**Research Brief 360: Combining Plants and Sunlight to Break Down Hazardous Compounds**

You are listening to the Superfund Research Program's Research Brief podcast. This month's brief is titled, "Combining Plants and Sunlight to Break Down Hazardous Compounds," and will highlight researchers work creating a plant-based compound that uses sunlight to break down hazardous compounds, like PFAS, and the material's ability to act as a sterilization agent. This green approach may be useful for a variety of chemical-removal and sterilization applications.

Researchers funded by the NIEHS Superfund Research Program, or SRP, designed a new material that effectively degrades harmful compounds, like PFAS, and bacteria. By combining the power of sunlight and a component of plants, called lignin, this approach harnesses sustainable and renewable resources to reduce exposures and protect health.

Project lead, Dr. Susie Dai, of Texas A&M AgriLife Research, explained that most current chemical degradation processes and sterilization techniques require harsh reaction conditions, use non-renewable resources, or are not environmentally friendly. The team wanted to address and overcome some of the limitations of more sustainable approaches that have been emerging.

To create the new material, Dai and postdoctoral researcher Dr. Wan Zhang, combined lignin with titanium dioxide to create a 3D polymer structure. Lignin is an abundant organic polymer that forms the structural tissue in most plants. Titanium dioxide is an inorganic compound derived from the metal titanium that has been previously shown to speed up chemical reactions under ultraviolet radiation.

For this experiment, the researchers placed the newly formed polymer structure under solar light, which activated it to become a photocatalyst, a term for a material that is chemically activated by light.

Zhang shared that the team wanted to design a photocatalyst that was able to degrade chemicals under natural conditions as effectiveness in everyday settings would set it apart from other photocatalysts which require UV light.

In the lab, the scientists showed that the new material was able to degrade the perfluorooctanoic acid molecule, or PFOA, into shorter chain PFAS. PFOAs are a type of PFAS used in a variety of products and firefighting foams since the 1940s that have been found in water, soil, and air. At certain levels, studies have shown that PFAS are harmful to human health.

In the lab, the new material was able to successfully remove PFOA. Adding more of the material improved performance, with up to 50% of the PFOA removed within hours.

The photocatalyst was also tested against a mobile device coated with Pseudomonas putida bacteria, which it was able to sterilize in a similar manner to a commercial disinfection wipe.

It also degraded a prescription drug called atenolol within five minutes, quicker than any of the other materials they tested.

According to Dai, this approach overcomes many previous limitations for environmentally friendly chemical degradation and sterilization. Enhancing efficiency, particularly under normal environmental conditions, can broaden potential applications of this technique to better protect human and environmental health.

If you'd like to learn more about this research, visit the Superfund Research Program website at niehs.nih.gov/srp. From there, click on the Research Brief title under the banner, and refer to the additional information listed under the research brief. If you have any questions or comments about this month's podcast, send an email to srpinfo@niehs.nih.gov.

Join us next month as we discuss more exciting research and technology developments from the Superfund Research Program.