ENVIRONMENT CANADA REPORT

TOXICANT AND PARASITE CHALLENGE OF THE MANZ INTERMITTENT SLOW SAND FILTER

G. Palmateer[1], D. Manz[2], A. Jurkovic[3],

R. McInnis[3], S. Unger[1], K.K. Kwan[3], B.J. Dutka[3].

Important considerations in the development and maintenance of safe water supplies are the availability and use of efficient, inexpensive and appropriate technology for assessing microbiological water quality. Realizing these problems, the International Development Research Centre (IDRC), Ottawa, and the Canadian Federal Departments of Health and Environment funded international and national projects to train local aboriginal community members to perform microbiological water quality tests on their drinking water. In some of the communities in developing countries it soon became obvious that all the potable waters being tested were positive for Enterobacteriacae.

This led to the questions, why keep testing, and what can be done about this pollution problem? There was a simple, inexpensive solution to this problem, the intermittent slow sand filter that had been developed by Dr. David Manz, University of Calgary. During this same time period a toxicology screening study of potable waters in the Mapuche homelands in Chile was initiated. Based on the data obtained from this study and an ongoing parallel IDRC sponsored study on drinking water quality, it became obvious that all the surface and underground waters used directly for drinking, cooking, washing, etc. were not only fecal polluted but also contained toxicants, many of which were pesticides. Both the faecal bacteria and toxicants were serious contaminant problems.

It appeared that the microbial pollution problem could be and was being solved by the Manz filter but the toxicants in the potable water problem, were still there. Also there appeared to be no simple inexpensive solution to this problem, in an area where each home had its own water supply, electricity was often unavailable and there were no local funds to assist the residents in obtaining clean safe water. This potential toxicological hazard is believed to be common to all countries, even those with centrally treated and distributed water supplies.

As a potential low-tech, inexpensive partial solution to this problem, a study funded by the International Development Research Centre (IDRC) was initiated at the National Water Research Institute to evaluate the ability of the Manz filter to remove toxicants through the bioaccumulative and biodegradation ability of the biofilm, the "heart" of the Manz filter. Also, since Cryptosporidium and Giardia cysts are problems in urban and rural North American communities as well as in other countries, it was decided to investigate the ability of the Manz filter to contain the cysts within the biofilm and sand layer, and perhaps provide a degree of safety to those drinking the filtered water.

The Manz intermittent slow sand filter was known from the literature to be user friendly, easily constructed from concrete or plastic, small enough to fit into the smallest kitchen and could remove 97% of the fecal coliforms present in the raw water before treatment by the Manz filter. This filter was evaluated for its ability to remove parasitic cysts and toxicants as well as bacteria. Using two different filters and two different water supplies our results indicated that the intermittent slow sand filter could remove 83+% total heterotrophic bacterial populations, 100% of Giardia cysts, 99.98% of Cryptosporidium oocysts and 50-90% of organic (pesticides plus others) and inorganic toxicants when administered in concentrations varying from 10>100 times environmental pollution levels.

1. Ministry of Environment, London, Ont. Canada
2. Davnor Inc. Calgary, Alberta, Canada
3. Environment Canada, National Water Research Institute, Burlington, Ont. Canada