07/11/2018

Řešení poodstavových průjmů a edémové choroby

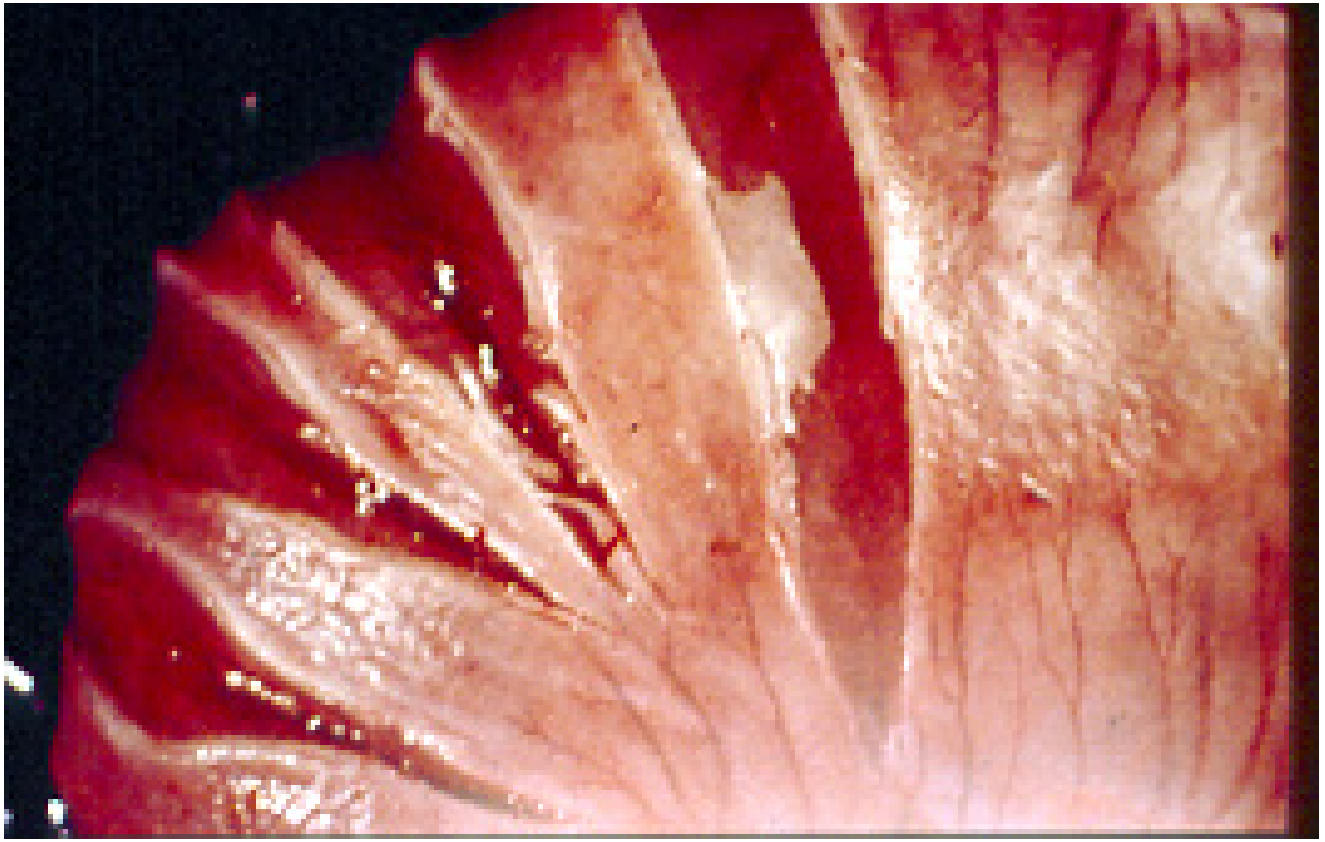
E. Marco

Marco vetgrup; SLP

Poodstavový průjem (PWD)

Foto: Rafael Servacal
http://servacal.blogspot.com.br/2013/11/enterotoxemia-por-e-coli.html

Edémová choroba



Osnova

- *E. coli*
- Predispoziční faktory
- Kontrolní opatření

Poodstavový průjem

Table1. *Microbial species detected in intestinal content and faeces of recently weaned and fattening pigs aged 28–75 days with diarrhoeic syndrome.*

4	*Clostridium* spp	31	4.1
5	*Lawsonia intracellular is*	17	2.2
6	*E. coli (SEPEC)*	14	1.8
7	*Salmonella* Enteritidis	11	1.5
8			0.8
9			0.4
10			0.5

- F4: 92 % izolátů u prasat s průjmem v průběhu prvního týdne
- V dalších týdnech převážně F18

- 87,4 % *E. coli* F18
- 12,6 % *E. coli* F4

M. Lyutskanov (2011). *Epidemiological characteristics of post-weaning diarrhoea associated with toxin-*

Problémy s *E.coli* po odstavu

Serogrupo	Fimbria o Pili	Toxina	Hemolisina
O8	K88 (F4)	LT, STb+/-STa	+
O149	K88 (F4)	LT, STb+/-STa	+
O157	K88 (F4)	LT, STb+/-STa	+
O138	F18ab, F18ac	Sta, STb +/- Stx2e	+
O139	F18ab	Sta, STb +/- Stx2e	+
O141	F18ac	Sta, STb +/- Stx2e	+
O157	F18ac	Sta, STb +/- Stx2e	+

Francis, DH. Enterotoxigenic *E.coli* infection in pigs and its diagnosis. *J.Swine Health Prod.* 2002; 10(4): 171-175

Predispoziční faktory

Hampson a kol. (1985) zjistili ETEC 0149 (Abbotstown) u 28 % odstavených selat ve skupině **bez klinických příznaků průjmu**

Table 2: Least squares means and standard error of the means (SE) for weights and average daily gain of Mixed and Control pigs housed in Rooms A and B*

		Mixing effect		Room effect		Gender effect	
		Mixed	Control	A	B	Female	Male
		n = 72	n = 72	n = 72	n = 72	n = 72	n = 72
Body weight (SE) (kg)							
Birth		1.64 (0.32)	1.50 (0.35)	1.54 (0.30)	1.58 (0.30)	1.53 (0.32)	1.59 (0.36)
10 days		3.54 (0.76)	3.51 (0.66)	3.73^{a} (0.68)	3.30^{b} (0.74)	3.48 (0.71)	3.57 (0.71)
20 days		5.80 (0.14)	5.58 (0.88)	6.19^{a} (0.11)	4.94^{b} (128)	5.59 (0.12)	5.76 (0.11)
Weaning†	A	7.91^{a} (0.21)	7.51^{a} (0.16)	NA	NA	7.15 (0.15)	7.31 (0.12)
	B	5.23^{b} (0.13)	6.61^{c} (0.17)	NA	NA		
40 days		9.09 (0.17)	9.47 (0.18)	9.87^{a} (0.16)	8.48^{b} (0.19)	9.16 (0.18)	9.42 (0.16)
50 days		11.2 (0.23)	12.1 (0.25)	12.3^{a} (0.22)	10.8^{b} (0.28)	11.5 (0.25)	12.0 (0.24)
58 days (final)		13.6 (0.30)	14.5 (0.36)	15.6^{a} (0.32)	12.2^{b} (0.34)	14.0 (0.34)	14.2 (0.33)
Average daily gain (SE) (g/d)							
Birth-weaning	A	248^{a} (6.9)	240^{a} (5.1)	NA	NA	228 (5.1)	237 (4.3)
	B	148^{b} (6.3)	231^{a} (6.9)	NA	NA		
Weaning-final		211 (7.1)	221 (8.1)	224 (7.1)	204 (8.7)	215 (7.6)	220 (8.2)

* In Room A and Room B, three male and three female focus pigs were selected from each Mixed and Control litter (n = 72 pigs, three males and three females per litter, 12 litters per treatment). Focus pigs were weighed at birth and at 10, 20, 28 (weaning), 40, 50, and 58 days of age. Pigs were mixed as described in Table 1 and weaned at 28 days of age, and the experiment ended when they were 58 days of age.

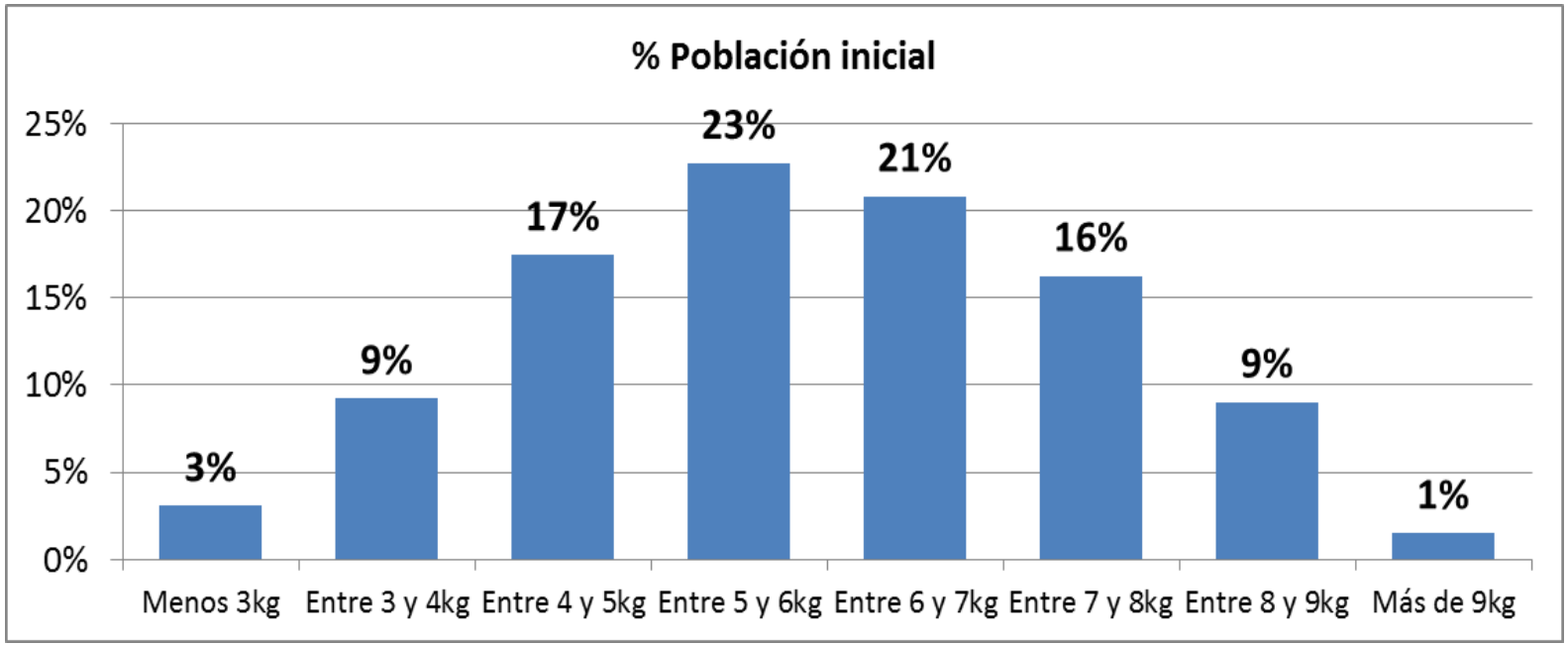
† Significant interaction between mixing and room effects ($P < .05$; least squares differences).

^{abc} Means with different superscript letters within the same effect and parameter differ ($P < .05$; least squares differences)

NA = not applicable.

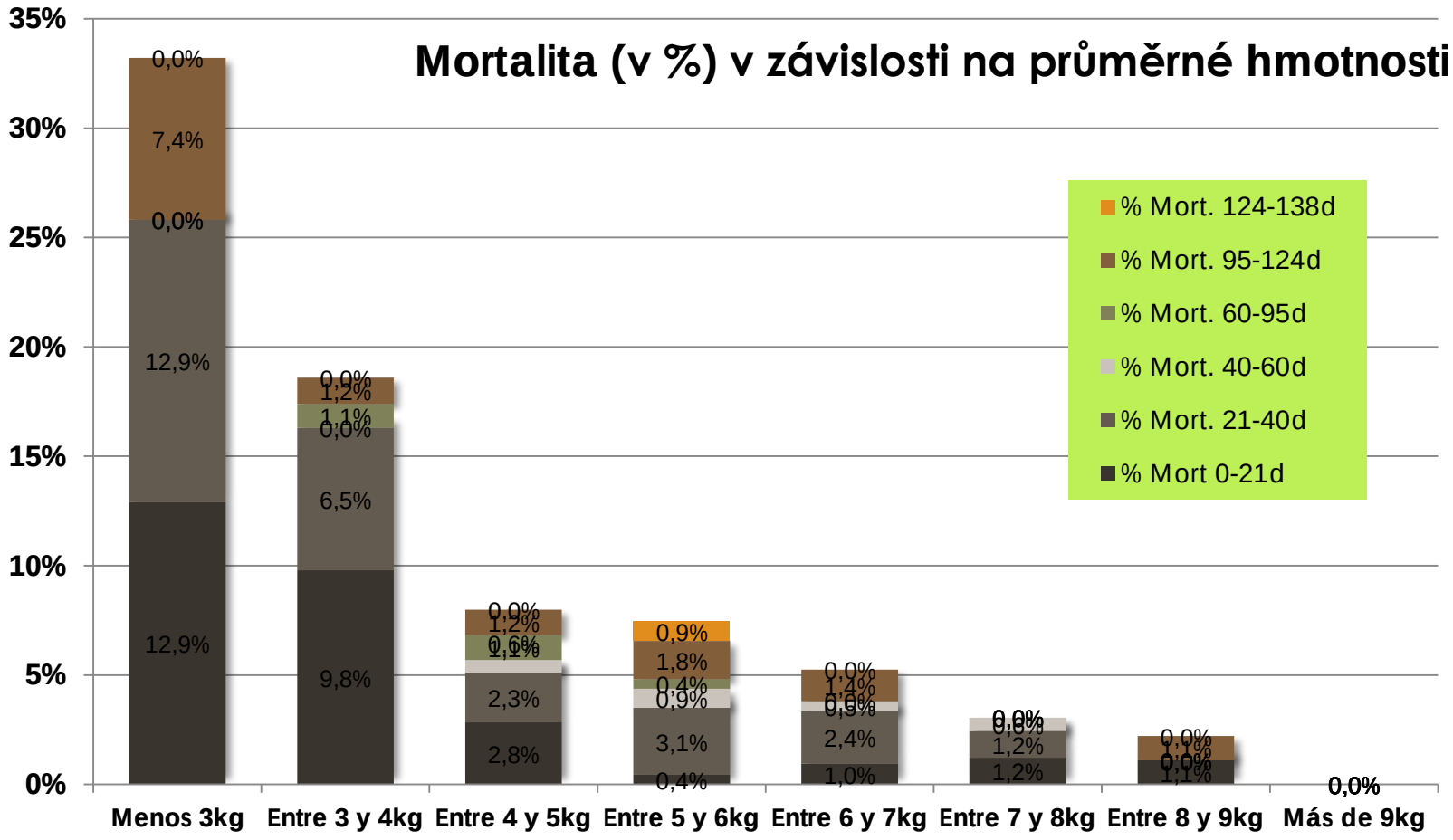
Quiñonero, J, *et al.* (2012). Effect of mixing piglets affected by E.coli diarrhoea on growth and welfare responses. J. Swine health Prod. 20(5):216-222

Selata: hmotnost při odstavu



Kvalita selat předurčuje výsledky

A. Vidal, 2015


Mortalita (v %) v závislosti na průměrné hmotnosti
35%
30%
25%
20%
15%
10%
5%
0%
% Mort. 124-138d
% Mort. 95-124d
% Mort. 60-95d
% Mort. 40-60d
% Mort. 21-40d
% Mort 0-21d
0,0%
7,4%
0,0%
12,9%
12,9%
0,0%
1,2%
1,1%
0,0%
6,5%
9,8%
0,0%
1,2%
0,6%
1,1%
2,3%
2,8%
0,9%
1,8%
0,4%
0,9%
3,1%
0,4%
0,0%
1,4%
2,4%
1,0%
1,2%
1,2%
0,0%
1,1%
0,0%
0,0%
Menos 3kg
Entre 3 y 4kg
Entre 4 y 5kg
Entre 5 y 6kg
Entre 6 y 7kg
Entre 7 y 8kg
Entre 8 y 9kg
Más de 9kg

A. Vidal, 2015

Predispoziční faktory

Vyšší riziko PWD je spojeno s:

- vyšším **počtem prasnic** (P = 0,02)

Taina M Laine, Tapani Lyytikäinen, Maija Yliaho and Marjukka Anttila. *Risk factors for post-weaning diarrhoea on piglet producing farms in Finland.* Acta Veterinaria Scandinavica 2008, 50:21

Predispoziční faktory

Vyšší riziko PWD je spojeno s:

- vyšším **počtem prasnic** (P = 0,02)
- **omezeným příjmem krmiva** (P = 0,02): krmení 3 a vícekrát/den v porovnání s krmením ad libitum

Taina M Laine, Tapani Lyytikäinen, Maija Yliaho and Marjukka Anttila. *Risk factors for post-weaning diarrhoea on piglet producing farms in Finland*. Acta Veterinaria Scandinavica 2008, 50:21

Vztah mezi nízkým příjmem krmiva v průběhu prvního dne po odstavu a výskytem průjmů

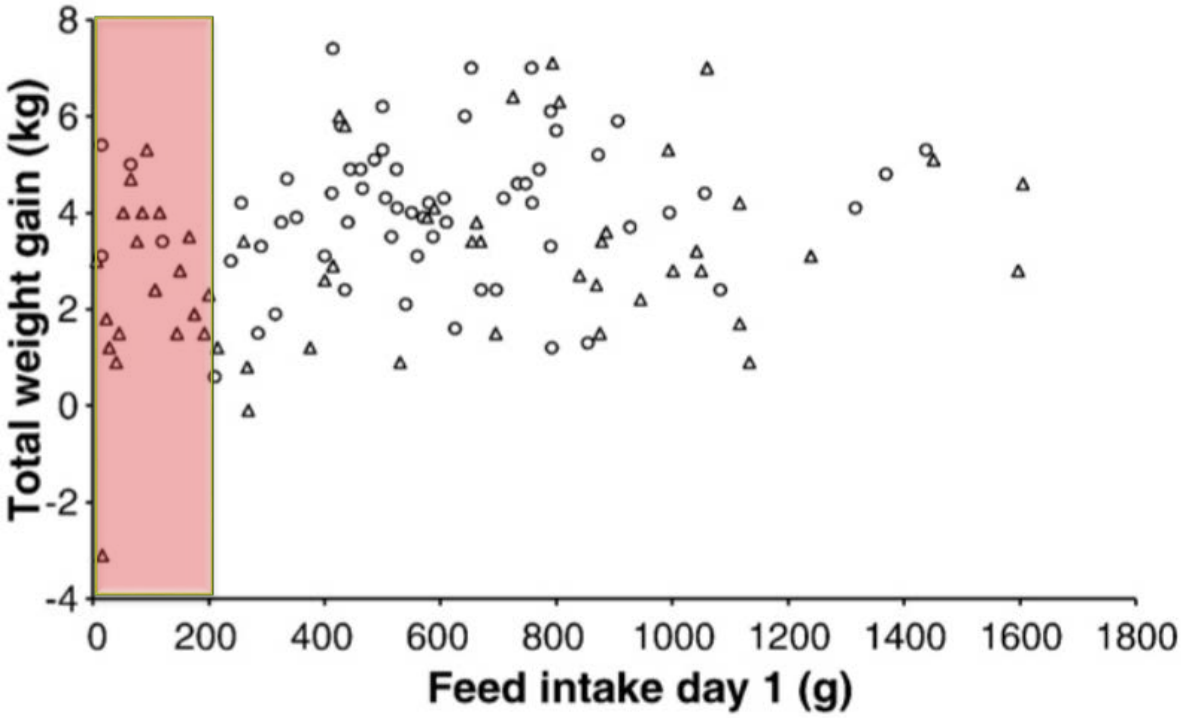
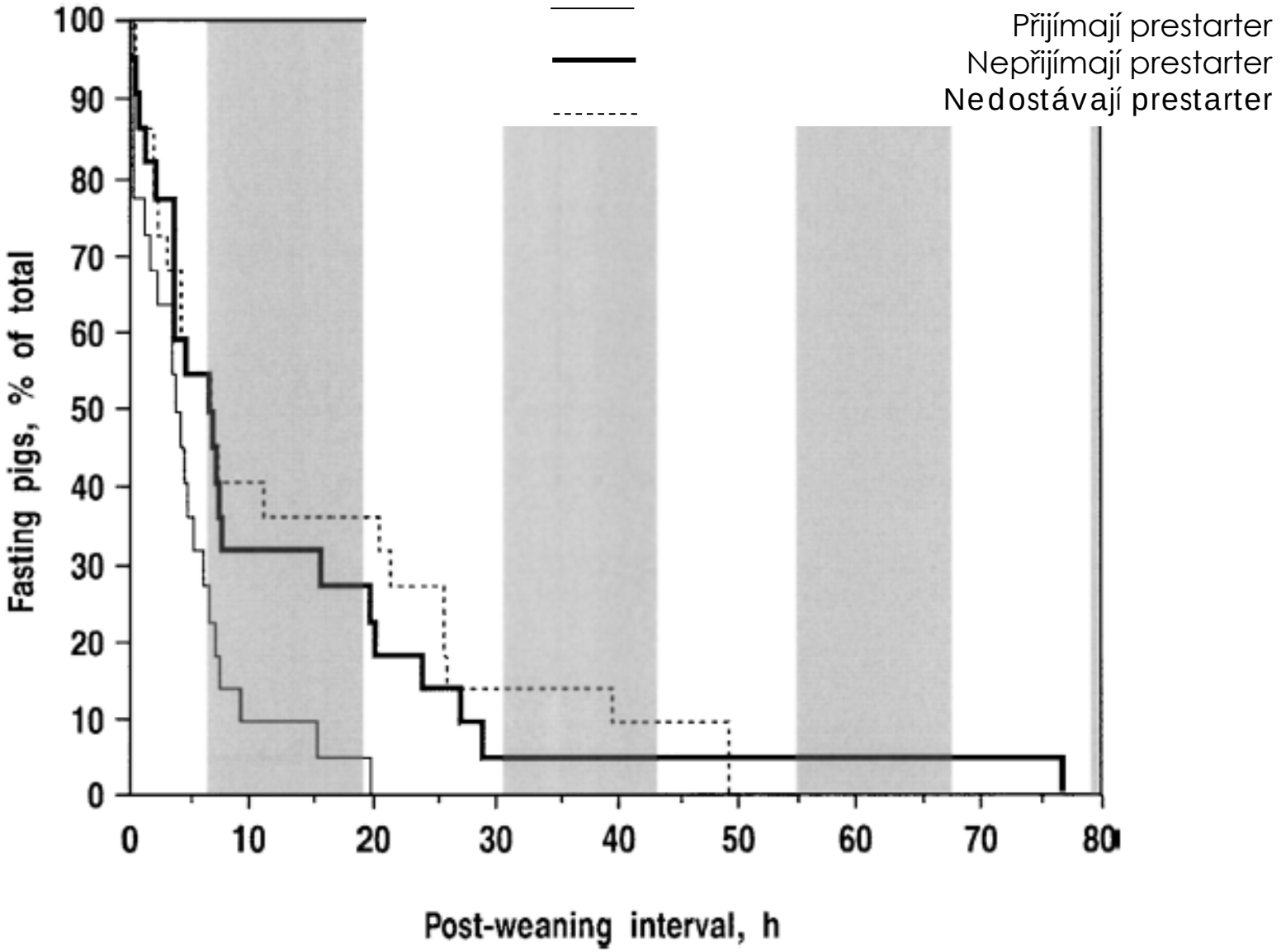


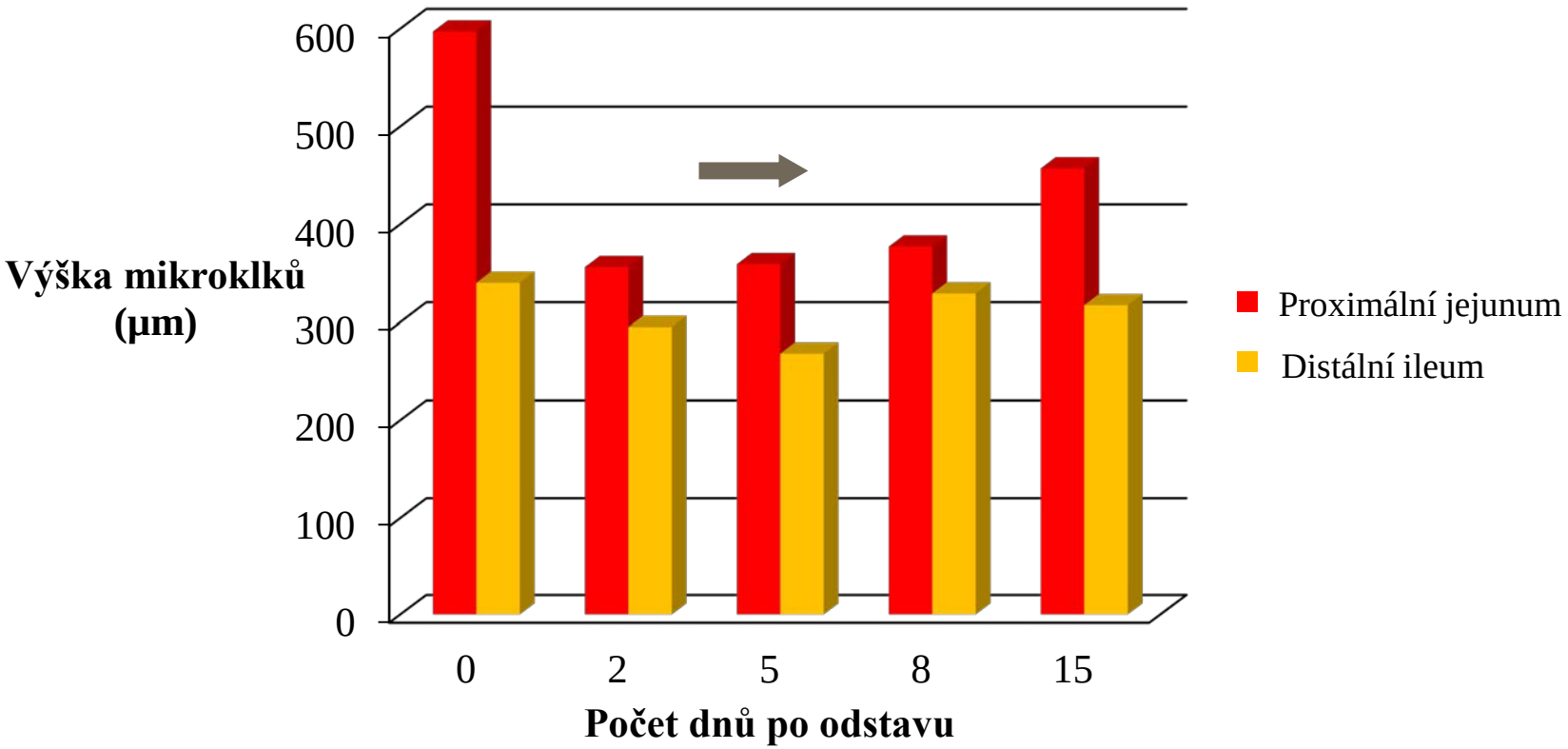
Fig. 3. Total weight gain during the 10-day experimental period as a function of feed intake during the first day after weaning in two clusters of piglets, i.e. piglets developing a diarrhoea-like condition (triangles) and piglets with only a slight increase in faecal score (circles) (see text for details). All piglets were included regardless of dietary treatment and inoculation.

M.T. Sørensen et al. / Livestock Science 123 (2009) 314–321



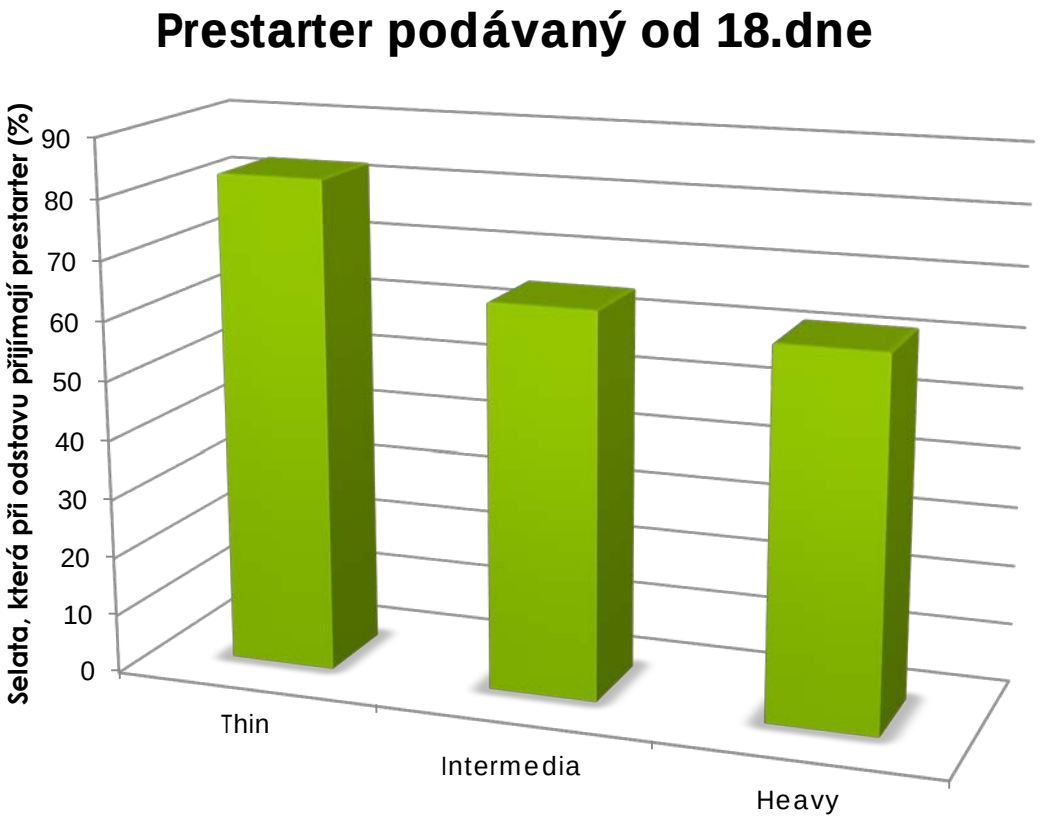
Brunix, et al. *Effect of creep-feed consumption on individual feed intake characteristics and performance of group housed weanling pigs*. J. Anim. Sci. 2002, 80: 1413-1418

Vliv odstavu na střevní klky



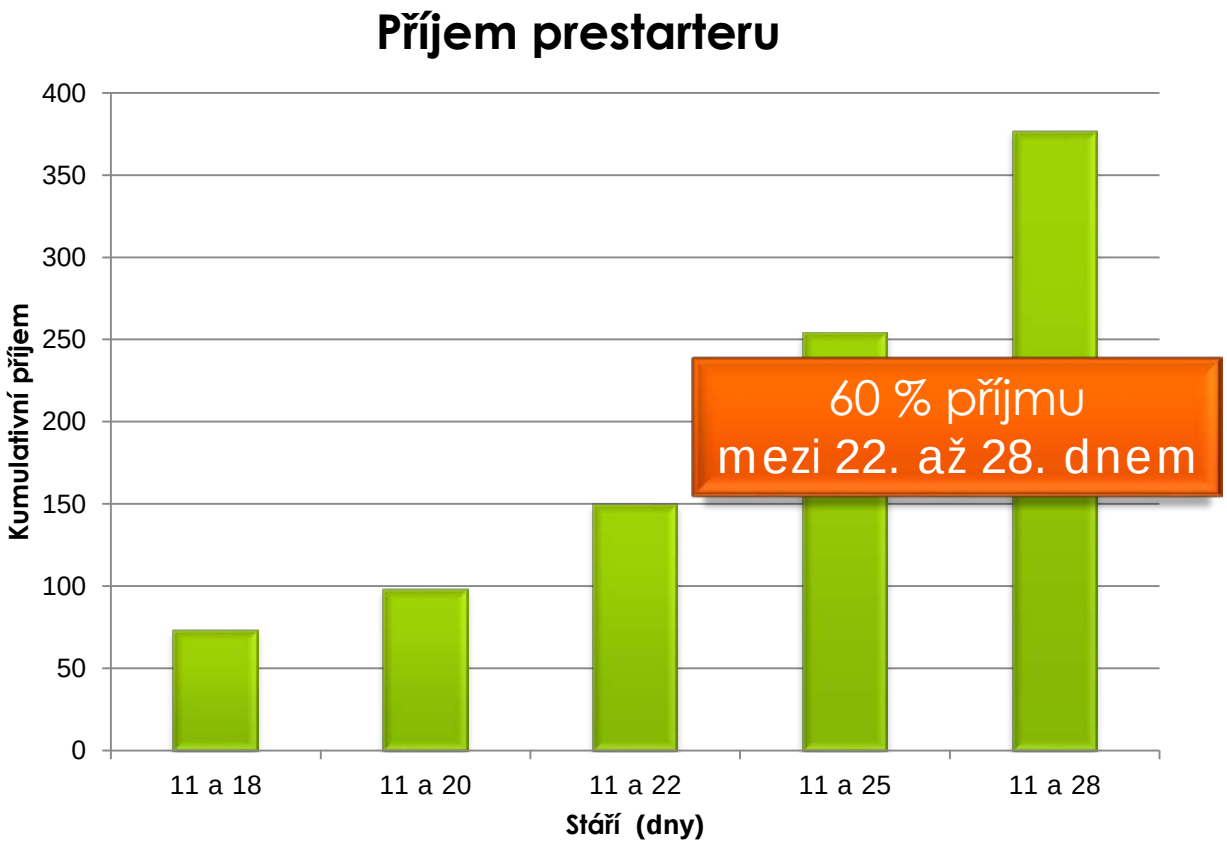
Gaëlle Boudry, *et al.* 2004. Weaning Induces Both Transient and Long-Lasting Modifications of Absorptive, Secretory, and Barrier Properties of Piglet Intestine. The Journal of Nutrition 134:2256-2262

Hladová selata mají vyšší příjem krmiva



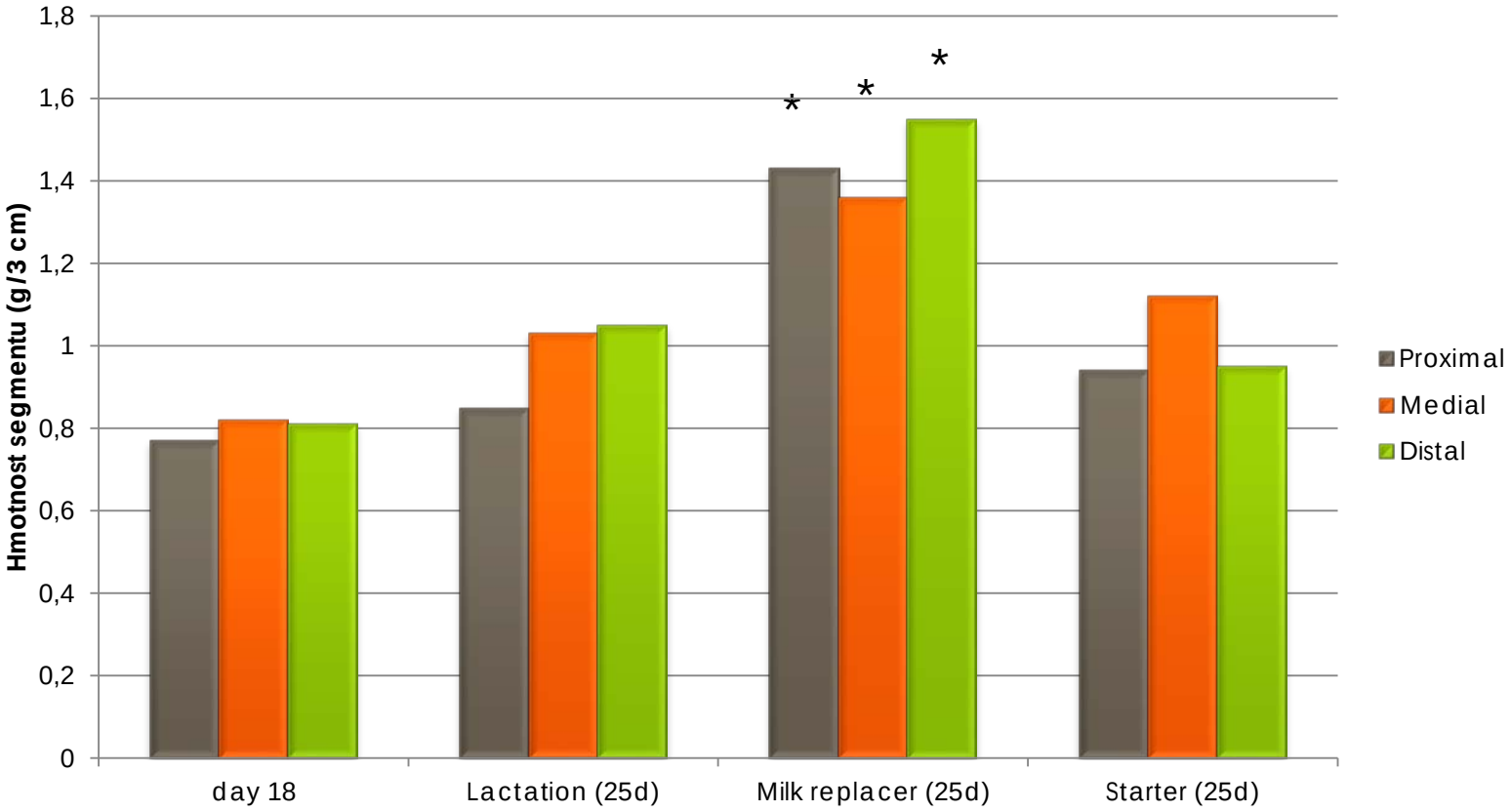
Sulabo *et al.* 2009

Příjem prestarteru



Brunix, et al. *Effect of creep-feed consumption on individual feed intake characteristics and performance of group housed weanling pigs*. J. Anim. Sci. 2002. 80: 1413-1418

Hmotnost tenkého střeva ve vztahu k podávání mléčných náhrad



* : $p < 0,05$

Ruurd T. Zijlstra, *et al. Effect of Feeding a Milk Replacer to Early-Weaned Pigs on Growth, Body Composition, and Small Intestinal Morphology, Compared with Suckled Littermates.* J. Anim. Sci. 1996. 74:2948–2959

Predispoziční faktory

Vyšší riziko PWD je spojeno s:

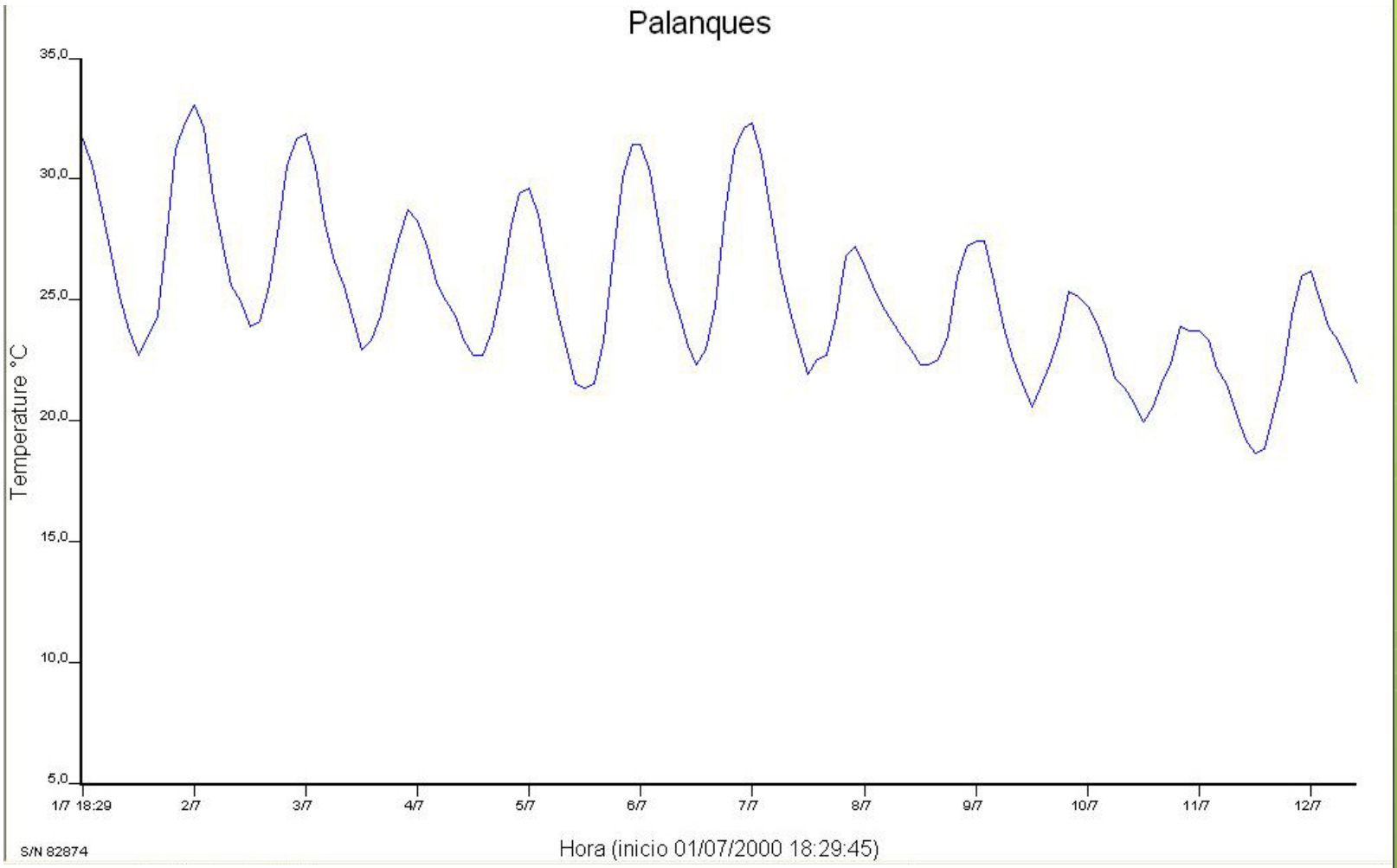
- vyšším **počtem prasnic** (P = 0,02)
- **omezeným příjmem krmiva** (P = 0,02): 3 a více krmení denně v porovnání s krmením ad libitum
- manuální **regulací teploty**, automatická regulace teploty snižuje riziko (P = 0,03).

Taina M Laine, Tapani Lyytikäinen, Maija Yliaho and Marjukka Anttila. *Risk factors for post-weaning diarrhoea on piglet producing farms in Finland.* Acta Veterinaria Scandinavica 2008, 50:21

Ovlivňující faktory

- Management chovu
- **Prostředí**
- Krmivo
- Onemocnění

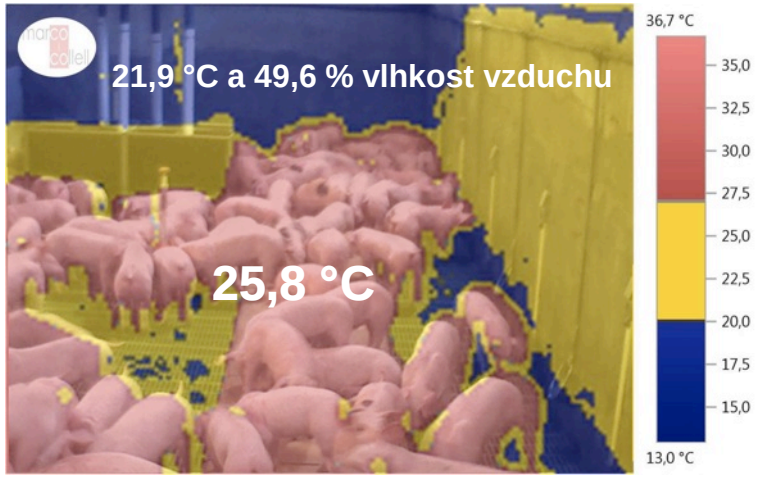
Teplotní výkyvy

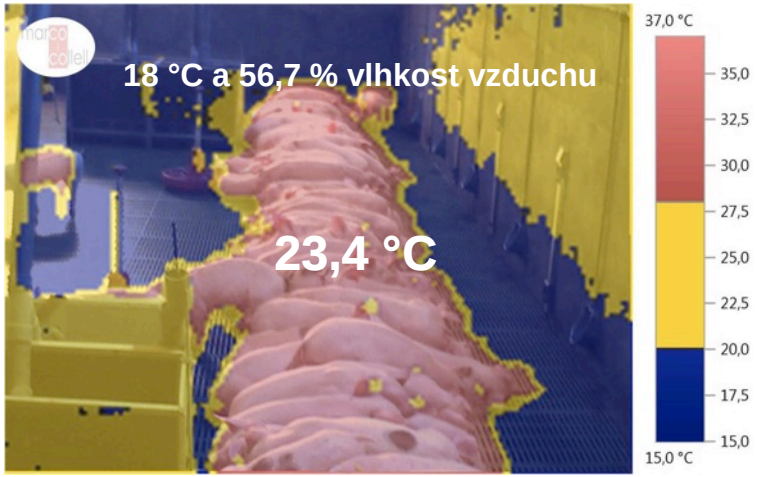


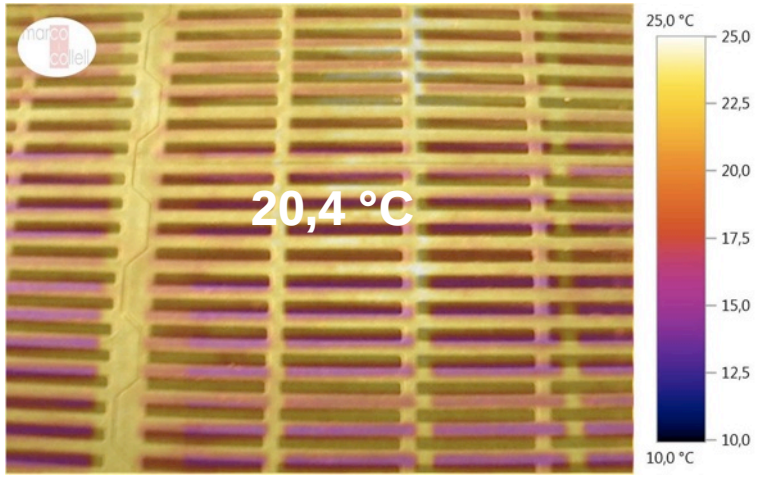

Budou tato selata
přijímat krmivo?

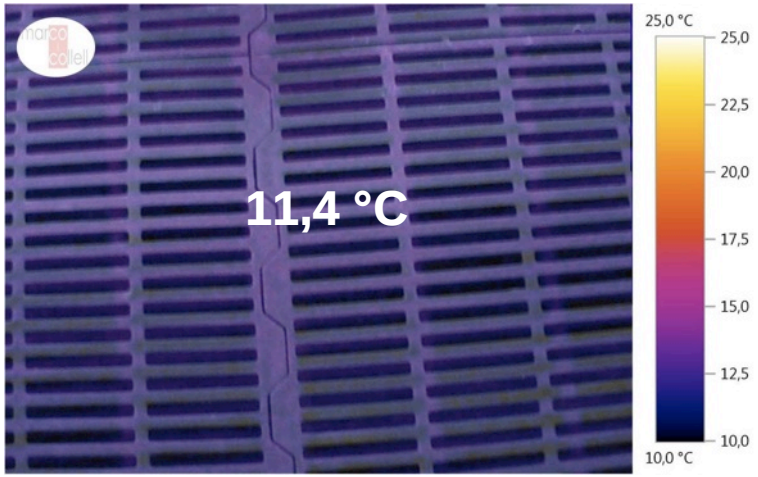

Budou tato selata
přijímat krmivo?

Tepelný komfort









37 odchoven, 8100 odstávčat

(6 kg až 20 kg)

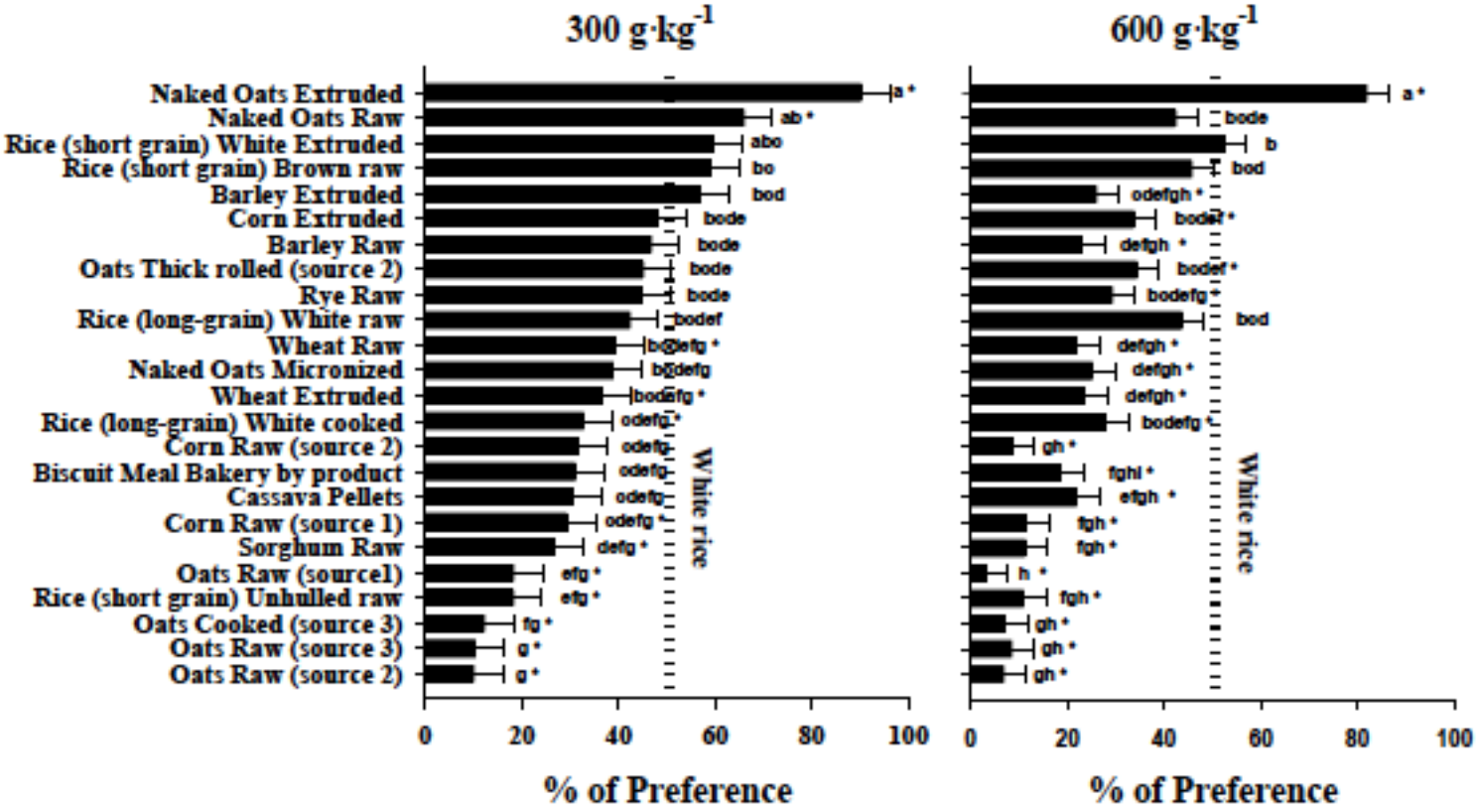
DIAGNOSTIKA PROSTŘEDÍ			
Parametr	**Správně (%)**	**Nesprávně (%)**	**Komentář**
[CO_2] v úrovni selat	32	68*	*93 % vys., 7 % níz.
Vlhkost (%)	50	50*	*78 % vys., 22 % níz.
Rychlost přívodu vzduchu (m/s)	6	94	Vys.
Rychlost proudění vzduchu v úrovni selat (m/s)	17	83	Vys.
Výměna vzduchu	21	79	Kouřový test
Čidla - umístění	42	58	Chyba > 1 °C

[CO_2] v úrovni selat	Správně mezi 1500 ppm a 2000 ppm
Vlhkost (%)	Správně mezi 50 % a 80 % (ideálně 70 % – 75 %)
Rychlost přívodu vzduchu (m/s)	1,5 m/s
Rychlost vzduchu v úrovni selat (m/s)	0,2 m/s
Distribuce vzduchu	Rychlý přívod a odtah, homogenní distribuce
Čidla	Maximální odchylka: 0,5 – 1 °C

Ovlivňující faktory

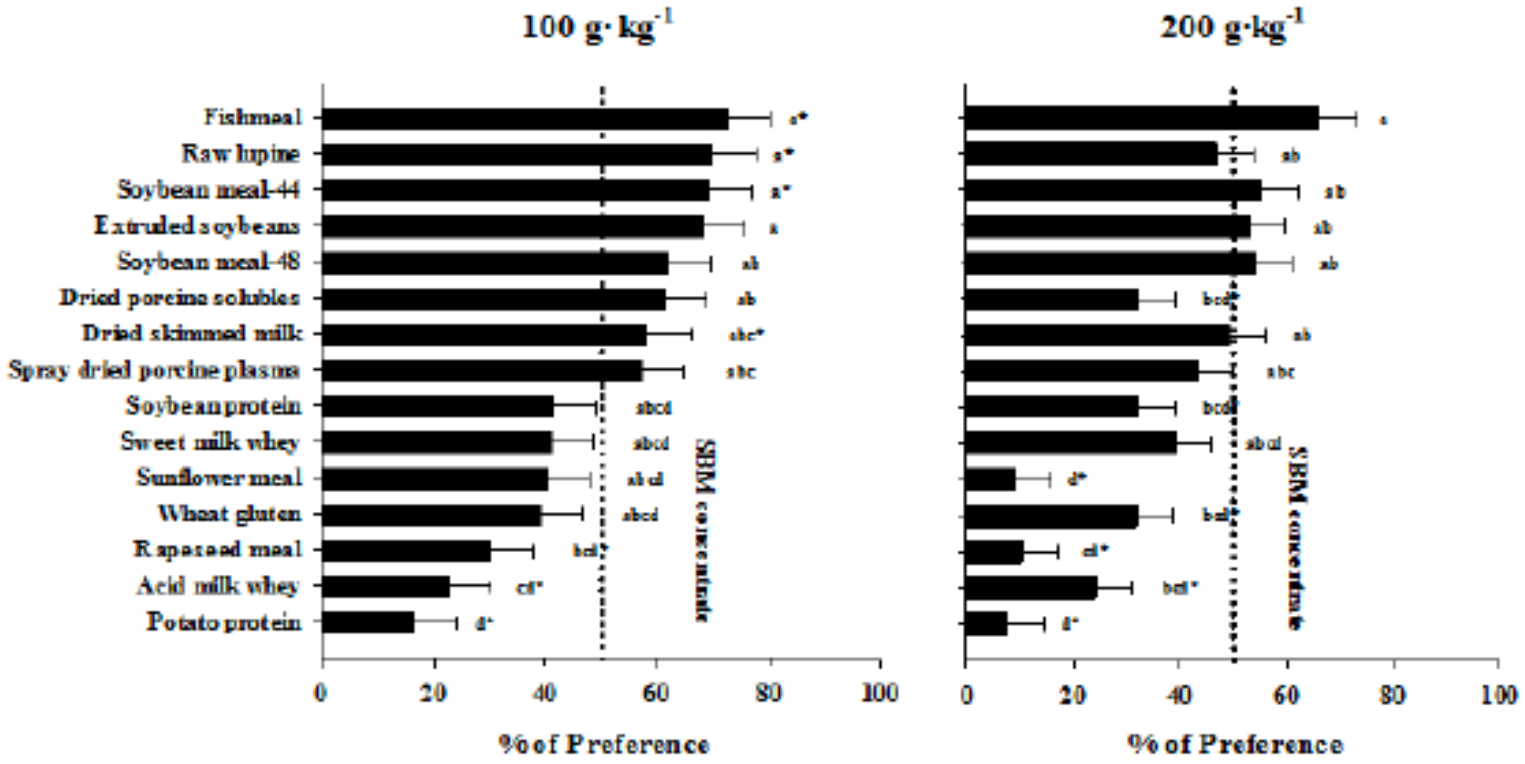
- Management chovu
- Prostředí
- **Krmivo**
- Onemocnění

Krmivo: organoleptické preference (obiloviny)



Figueroa, J. Learning Strategies to increase piglets feed intaka after weaning.2012 Phd Thesis Facultad Veterinaria UAB

Krmivo: organoleptické preference (zdroje bílkovin)



Figueroa, J. Learning Strategies to increase piglets feed intaka after weaning.2012 Phd Thesis Facultad Veterinaria UAB

Ovlivňující faktory

- Management chovu
- Prostředí
- Krmivo
- **Onemocnění**

Čištění a dezinfekce

Pen Floors			Enterobacteriaceae[a]				Salmonella[b]			
			Before washing		After washing		Before washing		After Washing	
Category	Farm	Samples Tested (n)	Range	Median	Range	Median	Positive samples (n)	Range	Positive samples (n)	Range
3	A	64	1.7-6.6	4.5	0-5.8	0.8	–[c]	–	–[c]	–
High 2	B	64	3.5-6.1	4.6	0-1.6	0	–[c]	–	–[c]	–
High 2	C	72	0-5.1	1.2	0-1.6	0	1	1.1	–[c]	–
1	D	84	2.6-6.1	4.6	0-3.6	0.8	26	36->106	1	7.2
1	E	84	0-3.6	1.6	0-3.2	0	–[c]	–	–[c]	–
1	F	60	1.2-5.1	3.3	0.7-4.2	2.9	–[c]	–	–[c]	–
1	G	72	0-6.0	2.0	0-3.6	0	–[c]	–	1	0.36
1	H	48	0.8-4.2	3.7	0.7-4.1	2	–[c]	–	–[c]	–

Table 1. Effect of cleaning procedure on levels of *Salmonella* and *Enterobacteriaceae* on the pen floors. [a]Log10 cfu/cm^2. [b]MPN/cm^2; detection limit, 0.36 MPN/cm^2. [c]Negative for *Salmonella* (detection limit, <0.36 MPN/cm^2).

Mannion, C. *et* al. 2005. *The efficacy of cleaning and disinfection on pig farms.* Safepork 2005

Čištění a dezinfekce

Feeder/Drinker Units			Enterobacteriaceae[a]				Salmonella[b]			
			Before washing		After washing		Before washing		After Washing	
Category	Farm	Samples Tested (n)	Range	Median	Range	Median	Positive samples (n)	Range	Positive samples (n)	Range
3	A	16	3.0-5.6	4.4	2.4-6.8	5.2	–[c]	–	1	4600
High 2	B	16	3.7-5.7	5	0.7-6.8	5.6	–[c]	–	3	11-240
High 2	C	24	0-6	2	2.0-6.0	5	–[c]	–	–[c]	–
1	D	27	3.7-6.1	5.5	0-6.1	4.9	6	0.92-105	2	0.6-7.2
1	E	36	1.5-4.9	3.4	0-5.5	3	–[c]	–	–[c]	–
1	F	24	0.5-4.9	3.5	3.2-5	4.4	–[c]	–	–[c]	–
1	G	24	0-5..5	2.8	0-4.1	2.8	–[c]	–	–[c]	–
1	H	20	3.4-4.9	3.9	3.3-6	4	–[c]	–	–[c]	–

Table 2. Effect of cleaning procedure on levels of *Salmonella* and *Enterobacteriaceae* in feeder/drinker units
[a]Log10 cfu/cm². [b]MPN/cm²; detection limit, 0.36 MPN/cm². [c]Negative for *Salmonella* (detection limit, <0.36 MPN/cm²).

Mannion, C. *Et* al. 2005. *The efficacy of cleaning and disinfection on pig farms.* Safepork

Detergenty

Metoda čištění	Dezinfekční prostředek	Kategorie 25-110 kg	Zlepšení (%)
Voda	Žádný	98,1	0
Voda	Peroxid	95,4	2,8
Voda + detergent	Žádný	95,6	2,6
Voda + detergent	Peroxid	92,9	5,2

J. Waddilove, 2010. *Cleaning comes before disinfection.*
https://www.pig333.com/what_the_experts_say/cleaning-comes-before-disinfection_3004/

Realita

	ADG (g/d)	Průjem (%)	Mortalita (%)
Konvenční chov	325,4	37,14	3,28
Experimentální chov	465,8	4,4	0
Rozdíl	140,4	-32,77	-3,25

Madec, F. and E. Leon. 1999. The role of management and husbandry in the pig health with emphasis on the post-weaning enteric disorders. In: (P.D. Cranwell, Ed.): Manipulating Pig Production VII. Australasian Pig Science Association, Werribee, Australia. pp. 200- 209.

Dezinfekce

Table 7. Evaluation of the bacteriocidal activity of seven chemical disinfectants against *E coli* (Abbotstown strain) and E coli NCTC 10418 (Type strain) using British Standard Method BSEN 1656:2000 (phase 2 /step 1). Results are given as the lowest effective concentration of product giving at least 10^5 reduction in viable bacterial count under the stated test conditions.

Bacteria	Disinfect ~	Test conditions											
		Low organic matter						High organic matter					
		4° C		10° C		20° C		4° C		10° C		20° C	
		30 min	60min	30 min	60min	30 min	60min	30 min	60min	30 min	60min	30 min	60min
EC (A)^	A	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100
	B	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100
	C	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100
	D	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100
	E	1/200	1/200	1/200	1/200	1/100	1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100
	F	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100
	G	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100
EC (T)*	A	1/400	1/400	1/400	1/400	1/400	1/400	1/100	1/100	1/100	1/100	1/100	1/100
	B	1/800	1/800	1/800	1/800	1/800	1/800	1/200	1/200	1/200	1/200	1/200	1/200
	C	1/1000	1/1000	1/1000	1/1000	1/1000	1/1000	1/200	1/200	1/200	1/200	1/200	1/200
	D	1/200	1/400	1/200	1/400	1/400	1/400	NE 1/100	NE 1/100	NE 1/100	NE 1/100	1/100	1/100
	E	1/400	1/800	1/800	1/800	1/1000	1/1000	1/400	1/400	1/400	1/400	1/400	1/400
	F	1/800	1/800	1/800	1/800	1/1000	1/1000	1/100	1/100	1/100	1/200	1/200	1/200
	G	NE 1/100	1/100	1/100	1/100	1/100	1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100	NE 1/100

^ *E.coli* (Abbotstown strain) - field isolate P5297/06. Isolated from porcine intestine (diarrhoea outbreak)
* *E.coli* NCTC 10418 (Type strain)
~ The key for the disinfectant compounds is given in Table 2
NE 1/100 = Not effective at the highest concentration tested (1/100)

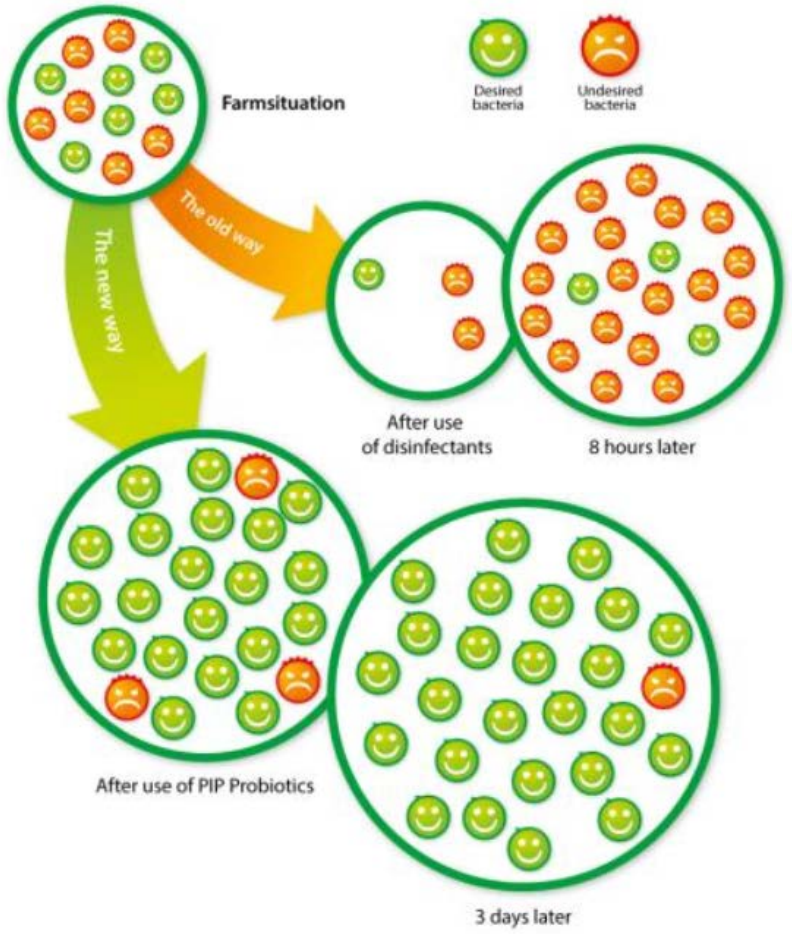
Jill R. Thomson, Nichola A. Bell, Meighan Rafferty. *Efficacy of some Disinfectant compounds against porcine bacterial pathogens*. Pig Journal 2007

Dezinfekce

Key	Active compound	Recommended dilution range
A	Iodine (acidic based)	1:125 – 1:600
B	Glutaraldehyde plus quaternary ammonium	1:50 – 1:190 (SVD 1:250)
C	Peracetic acid plus hydrogen peroxide	1:100 – 1:200
D	Iodine	1:200
E	Quaternary ammonium plus hydrogen peroxide	1:100 – 1:200
F	Quaternary ammonium	1:50 – 1:100
G	Peroxygen	1:100 – 1:200

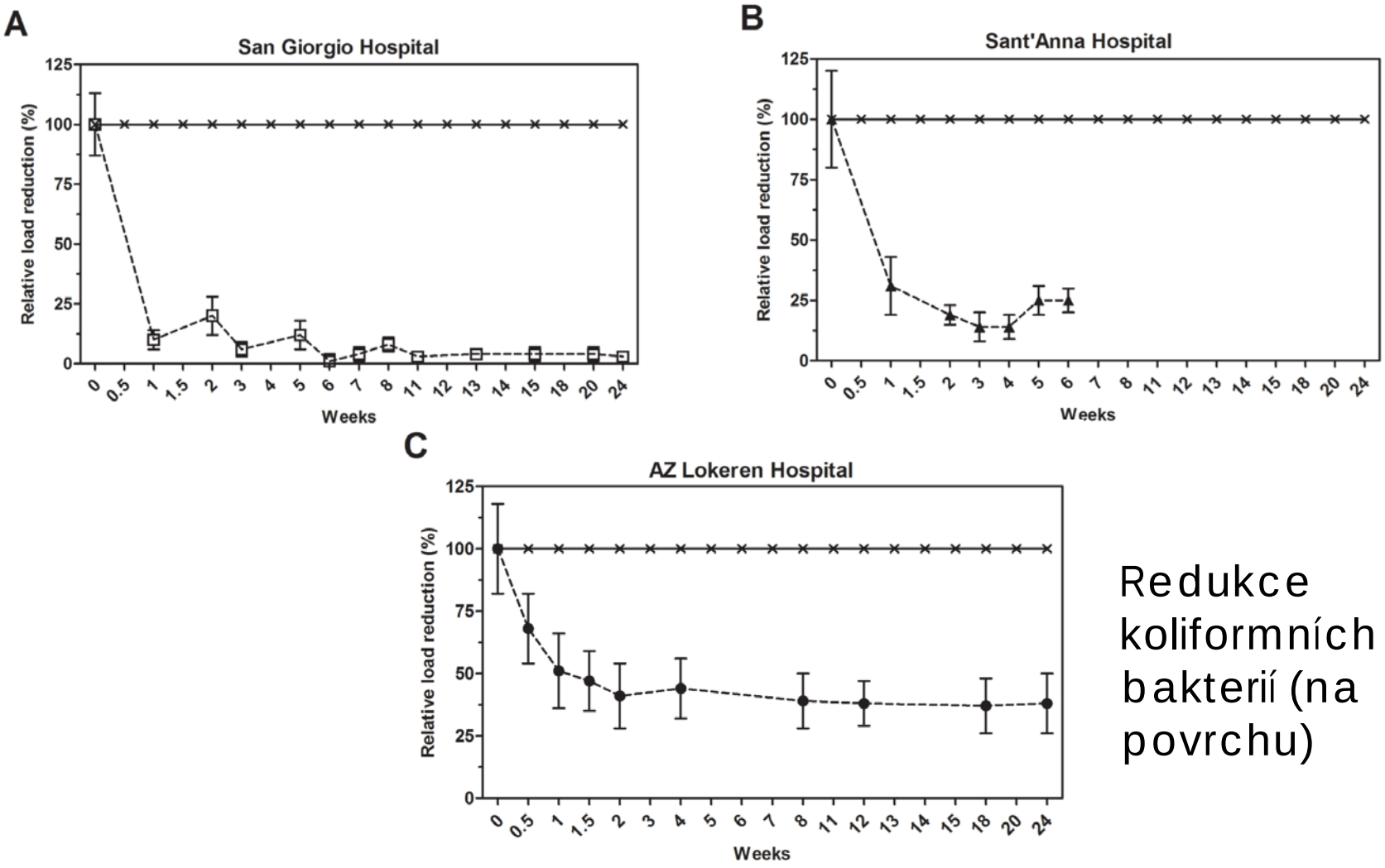
Jill R. Thomson, Nichola A. Bell, Meighan Rafferty. *Efficacy of some Disinfectant compounds against porcine bacterial pathogens.* Pig Journal 2007

Nový koncept dezinfekce



PIP Animal BV – OneHealth BV
Nieuws / News Nr 1, 1-11-2014

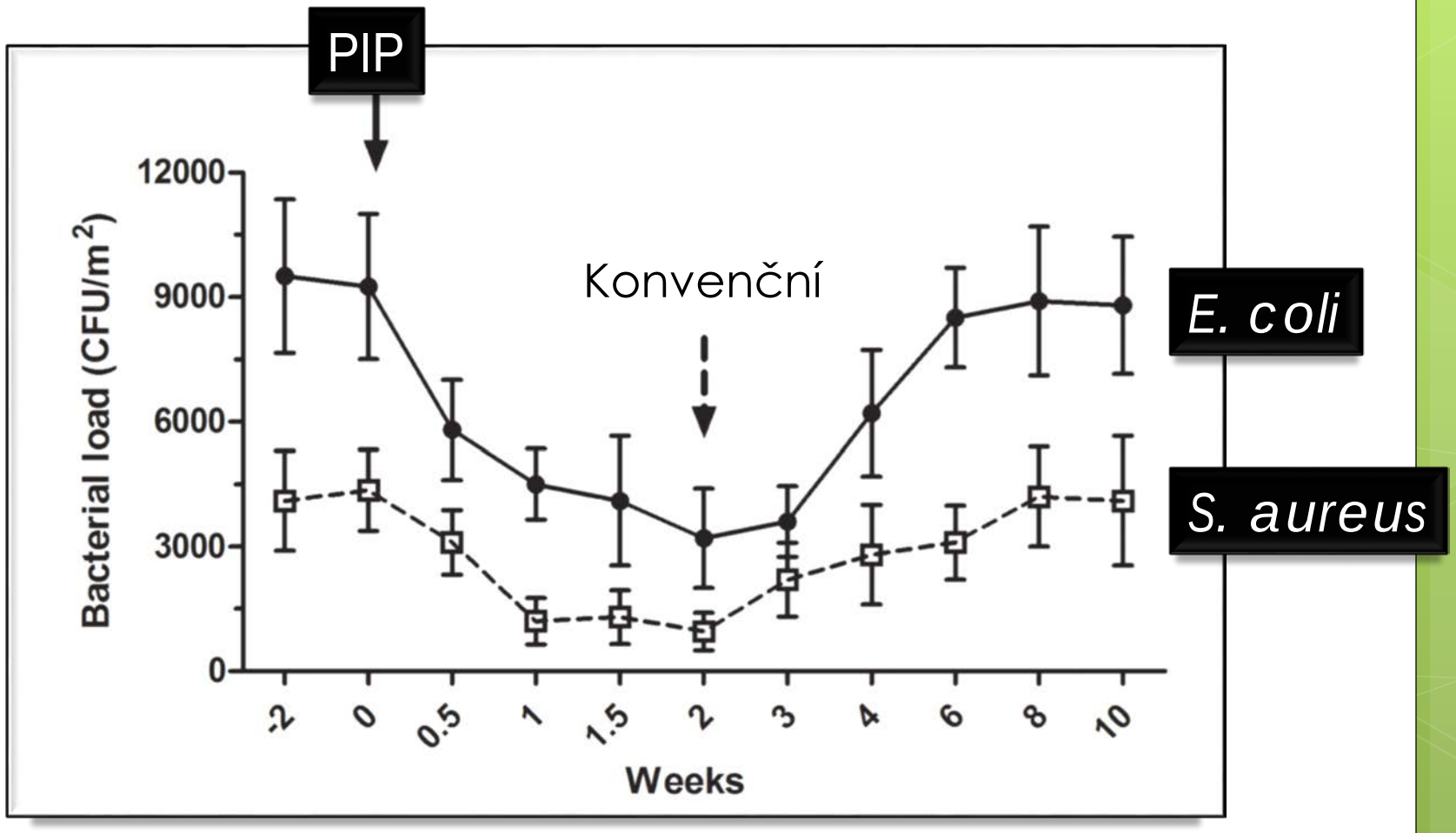
Nový koncept dezinfekce



Redukce koliformních bakterií (na povrchu)

Vandini A, Temmerman R, Frabetti A, Caselli E, Antonioli P, et al. (2014) Hard Surface Biocontrol in Hospitals Using Microbial-Based Cleaning Products. PLoS ONE 9(9): e108598. doi:10.1371/journal.pone.0108598

Nový koncept dezinfekce



Vandini A, Temmerman R, Frabetti A, Caselli E, Antonioli P, et al. (2014) Hard Surface Biocontrol in Hospitals Using Microbial-Based Cleaning Products. PLoS ONE 9(9): e108598. doi:10.1371/journal.pone.0108598

Predispoziční faktory

- Kvalita vody
  - po bakteriologické stránce
  - po chemické stránce

Čistota vody

Společná nádrž (21/6/13)

PARAMETR	HODNOTA	REFERENCE
E. coli (CFU/100 ml)	0	0
Aerobi, 22 °C (CFU/1 ml)	1	< 100
Cl. perfringens (CFU/100 ml)	0	0
Pseudomonas aeruginosa (CFU/250 ml)	0	0
Enterococus (CFU/100 ml)	0	0
Koliformní celkem (CFU/100 ml)	0	0

Kvalita vody na porodně

PARAMETR	5/6/13	21/6/13	18/9/13	REFERENCE
E. coli (CFU/100 ml)	0	136	0	0
Aerobi, 22 °C (CFU/1 ml)	298/345	283	66	< 100
Cl. perfringens (CFU/100 ml)	23/45	364	9	0
Pseudomonas aeruginosa (CFU/250 ml)	0	0	0	0
Enterococus (CFU/100 ml)	12/1	140	11	0
Koliformní celkem (CFU/100 ml)	0/8	158	0	0

Použití ClO_2

.	Dutch Standards		Canadian Standards	EPA Standards (Human)
Item	**No Risk**	**Risk**	**Maximum**	**Maximum**
pH	5 - 8	> 9 & < 4	.	6.5 - 8.5
Ammonia[1]	< 1	> 2	.	.
Nitrite (as N)	< 0.1	> 1	10	1
Nitrate (as N)	< 25	> 100	100	10
Chloride	< 250	> 1,000	.	250
Salt (via NA)	< 1,000	> 2,000	.	.
Iron	< 0.2	.	.	0.3
Manganese	< 1	> 2	.	0.05
Sulfate	< 100	> 250	1,000	500
Calcium	.	.	1,000	.
TDS	.	.	3,000	500

[1]High levels of ammonia indicate bacterial contamination (manure), which would make water unsuitable

Eric van Heugten. **Guidelines for Water Quality in Pigs** .June 1, 2000. Animal Science Facts. ANS 00-811S

Každodenní sanitace

Table 4: Cumulative percentage of weaned pigs[1] from which *Escherichia coli* strain M1823B (challenge strain) was isolated during sample collection periods on Day 0 (prior to exposure), and Days 2, 4, 7, and 11 after initial exposure by inoculation (Inoculated Pigs) or direct (Pen Sentinels) or indirect exposure to the Inoculated Pigs.[2]

Treatment Group	n	No. of pigs (%) from which *E coli* strain M1823B was isolated[3]				
		Day 0 (prior to exposure)	Day 2	Day 4	Day 7	Day 11
Inoculated Pigs	20	0 (0)	18 (90)	19 (95)	20 (100)	20 (100)
Pen Sentinels	5	0 (0)	2 (40)	5 (100)	5 (100)	5 (100)
Direct Sentinels	25	0 (0)	0 (0)	12 (48)	17 (68)	20 (80)
Hand-wash Sentinels	25	0 (0)	0 (0)	0 (0)	13 (52)	23 (92)
Shower Sentinels	25	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Non-exposed Pigs (negative controls)	25	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

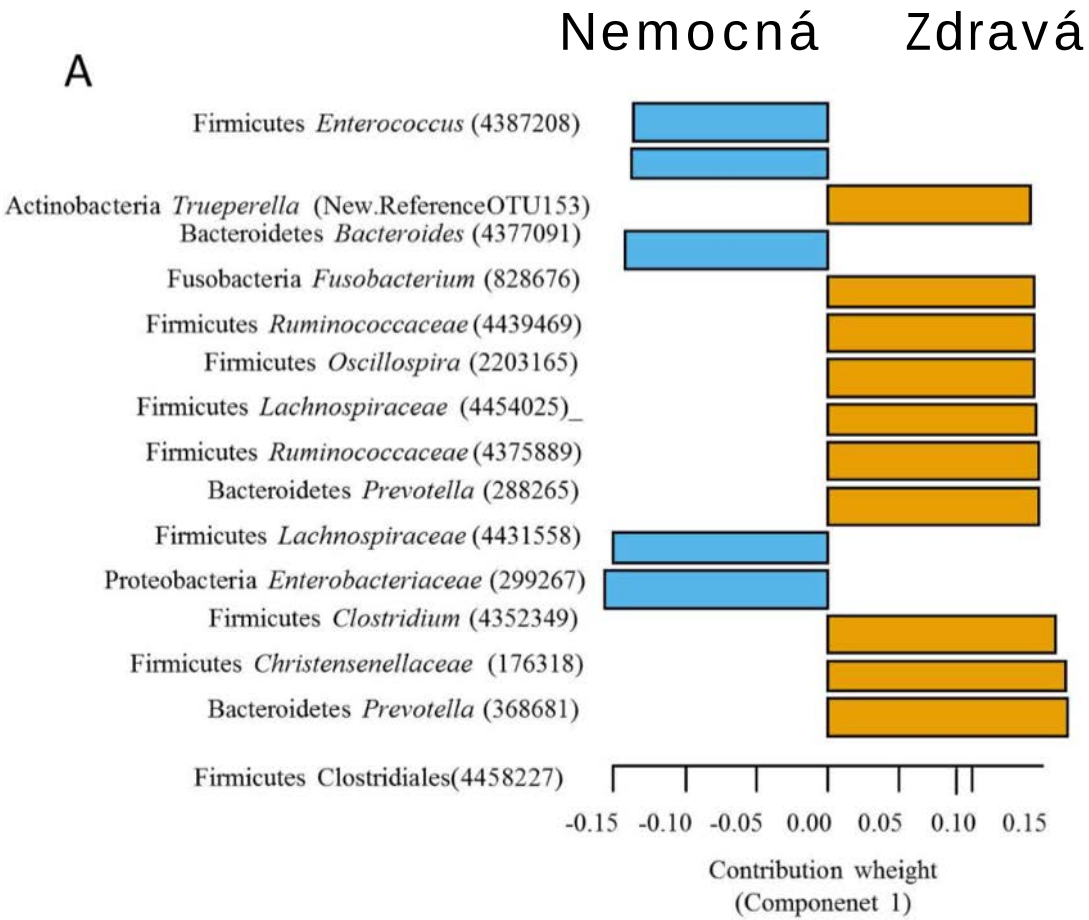
1 Inoculated Pigs were orally inoculated Days 0 and 2, and Pen Sentinels were housed with them except during inoculation procedures. On Days 1 through 10, Direct, Hand-wash, and Shower Sentinel groups (Table 1) were contacted according to the schedule in Table 2. When diarrhea was observed (except in Inoculated Pigs), affected pigs were immediately euthanized for cultural and histological examination. Pigs determined to be positive on a designated sample collection day or on the day of euthanasia were counted as positive for all subsequent sample collection periods.

2 Inoculated Pigs were individually offered 1.36 to 8.92 × 10^{10} colony forming units of *E coli* M1823B in liquid strawberry gelatin.

3 Strain M1823B was identified on the basis of antimicrobial sensitivity.

Amass SF, Halbur PG, Byrne BA, et al. Mechanical transmission of enterotoxigenic *Escherichia coli* to weaned pigs by people, and biosecurity procedures that prevented such transmission. *J Swine Health Prod.* 2003;11(2):61-68.

Mikroflóra



Dou S, Gadonna-Widehem P, Rome V, Hamoudi D, Rhazi L, Lakhal L, et al. (2017) Characterisation of Early-Life Fecal Microbiota in Susceptible and Healthy Pigs to Post-Weaning Diarrhoea. PLoS ONE 12(1): e0169851. doi:10.1371/journal.pone.0169851

Predispoziční faktory

- Kontinuální medikace po odstavu
  - Dlouhodobé používání antibiotik
- Medikovaná skupina
  - Změna mikroflóry
  - Početnější populace *E.coli*

Heather K. Allen, 2012. *Swine microbiota, What's changing?* Al. Leman Swine conference. p 63-65

Mikroflóra

- Je správné medikovat prestarter?
  - Hmotnost při odstavu: 6 kg
  - Průměrný denní příjem krmiva: 100 g/sele/den
  - Dlouhodobá medikace

Dochází k ovlivnění?

Mikroflóra

Jedna jediná injekční aplikace antibiotik může změnit střevní mikroflóru až na 5 týdnů

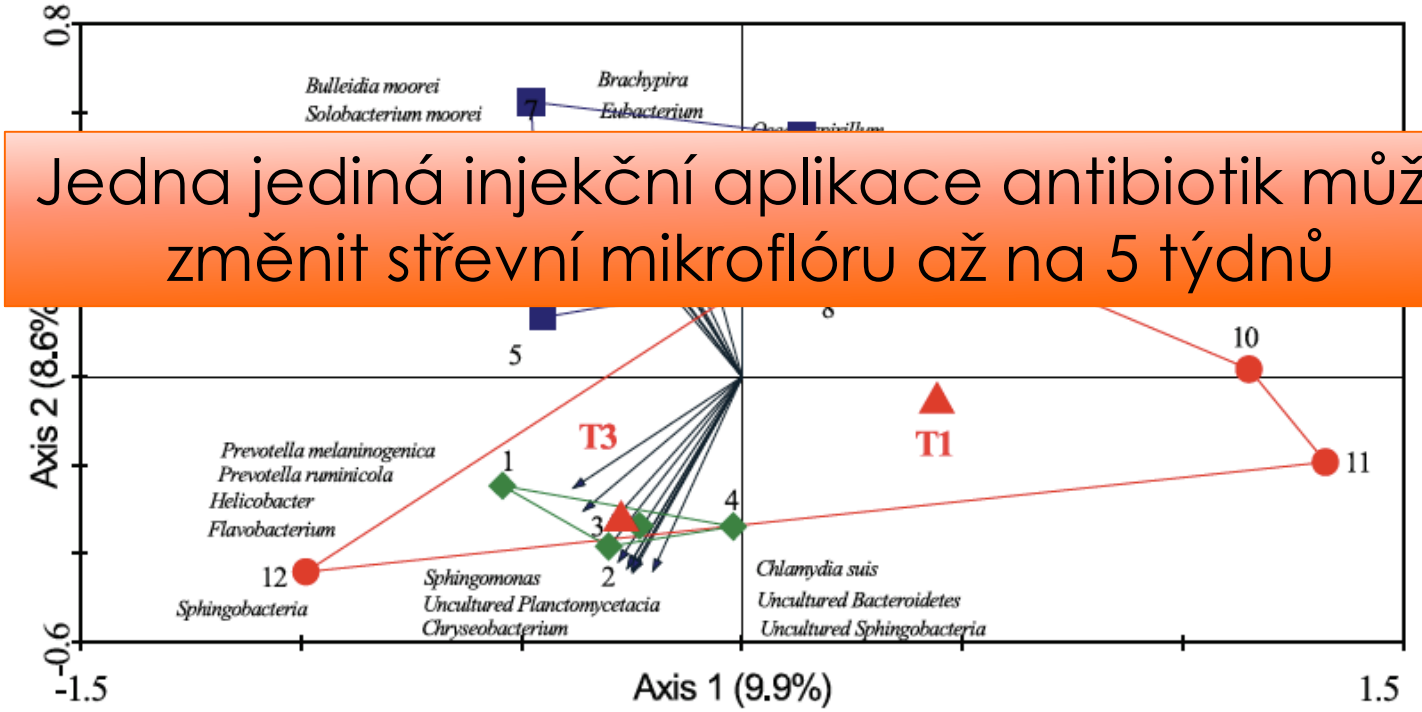


Figure 1. Triplot for RDA analysis of jejunal microbiota composition. Nominal environmental variables T1, T2 and T3 are represented by red triangles (▲). Samples are grouped by treatment: T1 (red; ○), T2 (blue; □) and T3 (green; ◇), each symbol represents a pool of four pigs, and numbers represent pool identity number. Microbial groups contributing at least 60% to the explanatory axes are represented as vectors. Both axes together explain 18.5% of the total variance in the dataset.
doi:10.1371/journal.pone.0100040.g001

Dirkjan Schokker *et al.* 2014. *Early-Life Environmental Variation Affects Intestinal Microbiota and Immune Development in New-Born Piglets.* PLoS ONE 9(6): e100040. doi:10.1371/journal.pone.0100040

Běžné postupy po odstavu

- Antibiotika působící proti *E.coli*
- Vysoký obsah minerálií:
  - Síran měďnatý (170 ppm až do 12.týdne)
  - Oxid zinečnatý (3000 ppm 15 dnů - není povolen ve všech zemích)

Comparison of Previous and Current Maximum Levels of Trace Elements for Pigs			
		Before 26.01.04	Current
Copper	Up to 16 wks of age – 55/60 kg	175	
	Up to 12 wks of age – 35/40 kg		170
	17 wks to 6 months of age	100	
	13 wks and older		25
	All other pigs	35	25
Zinc	All pigs	250	150
Manganese	All pigs	250	150
Cobalt	All pigs	10	2
Iodine	All pigs	10	10
Selenium	All pigs	0.5	0.5
Molybdenum	2.5	2.5	2.5
Iron	Piglets	1250	250 to 2 weeks pre weaning
	Other pigs	1250	750

Alternativy k antibiotikům a oxidu zinečnatému

Alternative feed additives	Efficacy*	Potential for developement*
Antibiotics	+++++	0
Zinc Oxide	++++	0
Copper sulphate	+++	0
Organic acids	+	0
Enzymes	+++	+++
Pre-fermentation and inoculation	?	+
Probiotics	+	+
Fermentable substrates (Prebiotics)	++	+++
Lactose	++	0
Zeolites and clay minerals	?	0
Nutraceuticals (e.g. gingseng, oregano)	?	+
Soya isolates	+	+
Immunoglobulins	++	?
Epidermal growth factors	?	?
Colostrally drived growth factors	?	?
Husbandry/management techniques	**Efficacy**	**Potential for development**
All-in-all production	++++	++++
Hygiene	++++	+++
Later weaning	?	+
Outdoor production	+	0
Colostrum quality and intake	++	++
Immunisation	+++	++
Drinking water quality and provision	++	+++
Education - owner and stockperson	++++	+++++

* - Efficacy and development based on a subjective score 0 (zero) to ++++ (very high), or ? (unknown)

Pluske, J. Journal of Animal Science and Biotechnology 2013, 4:1

Alternativy k antibiotikům a oxidu zinečnatému

- Vakcíny

Available online at www.sciencedirect.com
SCIENCE DIRECT®
Veterinary Microbiology 100 (2004) 255–268
veterinary microbiology
www.elsevier.com/locate/vetmic

Efficacy of vaccines against bacterial diseases in swine: what can we expect?

Freddy Haesebrouck [a,*], Frank Pasmans [a], Koen Chiers [a], Dominiek Maes [b], Richard Ducatelle [a], Annemie Decostere [a]

increased IgA titers in milk. Therefore, commer-

Tyto vakcíny nejsou příliš účinné proti průjmu u selat a nechrání proti poodstavovému průjmu

is not too high. These vaccines are not very effective against young pig diarrhoea and they do not protect against post weaning diarrhoea. For protection

F. Haesebrouck et al. *Efficacy of vaccines against bacterial diseases in swine: what can we expect?* Veterinary Microbiology 100 (2004) 255–268

Alternativy k antibiotikům a oxidu zinečnatému

- Vakcíny
- Organické kyseliny

Organické kyseliny

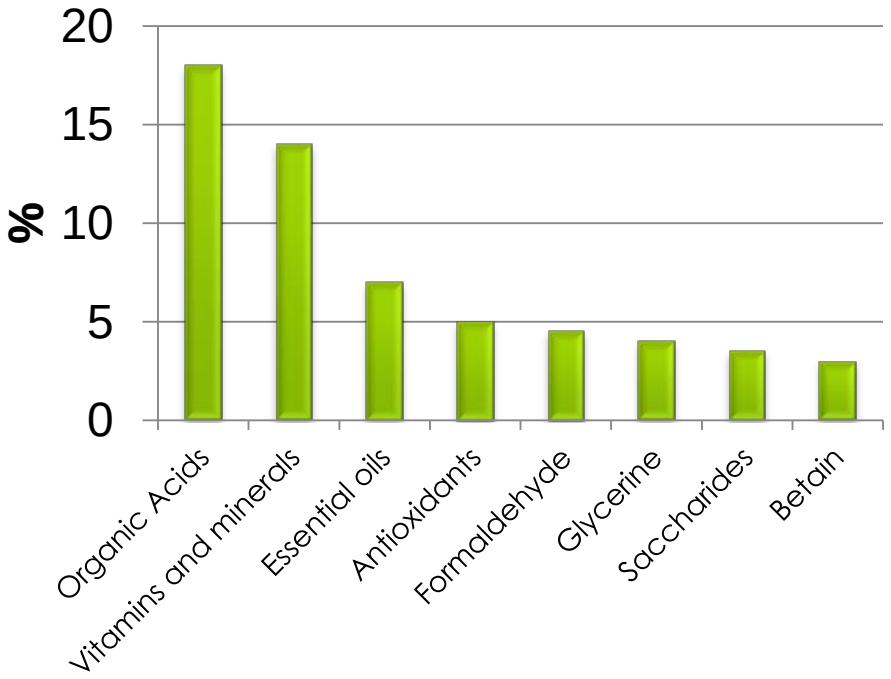
Acid	Molecular formula	MM (g/mol)	Density (g/ml)	Phys. form	pKa	Solubility in water
Formic	HCOOH	46.03	1.22	liquid	3.75	∞
Acetic	CH_3COOH	60.05	1.049	liquid	4.76	∞
Propionic	CH_3CH_2COOH	74.08	0.993	liquid	4.88	∞
Butyric	$CH_3CH_2CH_2COOH$	88.12	0.958	liquid	4.82	∞
Lactic	$CH_3CH(OH)COOH$	90.08	1.206	liquid	3.83	v
Sorbic	$CH_3CH:CHCH:CHCOOH$	112.14	1.204	liquid	4.76	s
Fumaric	$COOHCH:CHCOOH$	116.07	1.635	liquid	3.02	s
					4.38	
Malic	$COOHCH_2CH(OH)COOH$	134.09		liquid	3.4	∞
					5.1	
Tartaric	$COOHCH(OH)CH(OH)COOH$	150.09	1.76	liquid	2.93	v
					4.23	
Citric	$COOHCH_2C(OH)(COOH)CH_2COOH$	192.14	1.665	solid	3.13	v
					4.76	
					6.4	

[1] MM: molecular mass; ∞: soluble in all proportions; v: very soluble; s: sparingly soluble.

FEFANA 2014. Organic Acid in Animal Nutrition. ISBN 978-2-9601289-2-5

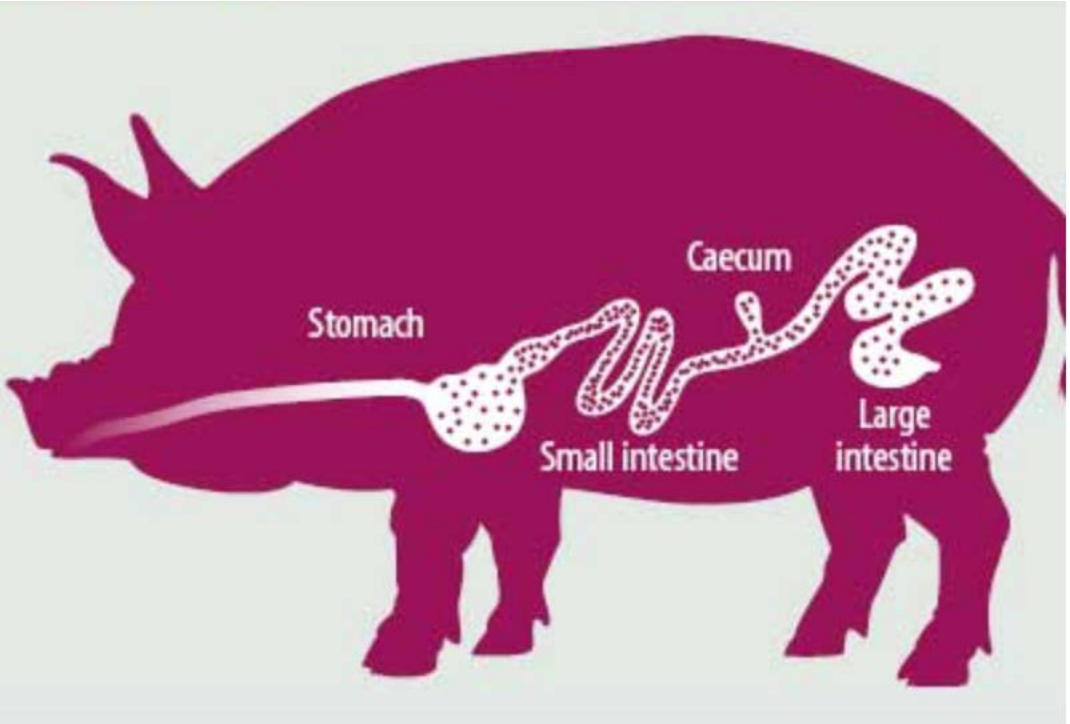
Synergický účinek organických kyselin

- Rostlinné extrakty / esenciální oleje
- Enzymy
  - Fytáty
  - Neškrobové polysacharidázy a xylanáza
  - MCFA



Riemensperger, A. *Organic Acid-Based Products – Market Evaluation and Technical Comment* .2012. The Pig Site. http://www.thepigsite.com/articles/3863/organic-acidbased-products-market-evaluation-and-technical-comment/

Organické kyseliny



http://www.pigprogress.net/Special-Focus/Alternative-Growth-Promotion/To-protect-or-not-to-protect-That-is-the-question/

Organické kyseliny

Table 7 - Effect of dietary protected organic acid blend supplementation on faecal microflora in lactating sows[1]

Item, log_{10}cfu/g	CON	POA1	POA2	SE	Linear[2]	Quadratic[2]
E. coli						
Farrowing	5.67a	4.93b	5.18b	0.10	0.008	0.001
Weaning	5.99a	5.23b	5.33b	0.10	0.07	0.60
Lactobacillus						
Farrowing	6.13b	7.49a	7.34a	0.07	0.02	0.92
Weaning	7.32b	7.75a	7.81a	0.06	0.001	0.14

SE - standard error.
[1] CON - basal diet; POA1 = CON + 0.1% POA; POA2 = CON + 0.2% POA.
[2] CON vs. POA1 vs. POA2.
a,b - means in the same row with different letters differ (P<0.05).

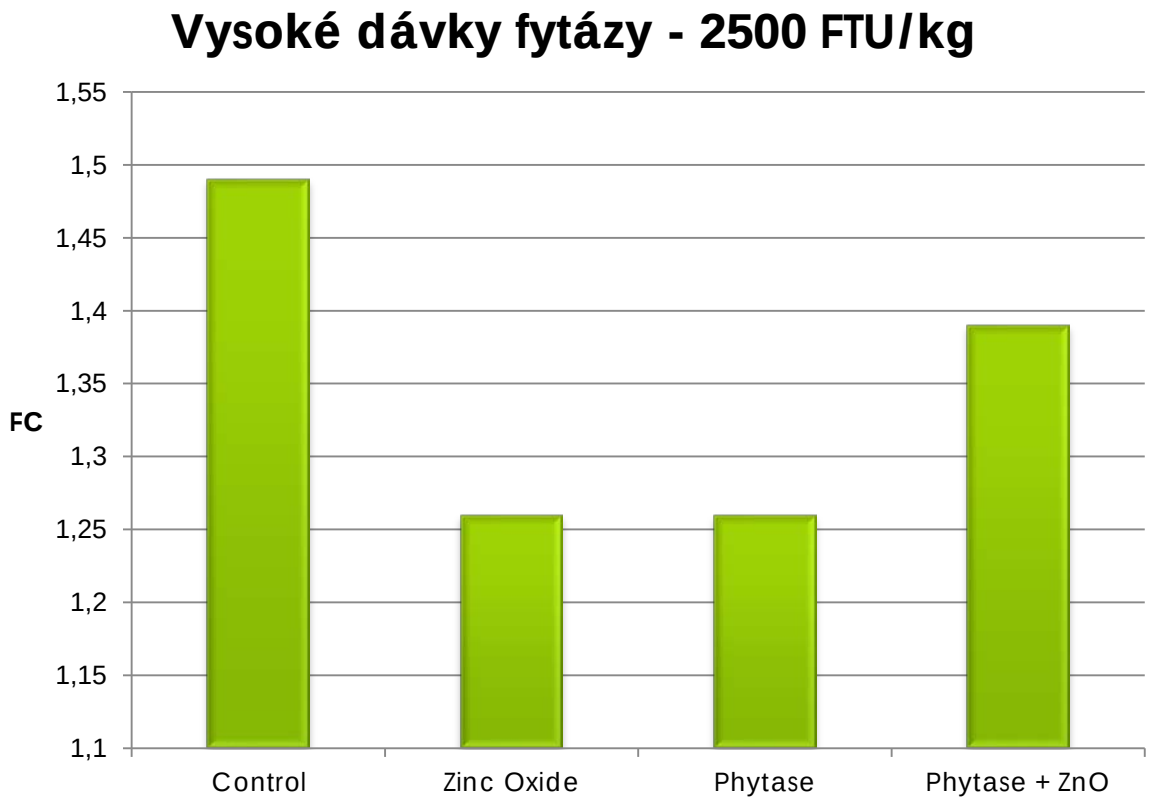
Účinné látky: 17 % kyselina fumarová, 13% kyselina citrónová, 10% kyselina jablečná, 1,2 % MCFA (kaprinové a kaprylové kyseliny), nosič

Mohana Devi et al. *Analysis of the effect of dietary protected organic acid blend on lactating sows and their piglets.* R. Bras. Zootec., 45(2):39-47, 2016

Alternativy k antibiotikům a oxidu zinečnatému

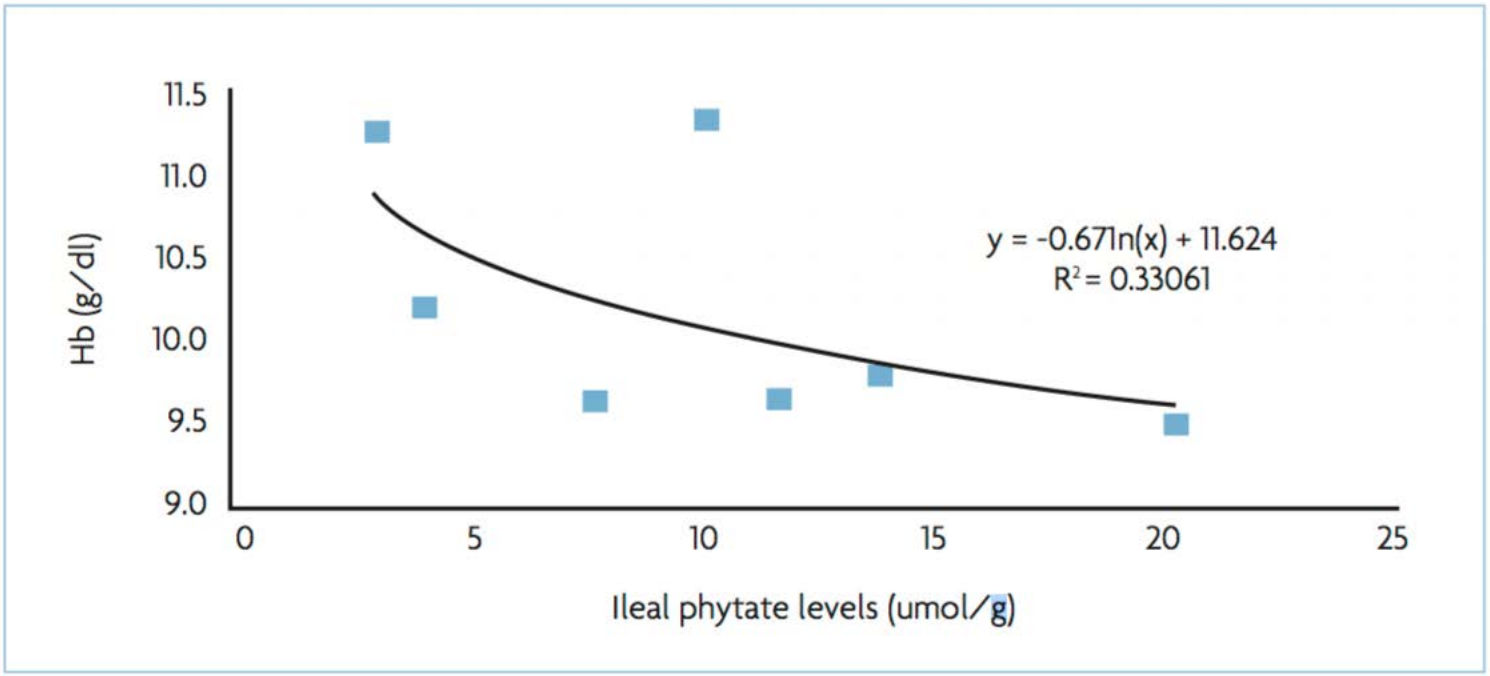
- Vakcíny
- Organické kyseliny
- Enzymy

Fytáza



S C Mansbridge, et al. *The effects of dietary digestible phosphorous, phytase and zinc oxide on the growth performance of weaner pigs*. Conference Paper. April 2015 DOI: 10.1017/S2040470015000035

Fytáza a insuficience železa



Casey Bradley International Pig Topics . 2016 Volume 31 Number 2

Proteáza a výskyt průjmu

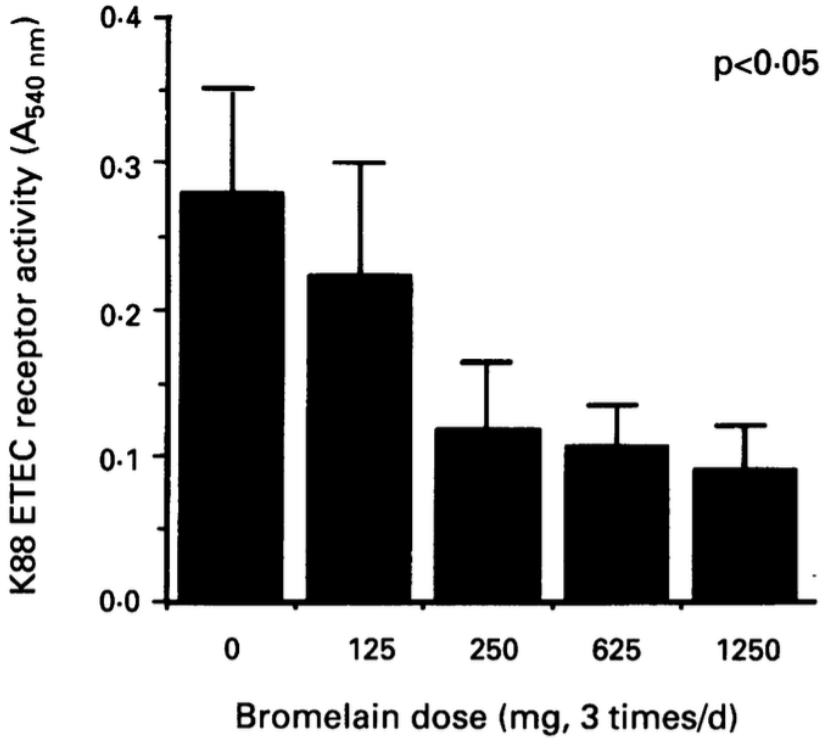


Figure 2: K88⁺ enterotoxigenic Escherichia coli *ETEC receptor activity of small intestine samples of pigs treated with bromelain or untreated. Columns with bars represent the mean (SEM) $A_{540\ nm}$ values of 19 samples taken from each pig (n=7 pigs per group). The reduction in enzyme immunoassay activity was significant (p<0·05).*

T L Mynott, R K JLuke, D S Chandler. *Oral administration of protease inhibits enterotoxigenic Escherichia coli receptor activity in piglet small intestine.* Gut 1996;38:28-32

Alternativy k antibiotikům a oxidu zinečnatému

- Vakcíny
- Organické kyseliny
- Enzymy
- Prebiotika a probiotika

MOS

- Na základě relevantních literárních údajů lze předpokládat, že manany pravděpodobně napomáhají udržovat integritu střeva a zažívací a absorpční funkci střev po odstavu. Malabsorpční syndrom spojovaný s tímto obdobím lze proto zmírnit přidáváním MOS do krmiva.

Halas, V. and Nochta, I. *Mannan Oligosaccharides in Nursery Pig Nutrition and Their Potential Mode of Action*. Animals (Basel). 2012 Jun; 2(2): 261–274.

MOS

Table 4. Incidence and severity of diarrhoea in weaned pigs fed diet supplemented with mannan oligosaccharide (MOS).

Treatment*	No. of diarrhoeic pigs†	Diarrhoea severity score (DSS)	
		Sum of DSS§	% difference
None	12/23 (52.17%)	54	/
MOS	6/23 (26.09%)	43	- 20.37

*Standard weaner diet only or diet supplemented with 0.2% of MOS; †during 35 d of experiment; §DSS: 0 = normal faeces, 1 = soft faeces; 2 = fluid faeces or 3 = severe diarrhoea

Hrvoje Valpotic, et al. *Effect of mannan oligosaccharide supplementation on blood and intestinal immune cells, bacteria numbers and performance in weaned pigs*. ACTA VET. BRNO 2016, 85: 267-276

Probiotika: Bakterie mléčného kvašení (LAB)

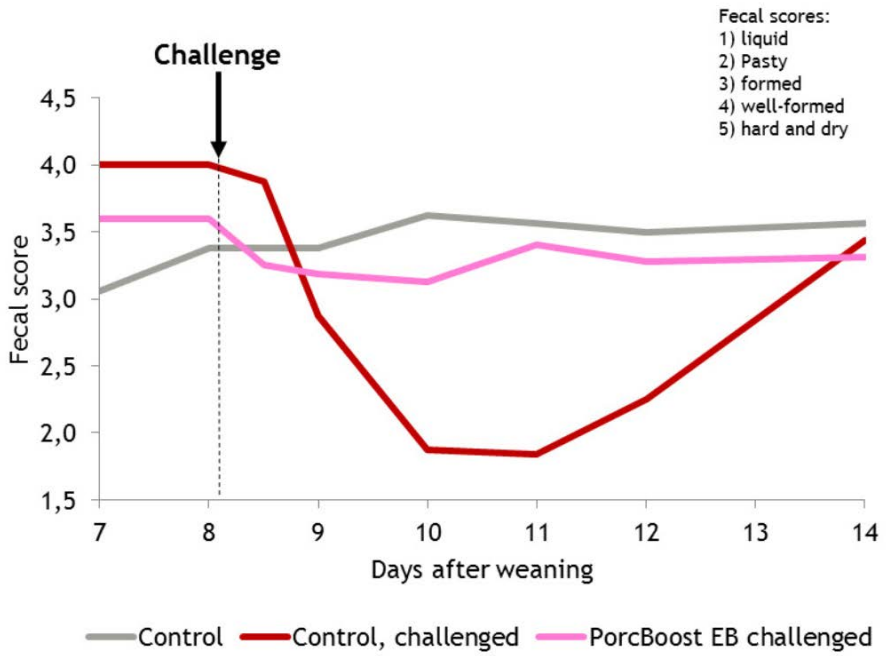
- Výsledky studií a zkušenosti s používáním LAB u prasat naznačují, že bakterie mléčného kvašení mají velký potenciál jako alternativa k antibiotikům přidávaným do krmiva.

Weaned piglets	*L. reuteri* BSA131	improve weight gain and feed conversion, reduce the number of fecal coliform	[37]
	LAB complexes	improve growth performance, increase apparent ileal digestibility of crude protein, crude fiber and organic matter	[24]
	L. rhamnosus GG	ameliorate diarrhea, increase sIgA concentrations and attenuate the elevation of serum IL-6 induced by *E. coli* K88	[38]

Fengjuan Yang, et al. The Use of Lactic Acid Bacteria as a Probiotic in Swine Diets. Pathogens 2015, 4, 34-45

Probiotika: PorcBoost®EB

- Unikátní kmen Bacillus subtilis pečlivě vybraný pro specifickou schopnost inhibovat E. coli.



http://www.mynewsdesk.com/chr-hansen-returns/news/porcboost-r-eb-reduces-e-coli-induced-diarrhea-piglets-200550

Prevence průjmu

- Vakcíny
- Organické kyseliny
- Enzymy
- Prebiotika a probiotika
- Imunostimulancia
  - „Hyperimunitní” dieta z vaječných žloutků

Protilátky z vaječného žloutku

Table 1: Prevalence of diarrhea and mortality[1] in pigs weaned at approximately 22 days of age, challenged 3 days later with K88+ *Escherichia coli*, and treated with egg-yolk antibodies (IgY)[2]

Treatment group[3]		n	Diarrheic pigs	Mortality
1	Negative control	12	0	0
2	Positive control	12	8	2
3	Low dose	12	9	3
4	High dose	12	7	2

1 Pigs with severe watery diarrhea were euthanised < 36 hours postinoculation.

2 IgY product obtained from Dr Ron Marquardt, Department of Animal Science, University of Manitoba, Winnipeg, Manitoba, Canada.

3 Group 1 and 2 pigs were fed unmedicated diet. Group 1 pigs were not challenged. Pigs in Groups 2 , 3, and 4 were challenged with 5 mL of a suspension containing 10^{11} CFU per mL of a K88+ *E coli*. Groups 3 and 4 were treated with IgY product mixed with the same diet fed to Groups 1 and 2. The ration contained 0.32% IgY product (dose recommended by the manufacturer) for Group 3 pigs and 3.2% IgY product (10 × the recommended dose) for Group 4 pigs

Chernysheva LV, Friendship RM, Dewey CE, et al. The effect of dietary chicken egg-yolk antibodies on the clinical response in weaned pigs challenged with a K88+ Escherichia coli isolate. J Swine Health Prod. 2004;12(3):119-122.

Prevence průjmu

- Vakcíny
- Organické kyseliny
- Enzymy
- Prebiotika
- Probiotika
- Imunostimulancia
- Fytogenní doplňkové látky v krmivech

Fytogenní doplňkové látky v krmivech

- Antioxidační účinek
  - Fenolové terpeny
  - Bioflavonoid
- Antibakteriální účinek
  - Monoterpeny karvakrol a thymol

Prevence průjmu

- Vakcíny
- Organické kyseliny
- Enzymy
- Prebiotika
- Probiotika
- Imunostimulancia
- Fytogenní doplňkové látky v krmivech
- Antioxidant
  - Vitamín E
  - Organický Se

Závěrečné shrnutí

- Naprosto zásadní je tlumení predispozičních faktorů.
- Alternativní přípravky musí prokazovat konzistentní výsledky.
  - Organické kyseliny
  - Enzymy
- Pro pochopení mechanismu účinku budou nezbytné další studie týkající se mikrobiomu střeva.

Marco vetgrup

Děkuji za pozornost