PRIFYSGOL ABERYSTWYTH UNIVERSITY

Sefydliad y Gwyddorau Biolegol, Amgylcheddol a Gwledig
IBERS ABERYSTWYTH
Institute of Biological, Environmental and Rural Sciences

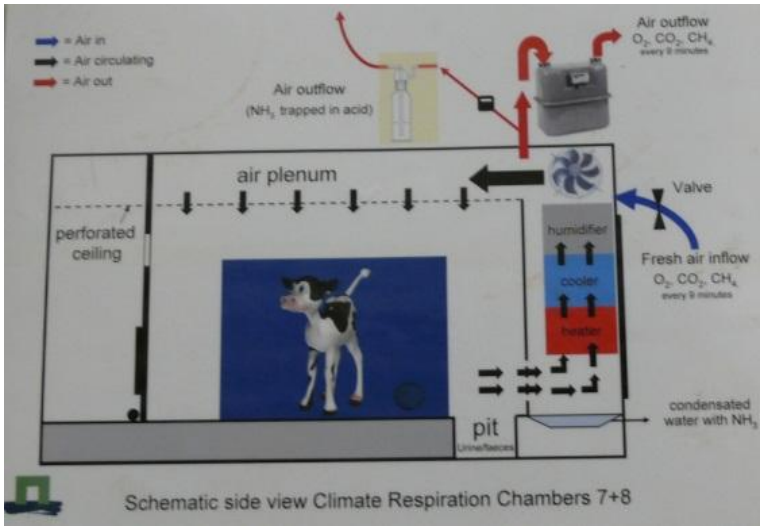
Lessons from SMEthane: Developing rapid in vivo screens to measure the effects of plant extracts on methane production

Kenton Hart

Introduction

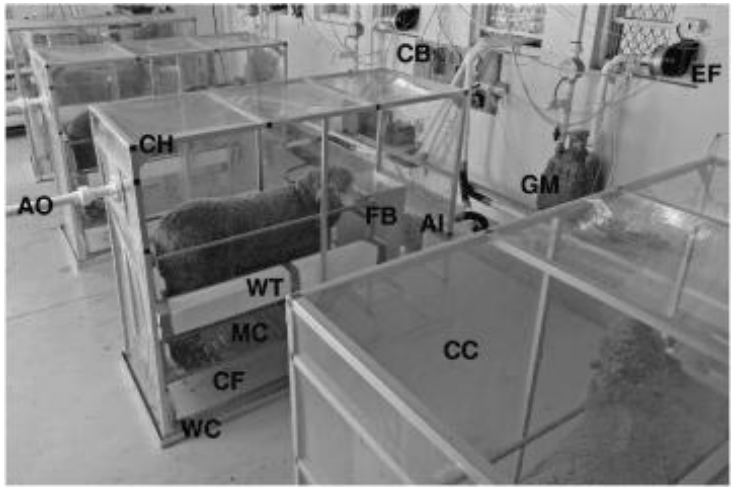
- *In vitro* cultures
  - Limited term
  - Provide a rapid initial screen
  - Large numbers and low cost
- *In vivo* experiments
  - Typically 21d adaptation, 7d sampling
  - Try to account for microbial adaptation
  - Low numbers and expensive

Methane measurements *in vivo*



- Animal calorimetry
- Gold standard
- Single animal
- Mass balance for gases
- Calculates energy partitioning
- Limited numbers and very expensive

Methane measurements *in vivo*



- Open circuit gas exchange
- Single animal
- Mass balance study
- Works using negative pressure
- Moderately priced
- Widely available

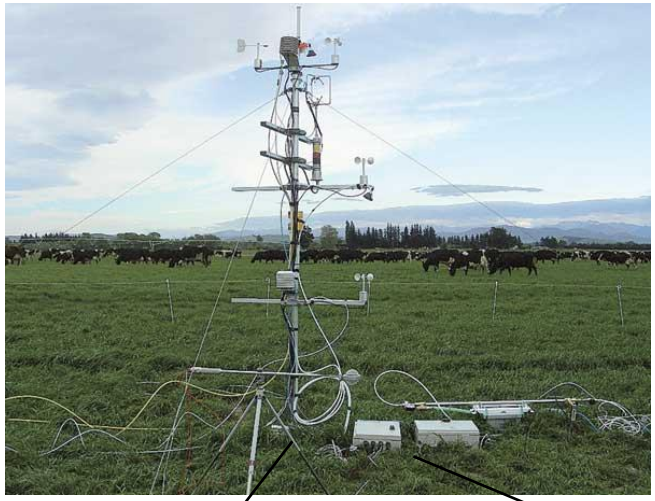
Methane measurements *in vivo*

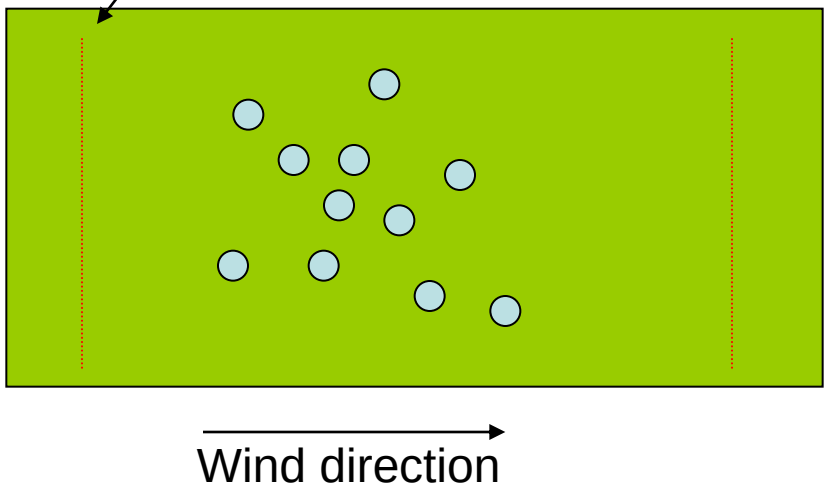
- Tents
- Measures groups of animals/individuals
- Mass balance study
- Works under negative pressure
- Needs power in fields
- Allows grazing

Methane measurements *in vivo*

- Tracer gas technique
- Allows larger numbers of individuals
- Can be adapted to barns
- Tracer gas emitted from bolus in rumen and captured in canister
- GWP is 24k that of CO_2
- High variability
- Samples can be stored for analysis

Methane measurements *in vivo*





- Micrometeorological
- Measure gases up and down stream of ruminants
- Calculate a mass balance
- Only measures 1 field
- expensive

Methodology

- Compounds pass *in vitro* screen
- Doses chosen by SME partner
- Design
  - 16 small ruminants
  - fed at maintenance
  - Individually penned
  - 5 d standard diet
  - 7 d standard + dose (control + 3 levels)
  - Last 2 d determine methane


AIRFLOW
Air Flow


ADC MGA-3000 SERIES MULTI-GAS ANALYSER
CH4
7.2PPM
Keypad Locked!
Remote Control Mode
ADC

Selected results: Organosulphourous compounds

	Dose in sheep ABER						
	0	1	2	3	s.e.d	P	Lin P
Intake, g/d	1190	1170	1170	1090	52.7	0.336	0.104
CH4, l/d	29.3	27.2	25.9	22.9	2.90	0.224	0.046
CH4, l/kgI	24.8	23.3	22.1	21.1	2.05	0.350	0.093
	Dose in goats CSIC						
	0	1	2	3	s.e.d	P	Lin P
Intake, g/d	659	712	689	454	39.9	0.071	n.d.
CH4, l/d	26.8	19.9	18.5	11.0	1.01	0.015	n.d.
CH4, l/kgI	36.5	27.1	27.9	24.1	1.35	0.046	n.d.

Please note that doses are not the same between goats and sheep

Further work

- Outstanding compounds are lined up for testing (CSIC and INRA)
- Outstanding data analysis to be completed
- All short term *in vivo* studies will be completed by November 2012

Positive outcomes

- Methane reductions can be observed
- No detrimental effects on animal health
- Allows a range of doses to be tested
- Limited cost screen
- Doses only limited by chamber availability

Less positive outcomes

- Both IBERS and CSIC had a low emitter
- Intake reduction observed
- No effects on performance
- Limited significant values

Conclusion

A short term in vivo screen has successfully been developed by the RTD consortium that means plant additives can be rapidly assessed in small ruminants to provide further justification for running more extensive long term studies