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# A MODULAR WATER TREATMENT PACKAGE FOR SURFACE WATERS IN RURAL LOCATIONS OF DEVELOPING COUNTRIES INCORPORATING NOVEL DESIGN AND OPERATIONAL FEATURES

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It is generally well accepted that safe water supplies and sanitary provision are key indicators of the health and socio-economic status of communities in both industrialised and developing countries. However, it is also becoming increasingly apparent that the absence of effective social and economic support for operation and maintenance may well render the installation of water treatment processes non-productive. Similarly, even where diligent skilled supervision is assured, the absence of hygiene education and a level of community development able to sustain and promote other primary health care initiatives, the expected health benefits of clean water and sanitation may not be attained.

In a few industrialised countries which bother to survey breakdowns in water supply and correlate them with outbreaks of waterborne disease, it is apparent that a high proportion of such incidents occur in small, usually rural supplies and are directly attributable to the breakdown of a single treatment process (normally disinfection). In 1975-1976, 3057 cases (16) outbreaks) of waterborne disease recorded in the US were caused by such failures (Craun and Gunn, 1979). In developing countries the record of successful applications of relatively high technology water treatment plant even in large municipalities is not good. The absence of skilled operatives, failures of supplies of chemicals and power are often cited as reasons for breakdown. In provincial and sub-provincial circumstances where reliance is normally placed on less sophisticated technology, the failure of treatment facilities is still depressingly common. In Peru, for example, of the 1,000 water supply systems which have been installed over the last 20 years, only 300 supply properly treated water.

Against this background, what hope is there for the vast majority of rural dwellers who live in small village communities depending on contaminated surface waters for their drinking water? Clearly the experience of both industrialised and developing countries, coupled with the obvious problems of financial and logistical support rules out the high technology solutions, especially those placing a large degree of reliance for microbiological safety on a single process i.e. disinfection. Thus the efficient treatment of surface waters in rural locations in developing countries will invariably depend on a combination of processes which incorporates as its centrepiece slow sand filtration. By allowing for various pretreatment options (and in cases of gross raw water contamination, the potential for terminal treatment) a system of multi barrier protection to the transmission of waterborne disease can be devised for most geographical, cultural, social and economic circumstances. Supplementary to the 'process barriers' however, are what may be termed 'essential organisational barriers' to waterborne disease. These include: optimal source selection; effective process supervision (operation and maintenance); public health awareness of operatives and consumers; regular

water quality monitoring of source, treated and supply waters; effective communications between those responsible for maintenance, water quality inspection and consumers; and financial and human resources to rectify problems and undertake repairs. Of these the failure of operation and maintenance procedures is as frequent a cause of breakdown as any.

Funded by the UK Overseas Development Administration, the University of Surrey has developed a modular water treatment package suitable for rural village communities with considerably simplified and streamlined operation and maintenance requirements. Trials in the UK have demonstrated that even highly turbid contaminated surface waters may be reliably treated, providing water of consistently potable quality without recourse to disinfection. Principally, this is achieved by a combination of 'process aids' which protect and enhance the efficiency of slow sand filtration (Parton et al., 1983). Experience with the system in rural locations in Peru is described with reference to community acceptance and participation, prospects for large scale uptake of the technology are discussed.

## REFERENCES

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