

# HUMAN HEALTH EFFECTS IN TRIHALOMETHANE EXPOSURE

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**Abstract:** On a global scale, pathogenic contamination of drinking water poses the most significant health risk to humans. To meet the drinking water criteria, the classic water treatment processes include: coagulation/decantation, filtration and disinfection. Chlorination is the most widely used technique for disinfection of the drinking water. A consequence of chlorination is the formation of Disinfection By-Products, such as trihalomethane, which has negative effects on human health, like genotoxicity, and carcinogenicity.

**Keywords:** drinking water, trihalometans, carcinogenicity, genotoxicity

**Rezumat:** La scară globală, contaminarea patogenică a apei potabile este considerată ca fiind cel mai important risc pe sănătate la oameni. Pentru a îndeplini criteriile de potabilitate, apa este supusă unor procedee de tratare care în mod clasic cuprind: coagularea/decantare, filtrarea și dezinfectia. Clorinarea este tehnica cea mai des utilizată pentru dezinfectia apei de băut. O consecință a clorinării este formarea produșilor secundari dezinfectiei cum sunt trihalometanii care au efecte negative asupra sănătății umane ca și: carcinogenitatea și genotoxicitatea

**Cuvinte cheie:** apa potabilă, trihalometani, carcinogeneza, genotoxicitate

## INTRODUCTION

In accordance with the objective of Bonn in 2001, "the healthy drinking water is water that consumers have trusted, water should not contain contaminants that negatively affect human health.

To achieve the aim of drinking water, water is treated, action that is complete with disinfection, usually with chlorine. A consequence of chlorination is the formation of Disinfection By-Products like trihalomethans which represent a real risk for human health.

THM are organic substances resulting from the aquatic reaction of various organic substances and chlorine.

In terms of aggregation state some DBP are volatile compounds such as chloroform and other are non-volatile compounds such as haloacetic acids respectively trichloro and dichloro acetic acid.

The chloroform is the most often investigated

THM in exposure assessment studies so as biomarkers of exposure to estimate the real assimilated dose and route of exposure similar and also as biomarker of biological response (4).

There have been many studies on toxicokinetics and toxicodynamics of trihalometans, especially about the chloroform.

It is known that THM, especially the chloroform, act selectively in the human body, with the target organs like liver and kidney, while affecting them by their hepatotoxicity and nephrotoxicity action.(5)

The multiple water usefulness, as of toxicokinetic point of view, allowing THM therein present, to follow different distribution processes in the human body.

The drinking water THM get in the human body by three important ways, namely: digestion by ingestion of tap water, the cutaneous way by dermal absorption during shower, bathing or swimming or respiratory inhalation of THM steams so that the total dose of exposure is the aggregation of the assimilated three-way doses.(5)

Recent studies have shown that the most effective way of exposure is the skin, so the blood THM concentration of those who did 10 minutes shower / bath using water from water was higher like blood levels of these substances to those who drank the same water.(6)

In same time there are studies that have shown the link between a particular season and one way of the human body THM exposure.

Thus the inhalation exposure is greater in winter when the cold season creates conditions for conducting prelevant indoor activities, while in summer time, primarily body entrance of THM is the skin during bathing water / shower or while swimming.

THM intake through drinking water was achieved in both seasons with comparable rates.(1)

There are many epidemiologically studies wich have approach both issues that about the THM toxicodynamics action mechanisms and also with reference to thereof toxic carcinogenetic, mutagenetic and teratogenetic effects.

Thus Backer L.C. and collaborators have noticed one strong link between the DBP exposure and opposite effects on the human body, especially the occurrence of some cancers of vital organs such as bladder and

## CLINICAL ASPECTS

colorectal cancer.(6)

Also there are toxicologically and epidemiologically studies that have focused on the DBP effects of reproduction (low birth weight, premature births, miscarriage, stillbirths, congenital central nervous system disorders, cardiovascular and mouth malformations).(3,4)

Some research papers has highlighted a strong association between exposure to THM, which are considered the most important DBP being also biomarkers of total exposure dose fetal birth weight, respectively as much as the total dose of intake water THM was higher the number of premature births was higher.

Numerous other studies have mentioned the link between THM exposure and manifested genotoxicity by miscarriage launching, birth of dead fetuses or the presence of congenital malformations. Could not show link between premature birth and THM exposure.(4)

There are studies, especially toxicologically studies about experiments made particular on Salmonella extracts, that revealed the drinking water THM mutagenicity. These studies heeding about that the only tap water intake of pregnant women needs to be after the reduction / domestic correction of the household level of THM by filtering only tap water.(3)

In 2007 the american scientist Richardson S.D. and collaborators from the U.S. Environmental Protection Agency, published results of all research activities conducted over 30 years about DBP the toxic effects on the human body.

It were identified more than 600 DPB generated in various disinfection processes, and 74 of them have been investigated in terms of their carcinogenic, mutagenic and teratogenic toxicity overwhelmed into 3 major groups.

The first group includes 8 DBP (including the bromdichlorometane and the bromoform) having both carcinogenic and genotoxic effects on human body.

The second class included 29 DBP like chloroacetaldehyde with certain genotoxic effects and the third group includes 14 products with unconvulsive effects in carcinogenicity and genotoxicity.

Also it was noticed that the DBP derived from the method of disinfection with bromine are genotoxic and carcinogenic than the DBP with chlorine and that about the highest genetic toxicity of the iodine DBP.(2)

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