obtained his PhD in Pharmaceutical Sciences specializing in Pharmacology and Toxicology in 1998 from Pyatigorsk State Pharmaceutical Academy. He is currently the Vice Dean of University of Ghana School of Pharmacy, the premier University in Ghana and Heads the Department of Pharmacology and Toxicology under the College of Health Sciences. He has acquired wide range of experience in the area of research into non-communicable diseases and natural products. He has also served on important Boards and Committees at the University. He is a member of the Technical Advisory Committee of the National Centre for Pharmacovigilance as expert in Pharmacology and Toxicology. He has made presentations in both local and international conferences and has over 40 peer-reviewed publications in reputed journals and 2 books to his credit including a manual of harmonized procedures for assessing the safety and efficacy of plant medicines in Ghana.

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