5
Sociocultural aspects

Human behavioural patterns are a key determining factor in the transmission of excreta-related diseases. The social feasibility of changing certain behavioural patterns in order to introduce excreta or wastewater use schemes, or to reduce disease transmission in existing schemes, can be assessed only with a prior understanding of the cultural values attached to practices that appear to be social preferences yet which facilitate disease transmission. Cultural beliefs vary so widely in different parts of the world that it is not possible to assume that any of the practices that have evolved in relation to excreta and wastewater use (see Table 2.1, page 24) can be readily transferred elsewhere: a thorough assessment of the local sociocultural context is always necessary (Cross, 1985).

5.1 Excreta use

Human society has evolved very different sociocultural responses to the use of untreated excreta, ranging from abhorrence through disaffection and indifference to predilection. For example, in Africa, the Americas and Europe, excreta use is generally regarded with disaffection or, at best, indifference. This results from the strongly held view that human excreta, especially faeces, are repugnant substances best kept away from the senses of sight and smell. Products fertilized with raw excreta are regarded as tainted or defiled in some way. Such views are not held, or at least not so rigidly, in relation to excreta-derived composts or wastewater sludges, and these materials are commonly used in agriculture, horticulture and land reclamation schemes.

In contrast, both human and animal wastes have been used in agriculture and aquaculture in, for example, China, Japan and Java for thousands of years (see Section 2.3). This practice is in social accord with the Japanese and Chinese traditions of frugality and reflects a deep ecological, as well as economic, appreciation of the dependent relationship between soil fertility and human wastes. In such societies intensive cultivation practices have evolved in response to the need to feed a large number of people living in an area of limited land availability, and this has necessitated the careful use of all the resources available to the community, including excreta. Thus excreta use is dictated by survival economics. Even so, any attempts to minimize health risks by altering the established excreta use practices are likely to meet with social acceptance and success only if the changes are minor and socially unimportant. Any attempts to alter a social preference are likely to fail. Thus excreta storage to inactivate trematode eggs is likely to be a feasible change to the belief that fresh (i.e. untreated) excreta must be used for maximal agricultural benefit, but exhortations not to eat raw fish are likely to fall on deaf ears.

In Islamic societies direct contact with excreta is abhorred, since by Koranic edict it is regarded as containing impurities (*najassa*). Its use is permitted only when the *najassa* have been removed. Thus the agricultural use of untreated excreta would not be tolerated, and any attempt to modify this would be futile. On the other hand, excreta use after treatment would be acceptable if the treatment is such that the *najassa* are removed—for example, after thermophilic composting which produces a humus-like substance that has no visual or odorous connection with the original material. *Najassa* may be deemed to be removed in other ways. In Java, for example, it is acceptable to fertilize fish-ponds with untreated excreta because the excreta are diluted by the pond water and because the water flows from one pond to the next; this combination of dilution and flow is considered to render the water pure (*tahur*), and so the practice is religiously acceptable.

In many developing countries the task of collecting urban nightsoil is regarded as employment of very low status, and consequently it is becoming increasingly difficult for urban authorities to recruit people for such work. As a result, sanitation facilities that produce nightsoil, such as bucket latrines, are being replaced by those that do not, for example pour-flush latrines. Indeed in some countries, for example India, the government is promoting programmes to replace bucket latrines with pour-flush toilets not only for reasons of improved health but also because of "society's demand for doing away with the degrading practice of human beings carrying nightsoil loads" (Venugopalan, 1984). There is therefore a trend for nightsoil to be replaced by latrine sludges as the raw material in excreta use schemes. From the viewpoint of excreta-related disease control this is to be welcomed as the pathogen load, and hence the potential risk to health, is substantially reduced.

5.2 Wastewater use

Untreated wastewater is currently used for crop irrigation in many parts of the world where it is produced, and there does not appear to be any significant sociocultural revulsion at this practice. (This is not always the case, however, and the practice may be initiated only by economic necessity.) Treated wastewater is much less objectionable in appearance than untreated wastewater and from a socio-aesthetic viewpoint is more suitable for agricultural and aquacultural use. Any public fears may be allayed by suitably designed information programmes.

In Islamic countries wastewater may be used for irrigation provided that the impurities (*najassa*) present in raw wastewater are removed. Untreated wastewater is in fact used in some Islamic countries, principally in areas where there is an extreme water shortage and then generally from a local wadi (ephemeral desert stream), but this is clearly a result of economic need and not of cultural preference. According to Farooq & Ansari (1983) there are three ways in which impure water may be transformed into pure water:

- self-purification of the water (for example, removal of the impurities by sedimentation);
- addition of pure water in sufficient quantity to dilute the impurities; and
- removal of the impurities by the passage of time or physical effects (for example, sunlight and wind).

It is notable that the first and third of these transformations are essentially similar to those achieved by modern wastewater treatment processes, especially stabilization ponds.

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Environmental aspects

Excreta and wastewater use schemes, if properly planned and managed, can have a positive environmental impact as well as increasing agricultural and aquacultural yields. Environmental improvement occurs as a result of several factors, the most important of which are the following:

- Avoidance of surface water pollution, which would occur if the wastewater were not used but discharged into rivers or lakes. Major environmental pollution problems, such as depletion of dissolved oxygen, eutrophication, foaming and fish kills, can be avoided.

- Conservation or more rational use of freshwater resources, especially in arid and semi-arid areas; fresh water for urban demand, wastewater for agricultural use.

- Reduced requirements for artificial fertilizers, with a concomitant reduction in energy expenditure and industrial pollution elsewhere.

- Soil conservation through humus build-up and through the prevention of land erosion.

- Desertification control and desert reclamation, through irrigation and fertilization of tree belts.

- Improved urban amenities, through irrigation and fertilization of green spaces for recreation (parks, sports facilities) and visual appeal (flowers, shrubs and trees adjacent to urban roads and highways).

Pollution of soil and ground water is clearly a potential disadvantage of using excreta and wastewater in agriculture. Under most conditions, wastewater irrigation does not present a microbiological threat to ground water since it is a process similar to slow sand filtration: most of the pathogens are retained in the top few metres of the soil, and horizontal travel distances in uniform soil conditions are normally less than 20 m. However, in certain hydrogeological situations (for example, in limestone formations) microbial pollutants can be transported for much greater distances, and careful investigation is required in such cases (see Lewis et al., 1982). Chemical pollutants, among which nitrates are of principal concern in the case of domestic wastes, can travel for greater distances, and there is the potential risk that drinking-water supplies in the vicinity of wastewater irrigation projects may be affected. Generally, water supplies should not be located within, or close to, wastewater-irrigated fields.

As a result of increased rates of salinization and waterlogging, soil pollution can occur through wastewater irrigation if inadequate attention is paid to leaching and drainage requirements. Saline drainage waters should be used to irrigate salt-tolerant crops where possible, and crop and field rotation will generally be necessary to avoid long-term damage to the soil structure. Adherence to good irrigation practice is essential to avoid adverse environmental effects, and standard texts should be consulted for further details (for example, Rydzewski, 1987; Pettygrove & Asano, 1984; Ayers & Westcot, 1985). Often a trade-off has to be made between agricultural production and environmental protection, and this must be carefully evaluated at the project planning stage (see Section 8). Many of the above potential disadvantages of wastewater irrigation, together with such hazards as odour, vector development and the effects of accidental discharges of toxic substances, can be avoided by the use of properly treated wastewater (see Section 7).

Excreta use in agriculture and aquaculture has many of the advantages of wastewater use, and fewer potential environmental disadvantages. Most on-site sanitation systems can be easily designed or adapted for reuse, and the resulting latrine sludges can be safely used. The production of excreta-derived compost by using pulverized domestic refuse to correct the carbon-to-nitrogen ratio and moisture content of excreta (see Section 7.2.3) has the greatest potential for environmental improvement, through the reclamation and subsequent use of the two worst visual pollutants of the urban environment in developing countries — excreta and domestic refuse. Excreta-derived compost is a valuable, pathogen-free soil conditioner and fertilizer. Its production and use provide a simple and environmentally advantageous solution to both human wastes reuse and environmental pollution in urban areas without a sewerage system.