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Ammonia Sanitisation of Faecal Sludge for Use as Fertiliser

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Abstract

Faecal sludge from pit latrines and pour flush toilets are often discharged directly into surface water, spreading diseases and causing eutrophication. Faecal sludge is rich in organic matter and plant nutrients, and has good use as fertiliser. However, there is a need to inactivate the pathogens in the sludge to reduce the health risk associated with sludge application on arable land.

One treatment alternative is the ammonia sanitisation, which utilise the pathogen inactivation by ammonia. The treatment inactivates bacteria, viruses and parasites. It is a simple technology which only requires uncharged ammonia and airtight storage for sufficient amount of time. In faecal sludge, urine is the main ammonia source, but in most current toilet systems, the ammonia from urine is either too diluted or ventilated away. For sludge with low ammonia concentration, additional ammonia in the form of the nitrogen fertiliser urea can be added to enhance the treatment. Preferably, by reducing the flush water volumes and using non-ventilated systems, faecal sludge could be sanitised without additional inputs.

To evaluate the sanitising effect of ammonia, the viability of *Ascaris* eggs was monitored during storage at lab scale at different ammonia concentrations and temperatures. At ammonia concentrations above 170 mM and 23°C, 99.9% reduction of *Ascaris* egg viability could be achieved within 1.5 month, this corresponds to 2 L flushwater per person and day. For flush water volumes of 6 L per person and day, the ammonia concentrations were lower (44 mM) and 6 months storage was required at 23°C. At higher temperatures, the inactivation of *Ascaris* eggs was faster and the required ammonia concentration lower. This makes the system applicable to many tropical low-income countries where the need for fertilisers and faecal sludge sanitisation is crucial.

Ammonia sanitised faecal sludge can be used as a sustainable source of cheap fertiliser, especially for farming in or near urban areas. By implementing toilet systems which use airtight storage and low flush water volumes, the intrinsic ammonia may be sufficient to sanitise the faecal sludge without additional treatment.

Keywords: Ammonia sanitisation, *Ascaris*, faecal sludge, inactivation