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Assessment of effects of methane inhibitors in ruminants

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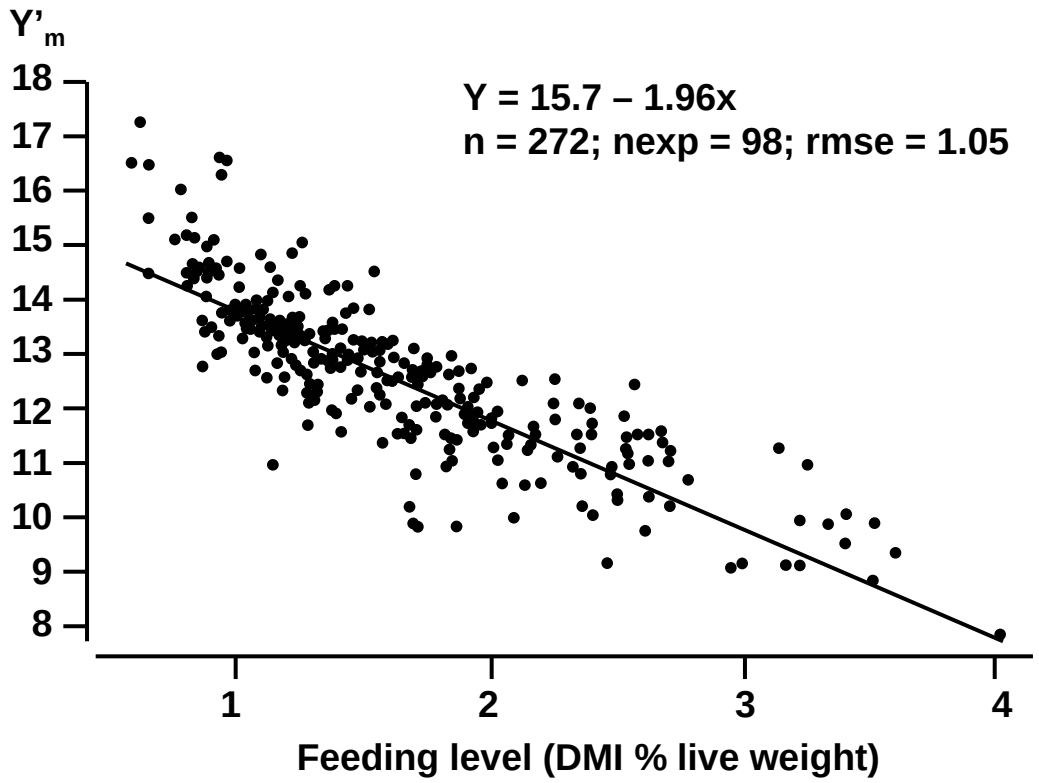
Some headings in the German press

- **“Eating beef impairs the climate”**
- **“Will the “waste gas tax” for cows come?”**
- **“Belching cows impairs our climate”**

Factors affecting ruminal methane production

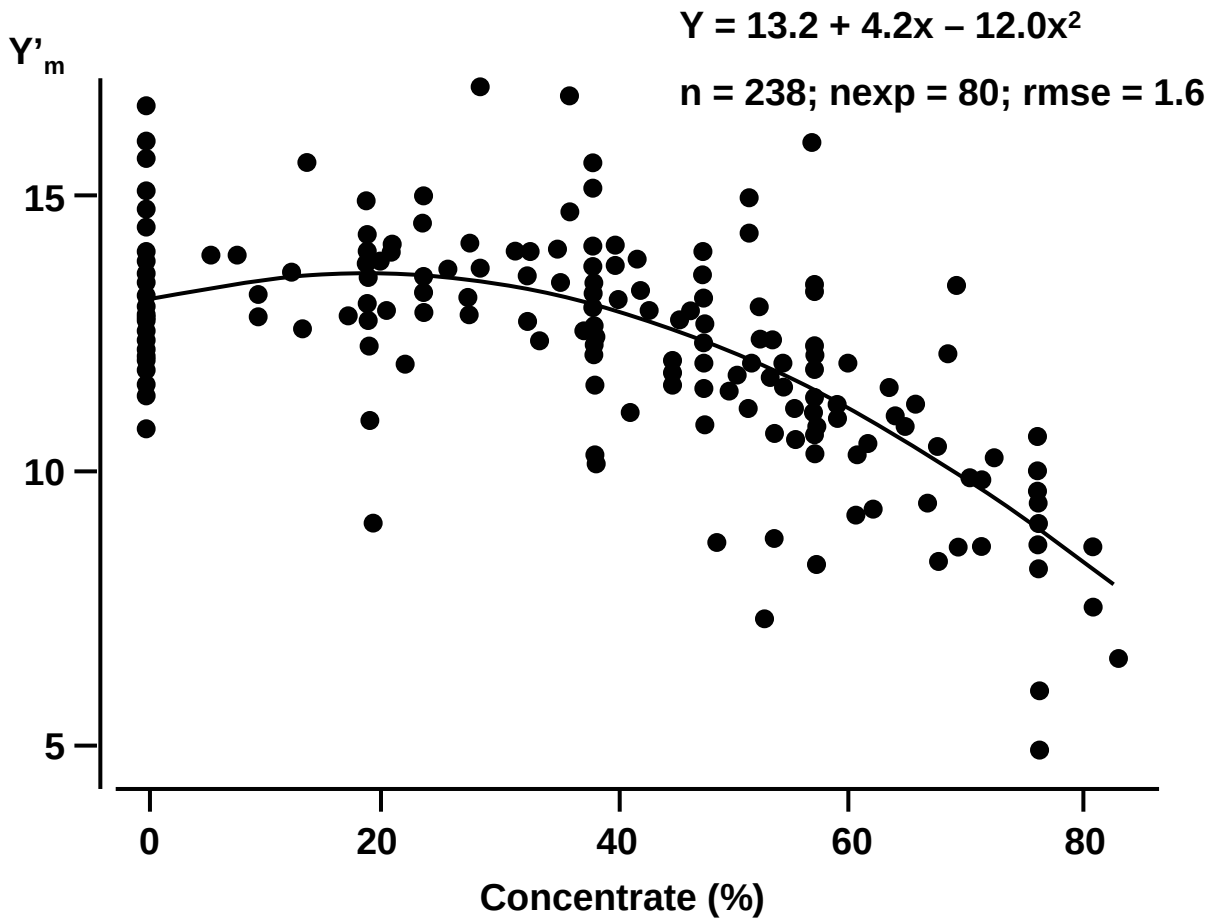
- **Feeding level (DMI, % live weight)/ Mean retention time in the rumen**
- **Frequency of feeding**
- **Chemical composition of the ration (amount and type of fat and carbohydrate)**
- **Proportion of concentrate (ruminal pH)**
- **Degradation-rate of the feedstuffs**

Influence of feeding level on Y'_m (Sauvant and Giger-Reverdin 2007)



Y'_m = gross energy in methane (% of gross energy intake)

Influence of dietary proportion of concentrate on Y'_m (Sauvant and Giger-Reverdin 2007)

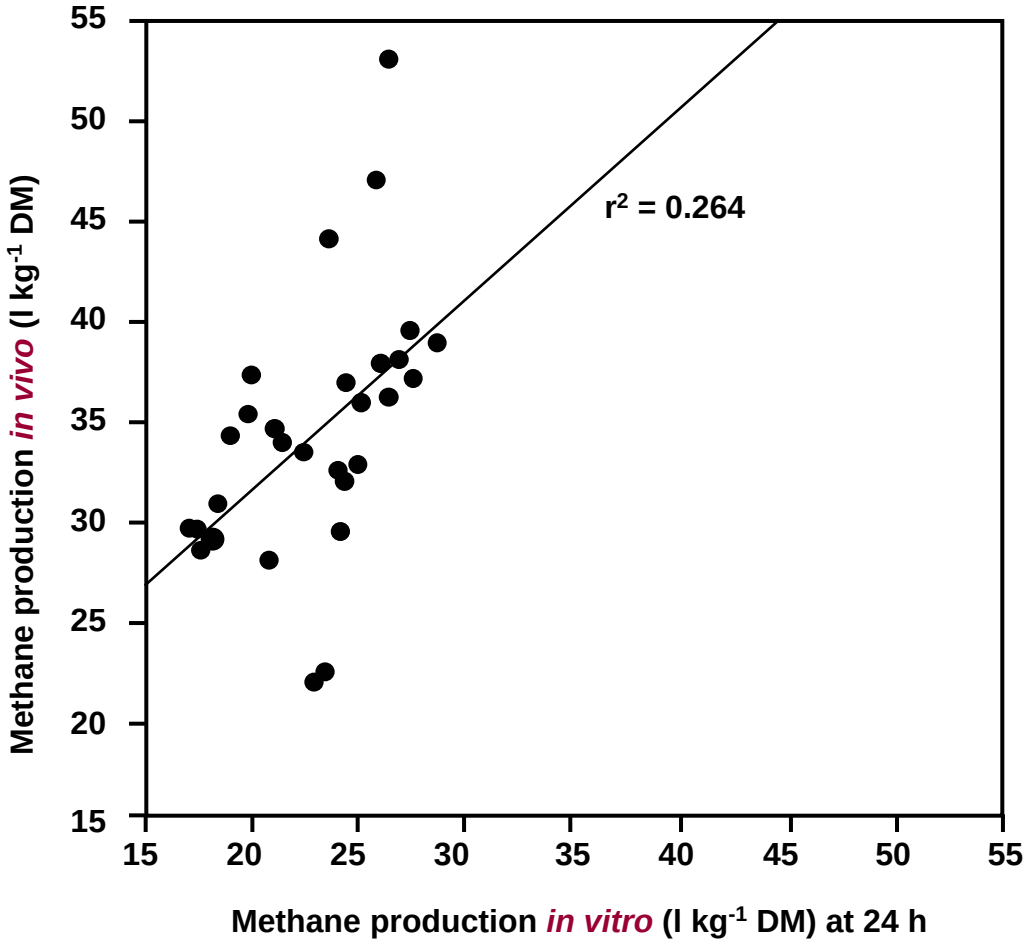


Y'_m = gross energy in methane (% of gross energy intake)

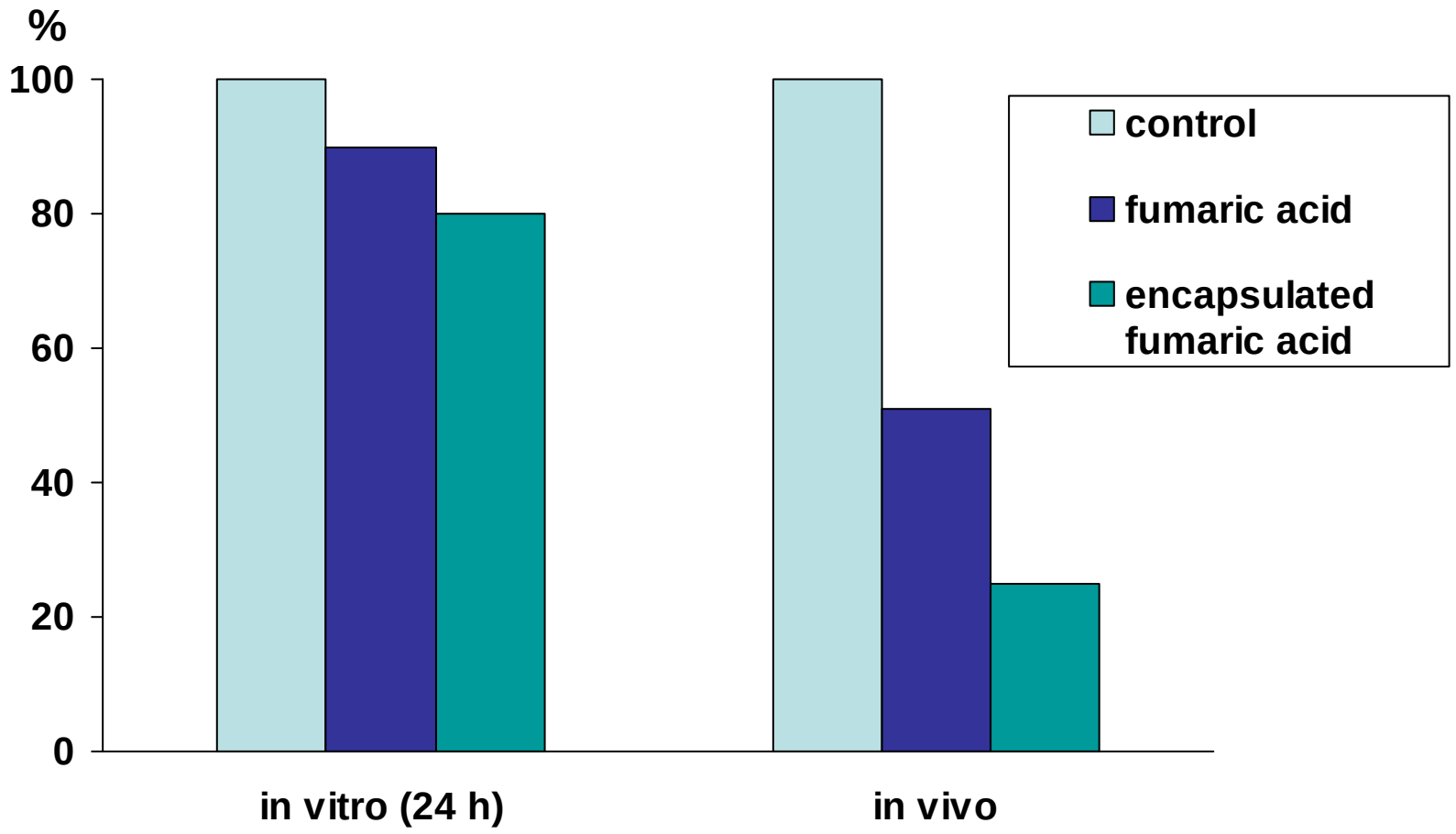
Some feed additives tested for reducing methane emissions

Additive	Effect on CH_4	Questions, problems, risks
Halogenated methane analogues	↓	• Potentially toxic • Possible transfer to edible animal products • Only transient effects • Too expensive • Not authorised in Europe
Ionophores (e. g. monensin)	↓	• Not authorised in Europe
Propionate enhancers (malate, fumarate)	(↓) - ↓↓	• Rumen pH ↓ (acidosis) • DMI ↓ • Onerous and expensive (about 2 kg for -10 % CH_4) • Long term *in vivo* experiments are needed
Lipids, some fatty acids	Depends on the type and amount	• Too high amounts depress fibre fermentation • Effects on fatty acid composition in animal products has to be considered • Further research is needed
Yeasts	In vitro: (↓) In vivo: ?	• Validation of specific strains *in vivo* is needed
Saponine, Tannine	Depends on the kind of plant	• A lot of different chemical compounds (-mainly from tropical plants) • Optimal dose ? • Can be negative for animal health, digestibility and feed intake • Long term *in vivo* experiments are needed
Plant extracts	Depends on the kind of plant	• Long term *in vivo* experiments are lacking

Relationship between methane produced *in vivo* and *in vitro* from a range of diets (Moss and Givens 1997)



Influence of fumaric acid and encapsulated fumaric acid on methane formation *in vivo* and *in vitro* (% of control, Wallace et al. 2006)



Proposal for three stages for assessing the CH_4 inhibition potential of feed additives in ruminants

1. ***In vitro*** **screening of various substances (if necessary with different rations)**
2. ***In vivo*** **experiments in target animals**
   a. **Short term (28 - 56 d)** with the most efficient substances on their effect on:
      - **acceptance**
      - **feed intake**
      - **rumen fermentation incl. CH_4-production**
   b. **Long term (total lactation/growing/fattening period)** recording
      - **animal performance** (feed intake, yields, feed conversion)
      - **health**
      - **quality/safety of milk/meat**
      - **CH_4-production**
      - **parameters of rumen fermentation during the experiment** (adaptation of microbial population?)