

# Approaches for regulating water in South Africa for the presence of pesticides

L London<sup>1</sup>, MA Dalvie<sup>1\*</sup>, A Nowicki<sup>1</sup> and E Cairncross<sup>2</sup>

<sup>1</sup>Occupational and Environmental Health Research Unit, Department of Public Health, University of Cape Town, Anzio Rd, Observatory, Cape Town, South Africa

<sup>2</sup>Department of Chemical Engineering, Peninsula Technikon, Bellville, Cape Town, South Africa

## Abstract

The public health significance of pesticide pollution of water sources in South Africa has received little attention from policy-makers and regulators, unlike microbiological quality of potable water. This anomaly is reflected in the current legislation in South Africa which is marked by inadequate regulatory standards for pesticides in water. Due to high costs, technical constraints and shortage of laboratory skills for pesticide analyses in South Africa, the poor regulatory framework has no monitoring data on which to base policy. In contrast, international experience in setting standards for maximum permissible levels of pesticides in water is extensive. The different approaches used by the World Health Organisation, the United States Environmental Protection Agency and the European Union are outlined, as well as the assumptions underlying these different approaches. Drawing on these models, recommendations are made as to how to integrate concerns for pesticide safety in environmental regulation and risk assessment in South Africa. Such measures would ensure consistency with recent developments in environmental management in South Africa that give primacy to a number of key environmental policy principles. A public health perspective should ensure that growing international concerns for long-term adverse health and environmental impacts arising from the presence of pesticides in water are adequately addressed in regulatory controls in South Africa.

**Keywords:** Water regulation, standards, pesticides, health

## Introduction

Long-term low-dose exposures to pesticides are increasingly thought to cause chronic health problems, including reproductive, immunological, respiratory, neurological and carcinogenic impacts (Maroni and Fait, 1993; Schettler et al., 1996; Gray and Ostby, 1998; Dalvie et al., 1999; Porter et al., 1999; Kirkhorn and Schenker, 2002; Colosio et al., 2003). Although much of the scientific evidence for these associations stems from epidemiological studies in the workplace, environmental routes of exposure, including ingestion of pesticides in water, are thought to be of greater public health significance because of the very large numbers of people potentially exposed, the difficulties in controlling chemically contaminated environments and the fact that small changes in contaminant levels may have significant adverse population outcomes (Barnes and Kalita, 2001; McKay and Moeller, 2001).

The public health significance of pesticide pollution of water sources in South Africa has received relatively little attention from policy-makers and regulators, unlike microbiological quality of potable water, which remains a high priority of legislative measures. This anomaly is reflected in the current drinking water guidelines in South Africa (Department of Water Affairs and Forestry, 1996a), which have detailed standards for inorganics and coliform content (Table 1) but few standards for organic contaminants, and only one standard for a pesticide, atrazine. Given that South Africa is the main market for pesticides in sub-Saharan Africa (Dinham, 1993), this is an important gap.

Monitoring for pesticides in water is made difficult in South Africa by a range of factors. These include the high costs of analyses, and of analytical equipment required such as a gas chromatograph, high-pressure liquid chromatograph and mass spectrometer. There is also a shortage of laboratory skills and institutional capacity available in South Africa for pesticide analyses (Rother and London, 1998) and an absence of practical, feasible and cost-effective field monitoring protocols (Dalvie et al., 2002).

The absence of a regulatory framework and water standards for, and monitoring data on pesticides, means that South Africa lacks the capacity to address a potentially serious public health matter. It is usually the poorest and most marginalised groups in society who bear the brunt of environmental pollution from pesticides (London and Rother, 1998).

## International water standards

In contrast, international experience in setting standards for maximum permissible levels of pesticides in water is extensive due to concerns for adverse health and environmental impacts, even at low levels and particularly for organic pesticides of high persistence. Standards for human health (Table 2) are generally much less stringent than standards for aquatic ecosystems (Table 3).

There are two approaches in setting drinking water standards internationally. Agencies such as the World Health Organisation (WHO) and the US Environmental Protection Agency (EPA) adopt a health-risk based approach whereby safe levels for humans are inferred using various extrapolations, assumptions and safety factors from toxicological data obtained on laboratory animals. More recently, the EPA has even moved to consider using data from human experiments to set pesticide tolerances (Anonymous, 2003), an action somewhat controversial in the scientific community

\* To whom all correspondence should be addressed.

☎ +2721 406-6610; fax: +2721 406-6163;

e-mail: [aqiel@cornack.uct.ac.za](mailto:aqiel@cornack.uct.ac.za)

Received 19 April 2004; accepted in revised form 21 September 2004.