

### Ernæring af svin

Fagdyrlægekursus, 13-16. november 2006  
 Per Saugbø, vildt fugl, PhD, dr. med. vet., prof., vildt fugl for Human Ernæring, KVL

8.00-8.15	Introduktion	- 4 grupper
8.15-8.45	Sæer 1 (case foderstruktur, E indhold)	
8.45-9.15	Sæer 2 (lebling, dragtighed, laktation)	- Foredrag, teori øvelser, case øvelser
9.15-9.30	Case opgaver, grupper	
9.30-10.00	Kaffepause	
10.00-10.30	Pattegrise 1 (udvikling, fordøjelse)	- Appetitvækker til øvrige indlæg
10.30-11.00	Pattegrise 2 (mælk, diarreer)	
11.00-11.30	Case opgaver, grupper	
11.30-12.00	Sæer-pattegrise, opsamling	- Generel viden, snarere end specifik viden
12.00-13.00	Frøkost	
13.00-13.45	Smågrise 1 (case, udvikling, fodring)	
13.45-14.15	Smågrise 2 (travningsproblemer)	
14.15-14.45	Case opgaver, grupper	
14.45-15.15	Kaffepause	
15.15-15.30	Smågrise, opsamling	
15.30-16.00	Slagtevin 1 (case, vækst - energi, P)	
16.00-16.45	Slagtevin 2 (appetit, sygdom)	
16.45-17.15	Case opgaver, grupper	
17.15-17.45	Slagtevin, opsamling	
17.45-18.30	Klinisk ernæring, grisen som model	

### Grisen som model for human ernæring?

### Rodent gastrointestinal tract

Rat (*Rattus norvegicus*)  
Body Length: 17 cm

### Mave-tarm anatomi - a nøglefaktor for species-specifik ernæring

**PIG (omnivore)**

**HORSE (herbivore)**

**MINK (carnivore)**

Similar tissue/cell metabolism

### Grise modeller – hvilke grise?

**Mini pig**

Slow growth  
Fat growth  
High viscera/body  
More herbivorous?  
More mature?  
Stress-resistant?

**Conventional**

Rapid growth  
Protein growth  
Low viscera/body  
More omnivorous?  
Less mature?  
Stress-sensitive?

### Gastrointestinal problems after 3 months feeding:

**High fat – low fiber:**

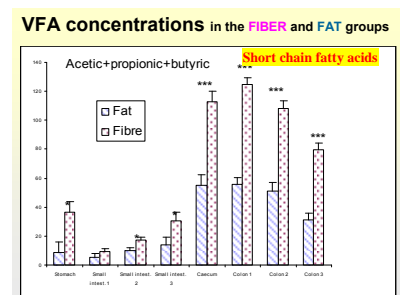
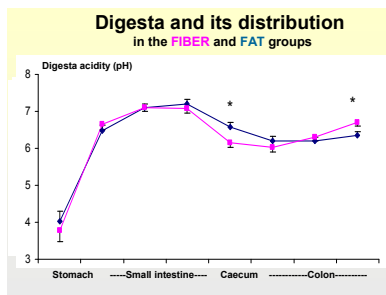
Stomach: Keratinization and mild erosive damage (early ulcer)

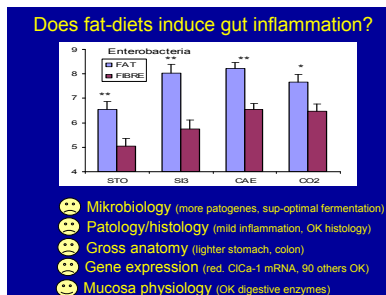
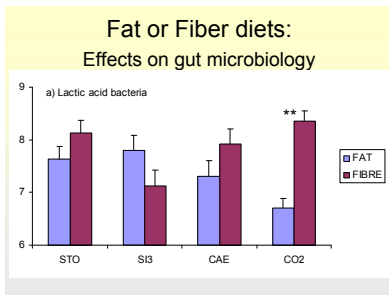
**Low fat – high fiber:**

Caecum: Red-brown/yellow inflamed mucosal surfaces  
Colon: Sticky food material with much epithelial contact

### Diet composition:

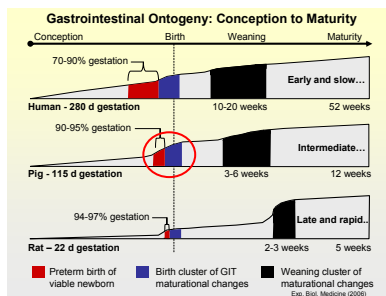
High fiber - low fat - high Ca:										Low fiber - high fat - low Ca:									
Animal	Protein	Fat	Starch	Cellulose	Ca	Fiber	Phosphorus	Animal	Protein	Fat	Starch	Cellulose	Ca	Fiber	Phosphorus				
Human	0.210	0.14	16.40	0.70	0.33	84.86	12.4	Mouse	0.300	0.38	22.88	0.88	0.13	35.53	0.21				
Pig	0.070	0.27	5.86	0.30	0.05	15.33	2.28	Swine	0.100	0.14	15.40	2.10	0.80	0.00	16.80				
Sheep	0.087	0.11	37.80	2.20	0.30	22.00	1.75	Human	0.100	0.14	15.40	2.10	0.80	0.00	16.80				
Sheep	0.225	0.19	8.89	0.54	1.80	136.0	0.00	Human	0.300	0.38	22.88	0.88	0.13	35.53	0.21				
Human	0.100	0.12	17.58	0.70	0.40	87.25	0.75	Human	0.300	0.38	22.88	0.88	0.13	35.53	0.21				
Sheep	0.100	0.11	7.35	0.81	1.60	83.70	0.30	Human	0.300	0.38	22.88	0.88	0.13	35.53	0.21				
Sheep	0.080	0.08	0.00	0.00	0.00	0.00	0.00	Human	0.300	0.38	22.88	0.88	0.13	35.53	0.21				
Human	0.080	0.08	0.00	0.00	0.00	0.00	0.00	Human	0.300	0.38	22.88	0.88	0.13	35.53	0.21				
Human	0.070	0.08	2.10	0.34	1.00	35.00	0.00	Human	0.300	0.38	22.88	0.88	0.13	35.53	0.21				
Human	0.070	0.08	2.10	0.34	1.00	35.00	0.00	Human	0.300	0.38	22.88	0.88	0.13	35.53	0.21				





### Grisen som model for ernæring af børn?

Per Sangild, Institut for Human Ernæring, KVL, København

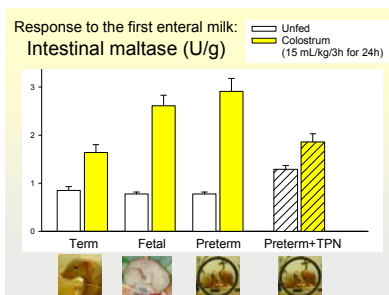


### Ændring i ernæring ved fødsel:

Parenteral ernæring in utero vs Enteral ernæring ex utero

Fødsel: Am.væske, Endokrinologi, Oral føde, Mikroflora, Metabolisme, Circulation

Hvordan tilpasses mave-tarm?

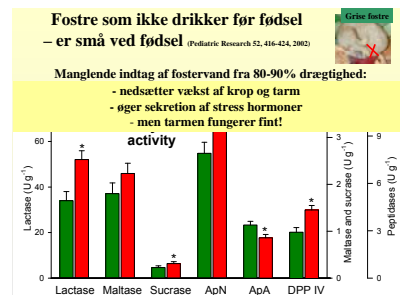


### Fodring af fostret før fødsel?

3 grise per kuld, 75-95% drægtighed, Fødsel ved kejsersnit

Katetre indsat i hals-arterie under bedøvelse

Bldprøver og fodring



### Tarmens respons på mælkeerstatning:

Mælkeerstatning

PRETERM erise

OK

Problem!

OK

### Necrotising enterocolitis in preterm pigs

Gastroenterology, 2006

### Necrotiserende enterocolitis (NEC) in præmature børn og grise:

Barn

Grise

Villus areal

Peptidaser

IgG's, IL's

Kortisol, GLP-2?

Flora diversitet

NOS, Arg.

DÅRLIG MÆLK & MIKROFLORA

J. Nutr. 135, 2006  
Am. J. Physiol. 289, 2005  
Gastroenterology, 130, 2006

### Mikroflora + dårlig diæt → NEC

Vaginal or Caesarean - Conventional		Germ free (sterile)
Colostrum	Formula	Formula
	Degrees of atrophy & dysfunction	Happy gut!
Pig NICU		

Gastroenterology | 130, 2006

### Mikrobiel diversitet (T-RFLP) efter fødsel:

	- NEC 20%	Kejsersnit COLOSTRUM
	Lav diversitet, langsom kolonisering - NEC 50%	Kejsersnit FORMULA
	- NEC 20%	Vaginal COLOSTRUM
	Høj diversitet, hurtig kolonisering - NEC 50%	Vaginal FORMULA

### Hvordan hindres NEC i præmature?

+GLP-2? +EGF?

Prox. intestinale hæmorrhage

Small intestinal necrosis

Caecum-colon necrosis

**Reduceret NEC:**

- ✓ Kolostrum, ingen TPN
- ✓ Sterile forhold
- (✓) Amnion væske
- (✓) Probiotika

haemorrhage

PH #35, COL SOW 6/2 30.06.04

Caecum-colon hæmorrhage

### NEC - perinatal gut mal-adaptation peak

Mucosal separation

NEC

Necrosis

Perforation

Bacterial overgrowth

Hypothermia

Ischaemia

Haemorrhage

Inflammation

Malabsorption

Maldigestion

Dystmotility

Clinical NEC diagnosis