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Diversity of the rumen microbes involved in methane production

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Methane emission by the ruminants appears to be a wasteful process in terms of dietary energy loss as methane, but is essential for maintaining continuous flow of re-oxidized cofactors required for feed fermentation. Plants containing secondary metabolites like tannins, saponins, alkaloids, essential oils, etc. and inorganic terminal electron acceptors like nitrate and sulfate seem to be the potent methane inhibitors. Various combinations of above feed additives can reduce enteric methane production by about 25-30%; hence can be propagated for the feeding of livestock to control methane synthesis. It is conceived that methanogen archaea are the major group responsible for methanogenesis and therefore this group of microbes was targeted to be explored in depth. By conventional cultivation techniques only a few methanogens (5-6) were reported to be present in the rumen of buffalo, but by use of meta-trans-genomic technique, many more genera of methanogens/hydrogen utilizers i.e., *Methanobrevibacter, Methanomicrobium, Methanothermobacter, Methanoplanus, Sulfolobus, Methanosarcina, Methanospirillum, Pyrococcus, Methanoculleus, Aciduliprofundum, Methanoregula, Methanosphaera, Methanosphaerula, Methanococcoides, Methanocaldococcus, Methanocorpusculum, Thermoplasma, Methanococcus, Methanobacterium*, etc. have been reported in buffalo. Though the metabolic pathway of methanogenesis is exclusively held by methanogens but it is only the availability of hydrogen pool in the rumen which dictates the extent of methane production and that might be the reason of no correlation of methane inhibition and population density of methanogens in the rumen. Therefore, indirectly fermentative microbes are equally responsible for methane production. Activity of fermentative microbes cannot be targeted as this is the main source of energy production for the host animal, so the strategies should be designed for methane inhibition taking care of hydrogen pool of the rumen. Therefore, it appears that the number of methanogens is not important but the numbers of hydrogen producers are more important for methane synthesis in the rumen.

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