

DBCP CONSUMER FACT SHEET

The following Fact Sheet was prepared by the State of California, Department of Health Services for distribution to customers of Public Water Systems that have elevated levels of DBCP in their water supply.

DBCP IN DRINKING WATER: WHAT DOES IT MEAN?

This publication has been prepared to inform customers of water utilities and owners of private wells about dibromochloropropane (DBCP) in drinking water. DBCP is the major pesticide contaminant of drinking water in California. Because the state adopted a new Standard of 0.2 parts per billion (ppb) for DBCP in public drinking water systems in 1989, water customers will be receiving notices when DBCP in their drinking water exceeds this maximum contaminant level (MCL). People who have contamination in their own water wells may also want to know more about the state's new standard for DBCP, although private wells are not legally required to meet the standard.

This document will answer the following questions:

- What is DBCP? How did it get there? How do I find out if my drinking water has DBCP?
- What are the health effects of DBCP?
- How will the new state standards for DBCP protect my health?
- How can DBCP be removed from drinking water?
- What about using bottled water or installing filters?
- What's being done to prevent water contamination?
- How can I get more information?

WHAT IS DBCP? HOW DID IT GET THERE?

DBCP is a fumigant pesticide that was used widely to kill nematodes in soil before planting. Between 1957 and 1977, about 32 million pounds of DBCP were sold and applied yearly in the United States, mainly for soybeans. California used 426,000 pounds at its peak use in 1977. DBCP's use in California was stopped in 1977, about

32 million pounds of DBCP were sold and applied yearly in the United States, mainly for soybeans. California used 426,000 pounds at its peak use in 1977. DBCP use in California was stopped in 1977 after it was found to cause infertility and sterility (reduced or no sperm) in workers who formulated the pesticide. In 1979 its use was banned nationally in all states except Hawaii due to concerns about worker sterility and the cancer risk from eating produce with DBCP.

Before DBCP was discovered in California ground water in 1979, experts believed that pesticides would not contaminate underground water supplies. They expected that DBCP would be adsorbed to the soil and be broken down chemically or biologically before it could reach the water table. This proved incorrect. Extensive water contamination has been found in agricultural areas where DBCP was used. In California this is mainly in the San Joaquin Valley.

It is estimated that as many as 500,000 Californians have DBCP in their drinking water supply. DBCP has been detected in more than 2,000 wells, including more than 230 public drinking water wells, in agricultural areas of the state. The DBCP levels in California generally are less than 10 ppb but often exceed the new standard of 0.2 ppb.

HOW DO I FIND OUT IF MY DRINKING WATER HAS DBCP?

Public water utilities are required to notify customers if DBCP is detected in the water higher than the maximum contaminant level (MCL). All public water utilities serving more than five households are now required by law to sample for all contaminants having MCL's. They must sample the water at least every three years or more frequently if the water supply is found likely to be contaminated. Because of the high analytical costs, however, only water systems in areas where DBCP was used have been required to monitor for DBCP.

Water suppliers are required to notify customers when MCL's are exceeded (such as through the next billing, newspaper ads, or other means) and to communicate yearly about the biological, physical, organic, and mineral quality of the water.

County health departments are responsible for seeing that monitoring is carried out by small-system water suppliers (5 to 199 service connections) while the Public Water Supply Branch of the California Department of Health Services (DHS) oversees monitoring of large water system (200 or more service connections). A list of Public Water Supply Branch offices is found at the end of this document.

FOR PRIVATE WELLS

If you have your own well and you live in an agricultural area where DBCP has been found, you should consider having your well water tested or extensively used. (Information on how to have water tested is available from you county health

department or water testing laboratories. The current average cost of laboratory analysis is about \$90). Extensive testing of wells has already been conducted in high

DBCP use areas, and about 1,500 public and private wells have been voluntarily removed from services because they exceeded the earlier, nonenforceable guideline (Action Level) of 1 ppb.

WHAT ARE THE HEALTH EFFECTS OF DBCP?

The two health hazards of concern for DBCP are cancer and male infertility.

CANCER

Laboratory experiments have shown that mice and rats fed DBCP developed cancer. When a chemical causes cancer in two species of test animals, scientists consider it likely to cause cancer in humans.

Several studies of human cancer and DBCP have been conducted without clear results. A preliminary study by the California Department of Health Service in 1982 found that cancer deaths were higher in areas where DBCP concentrations in the drinking water were higher. Specifically, it found a statistical relationship between increasing DBCP concentration in drinking water and stomach cancer and leukemia in persons consuming the water. This study only used data from death certificates and did not take into account important complicating factors such as ethnic backgrounds, which could influence dietary intake.

Four other studies involving humans have not confirmed increased cancer incidence. Two studies reported in 1986 did not find a statistically significant relationship between DBCP in drinking water and increased cancer. Two other studies have examined cancer in workers who were exposed to DBCP and found no cancer increase. All of these studies, however, have been inconclusive because of problems such as low levels of DBCP exposure, small study populations, or short follow-up time. Follow-up time is important because it may take 20 years or more for cancer to show up after exposure has occurred. Therefore the human studies so far have not told us whether or not DBCP causes cancer in humans.

Because of the problems with human studies, DHS scientists used data from the animal experiments to estimate DBCP's cancer potency and the risk it represents to humans in drinking water. This formed the health basis of the MCL for DBCP. Animal studies are routinely used for such purposes because they can be conducted under carefully controlled conditions. Also, most chemicals that cause human cancers also cause cancer in animals. The animal studies for DBCP also have some flaws, but they were considered adequate for assessing cancer risk.

MALE FERTILITY

In 1977 men working in two DBCP formulating plants were found to be incapable of producing sperm, or to have sperm levels that were very low. In the California plant, 14 out of 25 men were affected, and in an Arkansas plant, half of 106 workers were affected. In most cases, the men regained their fertility after their exposure to the chemical was stopped. A few men with the longest exposures remained permanently sterile. The workers in the plants were exposed to DBCP mainly by breathing the chemicals in the air as well as skin contact. The amount of DBCP workers were exposed to was many times higher than amounts present in drinking water.

HOW WILL THE STATE STANDARD FOR DBCP PROTECT MY HEALTH?

The maximum contaminant level (MCL) for DBCP is 0.2 ppb. This is the same as 0.2 micrograms per liter (ug/L) or 0.0002 parts per million (ppm). A part per billion means 1 part of chemical per billion parts of water. The levels of DBCP found in California drinking water supplies usually do not exceed 10 ppb.

The earlier 1 ppb action level set in 1979 was based primarily on the minimum concentration of DBCP that could be detected in drinking water with the analytical means available at that time. This level was also then considered adequate for protecting public health and economically feasible to attain. Action levels are not legally enforceable, but water utilities have voluntarily complied with them.

The 0.2 ppb MCL for DBCP is based on a cost-benefit analysis that considered the benefits of providing cancer protection versus the costs of removing the chemical, as explained further below. DHS has calculated that 0.4 ppb DBCP in drinking water represents a level of exposure at which no effect on fertility in humans would be expected (in fact, this level includes a very large safety margin), so cancer risk is the main health effect of concern.

With cancer-causing chemicals, no levels can be considered completely safe. This is because of the way these chemicals act on animals, which is different from other kinds of toxicants. Some degree of risk is believed to exist no matter how small the dose. Federal and state agencies use risk assessment to estimate the cancer risk presented by a hazardous contaminant and then try to reduce the risk as close as possible to a negligible level through regulatory controls. A negligible level is usually considered to be a level between 1 in 100,000 and 1 in 1 million additional cancer cases for a lifetime exposure (70years).

Once the negligible risk level has been estimated, economic costs and technological feasibility are taken into account. In case of DBCP the high economic costs of removal do not allow the negligible risk level to be achieved. The estimated risk is 1 in 10,000. This means that if 10,000 people were each to drink 2 liters of water a day containing

DBCP at 0.2 ppb for 70 years, one of them might contract cancer from drinking the water. This should be kept in perspective with the natural background rate of cancer, which is 1 case in every 4 people over a lifetime. Thus in a population of 10,000 an estimated 2,500 people would get cancer anyway, and the total number of cases would only be increased to 2,501 by DBCP. The number of theoretical additional cancer caused due to DBCP in drinking water has been applied to the exposed population in California and the following benefits have been calculated from the new MCL:

- Reduces the excess theoretical cancer cases from DBCP lifetime exposure from 163 to 6 in California.
- Reduces by 185,000 the number of California exposed to excessive levels of DBCP in drinking water from public water systems. This will be achieved by requiring that the 184 public wells contaminated with DBCP over 0.2 ppb be removed from services or the water be treated to meet MCL.
- Protects against the potential infertility hazard for all affected Californians.

It is important to note that risk assessments are likely to estimate a higher number of cancer cases than would actually occur. For example a standard 70-year lifetime is used for the length of exposure in these calculations. The actual exposure for the population is considerably shorter if people move around or don't drink all their water at home.

The costs of implementing the MCL have been estimated as follows:

One time capital cost of \$28.6 million.

Yearly operating and maintenance costs for treatment estimated at 4.3 million for the first five years, and 2.2 to 2.7 million for years 2-5.

A yearly average per capita to the consuming public ranging from \$0.08 to \$269.77.

The cost of trying to reduce the number of theoretical excess cancer cases below the level provided by 0.2 ppb was found to outweigh the benefits.

HOW CAN DBCP BE REMOVED FROM DRINKING WATER?

DBCP is highly mobile and long lasting in ground water. Its half-life in ground water has been estimated to range from 3.1 to 400 years depending on water temperature and pH. The median half-life value is 20 years. (Half-life refers to the time it takes for the

amount of the chemical to be reduced by one-half, as, for example, through degradation or breakdown). Sampling records show that the levels of DBCP in wells are gradually declining.

Replacement wells are usually the least expensive method of providing uncontaminated water, but they are not always feasible because of geology and ground water availability. The one recommended treatment method in this case is granular activated carbon, in which water is run through a bed of charcoal, which adsorbs chemicals. Air stripping, in which the DBCP is evaporated from the water by trickling the water down through a tower where it is exposed to air, is no longer considered effective. The cost of treatment is reflected in the capital and operating costs given above.

WHAT ABOUT USING BOTTLED WATER OR INSTALLING FILTERS?

If DBCP in your drinking water temporarily exceeds the new MCL of 0.2 ppb, you might want to consider using bottled drinking water. In cases where exposure could continue for a long time, however, such as with contaminated private wells, obtaining a safer water supply or installing a water treatment device, such as carbon filter, at home may be advisable.

Using bottled water or installing a water treatment device at the kitchen water tap will not, however, stop most exposure to DBCP if it is in your water supply. Most treatment units sold for home installation only treat water at the point of use, such as the kitchen faucet, and do not affect the major sources of exposure, which are air and contact through the skin. Because DBCP is volatile, it is released into the indoor air showers, baths, toilets, dishwashers, and other appliances. Nearly two-thirds of exposure to the chemical is estimated to come from breathing it in indoor air or through skin contact, whereas drinking accounts for only one-third of the exposure.

Point of entry filters, which treat water for the entire house, would remove these other sources of exposure, but these units are more expensive.

Water treatment devices are not all alike in their effectiveness at removing contaminants. Depending on the contaminants to be removed, some types work better than others. That is why it is best to have your water analyzed before deciding on which type of filter to buy. For DBCP, granular activated carbon treatment works best. Sources of further information on water treatment devices are given at the end of this section.

It is important that any water treatment device be maintained well for it to work effectively. The frequency of required maintenance will depend on the concentration of the contaminants being removed and the volume of water being treated. A maintenance contract may be advisable.

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Boiling water in your home to remove DBCP is generally not recommended because it only drives the chemical into the air where it may be inhaled.

Because of the difficulties of trying to remove DBCP and other contaminants at the home level, the state concentrates its efforts on requiring public water utilities to supply safe water. Tougher standards are being developed for a large variety of chemical contaminants in water. Nevertheless, legislation has been passed in the past few years to improve regulations of bottled water and water filters.

Historically, bottled water has had to meet the same standards for purity as ordinary tap water. Water bottlers may use water supplies and processes that they think may provide some additional level of safety or quality, but the law requires that public drinking water, be at all times pure, wholesome, and potable. DBCP has not been suspected to be present in any water sources used by drinking water bottlers.

The new bottled drinking water law (AB170, Statutes of 1987) requires bottled water processors to conduct annual testing of water sources for volatile organic compounds, including DBCP, unless the bottler can show DHS that the water source does not contain the compounds and is now vulnerable to contamination. The law also requires that lead and trihalomethanes in bottled drinking water do not exceed one-tenth their MCL's. Trihalomethanes are by products of chlorination treatment, which is necessary to disinfect the water.

California has recently adopted a law to prohibit false advertising a water filtration units and has established a certification program. The advertising law was designed to counter the unscrupulous tactics of sellers who were creating unnecessary fears about the safety of public drinking water and making exaggerated or unfounded claims about their products ability to eliminate contaminants. Enforcement of this law is the responsibility of local district attorneys.

The state program for certifying water treatment devices is still in the early stages. Although regulations for testing water filters have been presented at a public hearing DHS cannot yet provide information about the reliability of units and manufactures. There are other sources of information, however as follows:

One industry association has a voluntary testing program and can provide some information to consumers about their effectiveness (Write to the national Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106).

Free brochures about buying home water treatment units can be obtained as follows: "Buying a Home Water Treatment Unit" from the Office of consumer/Business Education, Federal Trade Commission, Washington D.C. (202) 326-3650, and "Home Water Treatment Fact Sheet" from EPA's Safe Drinking Water Hotline at

1-800-426-4791 (Note materials ordered through the EPA Hotline may take three to four weeks for delivery).

Articles about water filters can be found in the public library. See the February 1983 issue of Consumers Reports, and "A Drop to Drink", by B. Webendorfer in the September 1988 Country Journal.

WHAT'S BEING DONE TO PREVENT GROUND WATER CONTAMINATION?

Because the expenses and difficulty of removing contaminants from ground water are now well recognized, a number of measures are being taken to prevent more water contamination. For example, laws have been passed to require removal or double-lining of underground storage tanks such as at gasoline stations and to prohibit dumping of hazardous wastes in areas where the chemicals might get into the water supplies.

Both the U.S. Environmental Protection Agency (EPA) and California Department of Food and Agriculture (DFA) now require testing of pesticides to see if they might leach through the soil and enter ground water. This testing became California law under the Pesticide Contamination Prevention Act of 1986 (AB 2021). Pesticides that are identified as having the potential to leach will be carefully monitored if they are applied in a way, such as injection into soil, that enhances their ability to migrate into ground water. If they are found in ground water or in soil below a certain level, they will be evaluated to find out if their uses can be changed to prevent pollution. If their uses cannot be changed, such pesticides can be subject to immediate cancellation.

Besides this prevention program, both the state and federal governments require that pesticides be given a full range of tests to determine health effects. Some older pesticides that were approved between the 1950's and early 1970's when regulations were not so stringent as now were not tested for cancer causing potential, ability to cause birth defects, and some other effects. The state's Birth Defects Prevention Act of 1984 (SB 950) set a March 1987 deadline in California for pesticide companies to submit studies or begin new ones to fill health "data gaps." In 1989 Congress passed pesticide reform legislation that sets a timetable for completing testing of older pesticides within eight years. These laws will bring about identification and cancellation of pesticides that pose special health hazards.

Besides these efforts, research is underway to develop pesticides that have less potential to harm health and the environment and to encourage reduced use of pesticides, such as through integrated pest management (IPM) practices. The DBCP episode has been a hard lesson, and government and environmental groups are working to prevent such contamination occurrences in the future.

HOW CAN I GET MORE INFORMATION?

a. Health Effects

DHS's Hazard Evaluation Section has fact sheets and other publications on water contamination (see d. below). A technical summary on health effects for all new and proposed MCL chemicals is contained in the "Statement of Reasons" of the regulation package developed for each of these chemicals. The statements of reasons can be obtained by writing the California Department of Health Services, Office of Regulations, P.O. Box 942732 (714 P St.), Sacramento, CA 94234-7320 (916/32204990) or Public Water Supply Branch office in your area of the state. (See list of these offices below).

b. Regulatory Proceedings

Information on regulatory hearings and proceedings is available from the Office of Regulations (see a., above for the address). Write or call the office if you want to be placed on the notification list for hearings on proposed California MCL's.

c. Contamination Levels and Occurrence

Contamination levels and occurrence information is available from water suppliers. Information on monitoring requirements is available from DHS's public Water supply Branch for systems with 200 or more connections and county health department for systems with fewer than 200 connections.

d. Water Contamination In General

Some suggested sources of further information in California are as follows:

Literature:

Fact Sheets on Chemical contaminants in Drinking Water. (These fact sheets and the following article on chemical contamination of water are available by writing or calling the Hazard Evaluation Section, 2151 Berkeley Way, Room 619, Berkeley, CA 93704, (415) 540-3063. These fact sheets may not yet reflect the new MCL's that have been adopted.)

Russell H. Jackson RJ, Spath DP, et al. Chemical Contamination of California Drinking Water. West J Med (1987) (147) 615-622 (Copies are available from the Hazard Evaluation Section, listed below).

Berteau PBPB, Spath DP. The Toxicological and Epidemiological Effects of Pesticide Contamination in California Ground Water (Chapter 23).

Cohen DB Ground Water Contamination by Toxic substances: A California Assessment (Chapter 29). In: Garner WY Honeycutt RC, Nigg HN, eds. Evaluation of Pesticides in Ground Water. Washington, DC: American Chemical Society, 1986.

1, 2-Dibromo-3-Chloropropane Health Advisory. Office of Drinking Water, U.S. Environmental Protection Agency, Washington, D.C. 1985.

A free educational booklet for the general public on water contamination and health hazard issues in California is expected to be available in early 1990 from the Hazard Evaluation Section, California Department of Health Services (see below).

Health Effects of Toxic Substances: A Directory of References and Resources (1986). (A new edition, entitled "The Toxics Directory", is expected in early 1990).

This publication lists and describes more than 60 agencies that regulate or have information on toxic substances. It also lists recommended books, articles, and database on chemical contaminants in air, food and water, hazardous wastes, chemicals in the workplace and their human health effects. Prepared by Hazard Evaluation Section Section, 104 pages @ \$3.95. Publication No. 7540-958-1300-3. To order, mail a check made out to "State of California" to Publications Section, P.O. Box 1015, North Highlands, CA 95660.

Public Agencies:

Public Water Supply Branch (PWSB) California Department of Health Services,
2151 Berkeley Way , Berkeley, CA 94704 (415) 540-2154

Headquarters: 714 "P" Street, RM 692, Sacramento, CA 95814 (916) 323-6111

Collects and evaluates water quality information on drinking water in California. Provides assistance to local health departments, water purveyors, and the general public on issues related to water quality, water supply, and water treatment. Advises the Water Resources Control Board and the nine Regional Water Quality Control Boards on public health protection of water supplies. Develops state drinking water standards in cooperation with the Hazard Evaluation Section and insures compliance with drinking water standards by water purveyors.

Other regional and/or district offices are as follows:

Santa Rosa-50 D Street, Suite 205, 95404-4752, (707) 576-2145
Sacramento-8455 Jackson Road, Room 120, 95826, (926) 739-4034
Reeding-2135 Akard Ave., Room 14, 96001, (916) 225-2125
Fresno-1040 E. Herndon, 93720, (559) 447-3300
Stockton-Sate Bldg. 31 E. Channel Street, Room 270, 95202 (209) 948-7697

Santa Barbara-530 E. Montecito St., Rm. 102, 93105, (805) 963-8616
Santa Ana-29 Civic Center Plaza, Rm. 325, 92701, (714) 558-4410
Los Angeles-1449 W. Temple St., Rm. 201, 90026, (213) 620-2980
San Diego-State Bldg., 1350 Front St., Rm. 2050, 92101, (619) 237-7391
San Bernardino-1836 S. Cemper Center Circle, Suite B, 92408 (714) 383-4329

HAZARD EVALUATION SECTION

California Department of Health Services
2151 Berkeley Way, Room 619
Berkeley, CA 93704 (415) 540-3063

The Hazard Evaluation Section performs risk assessments on toxic substances in the non-workplace environment and advises state and county agencies about safe exposure levels. The section also assesses the health effects of environmental contaminants, including pesticides, food, and water contaminants, and air pollutants, for the development of regulatory standards and health advisories. It also educates health professionals and the public about health effects of environmental toxicants. A list of publications is available. Questions about the toxicity of specific environmental chemicals not related to the formal evaluation process are often referred to the Toxic-Info center, which was established and funded by the section.

TOXIC-INFO CENTER

San Francisco Regional Poison Control Center
San Francisco General Hospital
1001 Potrero Ave., Room 1E86
San Francisco, CA 94110, (800) 233-3360 and (415) 821-5338
24 hours/day, 7 days/week, Service area: Statewide

Provides 24-hour, toll-free information to county health personnel, medical personnel, first responders, and the general public concerning toxicologic and hazardous aspects of chemical emergencies. Depending upon circumstances, makes referrals to additional resources and notifies responsible state and local agencies. The Toxic-Info Center will also respond to request for information regarding nonemergency situations.

The Toxic-Info Center is supported by the California Department of Health Services and is affiliated with the University of California at San Francisco and the San Francisco Regional Poison Center. Jointly with the Poison Control Center, it maintains an extensive hazardous materials and poisoning library including computerized databases. These affiliations make it possible to integrate the medical and environmental aspects of hazardous materials incidents.

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**Prepared by the Hazard Evaluation Section and Public Water Supply Branch of
the California Department of Health Services, Berkeley, CA.**

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