

such information, it is difficult, if not impossible, to establish minimum tolerance levels for inclusion in standards on potable water quality. Furthermore, the increasing contribution of industrial waste containing both inorganic and organic chemicals or unknown or undetermined composition also complicates the problem. Many of the chemical limits contained in the Drinking Water Standards relate to time-honored materials without appropriate recognition of new and exotic forms of chemicals which pass through both sewage and waste treatment plants and water supply treatment plants with little or no reduction.

The total body burden exposure is becoming increasingly important. It is essential that total intake of a given chemical by man be considered in establishing the respective limit for its presence in air, water, and food. An excellent example in this regard relates to lead in the environment which is present in water, air, food, and cigarette smoke. Relative judgments have to be made as to the appropriate levels in each of these categories in order to establish meaningful standards.

The lack of specific guidelines is well exemplified by the establishment of a limit for carbon chloroform extractables in the Drinking Water Standards. These are organic materials which can be removed by the use of activated carbon and the standard provides a gross measure of organic materials which may be present in the water supply. Laboratory studies have indicated that these materials are carcinogenic in nature. While still at an extremely low level of concentration in many of our municipal water supplies, studies are needed in order to identify the particular chemicals to permit the establishment of limits for various organic chemicals hazardous to health. The difficulties in trying to establish absolute limits for all chemicals which may be found in drinking water supplies are obvious. Nevertheless, a surveillance program is needed in order to provide better information on the types of chemicals which are increasingly finding their way into water supplies, both ground and surface. It is essential that a continuing review and appraisal of the Drinking Water Standards be maintained in order to keep abreast of the problem.

#### CHEMICAL EXPOSURES

The following specific examples highlight the importance of chemicals in our domestic water supply. Marked geographical differences have been noted in man's morbidity and mortality rates. It is reasonable to assume that some of these rates might be related to the varying chemical composition of drinking water supplies. As noted above, potential carcinogenic and toxic substances are being found in water sources although currently at levels which are not believed to be hazardous. Some of these substances are incompletely removed by conventional water treatment methods. Distribution of death rates for malignant neoplasms of digestive organs, cirrhosis of the liver, and chronic and unspecified nephritis in certain metropolitan areas suggests that there could be an association with drinking water quality.

Specific examples of health problems to which answers are needed on the subject of contaminants in drinking water supplies may be listed as follows:

1. The increased incidence of cancer of the bladder in certain geographical areas of the country where the raw water supplies have received the municipal, industrial, and agricultural wastes of up-stream cities on the Mississippi-Missouri-Ohio river chain.
2. The potential toxicity of high nitrate concentration currently known to cause methemoglobinemia in infants.
3. The limits for lead in water supply in terms of whole body exposure and its potential as a cumulative poison in humans.
4. The fate of antibiotics, hormones, and similar materials in waste waters discharging to sources of water supply must be established.
5. Further exploration of the relationship of copper to arthritis.

The above are only a partial listing of the health-related problems of chemicals in drinking water supplies. While progress is being gained in securing municipal and industrial waste treatment facilities throughout the nation, these plants are not always effective in the removal of the dissolved inorganic and organic chemicals which are believed to have toxic potential to the human organism. Basic to all studies of the effects of chemical contaminants in water supplies is the need for