

# Impact of the thermal treatment of pig slurry on vegetative and spore forming bacteria

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## Abstract

Microbiological risk from pig slurry is considered a major public health problem, as pathogenic microorganisms can be spread from land application of manure. Furthermore, with growing demand of water quality for domestic and industrial use, it is becoming necessary to find reliable methods for sanitisation that are economically acceptable. In this context, the aim of this study was to establish the effectiveness of thermal sanitation of pig slurry. The continuous pilot plant (115 litres/hour) used in this study, comprised two tubular heat exchangers followed by hot liquid retention set at 10 minutes. The first exchanger recovered up to 70% of heat from the returning hot liquid to pre-warm the feed to an intermediate temperature. External heat was used in the second unit to reach the target temperature set as 70, 80 and 96°C. The effect of the thermal treatment was evaluated on *E. coli*, *Salmonella*, enterococci, *C. perfringens* and on Total Culturable Bacteria (TCB), all naturally occurring in the pig slurry. Colonies present after heat treatment on medium used for TCB counts were identified using molecular methods based on 16S rRNA gene analysis. Heating at 70°C was sufficient to inactivate mesophilic vegetative bacteria. Holding for 10 min at 80°C inactivated vegetative forms of all indicators tested but not the related spores. The identification of the colonies revealed the presence of *C. botulinum*, *C. sporogenes* and *C. perfringens*. When held for 10 min at 96°C, we observed a reduction of spore forms by less than 2 log<sub>10</sub> for TCB and by 4 log<sub>10</sub> for *C. perfringens* which was still present at around 20 CFU/g of slurry. A longer retention of 20-30min may be sufficient to ensure its absence in 1 gram. However, a complete removal of risk could not be assured because of the presence of more resistant spore formers such as *C. botulinum*. Despite the reduction, more than 10<sup>3</sup> CFU/g of TCB still remained possibly including pathogens. Temperatures over 96°C are thus needed if the target is the complete inactivation of all spores.