Business Meeting: **Pig Commission EAAP**
September 7 2004 ***BLED***

Energy Evaluation Systems in Europe

C . Wenk

Energy Evaluation Systems

Contributions at the EAAP Energy Metabolism Symposium 9.2003

Aumaître and Rodehutscord		Discussion leaders	
S. Boisen	Denmark	J. van Milgen	France
H. Fandrejewski	Poland	A. Susenbeth	Germany
W. Gerrits	Netherlands	C. Wenk	Switzerland
V. Halas	Hungary		
J. Heger	Slovakia		
J.E. Lindberg	Sweden		

Contributions at the EAAP Energy Metabolism Symposium 9.2003

Working group

C. Wenk	Switzerland
M. Rodehutscord	Germany
J. van Milgen	France

Harmonisation of Energy Evaluation Systems for Pigs Full version 2.2004

Caspar Wenk / Hans Peter Pfirter
Jaap van Milgen
Markus Rodehutscord

Aimé Aumaître
President of the European Association of Animal Production (EAAP)

Completed questionnaire before
March 31 2004

Harmonisation of Energy Evaluation Systems for Pigs Full version 2.2004

1. **Short description of the basis of your energy system**

1.1. Energy requirements
1.2. Feed evaluation

2. **Determination of the energy and nutrient content**

2.1. Gross energy (heat of combustion)
2.2. Use of "digestible nutrients" in your EES

3. **Experiments with animals**

3.1. Digestibility trials
3.2. N-, C- and Energy balance studies

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4. **Examples of calculation of your EES**

4.1. Energy requirements
4.2. Energy content of feedstuffs:
Calculate energy content of following feedstuffs
4.3. Energy content of diets:
Calculate energy content of following diets

5. **Your expectations in a harmonization of EES in Europe**

Energy Evaluation Systems

Responses to the questionnaire of February 2004

Germany	Rostock	Chudy	in detail
Germany	GFE Frankfurt	Rodehutscord	in detail
Austria	Boku Wien	Windisch	partly
Netherlands	CVB Lelystad	Blok	in detail
Germany	FNB Rostock	Jentsch	in detail
France	INRA Rennes	Noblet	partly

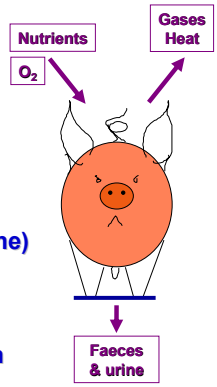
Steps of Energy Utilization

Gross energy

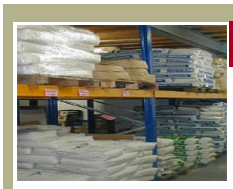
Digestible energy — E (feces)

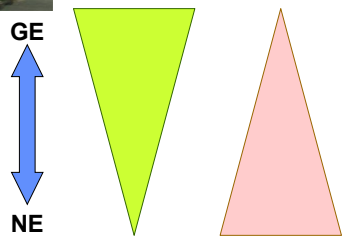
Metabolizable energy — E (urine, methane)

Net energy production (retained energy, lactation, . . .) — Heat production

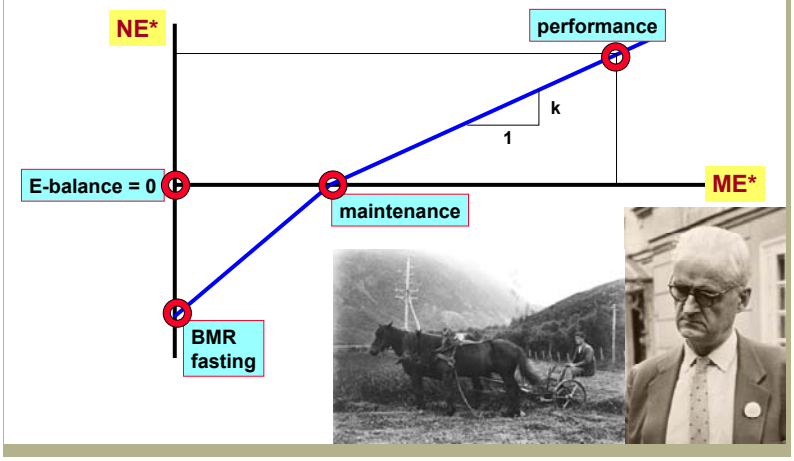


From Gross Energy to Net Energy

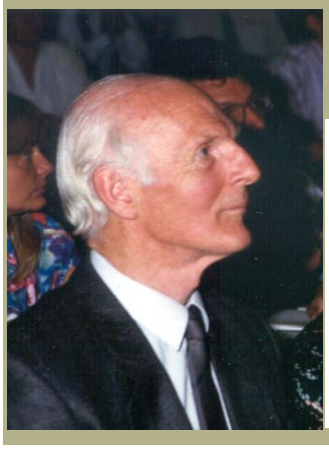




Model of the Energy Balance



Aren van Es:



ME_M

$k_p, k_f, k_g, k_l, \ldots .$

$NE_L, \ldots , NE_g$

Transformation of Metabolizable Energy into Energy in the Form of ATP and Growth (van Es, 1974)

Theoretical utilization of metabolizable energy (ME) in in the form of protein, carbohydrates and fat for the formation of ATP, protein and fat

ME in Form of	ATP[1]	protein retention[2]	fat retention[2]
Protein	0.81[3]	0.87	0.50 - 0.60
	0.75[4]		
CHO	1.00	-	0.75 - 0.80
Fat	0.95	-	≥ 0.90
Experimental values		0.4 - 0.6	0.7 - 0.9
Growth			2/3

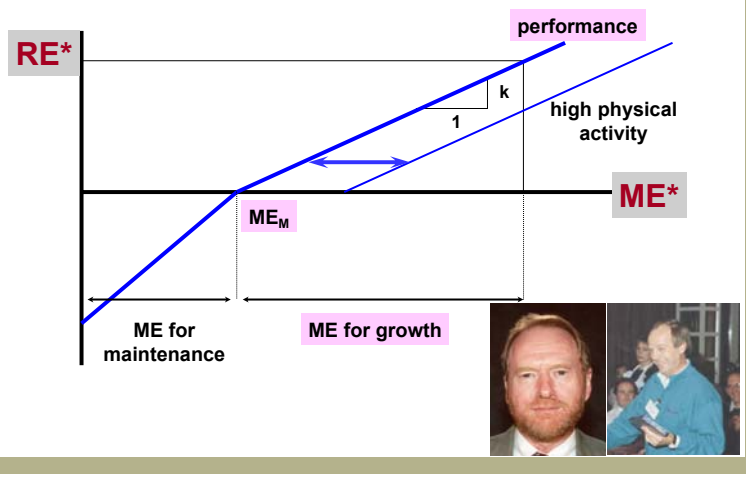
1 relative to CHO
2 partial efficiency of ME utilization
3 formation of urea
4 formation of uric acid

Partial Efficiencies ME Utilization

▪ Maintenance	k_E	= 0.70 - 0.80	∅ 0.80
▪ Growth			
Fat retention	k_F	= 0.70 - 0.80	∅ 0.75
Protein retention	k_P	= 0.40 - 0.80	∅ 0.55
total	k_V	= 0.60 - 0.75	∅ 0.65
▪ Gravidity			
Uterine growth	k_U	= 0.20 - 0.40	∅ 0.40
Maternal growth	k_{vm}	= 0.75 - 0.80	∅ 0.75
total	$k_{GR, V}$	= 0.70 - 0.75	∅ 0.70
▪ Lactation	k_L	= 0.70 - 0.75	∅ 0.72
Energy mobilization from body tissues (mainly fat) for milk formation			∅ 0.88

(NOBLET und ETIENNE, 1987)

Physical Activity and Intermediate Energy Utilization



Energy Evaluation Systems

Gross energy	
Digestible energy	Pig (CH, UK?????, I, USA, Can, . . .)
Metabolizable energy	Beef Pig (D, S, . . .) Poultry Man
Net energy (retained energy)	Dairy cow / beef (CH, F) Pig (DK, F, NL, UK, . . .)

Energy Evaluation Systems: Where are the weaknesses ?

Feed

Diets - individual feedstuffs
Feed analysis: fibers, others
Digestible nutrients
Feed additives
ANF
Techn. treatment
Additivity
. . .

Animal

Genetic potential
Feed intake - performance
Physical activity
Environment – management
Health
. . .

Energy Evaluation Systems: Where are the weaknesses ?

	Feed	Animal
Gross energy	Composition Nutrient digestibility Feed additives etc.	Age
Digestible energy	What is a digestible nutrient?	Performance Feed intake N-retention
Metabolizable energy	There are only about 6 institutes that perform energy metabolism studies in Europe	N-retention Environment Health etc.
Net energy (retained energy)		

Harmonisation of Energy Evaluation Systems for Pigs: Reduced version 1.9.2004

http://www.nb.inw.agrl.ethz.ch/pub_frame_nb.html

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