



## **The In-Vitro Gas Laboratory. Rumen and Cecum Carbohydrate Digestibility and Fractionation**

Hansen, Hanne Helene; Wahlgren, Maja Holm; Cornou, Cecile

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# The *In-Vitro* Gas Laboratory – Rumen and Cecum Carbohydrate Digestibility and Fractionation



Hansen, H.H., Wahlgren, M.H & Cornou, C.

Centre for Herd-oriented Education, Research and Development, Department of Large Animal Sciences, University of Copenhagen

## What?

The purpose of the laboratory is to provide facilities for research on carbohydrate fractionation, rumen or cecum digestibility and methane production.

## Why?

- Feed costs contribute 50-70% of variable costs of equine and bovine production
- Feed digestibility = Money
- Rumen acidosis/laminitis associated with feed digestibility / fiber content of diets
- The use of feed additives to manipulate digestibility in horses or cattle has become more common, but documented effects are scarce
- The use of feed additives to decrease methane production in cattle is not well documented
- Mitigating methane (CH<sub>4</sub>) production from ruminants is desired
  - Because CH<sub>4</sub> is an approx. 25 times more destructive greenhouse gas than carbon dioxide (CO<sub>2</sub>)
  - Because CH<sub>4</sub> production represents an energy loss
- Animal production, fiber digestion and CH<sub>4</sub> emissions should be considered together

## How?

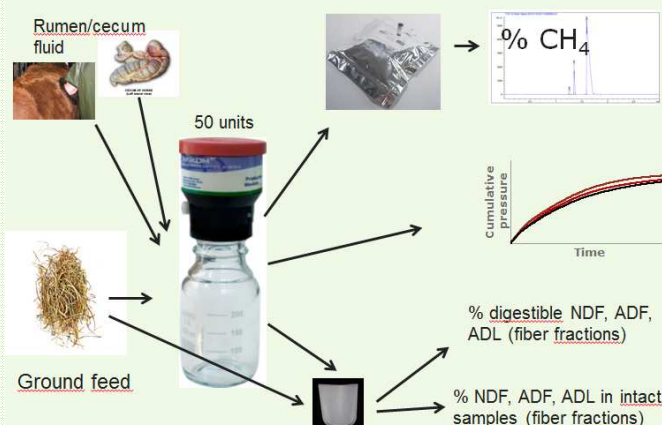
- Carbohydrate fractionation by sequential determination of neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL)
- Digestibility:
  - of dry matter or organic matter using a batch digestibility system
  - of dry matter or organic matter using the wireless in-vitro gas technique system
- Gas production kinetics minute by minute for 24, 36, 48 or 72 hours
- Methane quantification by gas chromatography

## How?

A schematic view of the processes:

### Research parameters

### Results



## Outputs:

- NDF, ADF and/or ADL contents of feed/rations
- ml total gas
- ml CH<sub>4</sub>
- Dry matter digestibility
- Organic matter digestibility
- Fiber fractions digestibility
- ml CH<sub>4</sub>/g DM
- ml CH<sub>4</sub>/g dDM
- ml CH<sub>4</sub>/g NDF
- ml CH<sub>4</sub>/g dNDF
- Fermentation kinetics variables (rate of degradation, maximum rate, "half-time" of degradation)

## Outcomes:

- Ansah T, Osafo E L K and Hansen H H 2013: Variety, harvest date after planting and plant fraction of Napier grass influence *in vitro* gas production. *Livestock Research for Rural Development*. Volume 25, Article #78. [www.lrrd.org/lrrd25/5/ansa25078.htm](http://www.lrrd.org/lrrd25/5/ansa25078.htm)
- Cornou, C., Storm, I. M. L. D., Hindrichsen, I. K., Worgan, H., Bakewell, E., Ruiz, D. R. Y., Abecia, L., Tagliapietra, F., Cattani, M., Ritz, C. & Hansen, H. H. A ring test of a wireless in vitro gas production system. 2013: *Animal Production Science* 53(6):585-592
- Hansen HH, Storm, IMLD, Sell AM, 2013: Effect of biochar on in vitro rumen methane production. *Acta Agriculturae Scand Section A* 62(4):305-309
- Tagliapietra F, Cattani M, Hansen HH, Bittante G, Schiavon S 2013: High doses of vitamin E and vitamin C influence *in vitro* rumen microbial activity. *Animal Feed Science and Technology*
- Tagliapietra F, Cattani M, Hindrichsen IK, Hansen HH, Colombini S, Bailoni L et al. 2012: True dry matter digestibility of feeds evaluated *in situ* with different bags and *in vitro* using rumen fluid collected from intact donor cows. *Animal Production Science* 52(5):338-346.
- MSc project about Icelandic vs DV horses (feces)
- MSc student about Icelandic vs DV horses (cecum fluid)
- Visiting scientist from France, NorFeed cattle feed additives
- Internship student from France, about carbohydrate source and buffer pH
- Veterinary final project from Italy about carbohydrate source and buffer pH
- PhD student from Italy about carbohydrate source and rumen methane
- MSc project on extreme diets in sheep
- MSc project on biochar additives for methane reduction

For more information contact: Assoc. Prof. Hanne H. Hansen, [hh@sund.ku.dk](mailto:h hh@sund.ku.dk), +45 35333083