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Microorganisms in Milwaukee rivers

Joseph Gergerich
University of Wisconsin - Milwaukee

Forest Stearns
University of Wisconsin-Milwaukee

MICROORGANISMS IN MILWAUKEE RIVERS

Fecal coliform bacteria have long been used as indicators of water pollution (Standard Methods, 1976). However, factors that influence the coliform population in natural water bodies may alter the relationships between the coliform bacteria and fecal pollution and hence the usefulness of the organsims as indicators. In nature, bacteria are parasitized by various bacteriolytic organisms (BLO); these organisms are small and difficult to identify. They include *Bdellovibrio* and various myxobacteria.

The bacteriolytic organisms apparently do not exist in the human intestional tract nor do they persist where populations of coliform bacteria are low. Where then do the bacteriolytic organisms originate, and is their delivery to the river influenced by season and by precipitation? Three null hypotheses were investigated: 1. there was no correlation between the bacteriolytic and the fecal coliform populations in the rivers. 2. there was no correlation between various rain events and these populations, and 3. no correlation existed between temperature and population levels. To examine these questions, coliform and bacteriolytic organsims were sampled weekly in the Milwaukee and Menominee Rivers during 1975 and 1976 (Gergerich, 1978).

On the Menominee River, samples were obtained at 41st St., 13th St., and from the intake and effluent of the Valley Power Plant. On the Milwaukee River, samples were obtained at the river mouth, Kilbourn Avenue, North Avenue Dam and Silver Spring Rd. Samples were collected weekly using a sterile 250 ml bottle thrown approximately 6 m. from shore. Water temperature was determined immediately.

A double assay was used to detect the bacteriolytic organisms. The water sample was diluted and poured over petri dishes in which "lawns" of *Escherichia coli* were growing. The degree to which the *E. coli* were parasitized provided the estimate of the BLO population. Coliform populations were estimated by pouring river water samples on sterile plates allowing them to grow and then counting the colonies that developed.

Population levels of fecal coliform bacteria and BLO were correlated at most sampling dates and sites. Presumably rainfall is implicated in these correlations. The delivery of coliform bacteria to the rivers seems to occur primarily through the combined sewer outflow. Twelve of 16 data sets produced significant positive correlations between rain and coliform populations. Increase in BLO populations was not correlated with rainfall as frequently, suggesting that additional environmental factors were involved. Water temperature seemed to have little influence on populations of either coliform bacteria or BLO. It was not possible to demonstrate the sources of the BLO, but they were found in raw sewage taken from the Jones Island plant on several dates. They may have entered the system either through leakage into the system or from combined sewers.

Once the organisms reach the rivers, factors other than rain become more important in regulating populations. Some coliform bacteria and bacteriolytic organsims presumably remain in the rivers at all times. Sedimentation, low oxygen levels and other factors influence populations. During a rain, runoff from the soil surface provides an increment of BLO, but at the same time, the largest increase in both coliform bacteria and BLO comes from the combined sewer overflow. The study produced as many new questions as it did answers. However, it is evident that functional populations of bacteriolytic organisms are present in Milwaukee rivers and that their abundance is related to levels of host bacteria and to environmental conditions.

LITERATURE CITED

Gergerich, J.M. 1978. Correlations between bacteriolytic organisms and fecal coliform bacteria in two Milwaukee rivers Ph.D. Dissertation. University of Wisconsin–Milwaukee. 102 pp.

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Joseph Gergerich
Forest Stearns
Department of Botany
The University of Wisconsin–
Milwaukee