Methods For Recovering Viruses From The Environment

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PAPER

Ultracentrifugation as a direct method to concentrate viruses in environmental waters: virus-like particle enumeration as a new approach to determine the efficiency of recovery

Catarina Prata, Andreia Ribeiro, Ângela Cunha, Newton. C. M. Gomes and Adelaide Almeida*

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Some health important enteric viruses are considered to be emerging waterborne pathogens and so the improvement of detection of these viruses in the aquatic environment is one of the most important steps in dealing with these pathogens. Since these viruses may be present in low numbers in water, it is necessary to concentrate water samples before viral detection. Although there are several methods to concentrate viruses in environmental waters, all present some drawbacks and consequently the method should be chosen that, despite its limitations, is adequate to achieve the aim of each study. As the effectiveness of the concentration methods is evaluated by determining the efficiency of viral recovery after concentration, it is important to use a simple and effective approach to evaluate their recovery efficiency. In this work ultracentrifugation, usually used as a secondary step for virus concentration, was evaluated as the main method to concentrate directly viruses in environmental water samples, using the microscopic enumeration of virus-like particles (VLP) as a new approach to estimate the efficiency of recovery. As the flocculation method is currently employed to concentrate viruses in environmental waters, it was also used in this study to assess the efficiency of the ultracentrifugation as the main viral concentration method in environmental waters. The results of this study indicate that ultracentrifugation is an adequate approach to concentrate viruses directly from environmental waters (recovery percentages between 66 and 72% in wastewaters and between 66 and 76% in recreational waters) and that the determination of VLP by epifluorescence microscopy is a simple, fast and cheap alternative approach to determine the recovery efficiency of the viral concentration methods.

Introduction

Health relevant enteric virus groups are nowadays considered to be emerging waterborne pathogens,[1,39,47] increasing the concern over the discharge of human enteric viruses not only into fresh water but also into estuarine and marine environments. In these environments they represent a health hazard in areas that are used for recreational purpose or from which shellfish are harvested for human consumption. The presence of those viruses in the aquatic environment represents a large problem for human health, economy and environmental ecology.[23,33,45] A large number of human enteric viruses have been shown to be discharged into marine waters by offshore sewage outfalls and they have also been detected in coastal water polluted by sewage treatment plants and septic tanks.[31]

Individuals suffering from diarrhea or hepatitis release a large number of viruses, values greater than 10^{11} and 10^{10} viral particles

Department of Biology and CESAM, University of Aveiro, Campus de Santiago, 3810-193 Aveiro, Portugal. E-mail: aalmeida@ua.pt

Environmental impact

Although viruses are the most abundant biological component in aquatic systems, the number of health significant viruses in water is low, but even at low concentrations these pathogenic viruses can cause disease. Consequently large volumes of water are required to detect enteric viruses, which implies sample concentration to a few millilitres before analysis. Consequently it is important to have a practical viral concentration method, such as ultracentrifugation, in order to monitor pathogenic viruses. As the effectiveness of the concentration methods is evaluated by determining the efficiency of viral recovery after concentration, it is also important to use a simple, effective, fast and inexpensive approach to evaluate their recovery efficiency, such as the enumeration of virus-like particles (VLP), by epifluorescence.

Use of the proposed method for virus recovery in future fomite sampling studies Environmental hygiene intended to mitigate fomite-mediated transmission has.I. Introduction II. Methods Which Depend on Virus Adsorption 20 A. Mechanisms of Virus Adsorption 20 B. Microporous Filter Adsorption.Sampling methods for recovery of human enteric viruses from environmental surfaces. Turnage NL(1), Gibson KE(2). Author information.The monitoring of surfaces is critical to highlight the spreading of viruses in hospital environment especially, thus contributing to elucidate.Full-Text Paper (PDF): Monitoring viruses in environmental samples. viruses implicated in outbreaks, the main methods available to concentrate and detect these have been developed to recover viral particles from.This review focuses on membrane-based methods of virus concentration from We summarize all published VIRADEL and CFUF studies o Environmental from water: a review of process parameters and their effects on virus recovery.Department of Environmental Sciences and Engineering, University of . We describe methods for recovering a model virus, bacteriophage MS2, from PPE. Robust methods for recovering viruses from PPE items are a.Human enteric viruses have been identified as leading causative agents of acute Sampling methods for recovery of human enteric viruses from environmental.Depanment of Environmental Sciences and Engineering, University of Nonh Carolina at Chapel Hill, Chapel Hill, Nonh Carolina, hybridization techniques) for the detection of enteric viruses in The precipitated viruses were recovered by.Investigate methods for the concentration, recovery, and identification of viruses, bacteria, and other microbiological organisms in water; and, to determine the.A METHOD FOR RECOVERING VIRUSES FROM SLUDGES. U.S. Environmental Protection Agency, Washington, D.C., EPA//J/ (NTIS PB).Department of Civil and Environmental Engineering, University of we assessed and optimized methods for recovering enveloped viruses.