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Marion Weedermann* (mweederm@dom.edu), Dominican University, 7900 W Division St, River Forest, IL 60305. *Qualitative Analysis of Models for Anaerobic Digestion including Syntrophic Interactions*. Preliminary report.

This study addresses two stages of anaerobic digestion, acetogenesis and methanization. First, we consider a first basic model that includes two types of bacteria and two nutrients. The nutrient for one organism is supplied to a well-stirred feed vessel. The growth of this species is accompanied by the formation of an intermediate product that is growth-limiting for the second organism. However, excess of the intermediate product is also growth inhibiting to the second organism. The model is then modified to study the impact of (i) an externally introduced toxin and (ii) a dynamically allocated toxin (syntrophy). In either case only one type of micro-organism is affected by the toxin while the second organism breaks down the nutrient.

We give conditions that ensure local and global stability for the various equilibria, and show that the inhibition may cause bistabilities of two equilibria. In the presence of a toxin there are additional possibilities for bistabilities including that of a periodic orbit and an interior equilibrium. (Received July 28, 2009)