

Microbiotests for the toxicity assessment of various types of water samples

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ABSTRACT

A microbioassay battery consisting of 4 Toxkit microbioassays (Algaltokit FTM, Daphtokit FTM magna, Protoxkit FTM and Thamnotokit FTM) and one rapid electrophysiological test, based on membrane response of *Nitellopsis obtusa* cells (Charatox), was used for the assessment of the acute toxicity of complex effluents in Lithuania. According to the integral toxicity evaluation, i.e. the toxic print, the least toxic effluents were biologically treated municipal wastewater samples. For the majority of these effluents it was not possible to calculate EC50 end point values for the Daphtokit FTM magna, Protoxkit FTM and Algaltokit FTM tests. The Charatox and the Thamnotokit FTM test were the most sensitive in the battery, responding to almost all samples that were characterized by chemical analysis as being outside of the Lithuanian MAC requirements.

Among the chemical parameters available for the effluents, total nitrogen showed the highest correlation ($r^2 = 0.93$) with the toxic print values. The determination coefficient (r^2) between the toxic print and an integral chemical characteristic (the sum of degrees of excess) was equal to 0.64 which implies a rather poor linear prediction of toxicity from chemical data.

INTRODUCTION

The idea of the concerted application of biological and chemical approaches in the area of water pollution control is accepted worldwide and serves as a basis for many current environmental strategies (Blaise *et al.*, 1988; Cairns and Mount, 1990). From the 1970s, biotesting methods have been used as screening tools for effluents and are approved for regulatory purposes in developed countries (Hansen, 1993; Blok and Balk, 1995). However, in Eastern European countries, specifically the Baltic States, the quality of anthropogenic discharges is managed mainly by physicochemical criteria. For example, water quality in Lithuania is judged by a total of 54 parameters (Environmental Ministry of Lithuania, 1996a), none of which is a toxicological examination. The shortcomings of controlling toxic pollutants based solely on chemical analysis have been discussed elsewhere (Persoone, 1991). The absence of direct toxicity assessment methods in our country, beside historical and traditional reasons, continues due to the financial inability to apply newly developed Western technology.

In this context, a series of FITA-programmes on "Transfer of the Toxkit technology to countries in Central and Eastern Europe" which started in 1995, sponsored by the Flemish Community in Belgium, has created a unique possibility to introduce a suite of standardized Toxkit microbioassays in 4 laboratories in Lithuania. The knowledge acquired in training courses as well as the supply of necessary equipment and Toxkit material during recent years has enabled toxicological investigations of various types of water samples to be conducted in parallel with chemical analysis.

New Microbiotests For Routine Toxicity Screening And Biomonitoring

L Darling-Hammond



New Microbiotests For Routine Toxicity Screening And Biomonitoring:

New Microbiotests for Routine Toxicity Screening and Biomonitoring Guido Persoone, Colin Janssen, Wim De Coen, 2012-12-06 The determination of the hazards resulting from the accidental or deliberate contamination of terrestrial and aquatic environments is in most countries still limited to the detection and quantification of the suspected pollutants by chemical analyses. Such an approach is unfortunately hampered by the following constraints: the costs as well as the technical difficulties of analyzing every individual chemical which may be present in the samples and the difficulty of assessing the hazards and risks of environmental contaminations from a set of chemical data. During the last decades the scientific and regulatory community has gradually realized that biological methodologies have to be taken into consideration for an ecologically meaningful assessment of the toxicological hazards of contaminants. Effect evaluations obtained with biological techniques indeed integrate the impact of all the contaminants to which living biota are exposed. Bioassays with selected test species representative for the biological communities of the environments under consideration are now applied more or less regularly to determine toxic and genotoxic effects. Taking into account the species specific and chemical specific character of toxicity to biota, the necessity of a battery of tests approach with species of different trophic levels is currently also generally accepted and implemented. It is clear that a balanced partnership between chemical, biological, toxicological and microbiological analyses is always the best strategy for generating the broadest information base on environmental hazards.

Small-scale Freshwater Toxicity Investigations Christian Blaise, Jean-François Férard, 2006-01-16 Developed developing and emerging economies worldwide are collectively contributing multiple stresses on aquatic ecosystems by the release of numerous contaminants. This in turn demands that basic toxicological information on their potential to harm living species be available. Hence environmental protection programs aimed at preserving water quality must have access to comprehensive toxicity screening tools and strategies that can be applied reliably and universally. While a good number of toxicity testing procedures and hazard assessment approaches have been published in the scientific literature over the past decades, many are wanting in that insufficient detail is available for users to be able to fully understand the test method or scheme and to be able to reproduce it successfully. Even standardized techniques published in recognized international standard organization documents are often lacking in thoroughness and minutiae. Paucity of information relating to biological test methods may be consequent and trigger several phenomena including generation of invalid data and resulting toxicity measurements, erroneous interpretation and decision taking with regards to a particular chemical or environmental issue or simply abandonment of testing procedures. Clearly, improperly documented toxicity testing methods can be detrimental to their promotion and use as they open the doorway to unnecessary debate and criticism as to their rationale. Furthermore, this situation can indirectly contribute to delaying minimizing or eliminating their application, thereby curtailing the important role toxicity testing plays in the overall protection and conservation of aquatic ecosystems. **The Power**

Struggle William T. Shannon,1996-08-21 *The Utilization of Bioremediation to Reduce Soil Contamination: Problems and Solutions* Václav Sasek,John A. Glaser,P. Baveye,2012-12-06 Traditional reliance on chemical analysis to understand the direction and extent of treatment in a bioremediation process has been found to be inadequate Whereas the goal of bioremediation is toxicity reduction few direct reliable measures of this process are as yet available Another area of intense discussion is the assessment of market forces contributing to the acceptability of bioremediation Finally another important component is a series of lectures and lively exchanges devoted to practical applications of different bioremediation technologies The range of subjects covers a wide spectrum encompassing emerging technologies as well as actual full scale operations Examples discussed include landfarming biopiling composting phytoremediation and mycoremediation Each technology is explored for its utility and capability to provide desired treatment goals Advantages and limitations of each technology are discussed The concept of natural attenuation is also critically evaluated since in some cases where time to remediation is not a significant factor it may be an alternative to active bioremediation operations Handbook of Industrial and Hazardous Wastes Treatment Lawrence K. Wang,Yung-Tse Hung,Howard H. Lo,Constantine Yapijakis,2004-06-29 Presenting effective practicable strategies modeled from ultramodern technologies and framed by the critical insights of 78 field experts this vastly expanded Second Edition offers 32 chapters of industry and waste specific analyses and treatment methods for industrial and hazardous waste materials from explosive wastes to landfill leachate to w International symposium on new microbiotests for routine toxicity screening and biomonitoring ,1998 **Alternatives to Laboratory Animals** ,2008 *Optics and Photonics in Global Homeland Security* Theodore T. Saito,2005 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences in the broad ranging fields of optics and photonics These books provide prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature *Waste Management Problems in Agro-industries, 1998* ,1999 **The Journal** ,2005 Archiv Für Hydrobiologie ,2001 Biological Effects of Contaminants in Marine Pelagic Ecosystems Ketil Hylland,Thomas Lang,Dick Vethaak,2006 The British National Bibliography Arthur James Wells,2000 Annales ,2001 **Management of Intentional and Accidental Water Pollution** Gyula Dura,Veska Kambourova,Fina Simeonova,2006-07-10 This book gives both theoretical knowledge and practical approaches on the complex process of water management in case of pollution with chemical and biological hazards The text provides an overview of chemicals and toxins that may be used for intentional water pollution Critical for successful prevention and control actions of accidental and intentional water pollution is the preliminary risk assessment understanding of the hazards and lessons learned from previous pollution events **Publications Bulletin** European Commission. Joint Research Centre,2000 American Book Publishing Record ,2000-07 *Reactions and Processes* W. A. Bruggeman,2001 Index of Conference Proceedings British Library. Document Supply Centre,2000 *Environmental Toxicology and*

Chemistry ,2005

Decoding **New Microbiotests For Routine Toxicity Screening And Biomonitoring**: Revealing the Captivating Potential of Verbal Expression

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