Tulane Researcher Helps Advance Global Study of “Forever Chemicals” in Marine Fish

January 23rd, 2026
|
Aidan Feulner

View PDF

A Tulane University researcher contributes to an international study examining how “forever chemicals” move through marine ecosystems and into seafood consumed by people around the world. The research offers new insight into environmental contamination, human exposure, and the future of chemical regulation.

Yanxu Zhang, a researcher in the Tulane School of Science and Engineering, is a co-author on a recent Science study analyzing the risks of human exposure to per- and polyfluoroalkyl substances, or PFAS, through marine fish consumption. PFAS are a class of synthetic chemicals widely used in industrial processes and consumer products for their resistance to heat, water, and oil. Their durability, however, also allows them to persist in the environment and accumulate over time.

“These substances are persistent in the environment, can accumulate through the food chain, and enter the human body and build up over time, posing a potential threat to health,” Zhang said.

While PFAS contamination is often associated with drinking water or freshwater fish near polluted sites, far less is known about how these chemicals behave in marine environments. This gap is especially important given the role seafood plays in diets worldwide.

“As an important component of the global diet, marine fish may serve as a major source of PFAS intake for humans,” Zhang said. “However, the contribution of marine fish as a source of PFAS exposure and the associated health risks still lack systematic assessment on a global scale.”

The study addresses this gap by using a marine food web model to predict PFAS concentrations in 212 edible marine fish species globally. These species represent 99 percent of the catch in the regions studied. The researchers validated the model predictions using measured data, making this one of the most comprehensive global assessments of PFAS in marine seafood to date.

The findings show that PFAS concentrations in marine fish are closely linked to historical chemical emissions and the ocean’s capacity to dilute contaminants. Fish higher in the food web generally exhibit higher PFAS concentrations. Exposure levels through seafood consumption also vary across countries, reflecting differences in economic conditions, dietary patterns, and historical PFAS use.

Zhang’s contribution to the study focused on understanding how PFAS move and disperse in nearshore marine environments, where human exposure risks are often highest. His prior research provided essential data and modeling expertise. He has previously worked on quantifying the scale and spatial distribution of PFOS emissions from land to the North Atlantic and helped develop models for PFAS transport and distribution in the global ocean.

“These experience and data contribute to the understanding of the dilution and diffusion patterns of PFAS in nearshore marine areas, which is a key component of this study,” he said.

One of the most notable findings of the research was that, on a global scale, estimated daily intake of PFAS from marine fish consumption remains relatively low compared to other exposure pathways.

“What stood out the most in the results was the relatively low estimated daily intake of PFAS exposure through marine fish consumption,” Zhang said. This result aligns with previous research showing that legacy PFAS exposure is often driven by drinking water and freshwater fish, particularly near contaminated sites.

At the same time, the study identified emerging concerns related to global seafood trade. International trade can shift PFAS exposure patterns by moving fish from regions with higher contamination to those with lower contamination. The study also found that some longer-chain PFAS compounds pose higher exposure risks than more commonly regulated chemicals.

“What surprised me, however, was the finding that some of the longer-chain PFAS … pose a higher exposure risk,” Zhang said, highlighting the need to expand monitoring beyond traditional PFAS compounds such as PFOS and PFOA.

For consumers, especially those who eat seafood frequently, the findings emphasize the importance of context and evidence-based risk assessment. “Detection alone does not mean seafood is unsafe,” Zhang said. “The key question is whether the amount of PFAS people consume through eating seafood exceeds health-based guidance values.”

Beyond consumer awareness, the research has important implications for policy and regulation. The findings can help inform PFAS concentration limits in marine fish, establish monitoring standards for international seafood trade, and guide global efforts to manage PFAS contamination in marine environments.

Looking ahead, Zhang emphasized the need for stronger oversight as new PFAS alternatives continue to enter the market. “It is essential to strengthen safety assessments during the research, development, and marketing stages of chemicals to avoid the cycle of ‘pollute first, regulate later,’” he said.

The author team includes scientists from multiple universities from China, the US, and Canada and led by Wenhui Qiu, Ge Yang, Zhaomin Dong, Minghong Wu, and Chunmiao Zheng. Through contributions to this high-impact international collaboration, Zhang is advancing Tulane University’s leadership in environmental science and supporting efforts to protect public health on a global scale.

References

Qiu, W., Yang, G., Cao, L., Niu, S., Li, Y., Fang, D., Dong, Z., Magnuson, J.T., Schlenk, D., Leung, K.M., Zheng, Y., Zeng, Z., Feng, L., Zhang, X., Zhang, Y., Fan, W., Huang, T., Ma, J., Wu, M., Tao, S., and Zheng C. 2025. Risks of per-and polyfluoroalkyl substance exposure through marine fish consumption. Science, 390(6779), pp.1305-1309.

Zhang, X., Zhang, Y., Dassuncao, C., Lohmann, R. and Sunderland, E.M., 2017. North Atlantic Deep Water formation inhibits high Arctic contamination by continental perfluorooctane sulfonate discharges. Global Biogeochemical Cycles, 31(8), pp.1332-1343.