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From the Journal of Microbiology

Viruses are believed to be a significant cause of recreationally associated water-borne disease. However, they have been difficult to document because of the wide variety of illnesses that they cause and the limitations in previous detection methods. A lack of required reporting and nonuniform water quality and chlorination/disinfection standards continues to contribute to water-borne recreational disease outbreaks

Water-borne disease can be acquired during water-related recreational activities such as swimming, boating or other water sports. Many epidemiological studies conducted at both marine and freshwater bathing beaches have shown that there is a significant increase in incidence of illness, including gastrointestinal, respiratory, ear and ocular and skin or wound infection among those who engage in water-based recreational activities (Cabelli *et al.* 1979, 1982; D Alessio *et al.* 1981; Seyfried *et al.* 1985a; Craun *et al.* 2005). Several viruses including coxsackieviruses, adenoviruses, echoviruses, hepatitis A virus, astroviruses and noroviruses have been shown to cause recreational water-borne disease outbreaks (Table 1). Some studies have found an association between certain bacterial water quality indicators and rates of illness among bathers (Cabelli *et al.* 1982; Corbett *et al.* 1993). Other studies have found that even water that is only marginally polluted or meets state or local water quality requirements can be the source of outbreaks of disease or can contain enteric viruses (Cabelli *et al.* 1979, 1982; Rose *et al.* 1987). There is inconsistency among the numerous epidemiological studies as to which indicator organisms best correlate with the incidence of illness (Corbett *et al.* 1993), and some studies have found illness in the absence of indicator organisms (Foy *et al.* 1968; Hauri *et al.* 2005; Papapetropoulou and Vantarakis 1998). The lack of a consistent correlation between indicator organisms and disease may be particularly troubling with respect to viral pathogens, because bacterial indicators have been found to be unreliable indicators in the presence of virus. Studies showing the presence of human enteric viruses in recreational waters and/or a positive correlation between swimming in recreational waters and increased risk of disease have been conducted at bathing venues around the world including Sydney, Australia (Corbett *et al.* 1993), Blackpool Beach, UK (Alexander *et al.* 1992), Northern Ireland (16 sites) (Hughes *et al.* 1992), Ontario, Canada (Seyfried *et al.* 1985b), Israeli coastal beaches (Fattal *et al.* 1991), Lake Pontchartrain, New Orleans (EPA 1981) and Hong Kong coastal beaches (nine sites) (Cheung *et al.* 1990).

From Water Research Science Direct

Table 1. Viruses shown epidemiologically to cause recreational water-borne disease outbreaks

Pollution of water by sewage and run-off from farms produces a serious public health problem in many countries. Viruses, along with bacteria and protozoa in the intestine or in urine are shed and transported through the sewer system. Even in highly industrialized countries, pathogens, including viruses, are prevalent throughout the environment.

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