



## CHAPTER I

### INTRODUCTION

Chlorination is the widely used method to against waterborne diseases and to improve water quality such as in cooling water process, drinking water process and swimming pool water because of its efficiency and reasonable cost without knowing its diverse health impact.

In most recent years, chlorination has been found to produce halogenated organic compounds in the water such as trihalomethane, short-chain halogenated hydrocarbon and aromatic hydrocarbon. These compounds occur in chlorination process by the reaction of chlorine and organic materials which are compounds of aquatic substances and human substances (Trussel and Umphres, 1978) such as citric acid, lipid, urine, etc.

Chloroform, carbon tetrachloride, methylene chloride, 1,1,1-trichloroethane and trichloroethylene are in a group of halogenated hydrocarbon compound which are classified as priority pollutant by Environmental Protection Agency (EPA) and World Health Organization (WHO). The pollutants, according to the study, can cause detriment to health such as toxic to kidney and liver. Many study indicate some compounds to be carcinogen in experimental animals and to be a suspected human carcinogen. These compounds may be found in chlorinated water. The quantities of these compounds depend on many factors such as reaction time, chlorine dose, precursor in water, photoreaction, etc.

Owing to the toxicity of such pollutant, WHO recommended that concentration of chloroform, carbon tetrachloride, and trichloroethylene in drinking water should not exceed 30, 3, and 30  $\mu\text{g/l}$  respectively and national primary drinking water regulation by EPA has established maximum contaminant levels for carbon tetrachloride, trichloroethylene and 1,1,1-trichloroethane of 0.25, 2.7, and 200  $\mu\text{g/l}$  respectively (Marshall, 1994).

Swimming pool is the place for health and recreation. The most important is water quality. Chlorination is the most widely used method for disinfecting swimming pool water. So these compounds may be found in swimming pool water. In 1993, Bangkok Metropolitan Administration reported that 296 swimming pools were registered. In fact, there are more

swimming pools than that were reported. The number of swimming pools increase every year nationwide, especially in the modern residential buildings, hotels, department stores, etc. Because there is an increase of swimming pool users. Consequently, chlorine for water disinfection in the swimming pools has been used at a large amount in order to cope with the pool-service's demand. Furthermore, there is no rigid official criteria to control swimming pool water quality. Despite the " Bangkok Metropolitan Administration's regulations on commerce which is disgusting or harmful to health; Type: Swimming pool-B.C. 2530 " available at present, there is no real enforcement. The research of Mattana *et al.* in 1987 showed that there were 45.9% of swimming pools in Bangkok that did not comply with that regulation.

According to chlorination byproducts occur by reaction of chlorine and organic material. In swimming pool used chlorine, it can be postulated that haloforms originated from chlorine and human-biological products, such as sweat, traces of urine, and human grease or from cosmetics, such as suntan oil (Chambon *et al.*, 1983). Therefore the excess of chlorine is used in swimming pools may cause the high level of halogenated hydrocarbon in swimming pool water.

Since Thailand is in the tropical zone and the weather is rather hot ; so chlorine in swimming pools dissipates quickly. The operators often put excess chlorine in the pools. This may lead to higher concentration of halogenated hydrocarbons in the pool water and thus it may impose harmful effects to human health.

### **Objectives**

1. To study factors affecting the occurrence of some halogenated hydrocarbon pollutants in swimming pools.
2. To study the level of some halogenated hydrocarbon pollutants in swimming pools.
3. To study the status of swimming pools in Bangkok.

### Scope of Study

The subjects of this study were swimming pools and swimming pool water in Bangkok and the water samples were collected in summer 1995.

Samples were analysed for five halogenated hydrocarbons as follows :

1. Methylene chloride
2. Chloroform
3. Carbon tetrachloride
4. 1,1,1-trichloroethane
5. Trichloroethylene

### Anticipated Benefits

To know the status and the level of some halogenated hydrocarbon pollutants in swimming pools



ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย