

EPA believes that it is important to pursue additional research on cancer from DBPs. EPA has several ongoing studies in addition to a collaboration with the National Toxicology Program of the National Institute of Environmental Health Sciences. More information on EPA's toxicology research program can be found at <http://www.epa.gov/nheerl>.

2. Other Byproducts with Carcinogenic Potential

a. *3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX)*—*multisite cancer*. MX is a byproduct of chlorination that is typically found at very low concentrations (approximately <0.000067 mg/L) in drinking water. The information available on MX was recently compiled in the *Quantitative Cancer Assessment for MX and chlorohydroxyfuranones* (USEPA 2000i). Overall, the weight of evidence indicates that MX is a direct-acting genotoxicant in mammals, with the ability to induce tumors in multiple sites. The primary sites for tumor formation are the thyroid and liver.

b. *N-nitrosodimethylamine (NDMA)*—*multisite cancer*. Health effects data indicate that NDMA is a probable human carcinogen, as described on IRIS (1991). Risk assessments have estimated that the 10^{-6} lifetime cancer risk level is 0.000007 mg/L based on induction of tumors at multiple sites. Recent studies have produced new information on the occurrence and mechanism of formation of NDMA but there is not enough information at this time to draw conclusions. More research is underway to determine the mechanism by which NDMA is formed in drinking water, and the extent of its occurrence in chloraminated systems.

3. Other Toxicological Effects

The Agency has modified the reference dose (RfD) values for 2 of the chlorinated acetic acids since the Stage 1 DBPR. Under the Stage 1 DBPR there was no established RfD for monochloroacetic acid (MCAA). Data from a drinking water exposure study of MCAA in rats by DeAngelo *et al.* (1997) were used to establish an RfD of 0.004 mg/kg/day based on observed increases in spleen weight. Data from DeAngelo (1997) were also used to calculate a new RfD of 0.03 mg/kg/day for trichloroacetic acid (TCAA) based on observed effects on body weight and liver effects. Detailed discussions of the new reference doses are located in section V of this preamble.

4. WHO Review of the Cancer Toxicology Literature (2000)

The IPCS report on Disinfectants and Disinfection Byproducts (WHO 2000) emphasizes that the bulk of the toxicology data focuses primarily on carcinogenesis. The Task Group found BDCM to be of particular interest because it produces tumors in both rats and mice at several sites. Although the HAAs appear to be without significant genotoxic activity, the brominated HAAs appear to induce oxidative damage to DNA, leading to tumor formation.

F. Conclusions Drawn From the Cancer Epidemiology and Toxicology

EPA believes that the cancer epidemiology and toxicology databases provide important information that contributes to the weight of evidence evaluation of the potential health risks from exposure to chlorinated drinking water. At this time the cancer epidemiology studies are insufficient to establish a causal relationship between exposure to chlorinated drinking water and cancer, but EPA does believe there is a potential association. The current database is sufficient for quantitative analysis on the endpoint of bladder cancer, as presented previously in the PAR analysis.

The association between DBP exposure and colon cancer remains more tenuous than the link to bladder cancer, although similarity of effects reported in animal toxicity and human epidemiology studies strengthens the weight of evidence for an association between DBP exposure and colon cancer. Studies finding potential relationships between exposure to chlorinated drinking water and rectal, kidney, and brain cancer also add to the weight of evidence for a public health concern. EPA believes that the overall cancer epidemiology and toxicology data support the decision to pursue additional DBP control measures as reflected in the Stage 2 DBPR.

G. Request for Comment

EPA requests comment on the conclusions drawn from the new health information summarized in this section. EPA requests comment on the weight of evidence evaluation of the potential reproductive and developmental hazards from DBPs and its potential implications for the regulatory provisions for the final Stage 2 DBPR. EPA solicits any additional data on the reproductive or developmental effects from DBPs that need to be considered for the final Stage 2 DBPR.

EPA requests comment on EPA's conclusions regarding cancer

epidemiology and toxicology, and the new studies discussed in today's proposal. EPA solicits any additional cancer epidemiology and toxicology data that need to be considered for the final Stage 2 DBPR.

EPA also solicits any health information available to further assess risk to sensitive subpopulations, especially children and the elderly.

IV. DBP Occurrence Within Distribution Systems

New information on the occurrence of DBPs in distribution systems raises issues about the protection provided by the Stage 1 DBPR. This section presents the new information used to identify key issues and to support the development of the Stage 2 DBPR. For a more detailed discussion see the *Stage 2 Occurrence Assessment for Disinfectants and Disinfection Byproducts* (USEPA 2003o).

Under the Stage 1 DBPR, compliance with the DBP MCLs is determined by averaging, annually and system-wide, all DBP measurements. The following discussion shows that compliance based on system averages of DBP concentrations allows a significant number of sampling locations within distribution systems to have DBP levels above the MCLs. These peak DBP occurrences are masked by averaging with lower distribution system occurrence levels. The populations served by portions of the distribution system with higher DBP concentrations are not receiving the same level of health protection.

The new information also shows that the highest DBP levels often do not occur at distribution system sites identified as representing maximum residence time. The information further shows that the highest TTHM and HAA5 levels often do not occur at the same site within the distribution system. These two findings suggest that it is appropriate to reevaluate the Stage 1 DBPR compliance monitoring sites in order to target those sites with high DBP levels. EPA believes that distribution system compliance monitoring sites need to be reevaluated to ensure identification of sites that reflect both high TTHM and HAA5 occurrence.

A. Data Sources

1. Information Collection Rule Data

The Information Collection Rule (USEPA 1996a) established monitoring and data reporting requirements for large public water systems. Under the Information Collection Rule, systems serving at least 100,000 people were required to conduct DBP and DBP-