

Fish like a **GIRL**

A look forward and a look back

I am not a big one for resolutions, but I do like to have goals for the next year, so maybe that is kind of like making resolutions. And, the older I get, the more I like to just sit for a minute and take stock of all the last year has brought to my doorstep.



By Beckie Gaskill
 OF THE LAKE LAND TIMES

2022 in review

For instance, this year, we got a whole new doorstep! Chet and I bought a house and the security of owning a home is like no other. Some may have heard of the mess my late husband left me in without ever having put my name on the home in which we lived — suffice it to say a community property state is not all it is cracked up to be, but I digress. Having my own home now, and sharing that home with Chet, is one of the best things that has happened over the last year.

Of course, as many know, Chet had a major heart attack back in September, which could have ended much, much worse. It was a couple of weeks before we had any idea if he would make it or not. I took many trips to Milwaukee, as Marshfield transferred him to Froedtert Hospital as soon as they got him stable enough to get in the chopper. To say the least, that ordeal changed our lives in many ways. It reminded us how fragile life is. It strengthened the bond we had together. It will still and always mean some changes moving forward. But we are tackling those changes and adjusting to everything that was thrown our way so quickly.

I have also had the opportunity, through my writing, to meet incredible groups of talented and passionate people. That is one thing that will never get old about being an outdoor writer. People are passionate about the outdoors. There are so many stakeholders of the fields, forests and waters of this state and all are passionate about protecting those resources as well as their rights to enjoy them how they see fit.

Attending conferences such as Wisconsin Water Week, the Wetland Science Conference, the Great Lakes PFAS Summit and the Upper Midwest Invasive Species Conference have

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TURKEY SURPRISE

DeDe Hall is surprised while working on a crossword puzzle by a visit to her bird feeder by a wild turkey on Thursday, Dec. 15, in Lac du Flambeau.

More research needed on human health effects related to exposure to PFAS mixtures

By Beckie Gaskill
 OF THE LAKE LAND TIMES

Earlier this month, at the Virtual Great Lakes PFAS Summit, Megan Kemp spoke about PFAS health effects on humans. Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease and water, according to the Centers for Disease Control (CDC). They can be found in a variety of products including clothing, furniture adhesive, non-stick cooking surfaces and insulations of electrical wiring. They represent thousands of diverse compounds. These compounds can be linear or branched and long chain or short chain. They do not occur

naturally and are all manmade. Many PFAS, including including perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are of special concern because they do not break down in the environment. They can be moved through soils and can contaminate drinking water. These substances are also known to bioaccumulate in fish and other animals. There are a variety of ways humans can be exposed to PFAS compounds, Kemp said. Workers in industries where the chemicals are used may be exposed to higher levels than others, but their exposure is primarily through inhalation, she added. In the general populations, the exposure route is ingestion. PFAS can come from contami-

nated food or water and, though by a lesser degrees, from hand to mouth transfer from surfaces treated with PFAS. "Substantial information gaps still exist for understanding human health effects," Kemp said, "particularly surrounding co-exposure to multiple PFAS and possible interactions between PFAS." Normally, humans are exposed to mixtures of PFAS, which are not homogeneous in nature. Studies that have looked at PFAS individually have not portrayed the effects of exposure to multiple chemicals, she said. Cumulative and interactive effects on human health were also not addressed by those studies.

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Science on Tap hosts Jennifer Price Tack for a presentation on bear research

By Beckie Gaskill
 OF THE LAKE LAND TIMES

Jennifer Price Tack works in the Department of Applied Science as the large carnivore and elk research scientist. Her job, she said, is on the science side of the Department of Natural Resources (DNR), rather than the policy side, which, she said, is a perfect fit with her personality.

She has slowly been pulled into the field of decision science. She works with others to provide annual population analysis and monitoring for wolves, bear and elk. The other part of her job is that, when research needs are identified by

stakeholder groups and DNR biologists, she provides the information those people need to make their decisions. She spoke about "science-based decision making." She said science cannot necessarily tell what should be done. It can provide information, but science cannot tell decision makers where they want to go with that information. People's values, she said, are what drives the decision making process. She can provide the science, she said, that helps people to evaluate how various policy options are going to affect the things they care

about. Science can help show how a certain policy in the area of bear management could affect agricultural damage, for instance. She said one thing she does with her information from her research is to help people think about what they want to achieve and how they can achieve that through their policies, even across competing objectives. Price Tack said she has a few projects going on right now. One of them has to do with litter size, cub survival and litter frequency and food for bears. The goal is to esti-

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Innovative Northwoods trail app gets new addition

Map It Vilas County app updated with new maps and search filters

Great news for hikers, bikers, skiers, snowmobilers, and trail users of all kinds: the Map It Vilas County app is now updated and easier to use than ever.

The Map It Vilas County trails app, originally released in 2014, has been revised to include updated trail maps, new functionality allowing users to pick their favorite trails and check off trails they've completed, plus additional search filters for water views and winter biking.

"Since its launch, we've been continuing to update different parts of the app, in hopes of making it more valuable to the greatest number of people," said Kim Lechner of Vilas County tourism and publicity. "We know trail users want to feel com-

fortable exploring, and for many people that means staying connected. The goal is to make it as easy as possible for visitors to plan their trail expeditions and feel confident in their exploration."

The app is available for free for Apple and Android devices and covers more than 60 multi-use trails. It can be used by snowmobilers, four-wheel riders, hikers, bikers, hunters, paddlers, birdwatchers, horseback riders, snowshoers and cross-country skiers. Users can find the perfect trail based on filters like activity, community, length, accessibility, pet-friendliness, water views and more. It even offers push notifications for trail openings and lets winter trail users know when snow is coming.

The concept for the app originated from a growing realization that many visitors wanted to use the trails but felt overwhelmed and unsure how to access the county's



CONTRIBUTED PHOTOGRAPH

large network of trail options. The app, which offers downloadable maps that can be used to navigate by GPS even without a cell signal, gives visitors peace of mind, and recently added trail photos let users know what to expect before they arrive and that they're on the right path as they explore in real time.

After eight years, the technology continues to resonate with travelers, evidenced by the more than 44,500 downloads since the app's inception.

To learn more about Vilas County, visit www.vilas.org. Visitors also can find Vilas County on Facebook, Twitter, Pinterest, Instagram and YouTube.

Research

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Animal studies

Animal studies, Kemp said, allow for the study of controlled exposure and health outcomes. The route of exposure and dose can all be controlled in these experiments. However, despite years of research that have been going on, she said, even for single PFAS chemicals, there is still uncertainty about human health effects.

Recent studies with mice, however, have started to look at effects of these compounds in combination. In vitro studies have "demonstrated complicated interactions with potential additivity" when looking at the interaction of compounds that more closely mimic exposures like those that would be seen in the general human population. These studies also choice of model, chemical mixture and dose can effect how different PFAS might act with each other.

The Agency for Toxic Substances and Disease Registry (ATSDR) looked at 14 PFAS compounds individually and published a draft toxicological profile in 2018, Kemp said. The final version of the document, released in May of 2021, said the 2018 draft's proposition that thyroid disease and decreased fertility, noted the results for these outcomes were not consistent across studies.

PFAS mixture studies

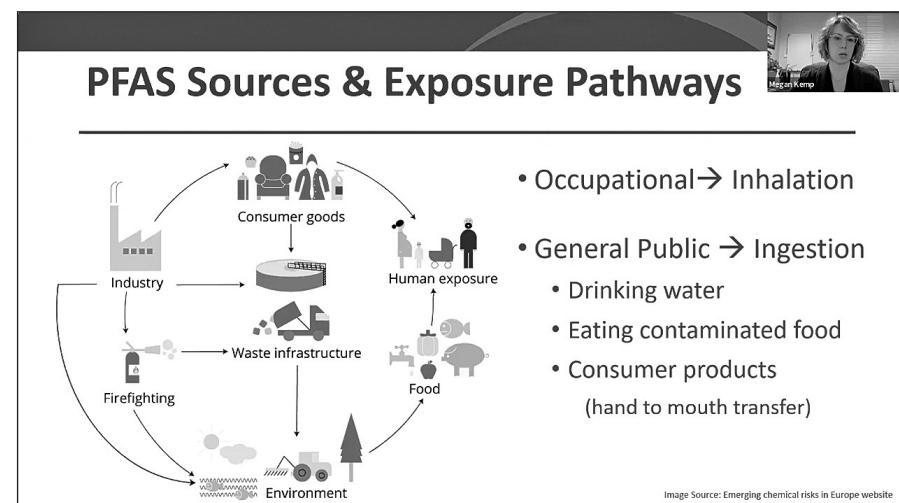
In 2021 the Centers for Disease Control's (CDC's) National Center for Environmental Health (NCEH) and the ATSDR published their recommendations for PFAS research that "highlighted the need for studies that examine the association between outcomes and exposure to PFAS mixtures." To fill the data gaps, epidemiological studies would be conducted and ATSDR and NCEH would develop guidance on risk assessment for exposure to PFAS mixtures. To date, however, no guidance has been released, she said.

"ATSDR specifically noted the need for studies examining the association between health outcomes and exposure to PFAS mixtures as well as the interactions of PFAS with other chemicals," Kemp said.

Recent study search

Recent studies, she said, have examined the effects of co-exposure to multiple PFAS compounds or PFAS and other pollutants. A wide range of health outcomes were examined in these studies. She spoke about various types of studies and the limitations of each type of study.

Approximately 90% of the 120 identified studies have been published since 2019, she said. In gen-



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Megan Kemp presented information on recent studies looking at PFAS exposure and its effects on human health at the Great Lakes PFAS Summit this month. She explained PFAS sources and exposure pathways using this diagram in her presentation.

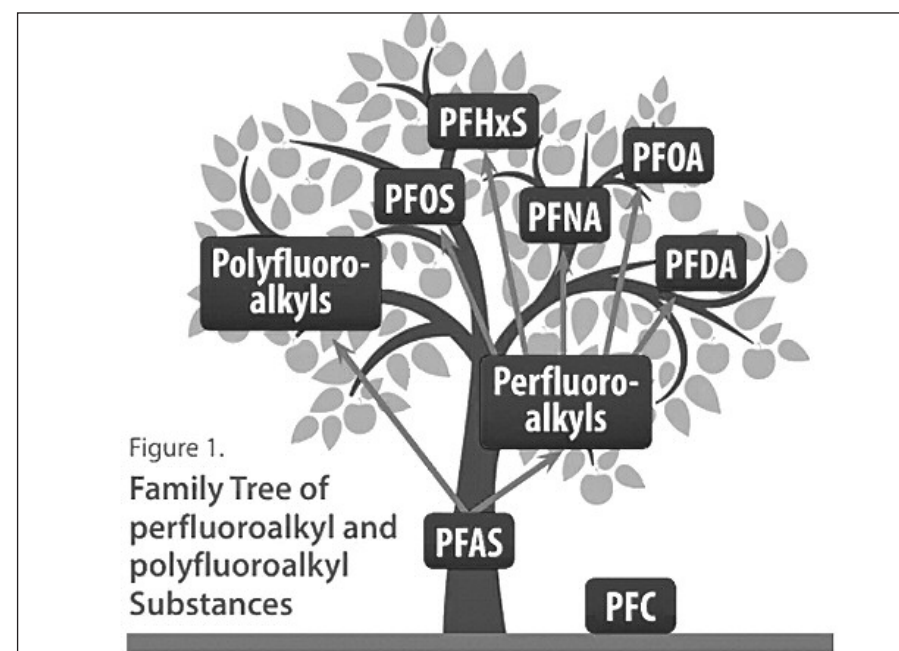


Figure 1.
Family Tree of perfluoroalkyl and polyfluoroalkyl Substances

PFAS are a group of chemicals that can be found in various manmade compounds and products. They can be long chain or short chain, or branched or linear. Megan Kemp used this "Family Tree of PFAS" in her recent presentation at the Great Lakes PFAS Summit to show the relationship between various compounds.

eral, most of the studies have involved general populations with a low level of PFAS exposure. Five studies looked at community residents with high PFAS exposures from a contaminated site. There was also one occupational exposure study. Studies looked at serum and plasma to determine the amount of exposure.

Various mixtures of PFAS were found in the blood of participants. On average, exposure to six PFAS was assessed, with a range of two to 22 PFAS assessed overall.

The health outcomes included cardiovascular issues, liver function, developmental effects (fetal and neuro-developmental), immunotoxicity, metabolic pathways, reproductive effects, thyroid hormones and cancers. Not all studies looked at the same outcomes, however.

Kemp also spoke about the strengths and weaknesses of different methods. However, the quality

of the input, she said, has the largest effect on the quality of the output. When combining and comparing studies, she said, it is also important to compare "apples to apples."

Kemp looked to see what cross sectional studies had been done in the area of PFAS and human health. Cross sectional studies look at a population at a single point in time. Variables are recorded at that time, Kemp said. These studies are useful for answering questions about the prevalence of a condition and give an indication where more research is needed. They can suggest correlations, but not causation. Studies like this pave the way for more research. Thirty of these studies were found in her search.

She also looked to find case control studies, which compare individuals with a disease to people without the disease. They then look back in time to determine if there were differences in exposure between the

two groups. These also cannot prove cause and effect, she said.

She then also looked for cohort studies, randomized control trials and meta-analyses and systematic reviews. These are higher level studies, which she diagramed on a "hierarchy of scientific evidence." She also highlighted the outcomes that were studied with each type of study she had found in her research. Not all outcomes studied, however, were found to have causation from PFAS compounds.

Results

Cohort studies, Kemp said, are showing decreased evidence of decreased birth weight, altered liver function, diabetes or glucose regulation and gestational hypertension as effects. However, consistent outcomes were only seen in two to five studies each, she said. Additional studies would be needed to prove causation of these outcomes.

In reviews and meta-analyses level studies, she said, outcomes from PFAS exposure were shown to be reduced birth weight, altered serum lipids (cholesterol), and diabetes, both Type II and gestational. Of the 13 of these studies, the only health outcome to show some consistency was low birth weight.

Of note, decreased vaccine response was not included in the list of outcomes studied. That, however, was the benchmark used recently by the Environmental Protection Agency (EPA) in establishing regulatory levels. This outcome was only examined in two PFAS mixture studies, Kemp said, both of which focused on the same cohort of children. Consistent findings across different segments of the population at different ages would, she said, lend strength to this potential association. As of now, evidence remains limited.

Kemp's conclusion

In the last few years, the number of studies has increased exponentially. However, interpretation of human data continues to be limited. It is also still unclear which statistical methods are more appropriate when looking at outcomes from PFAS mixture exposure. Kemp said there is a need for additional mixture studies and reviews that synthesize mixture data. She also called for standardization of research methods and reporting to create a better picture of the effects of exposure to various PFAS mixtures. With more studies now underway, she said, the understanding of PFAS exposure and outcomes in human health, will continue to grow and evolve.

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