



***Third edition of the Guidelines for the Safe Use of Wastewater, Excreta and Greywater
in Agriculture and Aquaculture***

Fact Sheet for WHO Country Offices

In 2006 WHO published the third edition of the Guidelines for the safe use of wastewater, excreta and greywater in agriculture and aquaculture in four volumes. The third edition supersedes the 1989 second edition. This fact sheet focuses on the Guidelines' principles and practices that are relevant for WHO country staff in their efforts to promote the safe reuse of water and the safe use of human excreta in the agricultural production process, and the safe consumption of produce cultivated with human waste inputs.

Target audience

A number of WHO Country Offices have a technical officer who is specifically responsible for issues related to drinking-water and sanitation. In many cases, these functions are part of a broader package of environmental health activities. In some WHO Regions, Environmental Health advisers cover a group of countries. Two regional centres (CEHA in Amman, Jordan and CEPIS in Lima, Peru) include water, sanitation and health in their remit. This fact sheet is intended for this diverse group of WHO technical professionals who assist Member States on a day-to-day basis on issues related to water and sanitation.

The WHO Constitution links the Organization with its Member States through ministries of health. With respect to drinking-water and sanitation, however, there is a great deal of diversity in the nature and magnitude of the role these ministries play. In some countries, this role may be limited or ministries of health may have no authority at all.

In the context of safe use of wastewater, excreta and greywater in agriculture and aquaculture the roles of ministries of health may be even less well-defined. Ministries of agriculture and environment are likely to perform promotional, normative and monitoring functions wherever this type of agriculture is practised in a formal way. More often, however, agriculture relying on an input of human waste is informal in nature and takes place in peri-urban areas which may lie beyond the jurisdiction of municipal authorities. In such settings, local NGOs usually play a key role.

Promotion by WHO staff of the principles and practice contained in the third edition of the Guidelines therefore requires that, with the consent of the national health authorities, contacts are established with the key players in ministries of agriculture and environment, with local government and with NGOs active in this area.

The Guidelines in brief

Primary prevention is at the heart of the third edition of the Guidelines. In a departure from the 1989 second edition of the Guidelines, they propose to Member States a level of

flexibility in the management of health risks, in accordance to what realistically can be achieved in the national socio-economic context. The key attributes of the Guidelines are:

Affordable risk assessment

Member States are given a choice between more costly and more time-consuming epidemiological field studies, or the rapid, affordable and reliable Quantitative Microbial Risk Assessment, a statistical method of assessing risks from specific hazards through different exposure pathways. QMRA has four components: hazard identification, exposure assessment, dose-response assessment and risk characterization.

Flexible setting of health based targets

Health-based targets provide the basis for the overall risk management, monitoring and evaluation strategy. They are set at the national level, but applied at the local level and therefore by definition require a contextual multiple-barrier risk management approach. The Guidelines propose a tolerable disease burden of $\leq 10^{-6}$ DALY per person per year, equal to the health protection level applied to safe drinking-water. National authorities can deviate from this global guideline value based on country-specific socio-economic constraints.

A systems approach to cumulative risk management interventions

To achieve the established health-based targets, authorities have to ensure the most cost-effective implementation of risk reduction measures along the entire chain from waste generation to produce consumption. Cumulatively, such measures will achieve the desired level of health protection. Options obviously include the partial or full treatment of wastewater, excreta and greywater, but they also include measures such as crop restriction, safe handling and application practices of wastewater, excreta and greywater, irrigation and fertilization withholding periods prior to harvest, hygienic marketing and food preparation practices and hygiene education. Typical health sector interventions such as drug treatment (to reduce intestinal worm loads in the population) or vaccination may also be included in the package of risk reduction measures.

Comprehensive monitoring

Rigorous and comprehensive monitoring is an essential element of any strategy to promote the safe use of wastewater, excreta and greywater. It consists of three components:

- Validation – to test new systems/processes for their capacity to meet specified targets
- Operational monitoring – real-time observations to check whether the system is working as expected
- Verification – to ensure the end product meets microbial quality specifications

The health issues addressed by the Guidelines

The health risks associated with the use of wastewater, excreta and greywater are by and large gastro-intestinal infections caused by viruses, bacteria, and protozoan and metazoan parasites. Diarrhoeal diseases, caused by a range of excreta-related pathogens, result in an estimated global mortality of 1.8M deaths and an estimated disease burden of 62M DALYs lost per year. Children are the most vulnerable: 90% of all deaths occur in the group under 5 years of age. Intestinal worm infections are wide-spread: some 1.45 billion people world-wide are infected with the roundworm *Ascaris*, and an estimated 1.3 billion have hookworm infection. The table below provides a summary with reference to the three vulnerable groups.

Table 1. Summary of health risks associated with the use of wastewater for irrigation (WHO, 2006)

Group exposed	Health threats		
	Helminth infection	Bacteria/viruses	Protozoa
Consumers	Significant risk of <i>Ascaris</i> infection for both adults and children with untreated wastewater	Cholera, typhoid and shigellosis outbreaks reported from use of untreated wastewater; seropositive responses for <i>Helicobacter pylori</i> (untreated); increase in non-specific diarrhoea when water quality exceeds 10^4 thermotolerant coliforms/100 ml	Evidence of parasitic protozoa found on wastewater-irrigated vegetable surfaces, but no direct evidence of disease transmission
Farm workers and their families	Significant risk of <i>Ascaris</i> infection for both adults and children in contact with untreated wastewater; risk remains, especially for children, when wastewater treated to <1 worm egg per litre; increased risk of hookworm infection in workers	Increased risk of diarrhoeal disease in young children with wastewater contact if water quality exceeds 10^4 thermotolerant coliforms/100 ml; elevated risk of <i>Salmonella</i> infection in children exposed to untreated wastewater; elevated seroresponse to norovirus in adults exposed to partially treated wastewater	Risk of <i>Giardia intestinalis</i> infection was insignificant for contact with both untreated and treated wastewater; increased risk of amoebiasis observed with contact with untreated wastewater
Nearby communities	<i>Ascaris</i> transmission not studied for sprinkler irrigation, but same as above for flood or furrow irrigation with heavy contact	Sprinkler irrigation with poor water quality (10^6 – 10^8 total coliforms/100 ml) and high aerosol exposure associated with increased rates of infection; use of partially treated water (10^4 – 10^5 thermotolerant coliforms/100 ml or less) in sprinkler irrigation is not associated with increased viral infection rates	No data on transmission of protozoan infections during sprinkler irrigation with wastewater

Essential functions

A number of essential functions for WHO Country Offices with respect to promoting the safe use of wastewater, excreta and grey water in agriculture and aquaculture help maximize the benefits Member States may derive from the third edition of the Guidelines:

- Assist in assessing the situation and trends with respect to the use of wastewater, excreta and greywater in agriculture and aquaculture, and analyse available epidemiological datasets for the health impacts of existing reuse schemes.

- Promote the use of Quantitative Microbial Risk Assessment (QMRA) as a basis to better define health-based targets in agricultural water reuse schemes
- Develop a database of successful interventions to reduce the health risks associated with the use of wastewater, excreta and greywater along the entire chain from waste generation to produce consumption, including financial and economic information
- Assist in setting realistic norms and standards that support the achievement of agreed health-based targets, and in establishing a comprehensive system of validating, monitoring and evaluating intervention strategies.
- Foster the creation of institutional arrangements between ministries and institutions in the health, agriculture, environment and local government sectors, focusing on roles and responsibilities within a common policy framework for the safe use of wastewater, excreta and greywater.
- Engage in national and local capacity building activities aimed at promoting the principles and practice proposed by the third edition of the Guidelines
- Strengthen the health sector's capacity, capability and jurisdiction to contribute to the safe use of wastewater, excreta and greywater, especially in terms of laboratory services.

Capacity building

The need to build capacity at national and local level for the implementation of the third edition of the Guidelines is reflected in the above essential functions. There are many options for capacity-building initiatives by WHO Country Offices and some of these are listed here:

- Organization of a national stakeholders meeting about the third edition of the Guidelines
- Initiation of a process of policy review, formulation, adjustment and harmonization towards a national policy framework for the safe use of wastewater, excreta and greywater
- Organization of training courses on intersectoral negotiation and decision-making in the development and management of water reuse in agricultural production
- Formulation of memoranda of understanding as a basis for improved intersectoral collaboration in the area of wastewater, excreta and greywater management
- Provision of technical inputs into grass-roots agricultural capacity building activities such as Farmer Field Schools
- Specific human resource development efforts with respect to risk assessment techniques and procedures, design of integrated risk management packages, economic analysis and evaluation, laboratory techniques and monitoring/evaluation.

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The views expressed in this background document represent the views of the author alone; they do not necessarily represent the decisions or the stated policy of the World Health Organization.