October 23, 2015

Mayor Joe Kilsheimer
City of Apopka
120 East Main Street
Apopka, Florida 32703

RE: Cancer Cluster Concern in Apopka, Florida

Dear Mayor Kilsheimer,

This summary is in response to an inquiry from a citizen in the Apopka, Florida area. There is a concern of a cancer cluster associated with chlorine or its byproducts from treatment at the local water utility company. The following information provides a background about cancer, breast cancer (as this was one of the main concerns), cancer clusters, and chlorinated water and potential health effects.

Cancer

Cancer is a term used for diseases in which abnormal cells divide without control. These cells are then able to invade other tissues. Some may spread to other parts of the body. Cancer is not a single disease. There are over 100 types of cancer. They attack the body in a similar way, but all cancers are not the same, nor are their causes. For example, the main risk factor for lung cancer is cigarette smoking, but for skin cancer it is sun exposure.

Although cancer is a serious and frightening diagnosis, it is a common disease. Current information shows that approximately one out of three Americans will develop cancer in their lifetime, and cancer will affect three out of four families. The risk of developing cancer increases with age, so as the population ages, more cases of cancer are expected in our communities.

Many people believe that something in the environment causes most cancers, but behavior and lifestyle account for most of the known cancer risks. Factors such as smoking, poor diet, obesity, heavy alcohol use, sexual and reproductive history, and genetic factors can all contribute to developing cancer. It is estimated that less than 10% of cancers are caused by environmental exposures. In contrast, cigarette smoking alone causes about 30% of cancers. In addition, family history is important and contributes to some types of cancer.

Most cancers take a long time to develop. It is usually decades from the time someone is exposed to something that might cause cancer to the time that cancer is discovered. This is one of the reasons that cancer is more common in older adults. In addition, the few chemicals that are linked to cancer must have fairly long and/or concentrated exposures before they typically cause cancer.

Breast Cancer

A risk factor can be modifiable (e.g., being obese or tobacco use) or non-modifiable (e.g., age, race, genetic predisposition) and can increase one's risk of developing cancer. Having a risk factor, or even several, does not mean that you will develop cancer. For instance, most women who have one or more breast cancer risk factors never develop the disease, while many women with breast cancer have no apparent risk factors. Overall, the risk for breast cancer can change over time due to factors such as aging and lifestyle.

Risk factors for breast cancer include the following:

- *Gender*: Breast cancer occurs more commonly in women, approximately 100 times more.
- *Age*: Your risk of developing breast cancer increases with age. About 1 out of 8 invasive breast cancers are found in women younger than 45, while about 2 out of 3 invasive breast cancers are found in women age 55 or older.
- *Genetic mutations*: Approximately 5% to 10% of breast cancers are the result of inherited genetic mutations (defects). The most common inherited genetic mutation is the *BRCA1* and *BRCA2*. Breast cancers due to these two genetic mutations occur more often in younger women and more often affect both breasts. In the United States, *BRCA* mutations are more common in Jewish people of Ashkenazi (Eastern Europe) origin than in any other racial and ethnic groups. Non-inherited gene mutations include HER2 (human epidermal growth factor receptor 2). Overexpression of this oncogene has been shown to play an important role in the development and progression of certain aggressive types of breast cancer. In recent years, HER2 has become an important marker and target of therapy for approximately 30% of breast cancer patients.
- *Family history of breast cancer:* The risk for breast cancer is higher among women whose close blood relatives have the disease. Having one first-degree relative (i.e., mother, sister, or daughter) with breast cancer doubles a woman's risk, whereas having two first-degree relatives increases a woman's risk about threefold.
- *Race and ethnicity*: Overall, White women are slightly more likely to develop breast cancer than are Black women. However, in women under the age of 45, breast cancer is more common in Black women. Asian, Hispanic, and Native-American women have a lower risk of developing breast cancer.
- *Dense breast tissue*: A normal female breast primarily consists of glandular and fibrous tissue verses fatty tissue. Women with dense breast tissue are 1.2 to 2 times more likely to develop breast cancer.
- *Menstruation*: Women who have had more menstrual cycles because they start menstruating early (before age 12) and/or went through menopause late (after age 55) have a slightly higher risk of breast cancer.
- *X-ray radiation exposure*: The risk of developing breast cancer from chest radiation is highest if the radiation was given during adolescence, when breasts are still developing. Radiation treatment after age 40 does not seem to increase breast cancer risk.
- *Birth control*: Studies have found that women using birth control have a slightly greater risk of developing breast cancer than women who never used them. Women who stopped using oral contraceptives more than 10 years ago do not appear to have any increased breast cancer risk.
- *Hormone therapy after menopause*: Studies have shown that using combined hormone therapy after menopause (prescribed both estrogen and progesterone) increases the risk of developing breast cancer.
- *Alcohol use*: The use of alcohol is clearly linked with an increased risk of developing breast cancer.
- *Being overweight or obese*: Being overweight or obese after menopause increases breast cancer risk.
- *Physical activity*: Evidence is growing that physical activity reduces breast cancer risk.

- *Chemicals in the environment*: Research does not show a clear link between breast cancer risk and exposure to substances that have estrogen-like properties found in some plastics, certain cosmetic and personal care products, pesticides (such as dichlorodiphenyldichloroethylene or DDE), and polychlorinated biphenyls (PCB).
- *Mold*: There is no evidence that exposure to mold increases the risk of developing breast cancer.
- *Asbestos*: Exposure to asbestos has been linked primarily to the increased risk of developing lung cancer, but few studies have assessed the risk of developing breast cancer.
- *Tobacco smoke*: Some studies have found long-term heavy smoking is linked to a higher risk of breast cancer.

Cancer Clusters

A cancer cluster is defined as a greater than expected number of cancer cases that occurs within a group of people in a defined geographic area over a specified period of time. If a suspected cluster includes cancers of different types or a common cancer, it is probably not a "true" cancer cluster. For example, if someone reported that there were many people with cancer in their community, but the kinds of cancer included lung, breast, leukemia, and prostate which are cancers known to have different risk factors, this would not be considered a cancer cluster. A confirmed cancer cluster is a relatively rare occurrence and few documented clusters have been linked to an environmental agent.

Chlorinated Water and Its Effects on Health

There is no substantial evidence that chlorine in drinking water or swimming pools can cause cancer. However, chlorine and chlorine gas can aggravate respiratory conditions and high concentrations of chlorine can lead to many health complications. There is limited evidence that disinfection byproducts (DBPs) in drinking water may be associated with a very small increased risk of cancer.

A wide variety of chemicals are added to drinking water to remove various contaminants to ensure safe drinking water. Among them are alum, iron salts, chlorine, and other oxidizing agents, all of which may leave residues of potentially hazardous by-products in the finished water. In fact, the most common source of synthetic organic chemicals in treated drinking water is the interaction of chlorine or other disinfectants with the naturally occurring particles found in the water. Byproducts of treatment with chlorine include trihalomethanes (THMs) and haloacetic acids (HAAs). THMs and HAAs are regulated in drinking water. The Environmental Protection Agency (EPA) has a limit set at 0.080 milligrams per liter (mg/L) or 80 parts per billion (ppb) for THMs and 0.060 mg/L or 60 ppb for haloacetic acids in which public water systems must meet these standards.

Water standards are calculated to consider daily exposure of a resident over a lifetime (70 years). Water utility companies are required to test for disinfectant byproducts on a quarterly basis. The water standards for total THMs and total HAAs are based upon carcinogenic concerns in rodents where liver cancer and kidney cancer has been found after high dose exposure. No link has been made to breast cancer or pancreatic cancer with exposure to these byproducts.

As long as the running average does not violate the water standard, the harmful effects of the byproducts in water are considered to be small. The risk of illness from disinfection byproducts is much lower than the risk of illness from drinking water that has not been disinfected. Water standards are set as close as possible to the concentration of a contaminant that experts believe a person can drink safely over a lifetime (assuming an average of 2L of water/day). For carcinogens, the levels are set at such low concentrations that the risk of cancer from this exposure becomes so small that it is considered negligible when compared to the background cancer rate of all Americans.

For concerns regarding a public water system (serving 25 or more people) and its regulation, please contact the Jeff Lawson or Fred Aschauer at (850) 245 8336 with the Florida Department of Environmental Protection.

Considerations for the Current Inquiry

From the information that has been provided, there does not seem to be an indication of a cancer cluster.

- The information provided about the cancer diagnoses in the area include a number of different types over several years. In addition, the main cancer of concern, breast cancer, is a common cancer.
- There is no evidence that chlorine in drinking water or swimming pools causes cancer and there is limited evidence that chlorine byproducts in drinking water is associated with cancer.
- According to the Florida Department of Environmental Protection, there is no indication that the levels of chlorine residuals or disinfection byproducts from the local water source were above the limits.

Sincerely,

Philip Cavicchia, PhD
Interim Director, Public Health Research Unit