

TESTIMONY OF
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BEFORE THE PA HOUSE COMMITTEE ON HEALTH

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My name is Susan Pickford and I am co-director of the Chloramine Information Center in Camp Hill, PA. Thank you for the opportunity to testify on the issue of a moratorium on the use of chloramine in Pennsylvania.

The Chloramine Information Center recognizes and appreciates the fact that disinfection of our drinking water is necessary and one of the greatest innovations of our time. Further, we respect the challenges facing the water industry in providing clean and safe water in an increasingly chemical infused world. Unfortunately, we have become a society that often responds to one problem with little thought to long term consequences, thereby creating more severe problems than those which we first sought to resolve. Such is the case of chloramine.

In the 1970's EPA research indicated that chlorine, when reacting with organic matter in source water, created new compounds through chemical reaction called 'byproducts'. These byproducts are commonly known as THMs and HAAs and were found to be carcinogenic. EPA formulated Stage 1 regulations limiting the levels of THMs and HAAs for the purpose of protecting the public from adverse health effects of these disinfection byproducts while maintaining protection against water borne disease.

However, the practical application of those regulations threatens to exposing us to highly toxic byproducts, acute adverse health consequences and water borne disease as well as damaging an already deteriorating infrastructure, polluting an already endangered Chesapeake Bay and local watersheds, threatening the life of water ecosystems and weakening our security against a terrorist assault on our water system.

Along with the maximum levels set for THMs and HAAs, EPA's Stage 1 regulations offered a 'toolbox' of options for water companies to employ to reduce these byproducts. Several

involved improved filtration and several involved additional chemicals. While monochloramine (mixture of chlorine and ammonia) is only one of the alternatives approved by EPA, it is the cheapest and therefore the most attractive to the water companies especially the private ones looking for profits in the management of a severely decrepit water system. In the 1970's, having just discovered the toxicity of byproducts of the chlorine we had been using for over 100 years, almost nothing was known about the byproducts produced by chloramine. Chloramine was believed to be more stable, less reactive which translated to longer lasting in the lines and reduction in formation of THMs and HAAs. All of which is true.

INEFFECTIVE BIOCIDES

However, inasmuch as chloramine is slower to react with organic matter, it is also slower to react with bacteria and viruses making it **2,000 times less effective in killing water borne bacteria such as e-coli and 10,000 times less effective in killing rotaviruses and polio1**. The World Health Organization warns that we should never compromise efficient disinfection.

“The shift to monochloramine to control THM formation may thus compromise disinfection and the Guidelines caution against such procedure.where there is a choice between microbiological guidelines or guidelines for disinfectants or disinfectant byproducts, the microbiological quality must always take precedence.” World Health Organization (see “biocides” in appendix)

For this reason, **Germany has banned the use of chloramine** in its country's drinking water facilities. (See German Book translation) France no longer uses it for the same reason. In fact only four European countries use chloramine and they use it rarely or occasionally. See world chart attached. In Pennellis County, Florida, chloramine was replaced with free chlorine when e-coli cultures increased with chloramine. See study attached. The scientific community is unanimous in their opinion that chloramine is an inferior biocide to chlorine. In fact, it is the least effective biocide of all the available disinfectant options.

In 1978, EPA banned the use of chloramine for the single reason that studies indicated it was an ineffective biocide against e-coli. Field test results indicated otherwise and EPA lifted the ban after one year in 1979. In the 30 years since that ban, countless studies and practical applications have proven the original data correct, chloramine is an ineffective biocide. We now have multiple known health risks proven by the scientific community in addition to ineffectiveness, yet EPA will not consider a ban on chloramine pending further study. (see “biocide” in appendix)

In addition, because chloramine is more stable than chlorine, it does not dissipate when exposed to air, it cannot be boiled out of water and requires yet more chemicals to remove. As a result, in the case of water main breaks or plant malfunctions, ammonia and chlorine will flow into creeks, streams, rivers and watersheds full strength and cause major fish kills. We have seen these results in the US and Canada where 90% of aquatic life was killed in 9 miles of stream, where protected steelhead trout were killed after a plant malfunction and in Canada where a thousand species of salmonids and invertebrates were killed as a result of a main break. (See ‘fish’ in appendix) Dead and poisoned fish as well as dead streams, pose health risk to humans as well as upsetting the life cycle of the environment. (see testimony of Molly Robertson for more in depth discussion of fish kills and watershed impact)

HIGHLY TOXIC BYPRODUCTS

Not only is Chloramine less effective in killing waterborne bacteria and viruses, it creates a new family of **byproducts that are determined to be 100 to 10,000 times MORE toxic than the regulated THMs** we are trying to reduce. None of the byproducts of chloramine are currently regulated.

While less reactive to organic material that forms THMs, chloramine is more reactive in the presence of nitrogenous material in the source water and the distribution system forming highly toxic nitrogen based byproducts. (see “byproducts” in appendix) Among these byproducts is **NDMA**, the most toxic of the many N-nitrosamines formed in chloramination. NDMA is already classified by the EPA as a “probable” human carcinogen. It is **genotoxic**

which means it is capable of breaking DNA strands, **cytotoxic** which means it damages cells not unlike radiation and **mutagenic** which means it causes cancer. Levels of NDMA were first discovered in chloraminated drinking water in California and Ontario. Recent studies indicate that the precursors can be found in biofilm in the distribution system as well as in the raw water. While detractors may say that NDMA is in food and also formed with chlorine, it is formed with chlorine only when chlorine becomes chloramine by interacting with ammonia in the environment or raw water in much smaller amounts than in a chloraminated system. It is not the chlorine that forms it, it is the chloramine. In food, items include beef and tobacco. We know that this is not naturally occurring as the beef industry scrubs beef with ammonia to kill bacteria and many chemicals are injected into cigarette tobacco. In fact, there have been articles that the use of ammonia in beef processing has been inadequate to kill e-coli bacteria and outbreaks have occurred. One also has the option of avoiding food that may contain NDMA. The use of ammonia in processing and the difference in quantity and frequency of beef consumed and water consumed makes this argument inapplicable. We can also avoid certain foods or purchase organic food. We cannot avoid our water or patronize a healthier vendor. Water is the only remaining sanctioned utility monopoly.

Another class of highly toxic byproducts formed in chloraminated water are **Iodo Acids**, which are, according to Michael Plewa, the **most toxic byproducts known** to be in drinking water. Contrary to the water company's claims, Iodoacetic Acids are not only formed in salt water environments. Our water system in Mechanicsburg, PA has Iodide in our source water. Iodoacids are also genotoxic. Dr. Plewa and EPA's own Susan Richardson discovered these byproducts in Corpus Christi Texas and were shocked at the level of toxicity. Dr. Plewa said, with the switch to alternative disinfectants we may be opening Pandora's Box.

Other families of highly toxic byproducts include **Hydrazine**, also classified by EPA as a "probable" human carcinogen, and **DXAA**, a more toxic form of the HAAs we currently regulate. (See attached studies.) **None of these byproducts mentioned above have been regulated by the EPA** in drinking water applications. NDMA has been regulated by Canada and California to 9 and 10 ng/l respectively. NDMA and Hydrazine appeared on the last CCL3

list of contaminants to study. IF chosen, there will be a 6 year period of study before considering regulation.

ACUTE HEALTH ISSUES

At the Chloramine Information Center we have received reports from people in 20 states indicating similar symptoms resulting from use of their chloraminated water. Their stories are varied as to how they made the connection to their water. None of those connections were easy to make with a lack of studies on acute health consequences and water companies, EPA and state agencies insisting that the water could not be the culprit. People in 20 states who have never heard of each other or communicated with us, reported respiratory ailments, digestive problems and persistent skin rashes. (see “reports of suffering” in the appendix) Several of these individuals went to doctors and specialists to diagnose their ailments. Without studies, the doctors have nothing to base their diagnosis on. Several people plugged their symptoms into the internet and came up with chloramine websites. When they contacted us we asked them to remove themselves from their water source or a period of time to see if their symptoms cleared up. They did in fact clear up and when they returned to their water, the symptoms returned. The most compelling story is that of Brie from Vermont, who will testify today. She did not believe that it would possibly be her water and resisted that theory for a year before removing herself from her water and finding that, indeed, her water was making her sick.

Nitrates are capable of reducing oxygen in blood cells. EPA,, DEP and water companies warn that chloraminated water should not be used in making baby formula as this can result in Blue Baby Syndrome. If mothers don't receive their water quality reports, or don't read them in fine detail, how are the

Nitrates are capable of reducing oxygen in blood cells. EPA,, DEP and water companies warn that chloraminated water should not be used in making baby formula as this can result in Blue Baby Syndrome. If mothers don't receive their water quality reports, or don't read them in fine detail, how are they to know not to feed their infants chloraminated water? We also don't know the effect of chloraminated water on the developing fetus.

While there are no studies on the acute health effect of chloramine per se, there are a number of studies on the respiratory effects of chloramine in chlorinated swimming pools. The chlorine combining with ammonia from human bodies and skin products combine to create tri-chloramine in the pool. The vapor coming off the surface of the water is inhaled and causes "swimmers' asthma". When swimmers remove themselves from swimming for a period of time the 'asthma' goes away. Lifeguards in indoor swimming pools have been diagnosed with swimmers asthma as well. We know there is a connection between tri-chloramine and respiratory disease. We also have the remarks of Dr. Richard Bull who attempted to study the dermal effects of chloramine with experiments on mice. However, 100% of his test mice died from inhaling the chloramine before he could test for dermal effects. He remarked that this did not occur with either chlorine or chlorine dioxide. The dermal and digestive issues are suggested in the literature by the accounts of symptoms from exposure to several components of chloramine and its byproducts. Without studies it is impossible to know which element is causing these symptoms. However, the anecdotal evidence is strong and convincing that these symptoms are coming from chloraminated water. (See "acute health symptoms" in appendix)

Why aren't we hearing from thousands of people in chloraminated areas if this is the cause? Several reasons. First and foremost is that water companies, the EPA and state agencies adamantly deny that the water could cause such symptoms. If people contact them asking questions, they are told to look somewhere else for the cause as occurred in Pittsburgh and Philadelphia. Also, different water companies use different levels of chloramine. York, a location often cited as evidence of no health effects of chloramine, uses only .02 to 1.9 ppm of monochloramine. Whereas, Clarion, on Pa American Water uses 3.3 ppm, almost the maximum allowed by EPA. Other factors such as temperature, pH and source water quality affect the strength and make up of the chloraminated water coming out of our faucets and showers. In some areas chloramine is used seasonally in the Fall quarter. People with symptoms during a particular season most likely pass them off as allergies or a quirk when they go away and don't return until that season rolls around again. And quite simply, some people just don't make the connection to water as a source of the problem because we all assume it is made safe for us by EPA and DEP.

DEP and EPA say that this is a small subset of highly sensitive people being affected. While this may be true, please consider something else... The chemicals may be having the same effect on the rest of us, we are just asymptomatic at this level of exposure. The damage is still being done to us, we are just unaware of it yet because our immune systems are stronger at this point in time. Whatever these chemicals are doing to the organs and chemistry of the 'oversensitive population' they are also likely doing to the rest of us.

FILTRATION

We have researched the filter companies to determine whether chloramine and its byproducts can be removed from our tap water. We have discovered that commercial filter companies know little about chloramine and its byproducts. The more unscrupulous ones promise to remove all chloramine and byproducts in order to sell people filters. The more honest ones admit that they just don't know. We spoke with NSF last year and were told that a standard 42 filter system would reduce monochloramine but not remove it. We asked about the byproducts. They did not know what the byproducts of chloramine were. We told them about NDMA, Iodo Acids, Hydrazine and DXAA. After researching these byproducts, NSF indicated that their standards and certifications could not state that they could remove or reduce any of these byproducts. (See "filters" in appendix) In fact, they stated that NDMA was 'the nastiest thing we've ever seen and we know of nothing that would be capable of removing it.'

Assuming arguing that a filter could remove the byproducts of chloramine, the cost is prohibitive for most consumers at thousands of dollars for a whole house filter and hundreds for point of use filters. In addition, the filters would only protect you within the four walls of your home. When we go to work, school, vacation, friends, family, restaurants, hotels etc, there would be no protection. When people move in this very transient society, are they to make that expenditure over and over again? (see prices in "filters" in appendix)

If filtration is the answer, it should not be the burden of the consumer, it should be the burden of the water company to filter the source water to avoid the formation of byproducts and

eliminate the need for chloramine. Advanced filter systems are in the process of being improved and certified and others are available now to water companies. Right now most water companies in Pennsylvania filter only 35 to 40% of the organic material out of the raw water before chlorination. If they filtered 70% of the organic material out, they could reduce the THMs of chlorine by another 30%, making our water safer.

INEFFECTIVE BIOCIDES

The scientific community is unanimous that chloramine is a less effective biocide than chlorine. In fact, it is the least effective biocide of the available treatment alternatives. The World Health Organization reports that it is 2,000 times less effective than chlorine in killing e-coli and 10,000 times less effective in killing rotoviruses and polio 1. (See "biocides" in appendix) Germany has banned the use of chloramine in their country because it is an ineffective biocide. Penillan County in Florida switched back to chlorine after e-coli cultures increased in their system following the implementation of chloramine. By using chloramine we are exposing the population to byproducts many times more toxic than THMs and reducing our protection from water borne diseases. There is no legitimate health reason to convert to chloramine.

OTHER UNINTENDED CONSEQUENCES OF CHLORAMINE

Infrastructure:

In addition to the direct health effect discussed above, chloramine causes leaching of lead, pits pipes and quite literally 'eats' rubber and elastomer (see "infrastructure" in appendix) The life span of a rubber fitting in chlorine is 5-6 years, in chloramine it is 5 months. Before water systems were aware of the proper application of chloramine, thousands of people in the D.C. area were exposed to high levels of lead in their water. Children will suffer a life of brain injury as a result of that lack of knowledge about chloramine. What else don't we know yet about this very toxic chemical compound? How many more unintended consequences will forever effect large populations of consumers? If we can't answer that question we shouldn't be using chloramine at this time.

Fish Kills

Chloramine has and will cause massive fish kills in local streams and creeks. While chlorine will dissipate as water runs down the street in a water main break, chloramine will not. It will run full strength into the stream and kill aquatic life. In Virginia, a main break in a chloraminated area killed 90% of aquatic life in 9 miles of stream. In California it killed protected steelhead trout and in Canada it killed a thousand species of white fish and invertebrates. (see 'fish kills' in appendix) We are the steward of the Susquehanna and the Yellow Breeches as well as hundreds of square miles of watershed going into the Chesapeake Bay. What goes into our waters has far reaching effects. Chloramine is not necessary to the public health in our state but it has the real potential of cause numerous negative public health and environmental consequences.

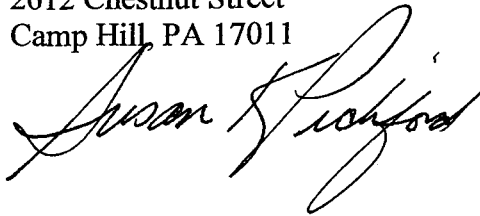
CONCLUSION

I have just touched the surface of what we know and, more importantly, what we DON'T know about chloramine and its unintended consequences. What we do know is that it is not necessary to convert to chloramine at this time in Pennsylvania. We do know that the emerging science on chloramine warns of highly toxic byproducts and ineffective inactivation of bacteria and viruses in water. We know that our imperfect knowledge of chloramine caused thousands of people to suffer damaging lead levels in their brains. We do know that our aquatic life has suffered at least three massive impacts. Our water meets current regulatory guidelines. We can prove some and suspect that all are also in compliance now with the 2012 regulations. We also know that compliance date of 2013 is 3 and 1/2 years away. A moratorium is prudent, logical, wise and necessary. EPA and DEP estimate that 20% of the country uses chloramine. That means that 80% uses something else. When has 20% of anything represented a model to be followed in science or any other forum? The Precautionary Principle as testified to by Nancy Cox, should be given great deference in situations such as these. Not unlike the Hypocratic Oath it requires that we first 'do no harm'. There is no harm to the water companies to issue a moratorium until 2012 or 2013 to allow more sober consideration of the consequences of our

intended actions. Chloramine presents the possibility of great harm to a large population and has given us a preview of that harm in the D.C. case, the fish kills and the hundreds of people reporting health symptoms. This is the havoc it has wreaked with only 20% use in the country.

Thank you for the opportunity to address you today on this important health issue.

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A handwritten signature in cursive script that reads "Susan K. Pickford". The signature is written in black ink and is positioned below the printed contact information.