WERF Phase II: The Impact of Digestion and Dewatering on Reactivation and Regrowth of Viable but Non-Culturable Indicator Bacteria

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ABSTRACT

Recently, a number of reports have found much higher densities of the indicator bacteria, either fecal coliform or *E. coli*, in dewatered cakes compared to the samples just prior to the dewatering process for anaerobically digested solids. This phenomenon has been attributed to either reactivation and/or regrowth. The objectives of this study were to examine the impact of digestion and dewatering processes on reactivation and/or regrowth of FC and *E. coli*. Samples were collected from several anaerobic digestion processes, two thermophilic and five mesophilic, with either centrifuges or belt filter presses used for dewatering. Samples were enumerated using standard culturing methods for FC and *E. coli* as well as quantitative polymerase chain reaction (qPCR) to enumerate *E. coli*. The results demonstrated that for the single stage thermophilic processes sampled, a large proportion of FC or *E. coli* remain viable but nonculturable (therefore, they are not measured by culturing methods), and these bacteria can be reactivated during centrifuge dewatering. After reactivation, the bacteria can grow quickly and reach peak concentrations of greater than 10^7 per gram of dry solids within a few days of storage, followed by die-off with further storage. When thermophilic digestion utilized a reactors in series configuration, the *E. coli* were destroyed and no reactivation or growth was observed after centrifuge dewatering. Samples after mesophilic digestion did not have significant quantities of viable but non-culturable *E. coli*. However, after centrifuge dewatering, growth of *E. coli* and FC occurred rapidly, reaching densities of greater than 10^7 per gram dry solids within a few days of storage, followed by a decrease in densities during continued storage. Cakes dewatered using a belt filter press did not show significant increases in the *E. coli* or FC density. The results suggest that centrifuge dewatering can reactivate viable but nonculturable bacteria, and the cake that is produced provides good growing conditions to support growth of FC and *E. coli*. 