

### Reference 6

Harahap, RP; Setiawan, D; Nahrowi; Suharti, S; Obitsu, T; Jayanegara, A 2020 Enteric Methane Emissions and Rumen Fermentation Profile Treated by Dietary Chitosan: A Meta-Analysis of In Vitro Experiments Tropical Animal Science Journal, 43(3):233-239. 10.5398/tasj.2020.43.3.233

### Background and objective

Chitosan may be obtained from deacetylation of chitin, which is a biopolymer present in the exoskeleton of crustaceans such as crabs and shrimp. Chitosan is very interesting to study because it can change the profile of volatile fatty acids (VFA) by increasing propionate concentration (C<sub>3</sub>) and thereby reducing the production of CH<sub>4</sub>.

This present study, therefore, aimed to perform a meta-analysis from published experiments regarding the effect of chitosan on methane emissions and rumen fermentation using in vitro batch culture experiments.

### Search strategy and selection criteria

The database was developed from studies reporting the use of chitosan to reduce enteric methane emissions from ruminants. 1) the article was published in English; 2) the concentration of chitosan in diet and CH<sub>4</sub> emissions were specified; 3) the experiment was carried out by using in vitro batch culture systems with cattle or sheep as rumen fluid donors.

### Data and analysis

A meta-analysis of data was performed by using mixed model methodology according to St-Pierre (2001), in which different studies in the database were treated as random effects whereas chitosan addition levels in diets were treated as fixed effects. Besides, the regression equations were also presented with p-value and root mean square error (RMSE). The statistical analysis was performed in SAS software version 9.1 (SAS Institute Inc., Cary, NC, USA) by using mixed procedure (PROC MIXED).

Number of papers	Population	Intervention	Comparator	Outcome	Quality score
12	Ruminant	Chitosan	No chitosan	Metric: 1) CH <sub>4</sub> emissions (mmol/d); 2) CH <sub>4</sub> emissions (mmol/g DOM); Effect size: not applicable	37.5

### Results

- Chitosan addition decreased enteric CH<sub>4</sub> emissions, both when expressed as CH<sub>4</sub>/day and CH<sub>4</sub>/DOM (p<0.001).
- NULL
- NULL
- NULL
- NULL

### Factors influencing effect sizes

- No factors influencing effect sizes to report

### Conclusion

Chitosan addition is able to mitigate enteric methane emission, alters rumen fermentation profiles toward a favorable direction, and improves nutrient digestibility.