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Microbial diversity of anaerobic syngas-converting enrichments from a multi-orifice baffled bioreactor (MOBB)

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Syngas fermentation can be used to produce fuels and chemicals from lignocellulosic biomass or other poorly biodegradable wastes. The aim of this study was to identify and characterize carboxydotrophic microorganisms in enrichments and evaluate their potential for syngas bioconversion. Anaerobic sludge that efficiently converted syngas (60% CO, 30% H_2, 10% CO_2) to methane, in a multi-orifice baffled bioreactor (MOBB), was used as inoculum to start enrichments with CO as carbon and energy source. Enrichments were started under a headspace containing 40% CO. Bottles amended with vancomycin and/or erythromycin were also inoculated to test the potential for enriching CO-converting methanogens. Methane and acetate were produced in the enrichment, but no growth or methane production was detected in incubation with antibiotics. In the enrichment, organisms related to *Acetobacterium* and *Sporomusa* species were the predominant bacterial species and *Methanobacterium* and *Methanospirillum* were the dominant archaea. The enrichment was subcultured and pasteurized to select for spore-forming bacteria and to inactivate methanogens. A stable enrichment culture was obtained that converted up to 100% CO. This enrichment produced hydrogen and acetate. The pasteurized culture showed a low microbial diversity; more than 90% of the community was related to *Sporomusa ovata* (97% identity). The results suggest that methane production from CO in the MOBB is a combined activity of carboxydotrophic acetogenic bacteria and hydrogenotrophic methanogens. Interestingly, growth of *S. ovata* with high concentrations of CO was never shown before.