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## Growth of *Salmonella* Typhimurium DT104 in mixed rumen cultures is differentially affected by essential oils

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### ► To cite this version:

Asim Kumar Misra, Mathieu Silberberg, Diego Morgavi. Growth of *Salmonella* Typhimurium DT104 in mixed rumen cultures is differentially affected by essential oils. 7. Joint Symposium of Rowett-INRA 2010, Jun 2010, Aberdeen, United Kingdom. hal-02750792

**HAL Id: hal-02750792**

**<https://hal.inrae.fr/hal-02750792>**

Submitted on 3 Jun 2020

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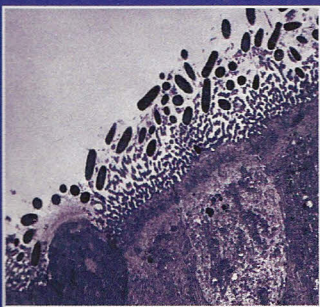
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University of Aberdeen



**Rowett-INRA 2010**

**23-25 June 2010**

**Aberdeen Exhibition and  
Conference Centre**



**Gut Microbiology:**  
new insights into  
gut microbial ecosystems

7th Joint Symposium organised by the **Rowett Institute of Nutrition and Health**, University of Aberdeen, Scotland (UK) & the **Institut National de la Recherche Agronomique**, Clermont-Ferrand-Theix (France)



### Animal variation in methane production and expression of *mcrA* gene in goats' rumen

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Methane is one of the major end-products of anaerobic fermentation of feeds in the rumen. An important variation between ruminants of the same species in methane emissions has been reported. Methanogens are the ultimate microorganisms responsible for methane synthesis in the rumen. Methyl-coenzyme M reductase (*mcr*) is a vital enzyme in methane production, and the *mcrA* gene coding for a subunit of *mcr* has been suggested as a potential indicator of the methanogenic activity. The aim of this study was to evaluate the intra and inter animal variability of methane production and the expression of the *mcrA* gene in goats fed 1:1 hay:concentrate diet. Methane production was measured in chambers in 4 cannulated goats during 3 consecutive days in two experimental periods (15 days of difference). Rumen samples were taken 2 hours after feeding to quantify the expression of *mcrA* using RTqPCR. Daily methane production averaged 24.8 and 31.1 l/kg DMI for periods 1 and 2, with a variation within animals of 10.0% and 14.7%, respectively. However, the relative expression of *mcrA* gene presented higher intra-animal variation (44.5% and 55.0% in periods 1 and 2, respectively). The inter-animal variation averaged 17.4% and 19.7% for methane production and 66.6% and 72% for *mcrA* expression. Pooling data from both periods together did not show any correlation between methane production and gene expression. Further research will be conducted with different diets to investigate the high variability of *mcrA* gene expression in order to use it as indicator of methanogenic activity in the rumen.

### Growth of *Salmonella Typhimurium* DT104 in mixed rumen cultures is differentially affected by essential oils

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Salmonellae are pathogenic bacteria that cause illness in ruminants and are also a major cause of food-borne human infections. Ruminants can harbour Salmonellae in their gastrointestinal tract and reduction of carriage is known to decrease salmonellosis prevalence. Essential oils (EO) with antimicrobial activity are added to feeds as performance-enhancers but their effects upon Salmonellae in the rumen are poorly known.

The inhibitory effect of selected EO on *S. enterica* serovar Typhimurium DT104 (STyphi) grown under rumen conditions was investigated. In the absence of active rumen microbes, carvacrol, cinnamaldehyde, eugenol, and thymol, all employed at practical concentration, showed moderate but significant antimicrobial properties that were dose-dependent (up to 40% STyphi growth inhibition compared to control) whereas pulegone was ineffective. When STyphi was co-incubated with rumen microbes for up to 24 h, the initial population decreased sharply at 6 h (-2.3 log/ml) and remained low at 24 h. Whereas cinnamaldehyde had no effect either on growth or fermentations, in the presence of 1 mM carvacrol, thymol, or 3 mM eugenol STyphi decreased by 1.9, 1.4 and 3.4 log/ml at 24 h without affecting fermentations. In contrast, higher concentrations of carvacrol or thymol (2mM) affected negatively fermentations and STyphi growth was the same as control.

These observations show that an increase in EO concentration does not necessarily improves the expected anti-salmonellae effect in the complex rumen microbial ecosystem. While EO supplementation at performance-enhancer doses may reduce carriage, their use at higher doses, i.e. as a preslaughter strategy, may have the opposite effect.