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RE-USE OF WASTE-WATER EFFLUENTS AND PUBLIC HEALTH IMPLICATIONS

O U T L I N E

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INTRODUCTION

Parallelling the increasing interest in use of recycled and the use of water once used, is the mounting concern regarding the public health implications.

Using water that has once been used is not new, but over the years this has been confined to using such water from streams that had afforded some dilution and self-purification of wastes previously discharged to it. Now we are short-circuiting the stream and its dilution and possible bacteriological improvement by using waste effluent more directly.

Obviously much of the concern and potential health implications are dependent upon the concentration of particular constituents in the waste-water re-used, and of principal importance - how the recycled water is used.

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Public health is founded on the principal of preventing illness and therefore there is justifiable concern if there is any question regarding potential health hazards. Potential public health hazards are not always fully appreciated by those not constantly exposed to these problems.

This paper is in outline form designed to raise questions for further discussion in this Seminar.

It is built around major headings of waste treatment methods and uses.

METHODS

1. Waste-Water Treatment by Land Disposal

a) While such effluents are chlorinated, pathogenic viruses, bacteria and parasitic nematodes and trematodes are all present in waste-water and have varying degrees of susceptibility to chlorine. This prevents drawing broad conclusions on disinfection as determined by coliform testing.(1)

b) Many of the detrimental health and hygiene aspects of land disposal should be significantly reduced by complete treatment, filtration and disinfection.(1)

c) Land site that has from 5 to 10 feet of continuous fine soil can avoid biological contamination of groundwater.(1)

d) There is a significant probability and a potential health hazard of inhaling pathogenic aerosols near a spray irrigation site.(1)

e) Where land disposal is the first step in a water cycling programme, total dissolved solids, sodium and nitrate-nitrogen build up in groundwater could involve a potential health hazard. Nitrate-nitrogen is implicated in infant methemoglobinemia.(1)

f) Where ponding results from land disposal and recycling (usually in spray irrigation), mosquito breeding is enhanced. Since this is waste-water there is an implication for a tremendous health hazard potential for anthropod-borne disease transmissions. Some birds on such irrigation sites have been affected.(1)

g) Bacteria and viruses are removed from waste-water by the upper soil mantle (1 cm) very efficiently when applied by spray irrigation and rapid infiltration ponds systems - less efficiently by overland runoff method (90 to 99 per cent).(5)

2. Advanced Waste Treatment (Physical and Chemical)

a) These types of processes offer one of the best possibilities for producing a reclaimed suitable for re-use - possibly with no further treatment.

USES

1. Domestic Consumption (Entirely or in Part)

a) Properly controlled break point chlorination with pH and turbidity considerations is of major importance in the disinfection of reclaimed water for drinking purposes.(1)

b) In the consumption of reclaimed waste-water tertiary treatment is indispensible as part of the reclamation process. Its necessity and importance cannot be overemphasized.(1)

c) Experience has shown that a quality of water tailored to meet requirements for many uses, including ground water recharge and eventual human consumption, can be produced.(1)

2. Use in Food Production and Processing

This includes irrigation, processing and packaging of food for human consumption.

a) Health hazards that can result from irrigating with reclaimed waste-water containing pathogens in the original wastes have been evaluated. While chlorination is necessary, micro organisms, including the typhoid group, cholera vibrios, Shigella, mycro-bacterium tuberculosis. Coxsacki virus, Polio virus (I & II), Schislosoma, Ascaris, hookworm and Trichuris have been found passing through the activated sludge process even though greatly reduced and even after chlorination. Many of these micro organisms were detected in effluents.(2)

b) Exposure of product (especially if used in processing) or in paper making where product is packaged in such paper.

c) Exposure of industrial personnel to reclaimed if not drinking water quality.

d) Possibility of inter-connections of piping carrying safe drinking water and reclaimed water, if latter is not bacterio-logically safe.

e) Radioactive material could be considered as a potential hazard in this category of use.

GENERAL COMMENTS IN GENERAL REFERENCE TO FACTORS INVOLVED IN PUBLIC HEALTH IMPLICATIONS

1. The removal of poliovirus virulent strain (Mahoney type 1) by Dialomaceous earth infiltration is possible.(3)

2. The removal of T-2 bacteriophage by Dialomaceous earth filtration is possible.(4)

3. Possible use of reeds (specific species) for conditioning of reclaimed effluents prior to use for consumption. Actually in practice in some European countries.(7)

Rushes or Reeds (Scirpus Lacustris) have been reported to eliminate or reduce Escherichia Coli among many other substances and this gives this method an important health consideration - especially since it is primarily used to pre-treat used water for further processing for drinking purposes.

4. Effect of toxic algae on human and animal consumption - seed algae possibly resulting from reclamation ponds in reclaiming process.

5. Toxic metals in amounts not able to detect.

6. Synergestic effect of unidentifiable contaminants.

7. Toxins produced as result of organic decomposition in waste-water.

8. Need for additional virological investigations.

9. It is possible that "renovated water" could be a more carefully produced water with special care taken not only to remove viruses and other pathogens and chemicals - since chemicals are known to interfere with disinfection (the real factory of safety), renovated waste-water effluents may be a lesser health hazard than treated surface water now used by many consumers. The renovation or re-use processes themselves are a general combination of carefully controlled waste treatment processes and a modified water treatment procedure.(6)

CONCLUSION

In presenting this outline for discussion, it must be emphasized that the real thrust or target objective of reclaiming waste-water is not nor has been to force or advocate the consumption of such re-use by humans, directly or indirectly.

One of the "spin-off" benefits of focussing attention on this subject of the re-use of waste-water effluents as part of a programme for water resources conservation and management, has been to help solve the growing problems of water pollution and to keep clean waters clean.

The writer lays no claim to this outline being a complete resume of the subject. It is designed to raise questions, state some conclusions (with the reference) and stimulate discussion at this Seminar on an increasingly important problem. If it succeeds in doing this, it will have served its intended purpose.

ANNEX I

REFERENCES

(Many of the following include other references)

1. The Virus Problem in the Windhock Waste-Water Reclamation Project, Nupen and Stander.

2. Waste-Water Management by Disposal on Land, US Army Corps of Engineers, Special Report 171.

3. Poliovirus Removal by Dialomaceous Earth Filtration, University of Texas (USA), Centre for Research on Water Resources, June 1972.

4. T-2 Bacteriophage Removal by Dialomaceous Earth Filtration, University of Texas, USA, Centre for Research in Water Resources, December 1971.

5. Assessment of the Effectiveness and Effects of Land Disposal, Methodologies of Waste-Water Management, US Army Corps of Engineers, Report 72-1, January 1972.

6. Re-assessment of the Virus Problem in Sewage and Surface and Renovated Waters, Dr Gerald Berg, 6th International Water Pollution Research Conference.

7. Purification of Water by Higher Plants, Kathe Seidel, Limnologic Statuin of the Max-Planck Society, Krefeld-Hulserberg, West Germany.