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Does Ileitis impact the maximum performance potential of pigs?

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MSD Animal Health

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Ileitis basics

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Lawson & Gebhart, 2000

Ileitis

- = Proliferative enteropathy
- Reported in pigs since 1930's
- *Lawsonia intracellularis*
- Bacterial species only in 1993

Ileitis basics

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Ileitis basics

Estimated herd prevalence in LATAM:

- **Brazil:**
  - 100% seroprevalence in MG, >90% in SP, MT, SC
  - ~40% of herds PCR positive
- **Argentina**
  - 90% seroprevalence (Morales, 2014)

Moreno et al., 2003; Ristow et al., 2008, Viott et al., 2013; Resende et al., 2015; Morales at el., 2014

Ileitis basics

Estimated herd prevalence in LATAM:

- Mexico
  - ?
  - Data not (easily) available

- What about other LATAM countries???

Ileitis basics

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Clinical presentation

- Proliferative hemorrhagic enteropathy (PHE)
  - Less common
  - Young adults 4 to 12 months old
  - Acute hemorrhagic diarrhea and anemia
  - Sudden death

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Ileitis basics

Clinical presentation

- Porcine intestinal adenomatosis (PIA)
  - Animals from 6 to 20 weeks old
  - Chronic transitory diarrhea
  - Compromised weight gain

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Ileitis basics

Subclinical infection

- Low performance
- No diarrhea!
  - Ileitis can be underestimated!

Personal archives

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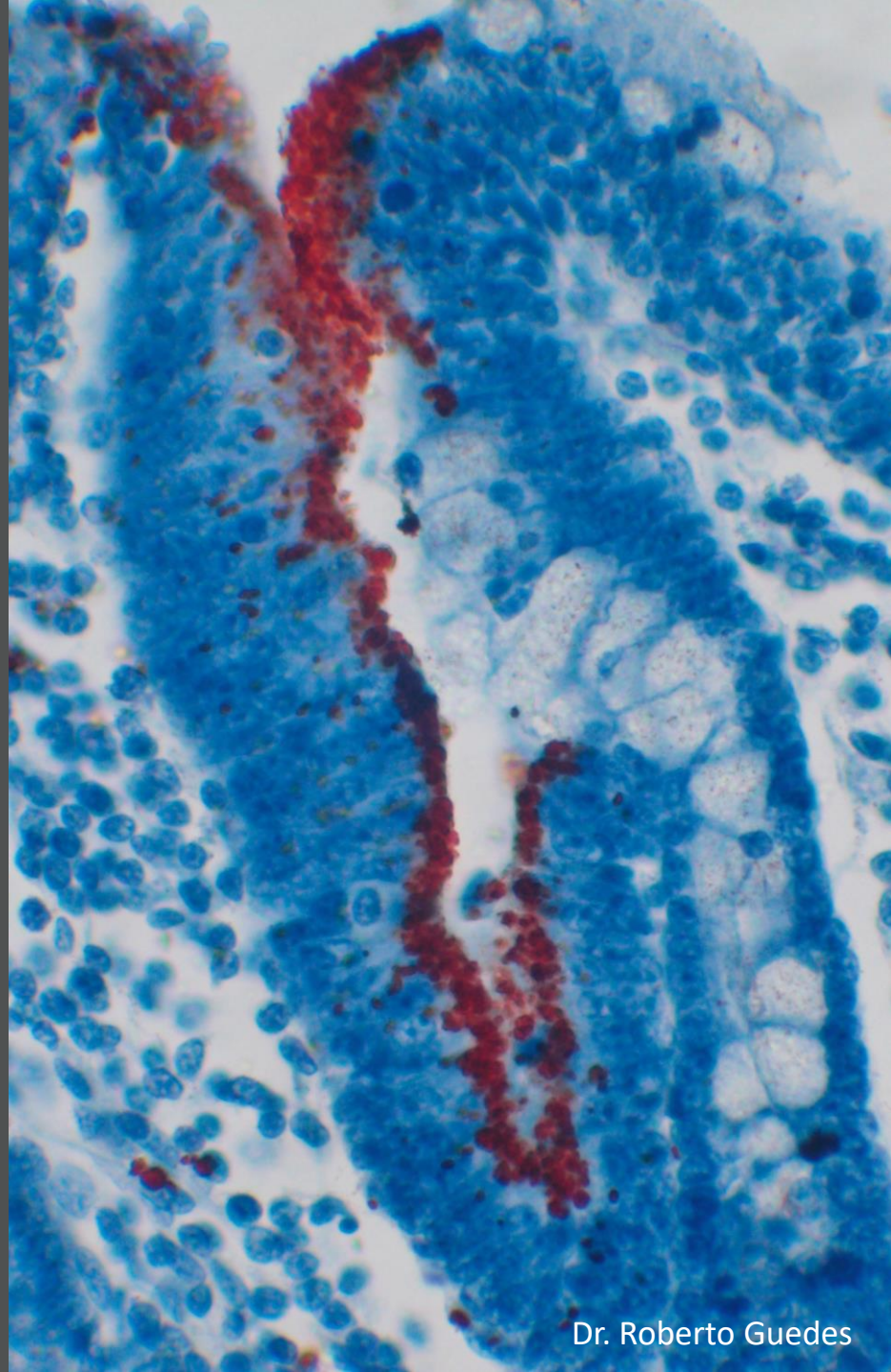
Ileitis basics

Diagnosis

- Gross lesions
- Histopathology + Immunohistoquemistry
- Serology
- PCR (RT-PCR)



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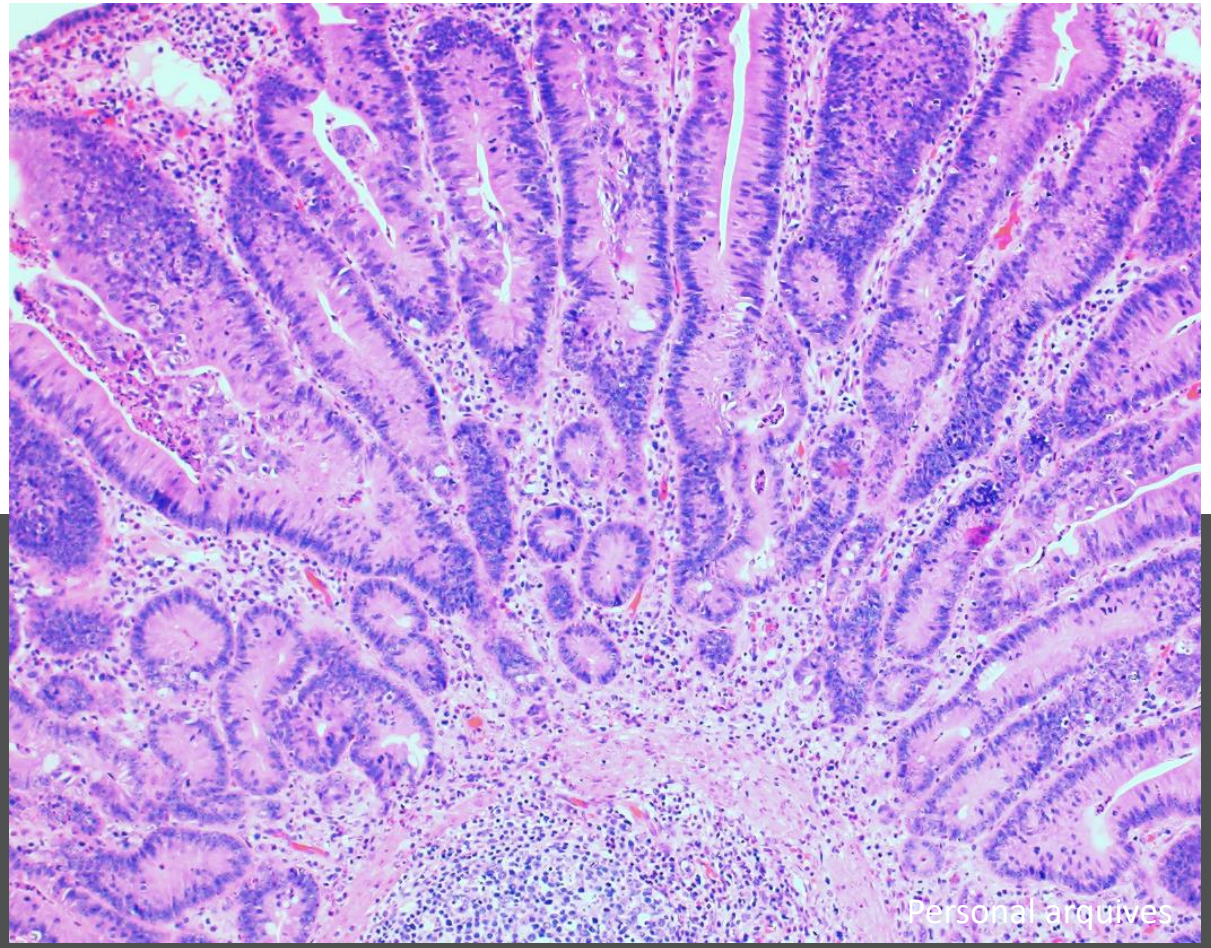
Ileitis details

Ileitis details

Normal small intestine



Intestine infected by *L. intracellularis*

Veterinary Microbiology 145 (2010) 286–291

Contents lists available at ScienceDirect

Veterinary Microbiology

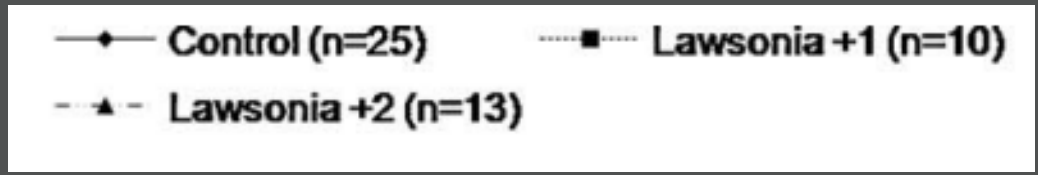
journal homepage: www.elsevier.com/locate/vetmic

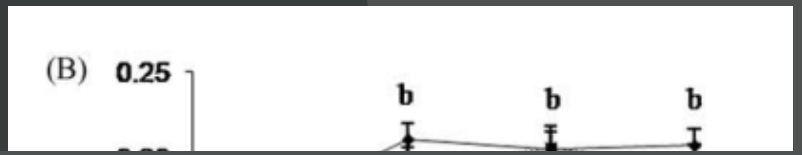
Intestinal absorption and histomorphometry of Syrian hamsters (*Mesocricetus auratus*) experimentally infected with *Lawsonia intracellularis*

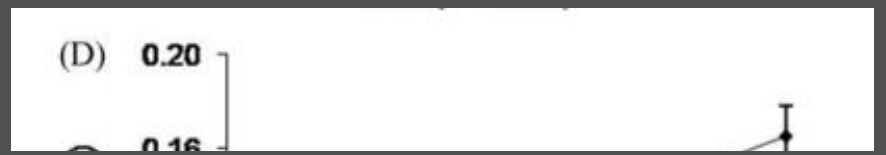
Fabio Augusto Vannucci [a], Elizabeth Lage Borges [b], Juliana Saes Vilaça de Oliveira [a], Roberto Mauricio Carvalho Guedes [a,*]

[a] Department of Veterinary Clinic and Surgery, Veterinary School, Universidade Federal de Minas Gerais, Belo Horizonte, MG 30123-970, Brazil
[b] Department of Physiology and Biophysics, Institute of Biological Science, Universidade Federal de Minas Gerais, Belo Horizonte, MG 31270-010 Brazil

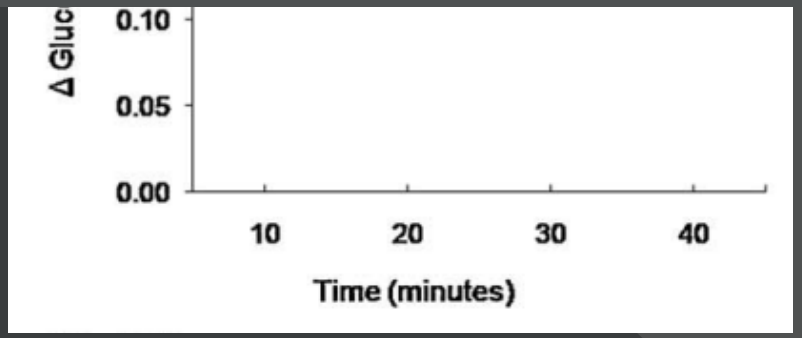
Ileitis details

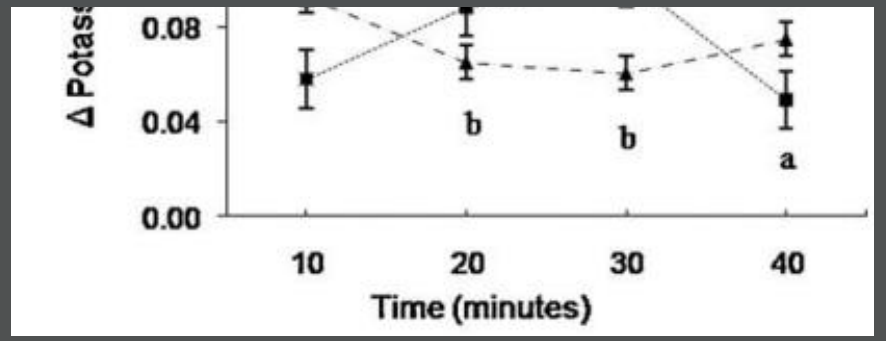


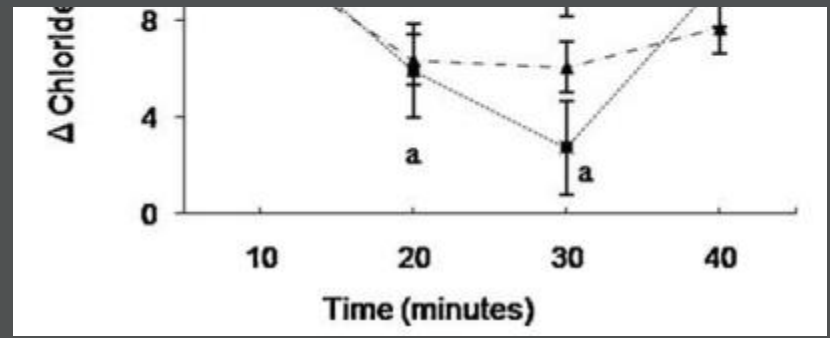




Malabsorptive diarrhea







Ileitis details

Helm *et al. Vet Res* (2021) 52:90
https://doi.org/10.1186/s13567-021-00958-2

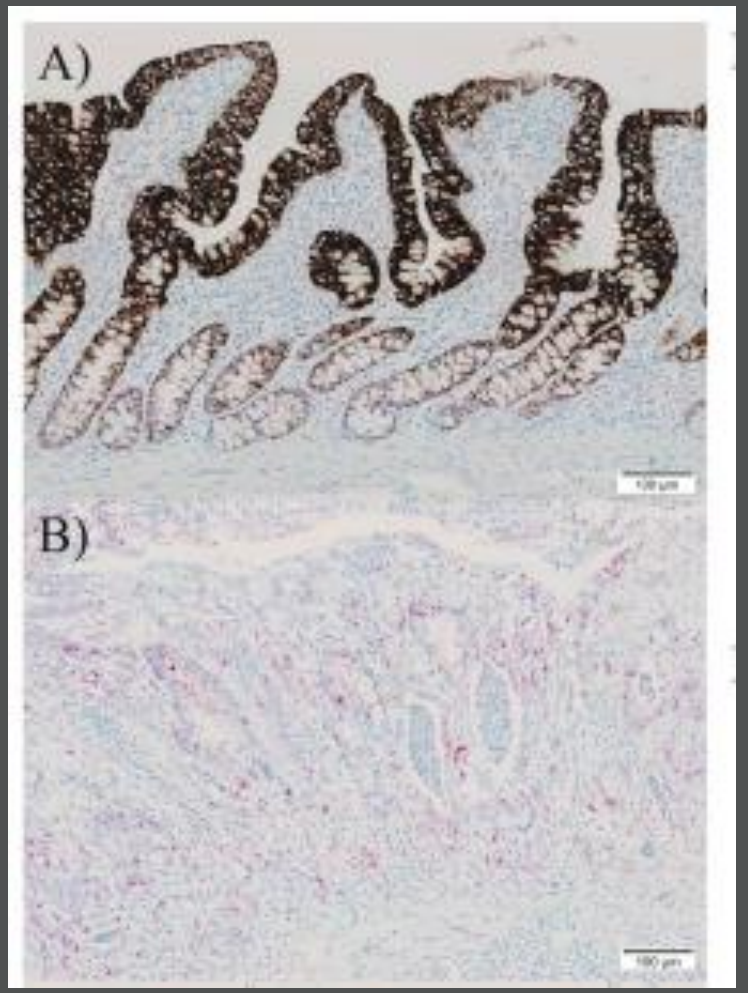
VETERINARY RESEARCH

RESEARCH ARTICLE Open Access

Lawsonia intracellularis infected enterocytes lack sucrase-isomaltase which contributes to reduced pig digestive capacity

Emma T. Helm[1], Eric R. Burrough[2], Fernando L. Leite[3] and Nicholas K. Gabler[1*]

Lack of absorptive and digestive enzymes → reduced digestibility



Poor performance?

Poor performance?

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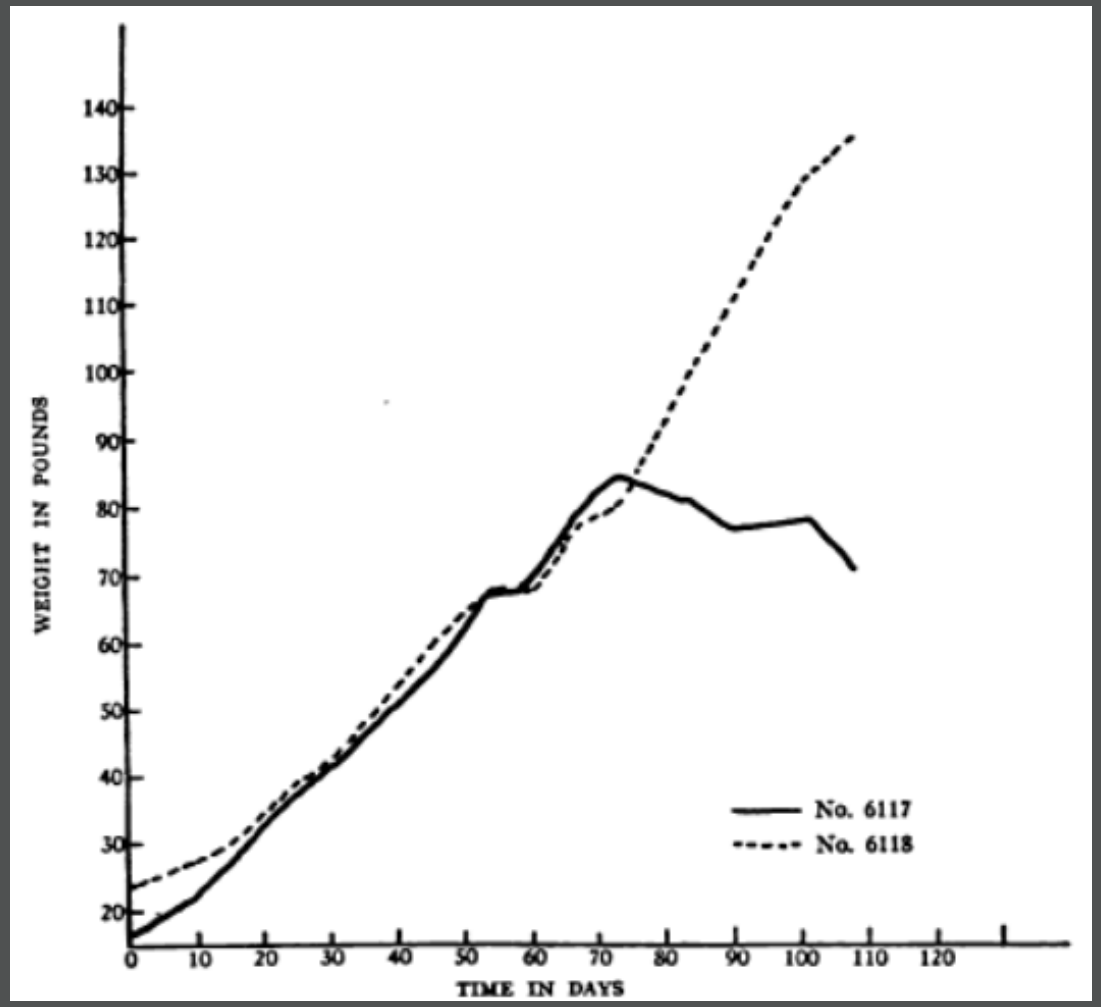
1939

STUDIES ON A RAPIDLY DEVELOPING INTESTINAL ADENOMA IN A PIG *

H. E. Biester, M.D., L. H. Schwarte, Ph.D., and D. F. Eveleth, Ph.D.
(*From the Veterinary Research Institute, Iowa State College, Ames, Iowa*)

- Weight loss + mild progressive diarrhea
- Intestinal lesions
  - Mesentery edema
  - Thickening of intestinal mucosa



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Subclinical ileitis produced by sequential dilutions of *Lawsonia intracellularis* in a mucosal homogenate challenge model

M.A. Paradis, DVM; R.I. McKay, PhD; J.B. Wilson, DVM, DVSc, PhD; G.H. Vessie, Dip. A.P.M. N.L. Winkelman, DVM; C.J. Gebhart, PhD; C.P. Dick, DVM, MSc

Table 2: Clinical and performance parameters in pigs administered varying doses of *L. intracellularis*

Treatment	Inoculum dose[1]	Fecal consistency score day 14[2]	ADG days 0 to 21/22[3]	Feed:gain days 0 to 21/22[4]
A	SPG	0.08^{a5}	0.40^{a}	1.63^{a}
F	3.2×10^{4}	0.18^{a}	0.25^{b}	2.07^{b}
E	3.8×10^{5}	0.43^{a}	0.23^{b}	2.10^{b}
D	2.2×10^{6}	0.37^{a}	0.24^{b}	2.24^{bc}
C	7.2×10^{7}	0.93^{b}	0.19^{b}	2.51^{bc}
B	2.4×10^{8}	1.34^{b}	0.16^{b}	2.92^{c}

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Infection dynamics of *Lawsonia intracellularis* in pig herds

H. Stege[a,b], T.K. Jensen[b,*], K. Møller[b], K. Vestergaard[c], P. Baekbo[c], S.E. Jorsal[b]

2004

Table 1
Longitudinal study of *L. intracellularis* infection in five Danish pig herds

	Herd A	Herd B	Herd C	Herd D	Herd E
Herd size (number of pigs slaughtered/year)	10,000	1800	4000	500	400
Feeding (home-mixed/ purchased)	Home-mixed	Purchased	Home-mixed	Home-mixed	Home-mixed
Production type (AI–AO/continuous)	Continuous (multi-site)	Continuous	Continuous	AI–AO/ continuous	AI–AO
Weaners included in survey (female/male)	20 (11/9)	20 (4/16)	20 (11/9)	20 (0/20)	20 (0/20)
Number of pigs slaughtered at the end of the study	8 (40%)	15 (75%)	16 (80%)	19 (95%)	20 (100%) (22 weeks old)
Average start weight (kg)	7	8	7	7	8
Average end weight (kg)	108	123	99	117	106
Average daily weight gain (g) (entire period)	536	529	429	557	588
% PCR positive pigs (at least positive once)	88[a]	72[a]	95[a]	85	20

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Short communication

Reproductive performance of gilts following an outbreak of acute proliferative enteropathy due to *Lawsonia intracellularis*

Carl-Patric Mauch *, Gabor Bilkei *

Bilkei Consulting, Raubbühlstrasse 4, 8600 Dübendorf, Switzerland

2005

Table 1
Fertility of *L. intracellularis* positive ($n = 15$ of 61 gilts) and negative ($n = 46$ of 61 gilts) (tested by immunofluorescence antibody [IFA] and polymerase chain reaction [PCR]) gilts, following a field outbreak of acute porcine proliferative enteropathy in a large indoor production unit

	L. intracellularis positive *N*/Nn = %	*L. intracellularis* negative *N*/Nn=%	*P*-value
Conception rate	301/280 = 93.0	282/272 = 96.5	0.001
Farrowing rate	301/198 = 65.8	282/218 = 77.3	0.001
Adjusted farrowing rate	301/222 = 73.8	282/236 = 83.7	0.001

N, number of gilts.
Nn, number of conceived gilts.

Table 2
Litter sizes of *L. intracellularis* positive ($n = 15$ of 61 gilts) and negative ($n = 46$ of 61 gilts) (tested by immunofluorescence antibody [IFA] and polymerase chain reaction [PCR]) gilts, following a field outbreak of acute porcine proliferative enteropathy in a large indoor production unit

	L. intracellularis positive $N \pm$ SD	*L. intracellularis* negative $N \pm$ SD	*P*-value
Total born	10.8 ± 1.1	11.3 ± 1.2	0.001
Born alive	9.8 ± 0.9	10.3 ± 0.8	0.001
Stillborn	0.83 ± 0.1	0.84 ± 0.2	ns
Mummies	0.18 ± 0.1	0.15 ± 0.01	ns

N, number of gilts.
Nn, number of conceived gilts.

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Estimate of direct financial losses due to porcine proliferative enteropathy

S. McOrist, S. H. Smith, L. E. Green

Veterinary Record (1997) **140,** 579-581

TABLE 1: Mean weight gain and feed conversion ratio, with likely feed and facility costs, in studies of groups of pigs challenged with *Lawsonia intracellularis* and unchallenged control pigs

Study number and challenge status	n	Mean start, finish weight (kg)	Average daily gain (kg/day) during study*	Feed conversion ratio during study†	Likely feed cost to market‡	Annual number of batches and likely cost per pig space§
1						
Yes	7	5·9,11·1	0·248 (21%)	2·0 (20%)	£52	2·07 - £9·7
No	7	6·3,12·9	0·314	1·6	£47	2·28 - £8·8
2						
Yes	7	5·3,12·3	0·250 (9%)	1·6 (6%)	£48	2·19 - £9·2
No	7	5·5,13·2	0·275	1·5	£47	2·28 - £8·8
3						
Yes	5	6·9,12·9	0·168 (20%)	2·6 (15%)	£50	2·09 - £9·6
No	4	6·7,14·5	0·210	2·2	£47	2·28 - £8·8
4						
Yes	8	8·3,14·8	0·310 (31%)	1·5 (13%)	£50	1·99 - £10
No	8	8·2,17·6	0·450	1·3	£47	2·28 - £8·8
5						
Yes	7	7·3,11·4	0·205 (28%)	2·0 (25%)	£53	2·02 - £9·9
No	7	7·4,13·1	0·285	1·5	£47	2·28 - £8·8

Poor performance?

How are you going to know if you have poor performance in your herd if you are not seeing diarrhea?

SEROLOGY

Poor performance?

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RESEARCH ARTICLE Open Access

Serological profile, seroprevalence and risk factors related to *Lawsonia intracellularis* infection in swine herds from Minas Gerais State, Brazil

Talita Pilar Resende[1], Carlos Eduardo Real Pereira[1], Michelle de Paula Gabardo[1], João Paulo Amaral Haddad[2], Zélia Inês Portela Lobato[2] and Roberto Maurício Carvalho Guedes[1*]

Out of 30 herds

- 30 → "No problem with diarrhea"
- 0 → *L. intracellularis* vaccine
- 30 → *L. intracellularis* seropositve

Poor performance?

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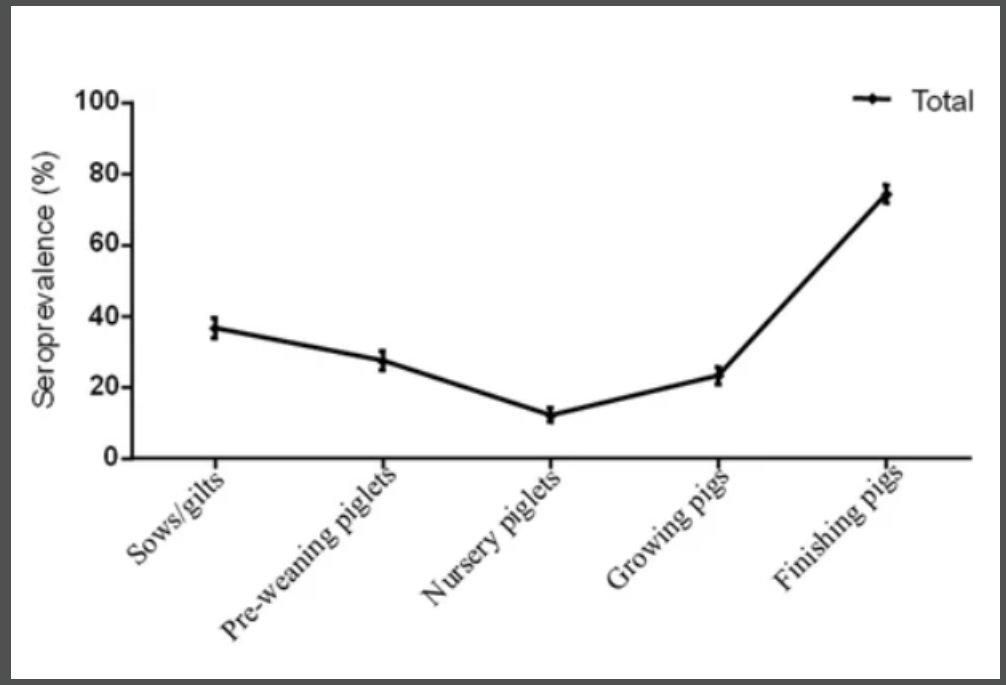
How to interpret serology results

If pigs are not vaccinated

- Negative: No seroconversion / farm is trully negative (?)
- Positive: Maternal antibodies / natural infection



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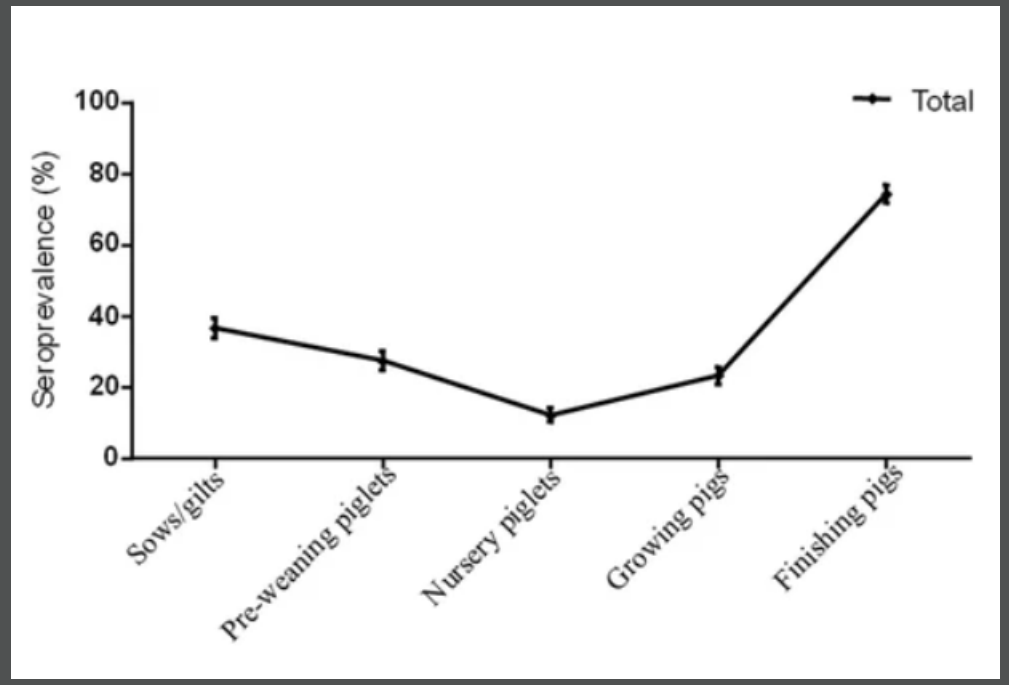
How to interpret serology results

If pigs ARE vaccinated

- Negative: No seroconversion yet*
- Positive: Maternal antibodies / natural infection / vaccinal antibodies

?



Poor performance?

How are you going to know if you have poor performance in your herd if you are not seeing diarrhea?

RT-PCR

Poor performance?

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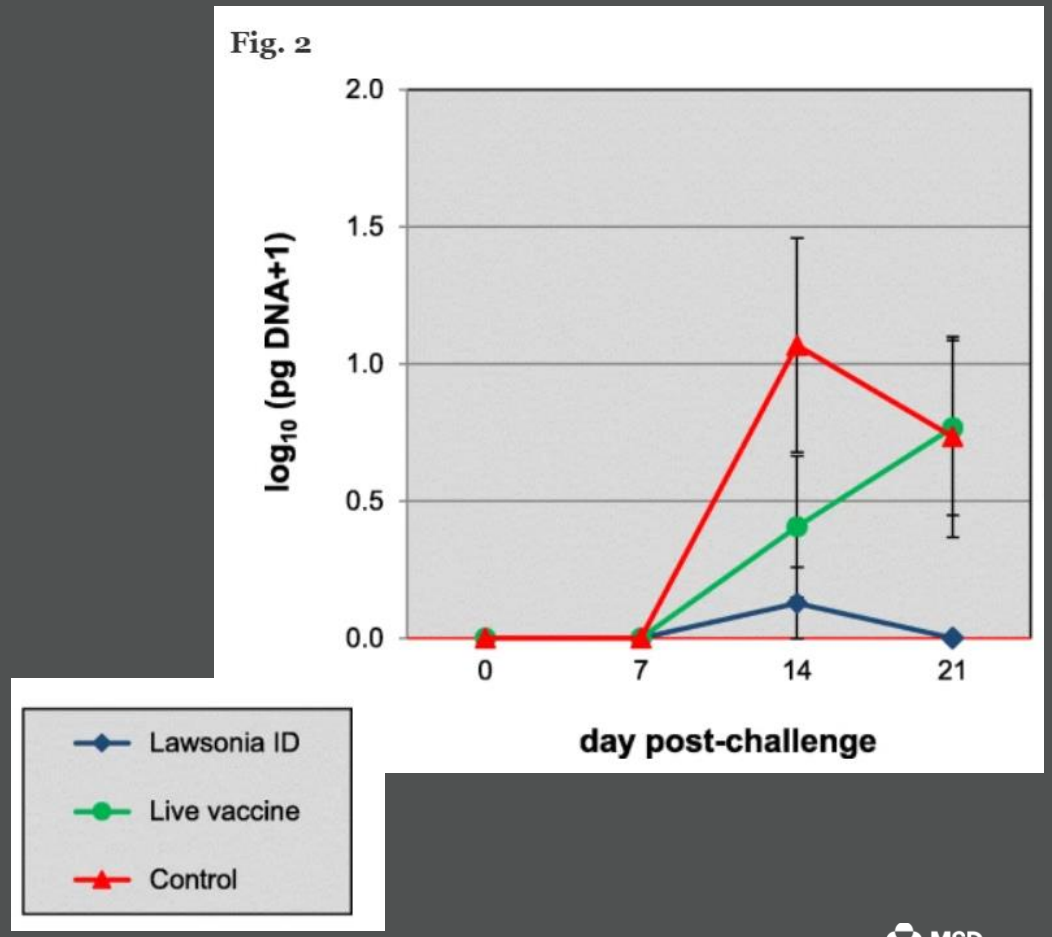
How to interpret PCR results

- Negative: Too early / too late / intermitent shedding
- Positive: What is the amount of Lawsonia?

Fecal shedding over time



Poor performance?

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Contents lists available at ScienceDirect

Veterinary Microbiology

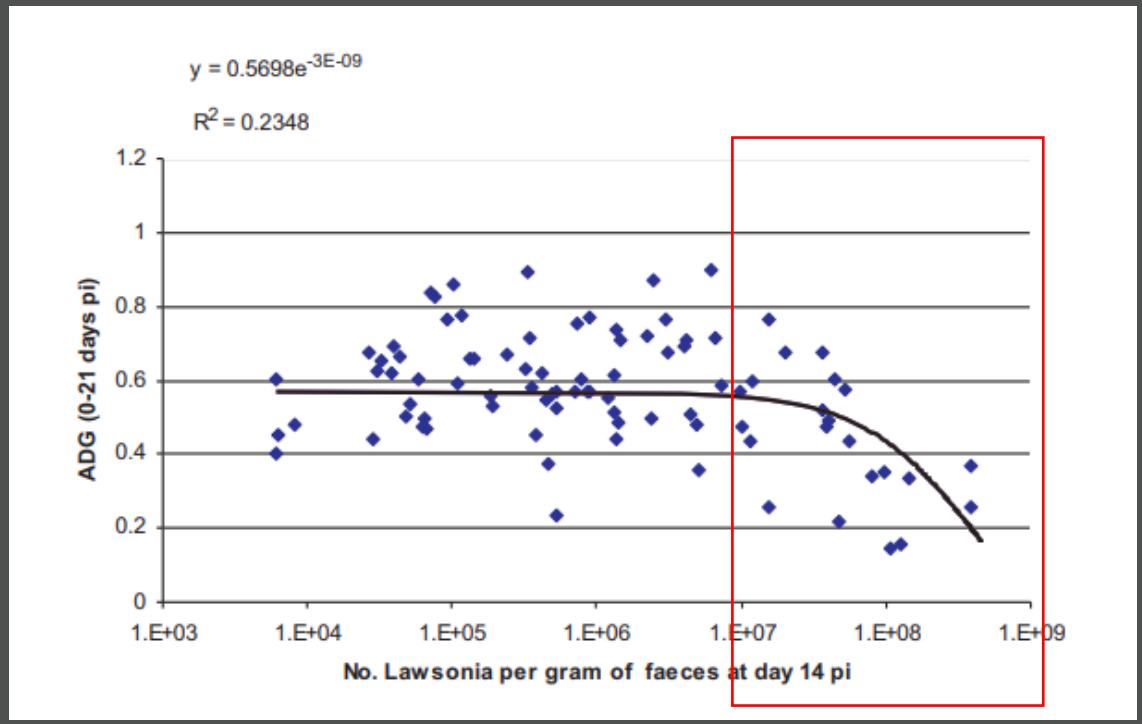
journal homepage: www.elsevier.com/locate/vetmic

Short Communication

The critical threshold of *Lawsonia intracellularis* in pig faeces that causes reduced average daily weight gains in experimentally challenged pigs

Alison M. Collins *, Idris M. Barchia

New South Wales Department of Primary Industries, Elizabeth Macarthur Agricultural Institute, PMB 4008, Narellan 2567, Australia



Fecal shedding higher than 10^7 *L. intracellularis*/g feces = reduced ADWG!

Poor performance?

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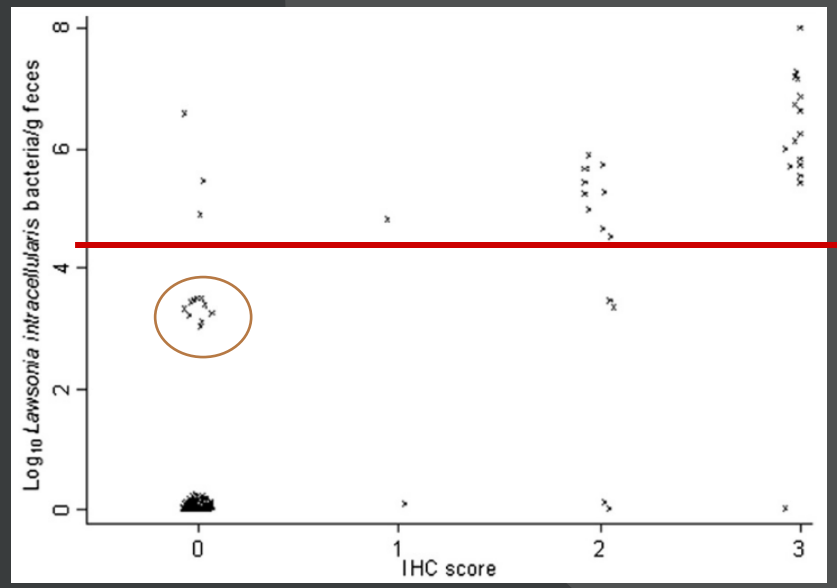
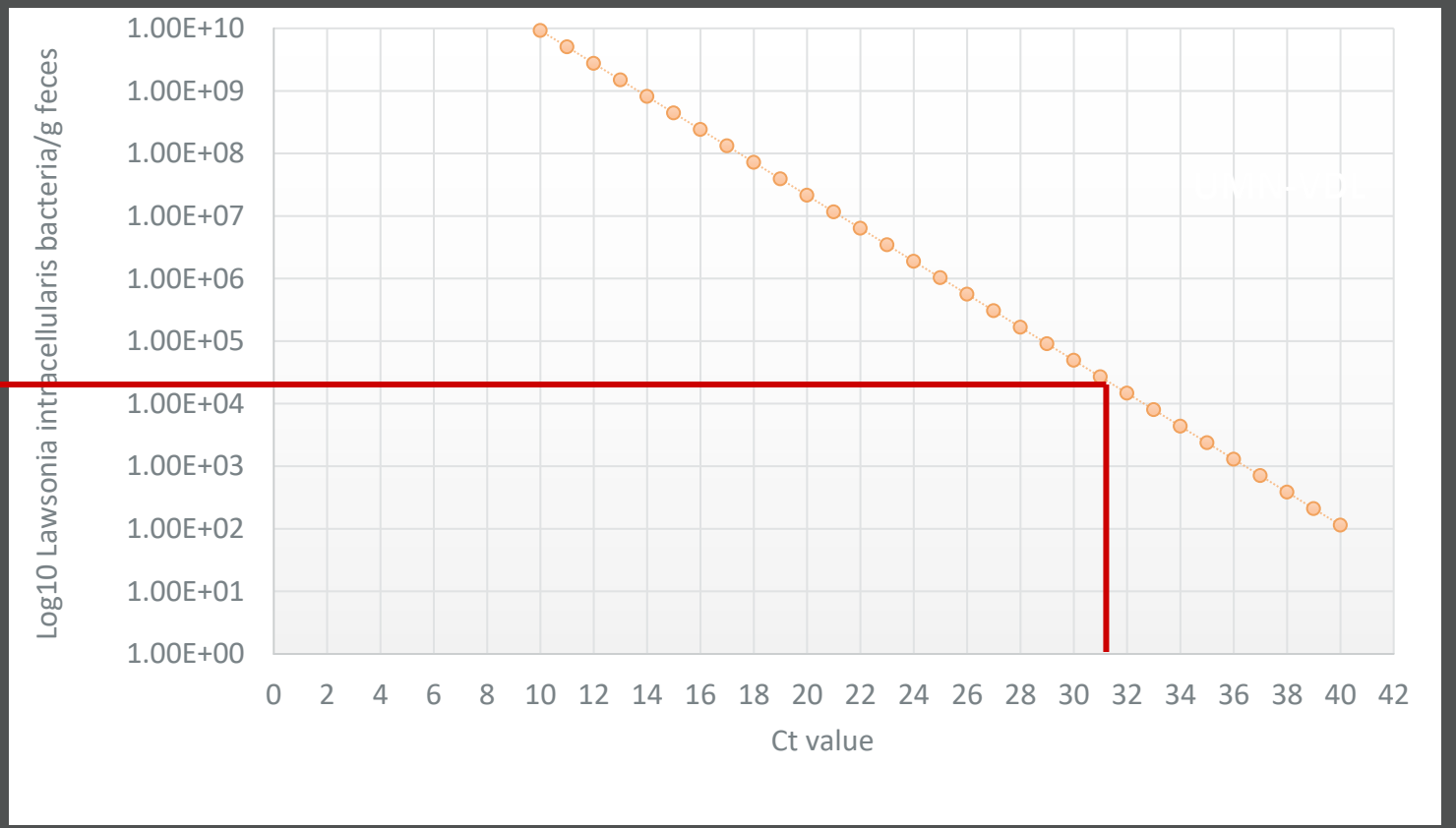
One Log10 increase in LI load increases *OR* for a pig to have a low growth rate by 2 times

BMC Veterinary Research 2012, **8**:198



Preventive Veterinary Medicine 108 (2013) 63–72



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Courtesy of Dr. Vannucci

Good news

Treatment options

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- Carbadox
- Tyamulin
- Tilmicosin
- Valnemulin

Vaccines!

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- Promote immune response
  - local and systemic
- Reduce intestinal lesions
- Decrease microscopic changes
- Decrease diarrhea

Vaccines!

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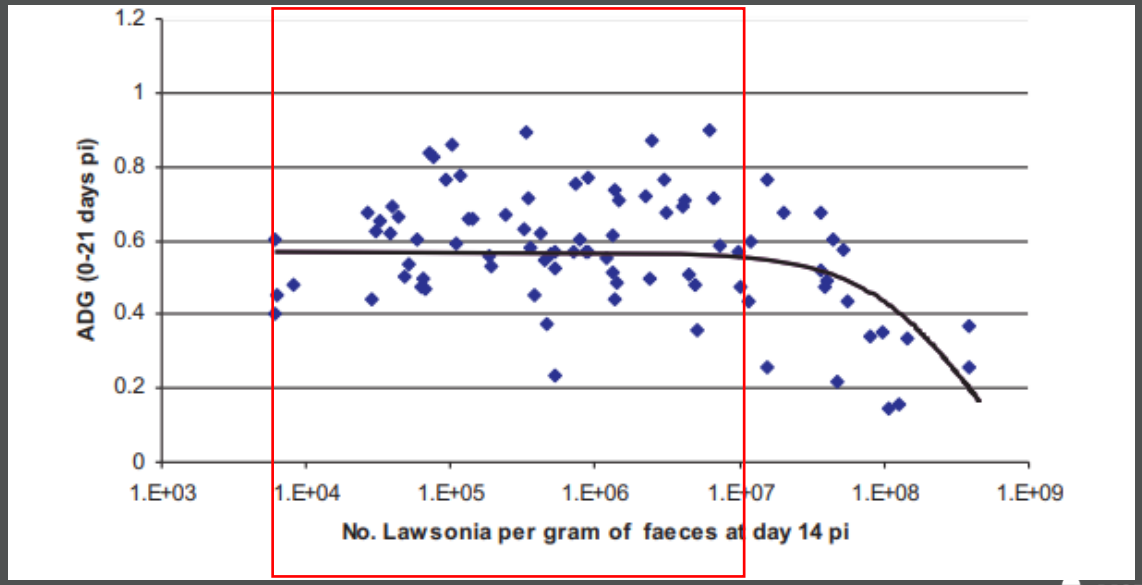
- No diarrhea / subclinically affected?
  - Decrease on fecal shedding!



Take-home mesages

Take-home messages

- Ileitis
  - Economic challenge for pig producers worldwide
  - Disturbs the intestinal morpho-physiology
    - Compromised digestibility and nutrient absorption
    - Energy use to keep homeostasis (?)
    - **Poor performance, <u>not always associated with diarrhea</u>**

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Take-home messages

- Unsure if your pigs are not performing as they could?
  - Average daily weight gain / feed conversion
  - Monitoring: Serology and RT-PCR
- Antimicrobials - still effective to control the infection
- Vaccination might be a better option in most cases

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Thank you!

Acknowledgements

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