breakthrough, that is, my presentation there tomorrow. It will be a factual reporting of where we stand in terms of removal of one impurity.

Mr. DADDARIO. It is little things like that, Mr. Everts, that sometimes show the gaps that exist in our liaison capabilities.

## QUESTIONS SUBMITTED TO CURTISS M. EVERTS BY THE SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT

*Question 1. Does the Public Health Service or the Federal Water Pollution Control Administration feel that adequate information on human health criteria is available to allow total reuse of municipal waste water? If not, what is missing, who is responsible for getting the facts, and when will we know whether this alternative water supply is available?*

Answer. It is believed that we have only enough information at the present time to proceed with pilot plant tests of processes for the use of reclaimed waste waters for all purposes. Processes now exist for renovating waste waters for use as water supplies, but the questions that have not been answered involve economics, the reliability of these processes, and the development of suitable standards by which their performance may be evaluated.

Although standards applicable to public drinking water supplies have been in use for more than 50 years, little, if any, work has been done to establish a basis for the development of criteria that could be applied to the use of reclaimed municipal waste water for all purposes. Drinking water standards always have included provisions for sanitary surveys of the water source to ensure that the water treatment plant used a raw water that was relatively unpolluted. Morbidity and mortality data have supported these finished water standards, for acute health effects in humans have not been attributed to waters that have met the standards. All possible toxic elements and compounds that could occur in water are not included in the standards for the reason that they have not been present in amounts considered significant, or they may have appeared only in trace concentrations on an erratic or periodic basis. If the raw water souurce is sewage, where contaminants are present in more concentrated form, a much more extensive set of standards will be necessary.

During the past decade, much has been learned about treatment of waste water for removal of some organic substances and bacteria. Not enough effort, however, has been devoted to the development of methods to remove other harmful contaminants, such as trace elements, pesticides, and some unidentified viruses.

Since little, if any, control can be exercised over the disposal of chemicals and other harmful substances into waste water collection systems, the problem of establishing fail-safe operating and control criteria for reuse of waste water becomes quite a complex problem, particularly when the reclaimed water is to be used for drinking and culinary purposes.

Whether reclaimed waste water can be used for all purposes also will depend upon the development of reliable methods and techniques for waste water treatment and for identification of contaminants. In addition, meaningful indicators must be developed and used to assess the impact of renovated waste water on human health. For example, such elements as copper, at the optimum level, are beneficial, but, at concentrations higher than optimum, they may prove harmful.

Except in a research situation, a water renovation plant could not be expected to analyze for everything that could be discharged into a sewer. Analytical cost and time would make the system impracticable. Some screening or indicator test procedures must be developed.

More precisely, the new information and techniques required are:

1. Improved and more rapid methods for the identification and measurement of pathogenic bacteria, viruses, and indicator organisms.
2. Improved techniques for the identification and measurement of trace elements and of natural and synthetic organic materials.
3. The determination of human health effects related to consumption of waters containing substances found in reclaimed waste waters.
4. The development of waste water treatment systems that can be depended upon to continuously operate and produce a water of safe quality for domestic use at all times.
5. Determination of the effectiveness of present advanced water treatment facilities in removing pathogenic parasites and other contaminants from waste water.