

Methods of Assessing Microbial Contamination of Surface and Ground Waters by Animal Feeding Operations

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Animal feeding operations have been recognized as potential major sources of nutrient, antibiotic, and microbial contamination to surface water and ground water. Management of animal wastes, however, has not included monitoring and assessment of microbial pollutants. The American Society for Microbiology has called for a national monitoring program to assess the status of the Nation's waters in relation to animal (and human) waste contamination. State and Federal monitoring programs have largely underassessed the status of microbial contamination of water because of the emphasis in recent years on chemical contamination. The lack of information from past monitoring programs on the microbial contamination of water can be remedied by future monitoring efforts. Available techniques and methods for sampling and analyzing bacterial, viral, and protozoan pathogens and their indicators need to be disseminated to water-quality professionals. This information can be used to help assess the status of the Nation's waters in relation to microbial contamination.

Recently developed methods for sampling and analysis of microbial contaminants are applicable to monitoring and assessing the effects of animal waste on streams, lakes, and ground water. Sampling and analysis of waterborne pathogens require special protocols for collection and analysis. These protocols include large volume samples and specialized sampling equipment. Waterborne pathogens often require sophisticated methods for separation from the water media, and detailed preservation, culture, and identification techniques. Conversely, improved and recently modified methods for sampling and analysis of microbial indicators are cost-effective and do not require specialized equipment or highly trained personnel.

Specialized sampling and analysis methods for ground water and surface water for microbial pathogens include 1-MDS filters for collection of enteric viruses and reverse transcriptase-polymerase chain reaction for analysis of enteric viruses. For *Cryptosporidium parvum*, examples of sample-collection methods and EPA method 1622 for analysis will be shown. New indicator methods will be reviewed including simultaneous determination of total coliform bacteria and *Escherichia coli* on MI media, methods for analysis of spore-forming and chlorine resistant indicators such as *Clostridium perfringens*, and methods of analysis of viral indicators --somatic coliphage and F-specific coliphage. These methods are readily applicable to the study of microbial contamination of natural waters by animal feeding operations.

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