Questions and Answers Regarding North Carolina Department of Health and Human Services Updated Risk Assessment for GenX (Perfluoro-2-propoxypropanoic acid)

This document contains a summary of preliminary information and is shared with local health departments as a means of providing awareness of currently available information, and as a tool to maintain consistency in communicating.

1. Why is NC DHHS updating its GenX risk assessment?

The goal of the North Carolina Department of Health and Human Services (NC DHHS) is to provide timely health information to residents and others who are concerned about potential health effects of GenX. When there is not a federal standard and sufficient scientific information available, the NC DHHS can develop and issue a health assessment. This assessment can include establishing a health goal, sometimes referred to as a health screening goal. A health goal is a non-regulatory, non-enforceable level of contamination below which no adverse health effects would be expected over a lifetime of exposure.

The NC DHHS shared a preliminary assessment for GenX with local partners on June 8,2017 in an attempt to provide some context for understanding the health risks that could be associated with levels found in the Cape Fear River during 2013-2014.

Since sharing the preliminary health assessment, NC DHHS has continued to review all available health information about GenX. Based on this review, continuing discussions, and consensus with EPA, NC DHHS has determined that sufficient data are available to make changes to the preliminary assessment.

The updated health goal is 140 ng/L for the most vulnerable population- i.e. bottle-fed infants, the population that drinks the largest volume of water per body weight.

This updated level is lower than the level in the preliminary assessment for several reasons, including the following:

- After consultation with EPA, a different set of animal studies was identified as an appropriate starting point for the assessment. This change lowered the health goal by 10-fold.

- Since the new starting point was based on intermediate (sub-chronic) rather than long-term (chronic) animal studies, an additional uncertainty factor was added, which lowered the level by another 10-fold.

- While the preliminary assessment assumed that drinking water was the only source of exposure, the updated value includes an assumption that only 20% of a person's GenX exposure comes from drinking water, lowering the level another 5-fold. EPA's practice is to use this 20% default factor as a generic assumption when information is lacking about other sources of exposure in

the environment, as is currently the case with GenX. NC DHHS's use of the 20% factor was included based on additional review and consultation with EPA.

Details of the specific updates and calculations for the updated health screening goal are presented in Appendix 3.

As with the preliminary assessment, it is important to note that this updated risk assessment is not final and is likely to be updated as new information becomes available or when standards are made available by the EPA.

2. What does the updated assessment for GenX mean?

For the most vulnerable population (bottle-fed infants) the updated health risk assessment means that there could be an increased risk of adverse health effects over a lifetime of consuming water with levels greater than 140 ng/L.

Because this goal/level is calculated based on the most vulnerable population, it is the most conservative and is protective of other groups, including pregnant women, nursing mothers, children, as well as other adults.

This updated health assessment is based on evolving toxicological data; therefore it is still considered provisional and is subject to further updates based on an ongoing review, consultation with federal agencies and other partners, and the introduction of new research and scientific information.

Although the preliminary assessment was based upon a study with combined cancer and non-cancer endpoints, the updated health goal considers non-cancer endpoints only. There are no studies in humans on cancer related to GenX. Only one animal study is available for cancer analysis, and it has shown increases in certain cancers. Based on conversations with EPA, there is not enough information at this time to identify a specific level of GenX that might be associated with an increased risk for cancer.

3. Does NC DHHS recommend that people stop using the municipal water for drinking or other purposes if levels are above 140 ng/L ?

NC DHHS will not be making a blanket recommendations about water use, but will work with local partners about health risks and messaging regarding sampling results. Individuals are encouraged to consider information in the health risk assessment when making decisions about water use.

The potential health effects from these chemicals should be balanced against the health benefits of municipal water, including routine monitoring for a variety of microbial and known chemical contaminants that could be present in private wells or other unregulated sources. There are many sources of contamination of groundwater, including naturally-occurring chemicals and minerals (for

example, arsenic, radon, and uranium), local land use practices (fertilizers, pesticides, livestock, animal feeding operations, biosolids applications), manufacturing processes, and sewer overflows. Studies to determine if any filtration systems could remove GenX and other perfluorinated chemicals are underway and DHHS will share new information as it becomes available.

4. Does this mean my water is unsafe if levels are over 140ng/L?

This health assessment is not a boundary line between a "safe" and "dangerous" level of a chemical. Rather, it is a level that represents the concentration of GenX at which no adverse non-cancer health effects would be anticipated over an entire lifetime to the most sensitive population.

5. Why is North Carolina providing an updated health assessment?

Although health information is limited for many of the newer or "emerging" perfluorinated compounds, NC DHHS has determined that there is sufficient scientific information to provide a preliminary health assessment for GenX.

The U.S. Environmental Protection Agency (EPA) is working to provide more health risk information for this chemical. However, the timeliness of that process is not sufficient to address the urgent public concerns raised by identification of GenX in the public drinking water supply.

6. What information did NC DHHS use in their preliminary assessment?

In the absence of health guidance values published by U.S. federal agencies, NC DHHS used GenX toxicity information available from the European Chemicals Agency (ECHA) to calculate a provisional health protective level of 71,000 nanograms per liter (ng/L, also referred to as parts per trillion). See Appendix 1 for the calculation of the preliminary assessment using the information from ECHA.

7. What are the potential health effects from exposure to GenX?

There are no studies regarding human health effects of GenX. However, animal studies demonstrate liver and red blood cell non-cancer effects and pancreas, liver, and testicular cancer effects. Whether or not animal effects will be the same in humans is not known. There is no health information about other perfluorinated chemicals.

8. Is it safe to eat fish from the Cape Fear River?

There are no fish advisories related to GenX. Preliminary information from EPA suggests that GenX is not anticipated to bioaccumulate in fish. A list of statewide and location-specific fish advisories related to other contaminants is available at http://epi.publichealth.nc.gov/oee/fish/advisories.html.

9. Is health information available for other emerging perfluorinated compounds found in the Cape Fear River?

In discussions with EPA and other partners, there is not sufficient identified data that can be used to develop a preliminary health risk assessment for the other newer or "emerging" perfluorinated compounds mentioned in the 2016 paper by Sun et al (PFO2HxA, PFMOAA, PFMOBA, PFO3OA, PFMOPrA and PFO4PA). This applies for exposure to these compounds individually and in combination. Scientific information such as animal toxicology studies and laboratory testing standards are needed by these agencies to conduct further health assessment on the other perfluorinated compounds. NC DHHS will continue to work with the EPA and CDC to identify and share any health risk information about these compounds as it becomes available.

10. Is health information available for 1,4-dioxane?

Health information about 1,4-dioxane is available at http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/1-4-dioxane.

11. Is NC DHHS working with NC DEQ, other agencies, or researchers?

Yes. NC DHHS, along with NC DEQ, has been in close contact with officials at EPA and the CDC to gather and review all health information related to GenX. EPA is working to develop a health risk assessment for GenX; however, the timeframe for that assessment is not known. NC DHHS staff are also in contact with academic researchers with knowledge and experience with these compounds.

Appendix 1: Calculation of the Preliminary Assessment

The European Chemical Agency (ECHA) information included a Derived No Effect Level (DNEL) of 0.01 mg/kg body weight (bw)/day for oral exposures. The DNEL reported by ECHA was calculated using a no-observed-adverse-effect-level (NOAEL) from a 2-year rat chronic toxicity/carcinogenicity study as the point of departure (POD) and applying default uncertainty factors, as described below:

- No-observed-adverse-effect-level (NOAEL) = 1.0 mg/kg body weight (bw)/day
- Total default uncertainty factors (UF) = 100 (interspecies variability = 10; intraspecies variability = 10)
- Formula: NOAEL/UF = DNEL

(1.0 mg/kg bw/day)/100 = 0.01mg/kg/day

NC DHHS calculated a drinking water equivalent level (DWEL) for GenX as follows:

- Dose (DNEL) = 0.01 mg/kg bw/day
- Body Weight = 7.8 kg (infant)
- Intake = 1.1 L/day (infant)
- Relative Source Contribution (RSC) = 1.0
- Unit Conversion = 10^6 ng/mg
- Formula: dose (mg/kg bw/day) X body weight (kg)/intake (L/day) X RSC X Unit Conversion = DWEL

(0.01 mg/kg/day) X 7.8kg/(1.1L/day) X 1.0 X 10^6 ng/mg = 71,000 ng/L

NOTE: nanograms per liter (ng/L) can also be expressed as parts per trillion or ppt

The values used for body weight and drinking water intake were based on infants (in order to be maximally protective) since they consume the highest amount of water in relation to their body weight. The preliminary calculation assumed that 100% of GenX exposure (relative source contribution) was from water consumption. The DWEL was used as our preliminary assessment.

Appendix 2: Calculation of the updated Health Assessment

After consultation with EPA, the following were updated:

- Sufficient data are available to support the use a lower no-observed-adverse-effect-level (NOAEL) as a point of departure for the assessment. This NOAEL (0.1 mg/kg/day) is 10-fold lower than the NOAEL used in the preliminary assessment and is based on effects on the liver in mice.
- Since this point of departure is based on a subchronic toxicity study rather than a chronic toxicity study, an additional uncertainty factor of 10 is included in the calculations.
- A relative source contribution (RSC) of 20% is used to account for potential exposure to GenX from other routes like air, soil, dust, and food. The RSC lowers the acceptable concentration in water due to the potential for other exposure routes.

Updated calculation:

- No-observed-adverse-effect-level (NOAEL) = 0.1 mg/kg body weight (bw)/day
- Total default uncertainty factors (UF) = 1000 (interspecies variability = 10; intraspecies variability = 10; and subchronic to chronic extrapolation = 10)
- Formula: NOAEL/UF = Reference Dose (RfD)

(0.1 mg/kg bw/day)/1000 = 0.0001mg/kg/day

NC DHHS calculated a drinking water equivalent level (DWEL) for GenX as follows:

- Dose (RfD) = 0.0001 mg/kg bw/day
- Body Weight = 7.8 kg (bottle-fed infant)
- Intake = 1.1 L/day (bottle-fed infant)
- Relative Source Contribution = 0.2
- Unit Conversion = 10^6 ng/mg
- Formula: dose (mg/kg bw/day) X body weight (kg)/intake (L/day) X RSC X Unit Conversion = DWEL

(0.0001 mg/kg/day) X 7.8kg/(1.1L/day) X 0.2 X 10^6 ng/mg = 140 ng/L

NOTE: nanograms per liter (ng/L) can also be expressed as parts per trillion or ppt

The values used for body weight and drinking water intake were based on bottle-fed infants (in order to be maximally protective) since infants consume the highest amount of water in relation to their body weight. The DWEL was used to set a provisional health goal for the most sensitive population (bottle-fed infants).

Appendix 3: References

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