Composting Deactivation of CWD Prions

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Chronic Wasting Disease (CWD), which is a Transmissible Spongiform Encephalopathy (TSE) disease, is an infectious disease of the neurological system that affects cervids, or animals such as deer, elk, and moose. CWD is caused by a prion, which is a misfolded protein mostly found in the brain of diseased animals. Cervids that contract CWD may take months or even years before they show symptoms of having the disease; however, the animal sheds prions into the environment potentially infecting other cervids. Late-stage disease symptoms can include extreme weight loss, lack of coordination, drooping head and/or ears, and excessive drooling, drinking, and urination. It is highly unlikely that deer in the late stages of the disease will be seen in the wild, and CWD always leads to the death of infected cervids if they do not die of another cause first.

CWD is persistent in soil, meaning that CWD prions can survive in the environment outside of the cervid's body. As prions accumulate on the landscape through bodily secretions, excreta, and carcasses, the importance of environmental transmission of CWD grows. This becomes a concern as prions are not affected by outside temperature extremes, ultraviolet radiation, antibiotics, anti-virals, or anti-fungal medications because they are particles of proteins with no nucleic acids (DNR or RNA). It is not yet understood how long prions can persist in the environment, but they could last for several or more years.

Finding efficient and economical ways of destroying or isolating prions is a priority. There's a pressing need to mitigate the risk of disease spread through carcass disposal and carcass transportation.

Identifying decontamination strategies that can be used on the landscape is increasingly important because CWD contaminated environments may continue to propagate disease.

Robert Michitsch and Kyle Hermann at the University of Wisconsin-Stevens Point and Eric Benbow at Michigan State University received funds provided under Public Act 207 of 2018 to explore whether composting could effectively degrade prions through microbial digestion. Some evidence suggests that microorganisms at thermophilic temperatures can degrade infectious prions. The researchers are employing a multi-barrier approach that maximizes carcass exposure to the relevant microbial community.

Experimentation began in December 2019 and has proceeded despite challenges posed by the pandemic. Nine CWD infected carcasses were spread across four active composting cells. A fifth cell with uninfected deer carcasses, and containers of CWD-infected brain materials buried in soil without composting, were included as controls.

The composting cells heated slightly over the winter (indicating moderate bacterial activity). By spring, all compost piles heated significantly and hit peak temperatures in early June. The highest average daily temperature was 45 °C (113 °F). Temperatures remained above ambient levels until September, indicating that active-phase composting had ended.

Samples were collected from each of the composting piles, underlying soil layer, soil burial containers, and from effluent drainage. As well, oak seedlings that sprouted naturally on the compost piles were retrieved for analysis. Prion testing of samples is ongoing, and the compost cells were readied for a similar study that started in Spring 2021.

Data analysis and a final report with findings are anticipated by September 2022.