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The influence of rumen ciliates' community composition on methane emissions of lambs

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Ciliate protozoa are the main ruminal hydrogen producers, that is used by the methanogenic archaea to produce methane (CH₄). Ruminants contribute relevantly to the total of anthropogenic emissions of this potent greenhouse gas. To mitigate the ruminants' CH₄ emissions many strategies as ciliates' elimination from rumen, are proposed. However, there is still a strong lack of knowledge on the relationships between the ciliates' community and rumen methanogenesis. We evaluated the relationships between the rumen ciliates community composition of lambs and CH₄ produced. Data derived from 54 animals raised for meat production and fed with a conventional, high-cereals and low-forage, finishing diet. Rumen fluid was collected at slaughter and ciliates analyzed by optical microscopy. Gas and CH₄ productions were evaluated *in vitro*, in glass bottles with gas detectors (Ankom System), incubating for 48 h individual rumen

fluid samples with the diet provided to the donor. The ciliates' total abundance (log₁₀ cells/ml rumen fluid), the *Isotricha*, *Dasytricha*, *Entodinium*, *Epidinium* and *Ophryoscolex* genera relative abundances (% total ciliates) and the CH₄ proportion (% total gas) were subjected to a regression analysis with incubation as random effect. CH₄ proportion increased linearly with the total abundance of ciliates in rumen fluid ($P < 0.0001$), but different relationships were identified for ciliates' genera. CH₄ proportion was negatively and quadratically related with *Entodinium* proportion ($P = 0.0231$ and $P = 0.006$ for linear and quadratic coefficients, respectively) and negatively and linearly related with *Isotricha* ($P = 0.002$) and *Epidinium* ($P = 0.035$) proportions. The results suggest that ruminal CH₄ emissions seems to depend on the rumen ciliates' community composition.

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Keywords: RUMEN CILIATE PROTOZOA; RUMINANTS' METHANE EMISSIONS; ENTERIC METHANOGENESIS; LAMBS; INTENSIVE PRODUCTION SYSTEM