Methane phenotypes, measuring equipment and software comparison
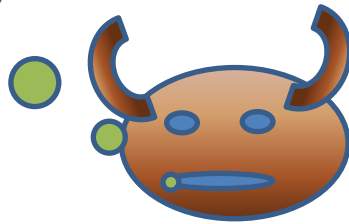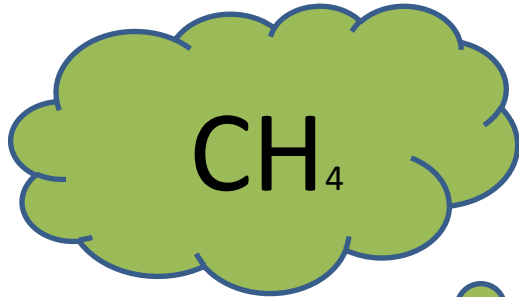
M Szalanski, G.F. Difford, J. Lassen & P. Løvendahl

Center for Quantitative Genetics & Genomics; Aarhus University; Denmark

EAAP 2016; Belfast; 29th August

mszalans@mbg.au.dk

Background

Aim

- Comparison between:
  - Two devices (two similar measuring methods)
  - Two types of input data
  - Two types of phenotypes

- Software development
  - New tool for generating phenotypes

Gasmet

"Agricultural Farm Niechłod".
"Agricultural Company Długie Stare sp. z o.o.", Wielkopolska, Poland.

Guardian

University of Nottingham.
Sutton Bonington, Leicestershire.

Input data

- Raw

- Morning background gas level extracted

Phenotypes

- Mean

- Background mean

- Milking as time interval

Mean vs background mean

Phenotype	Raw data		Morning background extracted	
	Guardian	Gasmet	Guardian	Gasmet
Mean	*Raw GU Mean*	*Raw GA Mean*	*Morning GU Mean*	*Morning GA Mean*
Background Mean	*Raw GU Backg. Mean*	*Raw GA Backg. Mean*	*Morning GU Backg. Mean*	*Morning GA Backg. Mean*

Materials

- 1407 milkings

- 56 cows

- 2 measuring methods

- 1 milking robot

"Wave" program
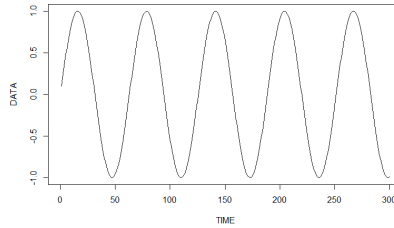
Phenotypes

Mean vs background mean

Phenotype	Raw data		Morning background extracted	
	Guardian	Gasmet	Guardian	Gasmet
Mean	0.34	0.44	0.37	0.44
Background Mean	0.35	0.43	0.35	0.43

Repeatability

Model: $Y_{M,BM} = \mu + Method_i + Cow_{ji} + error_{ijk}$

Guardian (GU) vs Gasmet (GA)

True correlation (within GU)

Phenotype	Raw GU Mean	Raw GU Backg. Mean	Morning GU Mean	Morning GU Backg. Mean
Raw GU Mean	1	0.90	0.95	0.89
Raw GU Backg. Mean		1	0.92	0.99
Morning GU Mean			1	0.92
Morning GU Backg. Mean				1

True correlation (within GA)

Phenotype	Raw GA Mean	Raw GA Backg. Mean	Morning GA Mean	Morning GA Backg. Mean
Raw GA Mean	1	0.99	~1	0.99
Raw GA Backg. Mean		1	0.99	~1
Morning GA Mean			1	0.99
Morning GA Backg. Mean				1

Guardian (GU) vs Gasmet (GA)

True correlation estimates (between GU and GA)				
Phenotype	Raw GA Mean	Raw GA Backg. Mean	Morning GA Mean	Morning GA Backg. Mean
Raw GU Mean	0.53	0.51	0.53	0.51
Raw GU Backg. Mean	0.45	0.44	0.45	0.44
Morning GU Mean	0.53	0.51	0.53	0.51
Morning GU Backg. Mean	0.45	0.45	0.45	0.45

Guardian (GU) vs Gasmet (GA)

CIA (Coefficient of Individual Agreement)

$$CIA = \frac{\text{difference of replicated measurements within a method}}{\text{difference between measurements from different methods}}$$

Guardian (GU) vs Gasmet (GA)

CIA (Coefficient of Individual Agreement)				
Phenotype	Raw GA Mean	Raw GA Backg. Mean	Morning GA Mean	Morning GA Backg. Mean
Raw GU Mean	0.51	-	-	-
Raw GU Backg. Mean	-	0.22	-	-
Morning GU Mean	-	-	0.39	-
Morning GU Backg. Mean	-	-	-	0.22

Guardian (GU) vs Gasmet (GA)

CIA (after data standardisation)				
Phenotype	Raw GA Mean	Raw GA Backg. Mean	Morning GA Mean	Morning GA Backg. Mean
Raw GU Mean	0.76	-	-	-
Raw GU Backg. Mean	-	0.73	-	-
Morning GU Mean	-	-	0.75	-
Morning GU Backg. Mean	-	-	-	0.73

Conclusions

- Interchangeability

- Gasmet vs Guardian

- New phenotypes need to be developed

- Software development

Thank you for your time

Guardian (GU) vs Gasmet (GA)

CIA (Coefficient of Individual Agreement)

i - subject
j – method
k - measurement

$$CIA = \frac{E(Yijk - Yijk')2/2}{E(Yijk - Yij'k')2}$$