The Inhibition of Methane-Producing Bacteria Using Novel Compound: BETA-carboline

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Methane is approximately 84 times more potent as a greenhouse gas than carbon dioxide, making the emission of this gas to the atmosphere a big threat to rising global temperature. One of the biggest producers of methane is livestock; more specifically, cattle. The methane in cattle is produced by methanogens, which are a group of archaea that produce methane as an end product of their anaerobic respiration. BETA-carboline is an alkaloid that possesses diverse biological properties, including antitumor, antiparasitic, and antimicrobial activities; however, its complete pharmacological effects are currently unknown. The aim of this study was to analyze the effect of 1-Acetyl-BETA-carboline (AbC) on methanogens using chemical synthesis. It was hypothesized that Methanobrevibacter smithii and Methanobrevibacter arboriphilus treated with BETA-carboline will result in inhibition of methanogens. Also, the cell viability and toxicity of BETA-carboline were investigated using a human hepatocyte model. The results showed that 1-Acetyl-BETA-carboline inhibited the growth of M. smithii and M. arboriphilus, higher concentrations of AbC exhibited greater inhibition of methane production, deoxycholic acid (DCA) added to AbC decreased the relative growth of both methanogens dramatically, and the study of toxicity in AbC revealed a concentration-dependent toxicity. 1-Acetyl-BETA-carboline inhibits the growth of M. smithii and M. arboriphilus, which shows BETA-carboline's potential in becoming a drug to inhibit methanogens in the cattle rumen, a potentially novel solution of slowing down methane emission into the atmosphere. Further studies could be conducted by performing an in vivo study.