Health Consultation

Public Evaluation of Private Well Sampling Data

STAMFORD PRIVATE WELL CONTAMINATION

STAMFORD, FAIRFIELD COUNTY, CONNECTICUT

Prepared by:
Connecticut Department of Public Health

FEBRUARY 11, 2015

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

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HEALTH CONSULTATION

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Prepared By:

Connecticut Department of Public Health
Environmental and Occupational Health Assessment Program
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

SUMMARY

INTRODUCTION

In the summer of 2013, the Stamford Health Department requested that the Connecticut Department of Public Health (CT DPH) evaluate the public health significance of private well sampling data in Stamford, Connecticut. The main focus of this health evaluation is to evaluate dieldrin and chlordane sampling analysis data from private wells in the City of Stamford (City). The source of the dieldrin and chlordane contamination in well water is believed to have been from past home termite treatment.

CONCLUSIONS

CT DPH evaluated past exposures to dieldrin and/or chlordane in well water. CT DPH reached the following conclusions in the health consultation:

Conclusion 1

Residents who cooked, drank, bathed, and showered with the highest concentrations of dieldrin or chlordane (or both contaminants) were exposed to these contaminants at levels that could harm people's health. Past exposures to the highest levels of dieldrin and/or chlordane may lead to a moderate increased risk of liver cancer relative to background cancer rates. Exposure to the highest levels of both dieldrin and chlordane could be enough exposure to cause damage to the liver.

Basis for Conclusion

Exposure has occurred and exposure to the highest concentrations of dieldrin or chlordane exceeds a level that could harm people's health. The dose is above a level where action needs to be taken to prevent or reduce exposure. Cancer risk from exposure to dieldrin and/or chlordane is moderate. Noncancer health effects from exposure to the highest levels of both dieldrin and chlordane cannot be ruled out.

Next Steps

The City and the CT DPH recommend that residents with private wells test their well for dieldrin and chlordane to find out if dieldrin/chlordane levels are below the state Action Level (AL). If dieldrin/chlordane levels exceed state ALs, then the CT DPH and the Stamford Health Department recommend installing a whole house Granular Activated Carbon (GAC) filter. ALs are health-based levels developed to be protective of children and adults with frequent, long-term exposure to contaminants in private well water.

Conclusion 2

CT DPH has concluded that in the past, residents who used well water contaminated with dieldrin and/or chlordane for cooking, drinking, bathing or showering (typical household activities), were exposed to these pesticides. Cancer risk estimates from exposure to the minimum and up to the median concentrations of these contaminants are very low to low and are not expected to harm people's health. However, it is prudent to take action to reduce exposure when the dieldrin and/or chlordane concentrations are above the AL.

Basis for Conclusion

Exposure has occurred and the dose is above a level where action needs to be taken to prevent or reduce exposure. Dieldrin and/or chlordane levels were well below noncancer health effect levels that were observed in toxicology studies and cancer risks are very low to low. It is prudent however, that action needs to be taken to reduce exposure when concentrations of these contaminants exceed the AL.

Next Steps

The City and the CT DPH recommends that residents with private wells test their well for dieldrin and chlordane to find out if dieldrin/chlordane levels exceed the state AL. If dieldrin/chlordane levels exceed state ALs, then the CT DPH and the Stamford Health Department recommend installing a whole house GAC filter.

The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health (CT DPH). CT DPH will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document. This report was supported by funds from a cooperative agreement with the Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services.

BACKGROUND AND STATEMENT OF ISSUES

In the summer of 2013, the Stamford Health Department requested that the Connecticut Department of Public Health (CT DPH) evaluate the public health significance of private well sampling data in Stamford, Connecticut. The main focus of this health consultation is to evaluate private well sampling data from the City of Stamford (City).

From1992-1996, the United States Environmental Protection Agency (US EPA) and the Connecticut Department of Energy and Environmental Protection (CT DEEP) tested four wells adjacent to the Scofieldtown Landfill in North Stamford as part of a well monitoring program. One of these tested positive for dieldrin, and chlordane. The well was subsequently put on a whole house granular activated carbon (GAC) filter.

As part of a large scale effort to more accurately study the impact of contaminants in the Scofieldtown landfill on private wells in the Scofieldtown community, the City conducted large scale sampling of homes in the Scofieldtown area near the Scofieldtown Landfill from July to December 2009. Approximately 100 residences were tested for dieldrin and chlordane, and about 70 of them tested positive for dieldrin and/or chlordane in January 2010. These wells (with the exception of 5 who had whole house GAC filters installed because they were too far from a municipal water connection) were connected to municipal water by the City. A small number of additional wells in the Scofieldtown area were also tested by CT DEEP in February 2010 and although a few tested positive for dieldrin and/or chlordane, CT DEEP did not connect these homes to municipal water and they were not given a whole house GAC filter. By this time, CT DEEP was no longer providing bottled water or whole house filters because the contamination source was determined to be unrelated to the landfill. However, some of these homes could have had wells where dieldrin and/or chlordane concentrations exceeded Connecticut Action Levels (AL), and if they did, CT DEEP, CT DPH, and the Stamford Health Department recommended to them that they privately install a GAC filter to eliminate exposure to the pesticide contamination in the wells. ALs are health-based levels developed to be protective of children and adults with frequent, long-term exposure to contaminants in private well water. Chlordane and dieldrin ALs were derived from the US EPA's oral cancer slope factors (IRIS 1990 and 1998).

After a study of the landfill revealed it was not the source of the private well contamination, the City and the CT DEEP concluded that past termite treatment was probably the source. The City and the CT DEEP ended government monitoring and treatment for dieldrin and chlordane in February 2010.

To investigate if the pesticide well contamination was more widespread than just the Scofieldtown area of Stamford, in the spring through fall of 2010, the Stamford Health Department, with assistance from the CT DPH, conducted random sampling of 34 private wells in the North Stamford area. One or two additional wells tested were found to be positive for dieldrin and/or chlordane.

In May 2010, the City recommended that every private well owner in the North Stamford area test their well for dieldrin and chlordane after several wells in the North Stamford area outside of the Scofieldtown area tested positive for the pesticides (these wells were sampled privately by homeowner and the results were shared with the City). The recommendations were further expanded to all of Stamford after several residences in the southern area of Stamford tested positive for dieldrin and/or chlordane.

In May 2011, the City passed an ordinance which subsidized the cost of citywide dieldrin/chlordane testing for residential wells. In exchange for this subsidized testing, the homeowner would be required to share the results of the sampling analysis with the Stamford Health Department. Because of the community's concern about volatile organic compounds (VOCs), they were also included in the testing.

In May 2013, the City voted to extend the above described ordinance for two additional years. However, because the results of the testing showed very little VOC contamination, the City decided to replace VOC testing with uranium and arsenic testing, because of the statewide prevalence of these naturally occurring contaminants in well water and new statewide well testing recommendations set by CT DPH.

Demographics

The site is the city of Stamford, Connecticut whose population is approximately 122, 643. The total area is approximately 52.1 square miles (United States Census Bureau 2010).

According to 2009 census data, 65% of residents are Caucasian and approximately 13.9% are black, 7.9% Asian, and 23.8% are Hispanic.

Environmental Contamination and Health Comparison Values

Private Well Sampling Data

From September 2009 to September 2013, the City, CT DEEP, and private labs sampled 1955 private wells in the City of Stamford. With the exception of approximately 10 residences, only one sample per household was taken. CTDPH evaluated exposures to try to get a sense of the lower level exposures as well as the middle and higher level exposures.

One hundred and seven samples tested positive for chlordane with 64 samples exceeding the AL (Table 1). One hundred eighty-two samples tested positive for dieldrin with 132 samples exceeding the AL. Comparison values were only used as screening to determine which contaminants to further evaluate.

Detected concentrations for dieldrin ranged from 0.01 parts per billion (ppb) to 1.3 ppb (up to approximately 43 times above the AL of 0.03 ppb) while positive chlordane concentrations ranged from 0.02 ppb to 7.4 ppb (approximately 25 times the AL of 0.3 ppb).

The median detected chlordane concentration was 0.42 ppb (1.5 times the AL). The median detected dieldrin concentration was 0.1 ppb (3 times the AL).

Only a few (15) tested positive for both dieldrin and chlordane. In those fifteen wells, dieldrin and chlordane concentration were similar to the range in wells where only one contaminant was found. Maximum concentrations found in both wells simultaneously were 1.1 (chlordane, 4 times the AL), and 1.3 ppb (dieldrin, 43 times the AL).

Table 1. Summary of Private Well Sampling Results from 1955 Residences in Stamford, Connecticut, September 2009- September 2013.

Contaminant	Concentration Range (ppb*)	Number of Exceedances of Comparison Value/Number of Samples Taken	Comparison Value (ppb)	Comparison Value Source
Chlordane	BDL[^]-7.4	64/1955	0.3/0.1/6	CT AL[@]/ CREG[#]/EMEG[&]
Dieldrin	BDL-1.3	132/1955	0.03[$]/0.002	CT AL/CREG

[*]ppb=parts per billion
[^]BDL=Below Detection Limit
[@]CT AL=Connecticut Action Level. Available at: http://www.ct.gov/dph/lib/dph/environmental_health/eoha/pdf/pw_action_levels.pdf
[#]CREG=ATSDR Cancer Risk Evaluation Guide
[&]EMEG=Chronic Child Environmental Media Evaluation Guide
[$]The CT AL for chlordane was adjusted for practical quantifiable laboratory limits

DISCUSSION

Exposure Pathway Analysis

To determine if community members are exposed to contaminants in private well water in Stamford, CT DPH evaluated the environmental data and considered how people might come into contact with contaminants in private well water. The possible pathways of exposure are dermal, inhalation, and ingestion. In other words, in order to be exposed to contaminants in private well water, one must come into contact with the water by touching it (during showering/bathing), breathing vaporized pesticides (during showering/bathing), drinking the water, or cooking with it. An exposure pathway consists of five elements (ATSDR 2005):

1. A source of contamination;
2. Transport through an environmental medium;
3. A point of exposure;
4. A route of human exposure; and
5. A receptor population.

ATSDR categorizes an exposure pathway as either completed, potential, or eliminated. In a completed pathway, all five elements exist and indicate that exposure to a contaminant has occurred in the past, is occurring, or will occur in the future. In a potential exposure pathway, at least one of the five elements has not been confirmed, but it may exist. Exposure to a contaminant may have occurred in the past, may be occurring, or may occur in the future. An exposure pathway can be eliminated if at least one of the five elements is missing and will never be present (ATSDR 2005).

Past Conditions

One hundred and ninety-six wells tested had water that contained dieldrin or chlordane levels that exceeded the AL. Since our current advice to homeowners with private wells in Stamford includes testing their wells for dieldrin and chlordane and treating the water with a whole house GAC filter if dieldrin and/or chlordane levels exceed the AL, it is assumed that residents followed our advice and are no longer being exposed to the contaminated well water. Therefore, it is assumed that there are no current, ongoing exposures, and all exposures to contaminated well water are evaluated as a past exposure pathway.

Public Health Implications for Adults and Children

When determining the public health implications of exposure to hazardous contaminants, CT DPH considers how people might come into contact with contaminants and compares contaminant concentrations with health protective comparison values. When contaminant levels are below health-based comparison values, health impacts from exposure to those levels are unlikely. Contaminant levels exceeding comparison values do not necessarily indicate that health impacts are likely but instead warrant further evaluation. In this health consultation, CT DPH used established Action Levels for private wells as health protective screening values. As stated previously, these values are health-based levels developed to be protective of children and adults with frequent, long-term exposure to contaminants in private well water. CT DPH only evaluated complete exposure pathways where private well contamination exceeded the established Connecticut Action Levels. General toxicology information on dieldrin and chlordane are provided in Appendix A.

Table 1 indicates that chlordane and/or dieldrin were detected in some private wells at levels above the AL in Stamford. Past exposure to private well water is a complete exposure pathway. CT DPH assumed that contact with private well water occurred daily through normal routine activities like bathing, showering, and drinking and that children ingested 1 L/day of private well water. In addition, it was assumed that adults drank 2 L/day of private well water and that contact with well water from showering, bathing, cooking, and drinking occurred for a lifetime of 70 years (EPA 1997). It is important to note, however, that it is largely unknown when

pesticide applications on any of the homes in this city occurred, so the actual exposure duration is uncertain.

Since inhalation exposure to dieldrin and chlordane is minimal as compared with ingestion and dermal exposures, inhalation is not evaluated. This is largely because these pesticides do not volatilize readily like volatile organic compounds (VOCs).

Noncancer Effects

Chlordane

Using the minimum detected and maximum detected concentrations of 0.02 to 7.4 ppb as the exposure level range, the daily dose from ingestion and dermal exposure ranges from 0.004- 1.3 µg/kg/day. The median concentration of 0.42 ppb results in a median daily dose from ingestion and dermal exposure of 0.074 µg/kg/day.

The dose from the maximum concentration exceeds the Agency for Toxic Substances and Disease Registry's (ATSDR's) Minimum Risk Level (MRL) for chronic oral exposure of 0.6 µg/kg/day (ATSDR 2000) and EPA's reference dose (RfD) of 0.5 µg/kg/day (IRIS 1998). MRLs and RfDs are estimates of daily exposure to humans that are likely to be without harmful noncancer effects. Because the maximum dose exceeded the MRL and RfD, noncancer effects from past exposure to chlordane in private well water from Stamford can not be ruled out. The most sensitive group, small children and infants, are at highest risk for adverse health effects from exposure to contaminants, thus there is an emphasis on this group when risk calculations are estimated. All dose and risk calculations for both noncancer and cancer effects from exposure to chlordane and dieldrin are provided in Appendix B.

In addition, using the above concentration range for chlordane in well water resulted in a Hazard Index range of 0.007 to 2.6. A Hazard Index greater than 1 indicates additional further evaluation needs to be conducted. A Hazard Index less than 1 indicates that noncancer effects from exposure are unlikely. Because the Hazard Index is greater than 1 for maximum chlordane concentrations, noncancer cancer effects from exposure to maximum levels of chlordane in well water can not be ruled out. However, since the Hazard Index is less than 1 for minimum levels of chlordane in well water, health effects from minimum levels are unlikely.

To provide further perspective on noncancer risk calculations, CT DPH compared the estimated maximum dose with effect levels from toxicology literature (Table 2). The estimated dose is lower than the effect level for serious health effects reported in a range of toxicology studies. The lowest observed adverse effect level (LOAEL) of 273 µg/kg/day, (ATSDR 1994) is approximately 210 times higher than the maximum chlordane level of 1.3 µg/kg/day. Because the maximum dose is many times less than the lowest effect level from toxicology literature, adverse health effects are unlikely.

It should be noted that the ATSDR MRL for chlordane was derived using a no observed adverse effect level (NOAEL) of 60 µg/kg/day for hepatic effects in rats. Because of the lack of human exposure studies, uncertainty factors of 10 for extrapolation from animal to humans and 10 for

human variability were used in deriving the MRL. The maximum chlordane concentration of 1.3 µg/kg/day is in the lower range of the uncertainty factor region of the MRL.

Table 2. Estimated Doses for Chlordane: A Comparison of Average Daily Doses (ADD) from Drinking Contaminated Water in Private Wells in Stamford, CT to Noncancer Effect Levels From Toxicology Literature

Maximum Chlordane Dose from Private Well Water (µg/kg/day)	Effect Level from Literature (µg/kg/day)	Comment
1.3^	273	LOAEL for chronic oral rodent exposure resulting in hepatocellular hypertrophy in females (ATSDR 1994)
	750	LOAEL for chronic oral rodent exposure resulting in hepatic necrosis and basis for EPA Reference Dose (Khasawinah, A.M. and J.F. Grutsch 1989).
	4000	LOAEL for chronic oral rodent exposure resulting in significant increase in liver weight, liver cell inclusion bodies, and liver cell hypertrophy (ATSDR 1994)
	16,000	LOAEL for chronic oral rodent exposure resulting in 11-18% decrease in body weight (ATSDR 1994)

^ Highest estimated ADD for noncancer effects using worst case exposure scenario

Dieldrin

Using the minimum detected and maximum concentrations of 0.01-1.3 ppb as the exposure level range, the daily dose from ingestion and dermal exposure ranges from 0.001- 0.13 µg/kg/day. The median concentration of 0.1 ppb results in a daily dose from ingestion and dermal exposure of 0.01 µg/kg/day. The upper end dose exceeds ATSDR's MRL for chronic oral exposure of 0.05 µg/kg/day (ATSDR 2002) and EPA's RfD which is also 0.05 µg/kg/day (IRIS 1998). Because the maximum dose from private wells in Stamford exceeded the MRL and RfD, noncancer effects from past exposure to dieldrin in private well water in Stamford can not be ruled out. Dose and risk calculations are provided in Appendix B.

In addition, using the above concentration range for dieldrin in well water resulted in a Hazard Index range of 0.007 to 2.6. Because the Hazard Index is greater than 1 for higher dieldrin concentrations, noncancer effects from exposure to higher levels of dieldrin in well water can not be ruled out. However, since the Hazard Index is less than 1 for lower levels of dieldrin in well water, health effects from lower levels are unlikely.

To provide further perspective on noncancer risk calculations, CT DPH compared the estimated dose with effect levels from toxicology literature (Table 3). The estimated dose is lower than the effect level for serious health effects reported in a range of toxicology studies. The lowest observed adverse effect level of 25 µg/kg/day, is approximately 200 times higher than the maximum dieldrin dose of 0.13 µg/kg/day Because the maximum dose is many times less than the lowest effect level from toxicology literature, adverse health effects are unlikely.

However, it should be noted that the ATSDR MRL for dieldrin was derived using a no observed adverse effect level (NOAEL) of 5 µg/kg/day for hepatic effects in rats. Because of the lack of human exposure studies, uncertainty factors of 10 for extrapolation from animal to humans and 10 for human variability were used in deriving the MRL. The maximum chlordane concentration of 0.13 µg/kg/day is in the lower range of the uncertainty factor region of the MRL.

Table 3. Estimated Doses for Dieldrin: A Comparison of Average Daily Doses (ADD) from Drinking Contaminated Water in Private Wells in Stamford, CT to Noncancer Effect Levels From Toxicology Literature

Maximum Chlordane Dose from Private Well Water (µg/kg/day)	Effect Level from Literature (µg/kg/day)	Comment
0.13^	25	LOAEL for chronic oral rodent exposure resulting in hepatocellular enlargement and vacuolation, bile duct proliferation (ATSDR 2002)
	50	LOAEL for chronic oral rodent exposure resulting in liver lesions and basis for EPA Reference Dose (Walker et al. 1969).
	140-260	LOAEL for chronic oral exposure in dogs resulting in vacuolation of renal tubules (ATSDR 2002)
	2500	LOAEL for chronic oral rodent exposure resulting in nephritis (ATSDR 2002)

^ Highest estimated ADD for noncancer effects using worst case exposure scenario

Dieldrin and Chlordane (Ingestion and Dermal Exposure)

A small number of wells (15) tested positive for both dieldrin and chlordane. Using the maximum concentrations found of both contaminants in one well (dieldrin: 1.3 ppb and chlordane: 1.1 ppb), the Hazard Indices of dieldrin and chlordane resulted in a combined Hazard Index of 3. See Appendix B for noncancer risk calculations. Because the combined Hazard Index is greater than 1 on higher combined concentrations of both contaminants, noncancer effects from exposure to higher levels of both contaminants in well water can not be ruled out.

It is important to note that, unlike the previous exposure scenarios where private wells contained only dieldrin or chlordane, and health effects data were available to compare with concentrations in wells (and subsequently, health effects from exposure were ruled out), that is not the case in this exposure scenario. There is no current data in toxicology literature that documents health effects from exposure to both dieldrin and chlordane in drinking water to compare with the maximum dieldrin and chlordane levels found in well water in Stamford. However, there are data from the toxicology literature that document the health effects of exposure to only dieldrin or chlordane on the liver. Thus, health effects from exposure to maximum levels of both dieldrin and chlordane present in well water cannot be ruled out.

For wells where lower levels of both chlordane and dieldrin were detected together, the Hazard Index is well below 1. Since the Hazard Index is much lower than 1, health effects from exposure to lower levels of both dieldrin and chlordane in well water are unlikely.

However, it must be stressed that only a very small number of wells (15/1955) contained both dieldrin and chlordane. As stated earlier, the concentration ranges in wells that had both contaminants are similar to those found in wells with only one contaminant present. These risk calculations assume that exposure occurred for 6 years (default exposure duration for noncancer risk (EPA1997)), at the same dieldrin and chlordane concentrations in wells. Since only one sample was taken, we do not have enough data to confirm the actual exposure duration time or real time exposure concentrations.

Cancer Effects

CT DPH also estimated lifetime cancer risks from exposure to chlordane and dieldrin for community members drinking and bathing/showering in the contaminated well water in Stamford (Table 4).

For estimating cancer risk, the US EPA typically provides a potency factor for an environmental contaminant, such as chlordane or dieldrin. This potency factor (known as a slope factor or unit risk factor) is an upper-bound estimate of theoretical cancer risk for the general population for a lifetime of exposure to account for the possibility that potency may vary between the individuals.

Chlordane (Ingestion and Dermal Exposure)

If a community member drank and bathed or showered with contaminated well water every day for 70 years at the detected concentration range of 0.02-7.4 ppb, it would result in a dose range of 0.0008-0.3 µg/kg/day. Using the US EPA's oral cancer slope factor, the theoretical risk range would be 3 additional cancer cases in 10,000,000 to 1 in 10,000. Background rates of cancer in the United States are 1 in 2 or 3 (NCI 2001). If a theoretical (estimated) cancer risk is greater than 1×10^{-4} or (one excess cancer in 10,000), CT DPH considers this to be a moderate risk of cancer related to that chemical exposure and action to reduce exposure is warranted. If the risk is below 1×10^{-6}, then the possible cancer risk from a chemical exposure is thought to be insignificant and action to reduce exposure is usually not warranted. The cancer risk estimate from exposure to chlordane in water ranges from minimal to moderate increased lifetime incremental cancer risk relative to background cancer rates. Lifetime exposure to the highest chlordane concentrations may lead to increased risk of liver cancer relative to background cancer rates.

If a community member drank contaminated well water every day for a lifetime of 70 years (default lifetime exposure duration, EPA1997) at the median chlordane concentration of 0.42 ppb, it would result in a dose of 0.02 µg/kg/day. Using the US EPA's oral cancer slope factor, the theoretical risk would be 6 additional cancer cases in 1,000,000. CT DPH considers this cancer risk estimate to be low relative to the background cancer rate and within the risk range

used by the US EPA (1×10^{-4} to 1×10^{-6}) to justify the need for cleanup or reducing exposure. This cancer risk decreases with a decrease in chlordane concentration.

Table 4: Cancer Risk Estimates From Lifetime Exposure to Chlordane and/or Dieldrin in Private Wells in Stamford, Connecticut

Contaminant	Cancer Risk (Lower End)	Cancer Risk (Median)	Cancer Risk (Upper End)
Chlordane	3 in 10,000,000	6 in 1,000,000	1 in 10,000
Dieldrin	4 in 1,000,000	4 in 100,000	5 in 10,000
Chlordane and Dieldrin			5 in 10,000

Dieldrin (Ingestion and Dermal)

If a community member drank the contaminated well water from Stamford every day for 70 years at the detected concentration range of 0.01-1.3 ppb, it would result in a dose range of 0.0002-0.03 µg/kg/day. Using the US EPA's oral cancer slope factor, the theoretical risk range would be 4 additional cancer cases in 1,000,000 to 5 additional cancer cases in 10,000. The cancer risk estimate from exposure to dieldrin in water ranges from low to moderate increased lifetime incremental cancer risk relative to background cancer rates. Lifetime exposure to the highest dieldrin concentration may lead to increased risk of liver cancer relative to background cancer rates.

If a community member drank and bathed or showered with contaminated well water every day for 70 years at the median dieldrin concentration of 0.10 ppb, it would result in a dose of 0.002 µg/kg/day. Using the US EPA's oral cancer slope factor, the theoretical risk would be 4 additional cancer cases in 100,000. CT DPH considers this cancer risk estimate to be low relative to background cancer rates.

Chlordane and Dieldrin (Ingestion and Dermal Exposure)

Using the maximum detected dieldrin and chlordane concentration in private wells simultaneously, the combined theoretical risk for residents who are exposed to both dieldrin and chlordane in private well water, the estimated combined risk is $5x10^{-4}$. This means that there might be 5 excess cancers in a population of 10,000 exposed to both chlordane and dieldrin from contaminated well water every day for 70 years. CT DPH considers this cancer risk estimate to

be a moderate increased lifetime incremental cancer risk from exposure to the highest concentrations of chlordane and dieldrin found in one well simultaneously relative to background cancer rates. Exposure to the highest levels of chlordane and dieldrin may lead to an increased risk of liver cancer relative to background cancer rates.

However, it must be stressed again, that only a very small number of wells (15/1955) contained both dieldrin and chlordane. As stated earlier, the concentration ranges in wells that had both contaminants are similar to those found in wells with only one contaminant present. These risk calculations assume that exposure occurred for a lifetime of 70 years, at the same dieldrin and chlordane concentrations in wells. Since only one sample was taken, we do not have enough data to confirm the actual exposure duration time or real time exposure concentrations.

Uncertainty

One must also emphasize that there is a large degree of uncertainty in the noncancer and cancer risk calculations because of data limitations on chlordane and/or dieldrin in private well water and the lack of information about exposure duration. A single measurement does not give sufficient data to base a decision about where chlordane and/or dieldrin (or any other contaminant) in a private well is likely to result in noncancer or cancer health effects. In addition, since we do not know how long the private well water was contaminated, it is not possible to know how long residents were actually exposed to the contaminated water.

EVALUATION OF COMMUNITY CONCERNS

Residents whose well water tests exceed the action levels for dieldrin and/or chlordane want to know if it is safe to bath, shower, or cook with the water while they are waiting to get a whole house GAC filter installed.

It is recommended that until a whole house GAC filter is installed:
**No baths or cooking until whole house filter is installed.*
**Showers are fine, but you should use a coarse spray, tepid temperatures (warm, but not hot) and have a bathroom fan running during and immediately after the shower.*
**If you are concerned, you can purchase a point of use carbon filter to put on the shower head until a whole house filter is installed.*

CONCLUSIONS

One hundred and ninety six wells in Stamford had dieldrin and/or chlordane concentrations that exceeded state drinking water ALs. Health education outreach has been successful in encouraging people to test their private wells and install whole house GAC filters if dieldrin and/or chlordane concentration exceed ALs.

CT DPH has concluded that in the past, residents who used well water contaminated with dieldrin and/or chlordane for cooking, drinking, bathing or showering (typical household activities), were exposed to these pesticides. Some of these homeowners and their families may

have been exposed to this contaminated water for a long time, but the actual exposure time is unknown. Residents who cooked, drank, bathed, and showered with the highest concentrations of dieldrin or chlordane (or both contaminants) were exposed to these contaminants at levels that could harm people's health. Exposure to the highest levels of dieldrin and/or chlordane may lead to moderate increased risk of liver cancer relative to background cancer rates. Exposure to the highest levels of both dieldrin and chlordane could be enough exposure to cause damage to the liver.

Cancer risk estimates from exposure to the minimum and up to the median concentrations of these contaminants are very low to low and are not expected to harm people's health. However, it is prudent to take action to reduce exposure when the dieldrin and/or chlordane concentrations are above the AL.

RECOMMENDATIONS

1. CT DPH recommends that the Stamford Health Department continue to work with CT DPH to inform residents in the City of the importance of testing their private wells for dieldrin and chlordane and following CT DPH recommendations of installing a whole house filter if their well test results indicate that dieldrin and/or chlordane levels exceed CT ALs.

2. CT DPH recommends that the Stamford Health Department continue to collect well water sampling results submitted as part of the City Ordinance program and share the results with CT DPH.

3. CT DPH recommends that the Stamford Health Department continue to work with the Stamford Community Advisory Panel on private well issues in the city and developing solutions to the well contamination problem.

PUBLIC HEALTH PLAN

Actions Taken

1. CT DPH, along with the City and CT DEEP, held a meeting in September 2009 with Scofieldtown residents whose private wells were contaminated with dieldrin and/or chlordane. The objective of this meeting was to provide information to the community residents about exposures and health impacts related to the private well contamination. CT DPH distributed 3 fact sheets at this session; a Stamford well water related fact sheet (Appendix C), and 2 ATSDR fact sheets on dieldrin and chlordane. In addition, CT DPH distributed a general fact sheet on private well testing (Appendix D).

2. Approximately 100 residences in the Scofieldtown area of North Stamford were connected to municipal water or a whole house GAC filter by CT DEEP by December 2009.

3. After a well survey report in the Scofieldtown landfill concluded that the source of the pesticide contamination was not the landfill, the CT DEEP and City ended government well monitoring and treatment. The Stamford Health Department with assistance from CT DPH, distributed letters to all North Stamford residents informing them of the pesticide contamination and recommending well testing.

4. In July 2010, the Stamford Health Department, with the assistance of CT DPH, randomly sampled 34 homes in North Stamford and concluded that the contamination is random and widespread.

5. In July 2010 and June 2011, The Stamford Health Department, along with CT DEEP, CT DPH, several community groups, and well venders, held a Private Well Open House to inform the community of the pesticide contamination and answer questions and concerns about exposure to these pesticides.

6. In fall 2011, the City passed an ordinance for subsidized pesticide testing. Residents could have their wells tested at a reduced cost and with the agreement that the test results would be shared with the City and CT DPH.

7. In fall 2011, the CT DPH helped put together a Community Advisory Panel (CAP) which consists of community members whose main purpose is to provide a more efficient way to obtain feedback from the Stamford community regarding well water contamination concerns and help the US EPA, the City, DEEP, CT DPH, and the Stamford Health Department find constructive ways to collaborate to address these concerns. The US EPA provided for funding for a facilitator for the first year.

Actions Planned

1. CT DPH will make this health consultation available to residents of Stamford.

2. CT DPH will continue to work with CT DEEP and the City to respond to health questions and concerns regarding private well contamination.

3. CT DPH will review any additional private well data and update this health consultation, if necessary.

4. CT DPH will continue to work with the CAP and the Stamford Health Department to provide advice on how to educate and inform the public regarding private well concerns.

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REPORT PREPARATION

This public health consultation for the Stamford Private Well site was prepared by the Connecticut Department of Public Health under a cooperative agreement with the federal Agency for Toxic Substance and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, and procedures existing at the date of the publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

Author
Sharee Major Rusnak, MSPH, ScD
Epidemiologist
Environmental and Occupational Health Assessment Program
Connecticut Department of Public Health

State Reviewers
Brian Toal
Amanda Killeen

Technical Project Officer
Greg Ulirsch
ATSDR
Division of Community Health Investigations

Appendix A
ATSDR Aldrin/Dieldrin and Chlordane
Fact Sheets

Aldrin and Dieldrin- ToxFAQs™

CAS # 309-00-2 and 60-57-1

This fact sheet answers the most frequently asked health questions (FAQs) about aldrin and dieldrin. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to aldrin and dieldrin happens mostly from eating contaminated foods, such as root crops, fish, or seafood. Aldrin and dieldrin build up in the body after years of exposure and can affect the nervous system. Aldrin has been found in at least 207 of the 1,613 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA). Dieldrin has been found in at least 287 of the 1,613 sites.

What are aldrin and dieldrin?

Aldrin and dieldrin are insecticides with similar chemical structures. They are discussed together in this fact sheet because aldrin quickly breaks down to dieldrin in the body and in the environment. Pure aldrin and dieldrin are white powders with a mild chemical odor. The less pure commercial powders have a tan color. Neither substance occurs naturally in the environment.

From the 1950s until 1970, aldrin and dieldrin were widely used pesticides for crops like corn and cotton. Because of concerns about damage to the environment and potentially to human health, EPA banned all uses of aldrin and dieldrin in 1974, except to control termites. In 1987, EPA banned all uses.

What happens to aldrin and dieldrin when they enter the environment?

- Sunlight and bacteria change aldrin to dieldrin so that we mostly find dieldrin in the environment.
- They bind tightly to soil and slowly evaporate to the air.
- Dieldrin in soil and water breaks down very slowly.
- Plants take in and store aldrin and dieldrin from the soil.
- Aldrin rapidly changes to dieldrin in plants and animals.
- Dieldrin is stored in the fat and leaves the body very slowly.

How might I be exposed to aldrin or dieldrin?

- Dieldrin is everywhere in the environment, but at very low levels.
- Eating food like fish or shellfish from lakes or streams contaminated with either chemical, or contaminated root crops, dairy products, or meats.
- Air, surface water, or soil near waste sites may contain higher levels.
- Living in homes that were once treated with aldrin or dieldrin to control termites.

How can aldrin and dieldrin affect my health?

People who have intentionally or accidentally ingested large amounts of aldrin or dieldrin have suffered convulsions and some died. Health effects may also occur after a longer period of exposure to smaller amounts because these chemicals build up in the body.

Some workers exposed to moderate levels in the air for a long time had headaches, dizziness, irritability, vomiting, and uncontrolled muscle movements. Workers removed from the source of exposure rapidly recovered from most of these effects.

Animals exposed to high amounts of aldrin or dieldrin also had nervous system effects. In animals, oral exposure to lower levels for a long period also affected the liver and decreased their ability to fight infections. We do not know whether aldrin or dieldrin affect the ability of people to fight disease.

Studies in animals have given conflicting results about whether aldrin and dieldrin affect reproduction in male animals and whether these chemicals may damage the sperm. We do not know whether aldrin or dieldrin affect reproduction in humans.

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Health Human Sciences

CS249955-C

Aldrin and Dieldrin

CAS # 309-00-2 and 60-57-1

How likely are aldrin and dieldrin to cause cancer?

There is no conclusive evidence that aldrin or dieldrin cause cancer in humans. Aldrin and dieldrin have shown to cause liver cancer in mice. The International Agency for Research on Cancer (IARC) has determined that aldrin and dieldrin are not classifiable as to human carcinogenicity. The EPA has determined that aldrin and dieldrin are probable human carcinogens.

How can aldrin and dieldrin affect children?

Children can be exposed to aldrin and dieldrin in the same way as adults. There are no known unique exposure pathways for children. Children who swallowed amounts of aldrin or dieldrin much larger than those found in the environment suffered convulsions and some died, as occurred in adults. However, we do not know whether children are more susceptible than adults to the effects of aldrin or dieldrin.

We do not know whether aldrin or dieldrin cause birth defects in humans. Pregnant animals that ingested aldrin or dieldrin had some babies with low birth weight and some with alterations in the skeleton. Dieldrin has been found in human breast milk, therefore, it can be passed to suckling infants.

How can families reduce their risk for exposure to aldrin and dieldrin?

- Since aldrin and dieldrin are no longer produced or used, exposure to these compounds will occur only from past usage.
- Because aldrin and dieldrin were applied to the basement of some homes for termite protection, before buying a home families should investigate what, if any, pesticides have been used within the home.

Is there a medical test to show whether I've been exposed to aldrin and dieldrin?

There are laboratory tests that can measure aldrin and dieldrin in your blood, urine, and body tissues. Because aldrin changes to dieldrin fairly quickly in the body, the test has to be done shortly after you are exposed to aldrin. Since dieldrin can stay in the body for months, measurements of dieldrin can be made much longer after exposure to either aldrin or dieldrin. The tests cannot tell you whether harmful health effects will occur. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The EPA limits the amount of aldrin and dieldrin that may be present in drinking water to 0.001 and 0.002 milligrams per liter (mg/L) of water, respectively, for protection against health effects other than cancer. The EPA has determined that a concentration of aldrin and dieldrin of 0.0002 mg/L in drinking water limits the lifetime risk of developing cancer from exposure to each compound to 1 in 10,000.

The Occupational Safety and Health Administration (OSHA) sets a maximum average of 0.25 milligrams of aldrin and dieldrin per cubic meter of air (0.25 mg/m^3) in the workplace during an 8-hour shift, 40 hour week. The National Institute for Occupational Safety and Health (NIOSH) also recommends a limit of 0.25 mg/m^3 for both compounds for up to a 10-hour work day, 40-hour week.

The Food and Drug Administration (FDA) regulates the residues of aldrin and dieldrin in raw foods. The allowable range is from 0 to 0.1 ppm, depending on the type of food product.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Aldrin/Dieldrin. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CHLORDANE
CAS # 57-74-9

Agency for Toxic Substances and Disease Registry ToxFAQs **September 1995**

This fact sheet answers the most frequently asked health questions (FAQs) about chlordane. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to chlordane occurs mostly from eating contaminated foods, such as root crops, meats, fish, and shellfish, or from touching contaminated soil. High levels of chlordane can cause damage to the nervous system or liver. This chemical has been found in at least 171 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is chlordane?
(Pronounced klôr′dān′)

Chlordane is a manufactured chemical that was used as a pesticide in the United States from 1948 to 1988. Technical chlordane is not a single chemical, but is actually a mixture of pure chlordane mixed with many related chemicals. It doesn't occur naturally in the environment. It is a thick liquid whose color ranges from colorless to amber. Chlordane has a mild, irritating smell.

Some of its trade names are Octachlor and Velsicol 1068. Until 1983, chlordane was used as a pesticide on crops like corn and citrus and on home lawns and gardens.

Because of concern about damage to the environment and harm to human health, the Environmental Protection Agency (EPA) banned all uses of chlordane in 1983 except to control termites. In 1988, EPA banned all uses.

What happens to chlordane when it enters the environment?

- Chlordane entered the environment when it was used as a pesticide on crops, on lawns and gardens, and to control termites.
- Chlordane sticks strongly to soil particles at the surface and is not likely to enter groundwater.
- It can stay in the soil for over 20 years.
- Most chlordane leaves soil by evaporation to the air.
- It breaks down very slowly.
- Chlordane doesn't dissolve easily in water.
- It builds up in the tissues of fish, birds, and mammals.

How might I be exposed to chlordane?

- By eating crops grown in soil that contains chlordane.
- By eating fish or shellfish caught in water that is contaminated by chlordane.
- By breathing air or touching soil near homes treated for termites with chlordane.
- By breathing air or by touching soil near waste sites or landfills.

How can chlordane affect my health?

Chlordane affects the nervous system, the digestive system, and the liver in people and animals. Headaches, irritability, confusion, weakness, vision problems, vomiting, stomach cramps, diarrhea, and jaundice have occurred in people who breathed air containing high concentrations of chlordane or accidentally swallowed small amounts of chlordane. Large amounts of chlordane taken by mouth can cause convulsions and death in people.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service
Agency for Toxic Substances and Disease Registry

ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html

A man who had long-term skin contact with soil containing high levels of chlordane had convulsions. Japanese workers who used chlordane over a long period of time had minor changes in liver function.

Animals given high levels of chlordane by mouth for short periods died or had convulsions. Long-term exposure caused harmful effects in the liver of test animals.

We do not know whether chlordane affects the ability of people to have children or whether it causes birth defects. Animals exposed before birth or while nursing developed behavioral effects later.

How likely is chlordane to cause cancer?

The International Agency for Research on Cancer has determined that chlordane is not classifiable as to its carcinogenicity to humans. Studies of workers who made or used chlordane do not show that exposure to chlordane is related to cancer, but the information is not sufficient to know for sure. Mice fed low levels of chlordane in food developed liver cancer.

Is there a medical test to show whether I've been exposed to chlordane?

Laboratory tests can measure chlordane and its breakdown products in blood, fat, urine, feces, and breast milk. The amount of breakdown products measured in body fat or breast milk does not tell how much or how long ago you were exposed to chlordane or if harmful effects will occur.

Has the federal government made recommendations to protect human health?

In 1988, the EPA banned all uses of chlordane. The EPA recommends that a child should not drink water with more than 60 parts of chlordane per billion parts of drinking water (60 ppb) for longer than 1 day. EPA has set a limit in drinking water of 2 ppb.

EPA requires spills or releases of chlordane into the environment of 1 pound or more to be reported to EPA.

The Food and Drug Administration (FDA) limits the amount of chlordane and its breakdown products in most fruits and vegetables to less than 300 ppb and in animal fat and fish to less than 100 ppb.

The Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Health and Safety (NIOSH), and the American Conference of Governmental Industrial Hygienists (ACGIH) set a maximum level of 0.5 milligrams of chlordane per cubic meter (mg/m^3) in workplace air for an 8-hour workday, 40-hour workweek. These agencies have advised that eye and skin contact should be avoided because this may be a significant route of exposure.

Glossary

Carcinogenicity: Ability to cause cancer.

Long-term: Lasting one year or longer.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

ppb: Parts per billion.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for chlordane (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Appendix B
Risk Calculations

Stamford Private Well Contamination Calculations

DIELDRIN-Min Concentration of Positive Hits

NONCANCER RISK

Ingestion, Min pos Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (ug/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	ADD_{Total}	RFD (µg/kg/day)	HI
1	0.01	6	0.058824	0.166667	0.000588235	0.001000000	0.05	0.02

Dermal Exposure

Derm Factor	ADD_d
0.7	0.00041176

CANCER RISK

Ingestion, Min Positive Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	ADD_{Total}	$ADD_{total\ Child\ +Adult}$	CSF $(mg/kg/day)^{-1}$	Cancer Risk
1	0.00001	6	0.058823529	0.01428571	5.04202E-08	0.000000086	0.000000231	16	4X10-6

Dermal Exposure

Derm Factor	ADD_d
0.7	3.5294E-08

CANCER RISK (child/adult age 1-30)

Ingestion, Min Positive Concentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	ADD_{Total}
2	0.00001	24	0.0125	0.01428571	8.57143E-08	0.000000146

Dermal Exposure

Derm Factor	ADD_d
0.7	0.00000006

CHLORDANE

Ingestion, Min Positive Concentration, child, aged 1-6 years, Chlordane

Ing Rate (L/day)	[Conc] (µg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	ADD_{Total}	RFD (µg/kg/day)	HI
1	0.02	6	0.058824	0.166667	0.001176471	0.003529412	0.5	7E10-3

Dermal Exposure

Derm Factor	ADD_d
2	0.00235294

CANCER RISK

Ingestion, Min Positive Concentration, child, aged 1-6 years, Chlordane 0.00102 ppm

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$ADD_{TotalChild}$	Toal $ADD_{Adult+Child}$	CSF $(mg/kg/day)^{-1}$	Cancer Risk
1	0.00002	6	0.058823529	0.01428571	1.0084E-07	0.000000303	0.000000817	0.351	3x10-7

Dermal Exposure Chlordane

Derm Factor	ADD_d
2	2.0168E-07

CANCER RISK (child/adult age 1-30)

Ingestion, Min Positive Concentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$ADD_{TotalAdult}$
2	0.00002	24	0.0125	0.01428571	1.71429E-07	0.000000514

Dermal Exposure Chlordane

Derm Factor	ADD_d
2	3.4286E-07

DIELDRIN-Max Concentration

NONCANCER RISK

Ingestion, Max Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (µg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	ADD_{Total}	RFD (µg/kg/day)	HI
1	1.3	6	0.058824	0.166667	0.076470588	0.130000000	0.05	2.6

Dermal Exposure

Derm Factor	ADD_d
0.7	0.05352941

CANCER RISK

Ingestion, Ave. Max Positive Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	ADD_{Total}	$Add_{total\ Child\ and\ Adult}$	$CSF(mg/kg/day)^{-1}$	Cancer Risk
1	0.0013	6	0.058823529	0.01428571	6.55462E-06	0.000011143	0.000030086	16	5X10-4

Dermal Exposure

Derm Factor	ADD_d
0.7	4.5882E-06

CANCER RISK (child/adult age 1-30)

Ingestion, Max Concentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	ADD_{Total}
2	0.0013	24	0.0125	0.01428571	1.11429E-05	0.000018943

Dermal Exposure

Derm Factor	ADD_d
0.7	0.0000078

CHLORDANE

Ingestion, Max Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (µg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	ADD_{Total}	RFD (µg/kg/day)	HI
1	7.4	6	0.058824	0.166667	0.435294118	1.305882353	0.5	2.6117647

Dermal Exposure

Derm Factor	ADD_d
2	0.87058824

CANCER RISK

Ingestion, Max Concentration, child, aged 1-6 years,

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$ADD_{TotalChild}$	Total $ADD_{Adult+Child}$	CSF $(mg/kg/day)^{-1}$	Cancer Risk
1	0.0074	6	0.058823529	0.01428571	3.73109E-05	0.000111933	0.000302218	0.351	1X10-4

Dermal Exposure Chlordane

Derm Factor	ADD_d
2	7.4622E-05

CANCER RISK (child/adult age 1-30)

Ingestion, Max Concentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$ADD_{TotalAdult}$
2	0.0074	24	0.0125	0.01428571	6.34286E-05	0.000190286

Dermal Exposure Chlordane

Derm Factor	ADD_d
2	0.00012686

DIELDRIN-Median Concentration

NONCANCER RISK

Ingestion, Median Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (µg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	ADD_{Total}	RFD (µg/kg/day)	HI
1	0.1	6	0.058824	0.166667	0.005882353	0.010000000	0.05	0.2

Dermal Exposure

Derm Factor	ADD_d
0.7	0.00411765

CANCER RISK

Ingestion, Median Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	ADD_{Total}	$ADD_{total\ Child\ +\ Adult}$	CSF $(mg/kg/day)^{-1}$	Cancer Risk
1	0.0001	6	0.058823529	0.01428571	5.04202E-07	0.000000857	0.000002314	16	4X10-5

Dermal Exposure

Factor	Add_d
0.7	3.5294E-07

CANCER RISK (child/adult age 1-30)

Ingestion, Median Concentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	ADD_{Total}
2	0.0001	24	0.0125	0.01428571	8.57143E-07	0.000001457

Dermal Exposure

Derm Factor	ADD_d
0.7	0.0000006

Chlordane

Ingestion, Median Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (µg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	Add_{Total}	RFD (µg/kg/day)	HI
1	0.42	6	0.058824	0.166667	0.024705882	0.074117647	0.5	0.1482353

Dermal Exposure

Factor	Add_d
2	0.04941176

CANCER RISK

Ingestion, Median Concentration, child, aged 1-6 years,

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$Add_{TotalChild}$	Total Add Adult and Child	$CSF (mg/kg/day)^{-1}$	Cancer Risk
1	0.00042	6	0.058823529	0.01428571	2.11765E-06	0.000006353	0.000017153	0.351	6x10-6

Dermal Exposure

Factor	Add_d
2	4.2353E-06

CANCER RISK (child/adult age 1-30)

Ingestion, MedianConcentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$ADD_{TotalAdult}$
2	0.00042	24	0.0125	0.01428571	0.0000036	0.000010800

Dermal Exposure

DermFactor	ADD_d
2	0.0000072

NonCancer Risk
(Dieldrin + Chlordane)

Dieldrin

Ingestion, Max Detected Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (µg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	ADD_{Total}	RFD (µg/kg/day)	HI
1	1.3	6	0.058824	0.166667	0.076470588	0.130000000	0.05	2.6

Dermal Exposure

Factor	ADD_d
0.7	0.05352941

Chlordane

Ingestion, Max Detected Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (µg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_{nc}$ (1/yr)	ADD_i (µg/kg/day	ADD_{Total}	RFD (µg/kg/day)	HI
1	1.1	6	0.058824	0.166667	0.064705882	0.194117647	0.5	0.3882353
								Total HI (Dieldrin + Chlordane)
								2.9882353

Dermal Exposure

Factor	Add_d
2	0.12941176

CANCER RISK Max (Dieldrin+Chlordane)

Dieldrin

Ingestion, Ave. Max Detected Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	Add_{Total}	$ADD_{total\ Child\ and\ Adult}$	CSF $(mg/kg/day)^{-1}$	Cancer Risk
1	0.0013	6	0.058823529	0.01428571	6.55462E-06	0.000011143	0.000030086	16	

Dermal Exposure

Factor	ADD_d
0.7	4.5882E-06

5x10-4

Ingestion, Max Detected Concentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	ADD_{Total}
2	0.0013	24	0.0125	0.01428571	1.11429E-05	0.000018943

Dermal Exposure

Factor	ADD_d
0.7	0.0000078

Chlordane

Ingestion, Max Detected Concentration, child, aged 1-6 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$ADD_{TotalChild}$	Total ADD $_{Child+adult}$	CSF $(mg/kg/day)^{-1}$	Cancer Risk
1	0.0011	6	0.058823529	0.01428571	5.54622E-06	0.000016639	0.000044924	0.351	

Dermal Exposure Chlordane

DermFactor	Add_d
2	1.1092E-05

Combined Cancer Risk
2x10-5

5 x10-4

Ingestion, Max Detected Concentration, child, aged 6-30 years

Ing Rate (L/day)	[Conc] (mg/L)	ED (yr)	$1/BW_c$ (1/kg)	$1/At_c$ (1/yr)	ADD_i (mg/kg/day)	$ADD_{TotalAdult}$
2	0.0011	24	0.0125	0.01428571	9.42857E-06	0.000028286

Dermal Exposure Chlordane

Derm Factor	Add_d
2	1.8857E-05

WHERE:

ADD_{ing}	= Average daily dose from ingestion
ADD_{d}	= Average daily dose from dermal exposure
ADD_{total}	= Total average daily dose
ADD_{adult}	= Total average daily dose adult
ADD_{child}	= Total average daily dose child
$ADD_{total\ child+adult}$	= Total average daily dose child + adult
AT_{nc}	= Averaging time for noncancer risk: 6 years
AT_{c}	= Averaging time for cancer risk: 70 years
Bw_{c}	= Child 50th %tile body weight for age 1-6 yrs; 17 kg; Adult 50th %tile body weight: 80 kg (ATSDR 2010)
[Conc]	= Min concentration, chlordane: 0.02 µg/L, dieldrin: 0.01 µg/L, Max concentration, chlordane: 7.4 µg/L, dieldrin: 1.3 µg/L, Median concentration, chlordane: 0.42 µg/L, dieldrin: 0.1 µg/L = Max concentration (found in one well), chlordane: 1.1 µg/L, dieldrin:1.3 µg/L
CSF	= Cancer slope factor, chlordane: 0.351 $(mg/kg/day)^{-1}$ (IRIS 1998); Dieldrin: 16 $(mg/kg/day)^{-1}$ (IRIS 1990)
Derm Factor	= Dermal Exposure Factor: chlordane: 2; dieldrin: 0.7 (EPA 2004)
ED	= Exposure duration; child: 6 years; child/adult: 24 years
HI	= Hazard index
Ing Rate	= Ingestion rate, child: 1L/day, adult: 2L/day
RfD	= EPA reference dose chlordane: 0.5 µg/kg/day (IRIS 1998), dieldrin 0.05 µg/kg/day (IRIS 1990)

Appendix C
North Stamford Private Well Contamination Fact Sheet

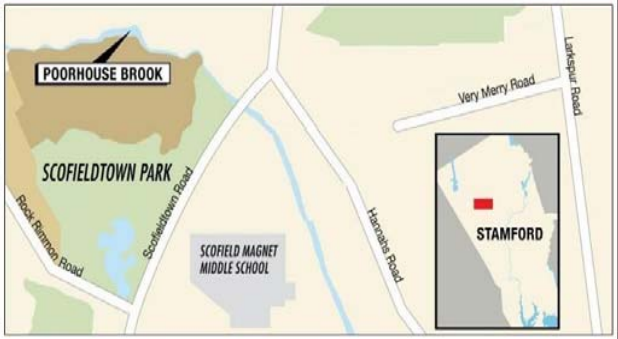
CT Department of Public Health

May 2010

Questions & Answers about Pesticides in Drinking Water in North Stamford

BACKGROUND

This fact sheet has been written to give you information about chemical contamination that has been found in some drinking water wells near the Scofieldtown Road Park and more recently, in other areas of North Stamford. Information in this fact sheet should help answer questions about the contamination.



Scofieldtown Road Park is a recreational park that was built on part of the Scofieldtown Landfill. The landfill took household and industrial waste until it closed in the late 1960s. The park was developed soon after and was recently closed due to concerns about soil contamination issues.

Recent well testing near Scofieldtown Road Park found a number of private residential wells with elevated levels of 2 pesticides, **dieldrin** and **chlordane**. The source of this contamination is unknown and currently under investigation. Many of these homes are now connected to city water. Because some additional private wells outside of the Scofieldtown area have tested positive for pesticides, the city of Stamford is now recommending that all residents in North Stamford test their wells for these pesticides. The city is currently in the process of developing a random well testing program throughout North Stamford.

WHAT ARE DIELDRIN AND CHLORDANE?

Dieldrin and chlordane are man-made pesticides that were used in the United States for control of a wide range of insects in soil, especially termites. From the 1950s to the 1970s, dieldrin and chlordane were widely used by farmers to kill insects in seed and on agricultural crops. Because of concerns about human exposure and risk, persistence in the environment and danger to wildlife, use of dieldrin and chlordane on food crops was banned in the late 1970s. These pesticides continued to be used to control termites in homes until the late 1980s, when all uses were banned.

What Are The Drinking Water Standards For These Chemicals? How Are The Standards Set?

The CT Department of Public Health (DPH) sets health-based **Action Levels** for many chemicals in **private well water**. When an action level is exceeded, DPH recommends the use of bottled water or drinking water treatment system for residents with contaminated private wells. DPH develops Action Levels in much the same way that the U.S. Environmental Protection Agency sets their standards for **public** drinking water. The action levels are set based on a person drinking 2 liters of water everyday of a lifetime.

- The Action Level for dieldrin is 0.03 micrograms per liter (ug/L), or parts-per-billion (ppb).
- The Action level for chlordane is 0.3 ug/L.

If a person is exposed to a chemical in their drinking water at a concentration **below** the Action Level, DPH considers their health risk from that exposure to be insignificant.

At concentrations above the Action Level, exposure over **many years** can increase a person's risk of health effects. For this reason, it is important to limit your exposure to drinking water when it exceeds an Action Level. It is also important to know that an increased health risk does not necessarily mean that a health effect will occur.

How Can You Get Exposed to These Chemicals?

If chemicals are present in your water, the most obvious way you can be exposed is through drinking the water (ingestion). Another way you can be exposed is through breathing. During activities such as bathing, doing dishes, or flushing a toilet, chemicals can evaporate into the air and can be inhaled into the body. However, the pesticides that are found in wells in North Stamford do not evaporate easily in the air, so breathing is not the most important way to be exposed. These pesticides can also be absorbed through the skin when bathing and showering.

Is the Drinking Water at the Scofield Magnet Middle School Safe to Drink?

Yes, the middle school's drinking water is safe. The Aquarion Water – Stamford System, which supplies public drinking water to the middle school, routinely tests the water for pesticides. The most recent tests, as reported to DPH, show that no pesticides were found in the drinking water.

What Types of Water Supply Systems are Available in the Scofieldtown Area?

Properties in North Stamford area are served by a private well, public supply well or public water distribution system. A private well is a well serving less than 25 people. Private wells are not regulated by DPH and are not subject to any water testing requirements. A public supply well serves at least 25 people. Public supply wells and water distribution systems are regulated by DPH and are subject to some type of water testing requirements.

What are the Health Effects of Dieldrin and Chlordane?

Dieldrin

People such as pesticide sprayers and workers in pesticide-making factories who were exposed to very high levels of dieldrin had nervous system effects such as convulsions. Animals who were given large amounts of dieldrin had nervous system effects as well, and also liver and kidney damage and problems with reproduction. It is not known for sure whether dieldrin causes liver, kidney or reproductive problems in humans. Dieldrin causes cancer in animals but studies in humans have been inconclusive. Based on the evidence in animals, dieldrin is classified as a probable human carcinogen. For this reason, health officials have tried to minimize the public's exposure to dieldrin by developing strict cleanup standards for dieldrin in soil and water.

Chlordane

Chlordane exposure can affect the nervous system, digestive system, and the liver in people and animals. Workers who were also exposed to high levels of chlordane have experienced convulsions. It is unknown whether chlordane exposure is linked to infertility or birth defects. Animals exposed before birth or while nursing developed behavioral effects later. Chlordane is not classifiable as to its carcinogenicity to humans, but it has been shown to cause liver cancer in mice.

Is There a Medical Test to Show if I have Been Exposed to Pesticides?

Dieldrin and chlordane can be measured in your blood, urine and body tissues such as fat. However, medical tests cannot tell you whether the pesticides that may be in your body are from recent exposure or from exposure long ago. Most Americans have low levels of dieldrin and chlordane in their bodies due to the wide use of these pesticides in the past. In addition, medical tests cannot predict whether a person will have health effects. For these reasons, DPH is not recommending any medical tests for residents living in North Stamford or students and staff at the middle school. However, if you have specific medical questions or concerns, you should speak with your own physician.

What Happens if My Well Water Exceeds Connecticut's Action Levels?

The City of Stamford will provide you with the name of a company you can hire to install a whole house granular activated carbon (GAC) filter in your home. It is similar to the small carbon filters that many people install on their faucets. However, a whole house system is larger and more effective than these small filtration systems. Properly monitored and maintained, a GAC filtration system is an extremely efficient and effective method to remove pesticides and many other potentially harmful substances in drinking water. The cost of the filtration system is approximately $1600.

My Well Water Exceeds the Action Levels, but I Don't have a Whole House Filter Yet. Is it Safe to Bathe, Shower, or Cook with my Well Water?

It is recommended that until a whole house filtration device is provided:

- No baths or cooking with the unfiltered water
- Showers are fine, but you should use a course spray, tepid temperatures (warm, but not hot) and have a bathroom fan running during and immediately after the shower.
- If you are concerned, you can purchase a point of use carbon filter to put on the shower head until a home filter system is installed.

What if I have more questions?

CT Department of Public Health
-Envir. & Occupational Health Assessment
Sharee Rusnak
860-509-7740
sharee.rusnak@ct.gov

- Private Well Water Program
Ray Jarema
860- 509-7321
raymond.jarema@ct.gov

Stamford Health Department
Anne Fountain
203-977-4396
afountain@ci.stamford.ct.us

CT Department of Environmental Protection
Amanda Flad
860-424-3351

Agency for Toxic Substances and Disease Registry (ATSDR) Fact Sheets

Dieldrin:

http://www.atsdr.cdc.gov/tfacts1.html
http://www.atsdr.cdc.gov/tfacts1.pdf

Chlordane:

http://www.atsdr.cdc.gov/tfacts31.html
http://www.atsdr.cdc.gov/tfacts31.pdf

CT DPH Fact Sheet for Private Well Water in Connecticut:
http://www.ct.gov/dph/lib/dph/environmental_health

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Appendix D
Private Well Testing Fact Sheet

PRIVATE DRINKING WATER IN CONNECTICUT

Publication Date: May 2013

Publication No. 24: Private Well Testing

Testing your well water provides you with information on the quality of your drinking water. Testing is the best way to ensure that your drinking water supply is safe from harmful chemicals. In addition, water testing can determine whether nuisance impurities are present, such as iron and manganese. The purpose of this fact sheet is to assist private well owners in deciding how frequently to test their private well water and what to test for. It also provides homeowners with information about how to get their water tested, understanding their water test results and protecting their well from contamination.

Private Water Supplies

Homeowners with private wells are responsible for the quality of their own drinking water. They are generally not required to test their drinking water. However, testing is a good idea even if you do not suspect a problem because testing is the only way to be sure your water is safe to drink. A good time to test is when buying a home so that you can make any contamination findings part of your home purchase decision. The best time of the year to test is after a spring or summer heavy rainy period. Even if your current water supply proves to be clean and safe to drink, regular testing is important because it establishes a record of water quality that may help identify and solve future problems.

In accordance with Section 19-13-B101 of the Public Health Code, testing is required for new wells. However, the required tests do not cover all contaminants. Water tests done during home purchases are usually required by the bank providing the mortgage. Contrary to common belief, such tests are not required by law. Water tests done for a home purchase do not necessarily cover all contaminants.

This fact sheet provides general guidelines for private well water testing. However, these are just guidelines. Check with your Local Health Department to find out whether there are water quality problems specific to your area. It is also a good idea to ask your neighbors whether they have ever had water quality problems. The Connecticut Department of Public Health (DPH) Private Well Program is also a resource for questions about private well testing. DPH's Environmental and Occupational Health Assessment Program is a resource for questions about safe limits of chemicals in water and health concerns. Contact information is provided at the end of this fact sheet.

What To Test For? How Frequently to Test?

Even if you do not suspect any well water problems, it is important to test your water to ensure that it is safe to drink. Table 1 lists the tests we recommend for all private wells even if you do not notice any problems with your water. Table 3 lists water quality issues you might encounter and what tests you should do if you have a particular issue with your water. Whenever you notice a change in the taste, color, odor, or clarity of your water, contact your Local Health Department or DPH for assistance.

Produced by The State of Connecticut Department of Public Health
Environmental Health Section, Private Well Program
450 Capitol Avenue, MS#51REC, PO Box 340308, Hartford, CT 06134
Phone: 860-509-7296 Fax: 860-509-7295

Table 1. Recommended Tests for All Private Wells		
Type of Test	**When?**	**Why?**
Basic Indicators (Potability) See Table 2 below	**Every Year** Also test after repair or replacement of your well, pump or water pipes. *If 5 years of results show no problems, test once every 5 years.*	Provides a general indication of water quality. Can provide clues that additional tests are needed. Required for all new wells.
Lead	**At Least Once** Also test when planning a pregnancy or if you have a child under 6 years old. *If your water is corrosive (pH less than 6.0), test every 3-5 years.*	Lead can leach from plumbing (pipes and faucets). Lead pipes may be in homes built before 1930. Lead-based solder may be in homes built before 1988. Brass is used in new plumbing and fixtures. All brass contains small amounts of lead. Corrosive water leaches more lead. Young children are more susceptible to harmful effects from lead exposure.
Arsenic, Uranium, Radon	**At Least Once** Ideally, repeat test every 5 years	Arsenic, uranium and radon are naturally occurring in some groundwater in CT. Private wells with high levels have been found sporadically around CT. Levels can fluctuate over time.
Volatile Organic Compounds (VOCs)	**At Least Once**	Gasoline, oil, solvents or industrial chemicals spilled or leaked on the ground could get into your well water.
Fluoride	**Every 5 years when a child under 12 is present**	Fluoride can occur naturally in wells throughout CT. A child's permanent teeth can become discolored from excess fluoride. Too little fluoride can increase risk of tooth decay. Your child's dentist will likely ask you about the fluoride level in your well water.

Some acceptable limits are based on aesthetics and some are based on health. If your water exceeds a Basic Indicator Parameter, contact your local health department for advice about whether you should stop drinking the water.

Table 2. Basic Indicators Test	
Parameter	**Acceptable Limit**
Total Coliform Bacteria	None Present
Nitrate-Nitrogen	10 mg/L
Nitrite-Nitrogen	1 mg/L
pH	6.4 - 8.5 Standard Units
Odor	Less than 2
Chloride	250 mg/L (milligrams per liter)
Hardness	150 mg/L
Apparent Color	Less than 15 Standard Units
Sulfate	250 mg/L
Turbidity	Less than 5 Standard Units
Iron	0.3 mg/L
Manganese	0.05 mg/L (taste/odor concern) 0.5 mg/L (health concern)

Table 3. Private Well Water Quality Issues and Testing Recommendations		
Water Quality Issue	**Possible Cause(s)**	**Recommended Water Test(s)**
Low pH (pH less than 6.0)	Naturally corrosive (low pH) water, low hardness, low alkalinity	Hardness, Alkalinity, Sulfate, Lead, Copper, Cadmium, Zinc
Buildup of limescale (off-white chalky solids) on hot water plumbing, fixtures, kettles. Reduced soap lathering.	Hard water (hardness level exceeding 150 mg/L)	Hardness
Blue or reddish stains on plumbing, fixtures or laundry. Plumbing leaks.	Corrosive (low pH) water.	Hardness, Alkalinity, Sulfate, Lead, Copper, Cadmium, Zinc
Rust-colored water, foul odor, rust stains on clothing and plumbing fixtures, rust coating in toilet tank	Elevated Iron or Manganese, Iron Bacteria	Iron, Manganese
Rotten egg odor, musty or swampy odor, tarnished copper and silverware, yellow or black stains on plumbing fixtures	Hydrogen sulfide gas, high sulfates, sulfur bacteria, iron/manganese bacteria, coliform bacteria	Odor, Hydrogen Sulfide, Sulfate, Coliform Bacteria, Iron, Manganese
Cloudy, Turbid, Muddy Water	Silt, Sediment, microorganisms	Turbidity and Coliform Bacteria, Check Well Construction with an expert
Chemical, fuel or fruity odor	Leaking underground fuel tank, gas station fuel spill, industrial chemical spill, road runoff	Volatile Organic Compounds (VOCs)
Nitrates exceed 10 mg/L Nitrites exceed 1 mg/L	Fertilizer runoff, malfunctioning septic system	Pesticides (contact your local health department about pesticide use in your area), Coliform Bacteria
Radon in Air exceeds 4 picocuries per liter	Naturally-occurring uranium in bedrock	Radon water test
Recurrent gastrointestinal illness	Human or animal waste contaminating well, cracked well casing, flooded well, malfunctioning septic system	Coliform Bacteria, Nitrates, Nitrites
Bitter, metallic taste	Corrosive (low pH) water	pH, Lead, Copper
Salty, brackish taste	Road salt runoff, nearby salt storage, well near salt water, improper setting on water softener	Chloride, Sodium, Total Dissolved Solids
Well within 1/4 mile of current or former orchard or farmland	Agricultural and/or arsenic-based pesticides get into well	Arsenic, Nitrates, Pesticides (ask for EPA Method 505)*
Well within 1/4 mile of commercial or industrial area	Gasoline, oil, solvents leaked or spilled on the ground get into well	Volatile Organic Compounds (VOCs)
Well flooding, ponding around well	Heavy rains, poor drainage around well	Basic Indicators
House foundation treated for termites before 1990	Termite pesticides leach into well	Pesticides dieldrin and chlordane
Noticeable change in taste, color, odor, or clarity of your water.	Unknown	Contact your local health department or DPH
* Contact your Local Health Department or CT Dept. of Energy and Environmental Protection for advice about whether you should test for additional pesticides.		

What If I Already Have A Treatment System In My Home?

If you have water treatment equipment in your home, you should monitor whether the treatment system is doing its job by testing for the specific contaminant(s) that the system is treating. Be aware that water treatment systems are designed for specific contaminants. Treatment systems will not necessarily remove all contaminants! Periodically you should test your water before and after treatment to be sure the system is continuing to work properly. Refer to Purchasing Water Treatment Equipment for more information about treatment.

How Do I Get My Water Tested?

You can have your water tested at any State-certified water testing lab. A current list of certified labs can be obtained from your local health department or from the DPH Certified Environmental Labs website. Make sure the private lab is certified to test drinking water for the contaminants you are requesting.

In most cases, you can collect a sample of your tap water yourself, although many labs will send a technician to collect a sample if you request. If you collect your own sample, carefully follow the laboratory's instructions to obtain a good sample. How to take a sample varies depending on the tests being done. For example, some contaminants such as lead and copper may require that water remains stagnant in the pipes for a minimum of 6 hours and is collected upon the first draw of water. Other contaminants require that the water be flushed or run for a minimum period of time before collecting the sample. Some contaminants require special sample bottles and procedures. Cleanliness is a must; make sure that nothing but the water comes in contact with the opening of the bottle or the inside of the cap. Timeliness is important, too. Some contaminants deteriorate or change form with time. Most water samples need to be kept cool when being taken to the lab. To assure accurate results, make certain the lab receives your water sample within the specified time directed on the instructions.

Keep Records

Keep a record of all your water tests for reference. Include the date and the test results. A change in the concentration of a contaminant may indicate that a water quality problem is developing. By comparing test results over time, you may find that a change in treatment is necessary or that a treatment device is not functioning properly.

Understanding Your Water Test Results

There are federal and state criteria for many of the substances that you might find in your well water. These criteria represent the concentration above which your water might not be safe to drink or might have a noticeable taste or odor.

DPH sets state drinking water criteria specifically for private wells, called Action Levels. Action levels are developed to protect you from health risks. Federal drinking water criteria to protect your health are set by the Environmental Protection Agency (EPA) and are called Maximum Contaminant Levels (MCLs). You should compare the results of your private well tests to these criteria to determine whether the water is safe. If any chemical detected in your water is higher than an Action Level or an MCL, you should:

- Retest the water to confirm the exceedance,
- Stop drinking the water until the issue is resolved,
- Contact your local health department, DPH, and DEEP for specific advice about using your water.
- Consider treatment to remove the contaminant(s) from your water. Refer to DPH's Publication about Purchasing Water Treatment Equipment for more information about treatment.

Refer to DPH's factsheet Chemical Contaminants in Private Wells factsheet for more information about drinking water criteria.

EPA also sets drinking water criteria to protect you from aesthetic concerns such as taste, color and odor. These criteria are called Secondary Standards. Secondary contaminants themselves do not present a health risk but could be an indication that your water has problems that could pose a health risk. One example is pH. If the pH of your water is too low, you might notice a bitter taste. The bitter taste does not pose a health risk but water with low pH is corrosive and corrosive water can leach metals like lead from pipes and fixtures. High levels of lead in your water does pose a health risk, particularly for young children.

Results of a Basic Indicators Test should be compared with the appropriate limits shown in Table 2 in this fact sheet. However, be aware that some of the parameters in the Basic Indicators Test are based on aesthetics (taste/color/odor) and some are based on health risk. If your water tests results exceed any of the limits on the Basic Indicators Test, contact your local health for advice regarding whether you should stop drinking the water.

Protect Your Well!

You can protect your private well by paying careful attention to what you do in and around your home as well as your neighbor's activities near your well. Regular testing and good practices to prevent contamination can help ensure that your well supplies you and your family with good quality drinking water. Here are some important ways you can protect your drinking water well.

- ⇒ Locate a new well far from potential contamination sources.
- ⇒ Hire a professional to construct a new well and periodically inspect an existing well.
- ⇒ Use backflow prevention devices on outside faucets.
- ⇒ Properly seal abandoned and unused wells.
- ⇒ Never flush gasoline, motor oils, automotive chemicals, painting chemicals or solvents down the sink or toilet into a septic system.
- ⇒ Inspect and maintain your septic system.
- ⇒ Keep livestock and pet waste away from well.
- ⇒ Do not allow road, driveway or roof runoff to collect around well.
- ⇒ Do not mix or use pesticides, herbicides, fertilizers, fuels or other hazardous materials near well.
- ⇒ Do not allow waste oils or gasoline to get into soil. Make sure home heating tanks are above ground or in basement. Never do automotive maintenance or repair on exposed soils in your yard.
- ⇒ Test your well water according to recommendations in this fact sheet.
- ⇒ As needed, consult sources of additional information listed at the end of this fact sheet.

For more information on well protection refer to Publication #26: Private Drinking Water Wells-Types of Construction

For More Information

For more information, please contact:

CT Department of Public Health
- Environmental and Occupational Health Assessment Program: 860-509-7740
- Private Well Program: 860-509-7296

CT Department of Energy and Environmental Protection
- Remediation Division: 860-424-3705

Your Local Health Department

For more information, click on the following links:

Safe Drinking Water Limits:
- Action Levels
- MCLs
- Secondary MCLs

CT Department of Energy and Environmental Protection
- Potable Water Program
- Remediation Division

DPH Private Well Fact Sheets:
- Arsenic in Private Wells
- Lead in Private Wells
- Uranium in Private Wells
- Fluoride in Private Wells
- Bacteria in Private Wells
- Iron and Manganese in Private Wells (1), Iron and Manganese in Private Wells (2)
- Nitrogen Contamination in Private Wells
- pH Acidity of Private Wells
- Questions to Ask When Purchasing Water Treatment Equipment
- Flood and Storm Water Concerns for Private Wells
- Private Wells-Types of Construction
- Hardwater-Softeners Facts and Issues
- Corrosion of Copper Pipe and Fittings

Other Resources:
- DPH Certified Environmental Labs
- Chemical Contaminants in Private Wells Fact Sheet
- DPH Groundwater and Well Contamination Publications
- DPH Private Well Program Publications
- ATSDR Hazardous Substances Fact Sheets (ToxFAQs)
- Hazardous Waste Site Lists
- EPA Office of Groundwater and Drinking Water
- EPA New England