

Over 114 different human enteric viruses have been isolated to date and have been implicated in a range of human disease. The group contains the polio and hepatitis A viruses, together with rotavirus (a major cause of infant diarrhoea in developing countries) and norwalk virus which is frequently implicated in outbreaks of idiopathic vomiting and diarrhoea. Both hepatitis A and norwalk viruses still cause problems in Europe.

The factors influencing the numbers and types of viruses in sewage were considered. They were shown to depend partly on the composition of the community from which the sewage derived with special regard to the age, level of health, economic status and general hygiene. It also is related to the composition of sewage, with water from industrial sources having a low virus content.

The treatment of sewage was examined. This process is important because it is the point at which the majority of viruses are released into the environment. Once dispersed a variety of routes exist by which they can return to the community and establish a cycle of infection. These include the contamination of drinking water, crops, shellfish and waters used for recreation. The treatment processes were shown to be capable of producing a range of products both liquid and solid with varying levels of virus contamination. In general viruses tend to associate with the solids and are therefore predominantly found in the sludges. All the treatment processes tended to reduce the numbers of viruses but, with very few exceptions, none removed them entirely. The importance of designing treatment systems with desirable pathogen control characteristics – plug flow rather than fully mixed, for example – was emphasized.

Data were presented on the concentrations of viruses found in a range of sludges and effluents; these were mainly a reflection upon the degree of treatment to which the material had been subjected. The results of a year long study at a treatment works near London were illustrated. These works, processing mainly domestic sewage by the activated sludge method, reduced virus numbers by approximately 99% which was considered to be good by comparison with other published results.

The types and concentration of viruses found in the River Thames over a period of several years were also shown. These viruses which are largely attributable to contamination by treated sewage effluents present a problem when the water is processed to produce drinking water. These findings were interpreted in terms of the epidemic state of the community, the influence of polio vaccination programmes, the ability of the viruses to survive in the environment and the limitations of viral analysis methodology. Successive waves of infection in the community were reflected in the virus content of the river. Amongst the various factors affecting survival temperature was found to be the most important with viruses being adversely affected by high temperatures.

The influence of temperature and time on survival were shown to be significant in a wide variety of treatment processes ranging from sludge digestion, pasteurization and composting to long term storage of lagooning. This theme was expanded to embrace the many other pathogens which may occur in sewage including such resistant organisms as ascaris and taenia.

The presentation concluded with the suggestion that

sewage should be regarded as a resource rather than a nuisance. Dried sewage sludge, for instance, contains some 20% fat and 50% protein plus significant quantities of fertilizers such as phosphate and nitrate. The assured destruction of pathogens including viruses will remove one of the major factors inhibiting its re-use.

Environmental contamination with Salmonellae by the spread of animal waste and sewage sludge

C. Breer

Institute of Clinical Microbiology and Immunology, Frobergstrasse 3, CH-9000 St. Gallen

Sewage sludge, used as a fertilizer in agriculture, is a main source for the pollution of the environment with Salmonellae. Among 370 samples of unsanitized sludge from 207 different sewage disposal plants in Switzerland, Salmonellae were detected in 339 samples (97%). All samples investigated from 199 plants proved to be positive with an average pf 780 Salmonellae per liter.

On the contrary, we were able to isolate Salmonellae only in 7 cases (1.3%) out of 555 samples of slurry from different cattle herds. In 55 farms, however, where the slurry was mixed up with sewage sludge, the percentage of Salmonellae recovery increased to 38.2%.

Among 100 samples of slurry from different pig fattening stations, we could isolate Salmonellae in 23.0% and in addition, the examination of 208 fecal samples from poultry herds revealed the presence of Salmonellae in 51 specimens (24.5%). The spread of animal wastes from intensive fattening plants of pigs and poultry has therefore the same importance for the environmental contamination by Salmonellae as the spread of sewage sludge.

Carotenoids from plankton and purple sulphur bacteria in lake sediments as indicators of changes in the environment

H. Züllig

CH-9424 Rheineck

The vast increase in the influx of phosphorus into our lakes during this century has led to a series of well-known phenomena associated with eutrophication, thereby altering a sector of our environment in a spectacular manner.

The primary effect, an increase in the production of plankton, has resulted in part of the pigments produced by biomass aggregating on lake beds, particularly carotenes, carotenoids, chlorophylls and phaeophytine. Alcohol and acetone mixed in a ratio of 1:1 release these coloring matters from bore samples. The amount of crude carotenoids can be determined almost exactly by photometry, measuring at 665 and 450 nm. The carotenes and carotenoids are separated by gradual development of the sediment extracts on silica gel thin layer plates, using hexane-acetone-propanol-2-mixtures. Their presence is not only proof of their conservation in lake sediment but also enables a qualitative and quantitative reconstruction of earlier plankton biocenosis according to order, family and sometimes also genus of the various algae.

The behavior of the dreaded *Oscillatoria rubescens* (so-called Burgundian blood) in Swiss lakes is manifested by