

The proof of safe use for the practical application of a urease inhibitor to mitigate ammonia emissions in cattle barns

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Ammonia emissions from cattle farming can be significantly reduced by using urease inhibitor (UI). To implement the use of a urease inhibitor in cattle barns, two application techniques (robotic manure scraper and flexible hose drop system) will be developed for automatically daily dosage, mixing, and application of the UI on the stable floor. In addition, proof of safe use for animals and humans must be provided. These goals are pursued in the project Prax-REDUCE.

For proof of safe use, inhalative and dermal exposure data are needed. Fluorometry is a methodical approach measuring these exposures. Instead of the UI, the fluorescent dye pyranine is used for data collection.

Laboratory tests have shown that Tyvek and nylon filters are suitable materials for detecting dermal and inhalative exposures. Based on animal behavioral studies, different exposure scenarios for both application techniques are simulated first in laboratory tests and afterward in practical trials in the cattle barn.

In dermal exposure measurements, a model cow is covered with Tyvek at the expected exposed parts of the body. For the detection of inhalative exposures, an aerosol collection pump with nylon filters as collector is used, which corresponds to the respiratory demand of a resting cow of approximately 650 kg. The volume flow is 100 l/min.

Subsequently, the pyranine concentrations collected on Tyvek as well as nylon filters can be determined on the Spectro fluorophotometer. The measured concentration can be converted into the spray liquid quantity or the UI quantity, which is relevant for the classification of the risk.

The first practical tests in the cattle barn showed good results regarding the applied method and used materials. Further exposure measurements will be performed in the cattle barn to confirm the reproducibility of the method with a higher data density.