IOWA STATE UNIVERSITY
Department of Animal Science

Slat level strategies to improve feed intake immediately post weaning

John Patience
Iowa State University
Ames, IA
jfp@iastate.edu

Presented to 2023 Leman China Conference

Why is there increased focus on feed intake?

- Increasingly frustrating producer issue
- Larger litters means more, smaller pigs at weaning
- The cost of high-quality stage 1 and 2 starters is very high
- Low feed intake impacts much more than just performance

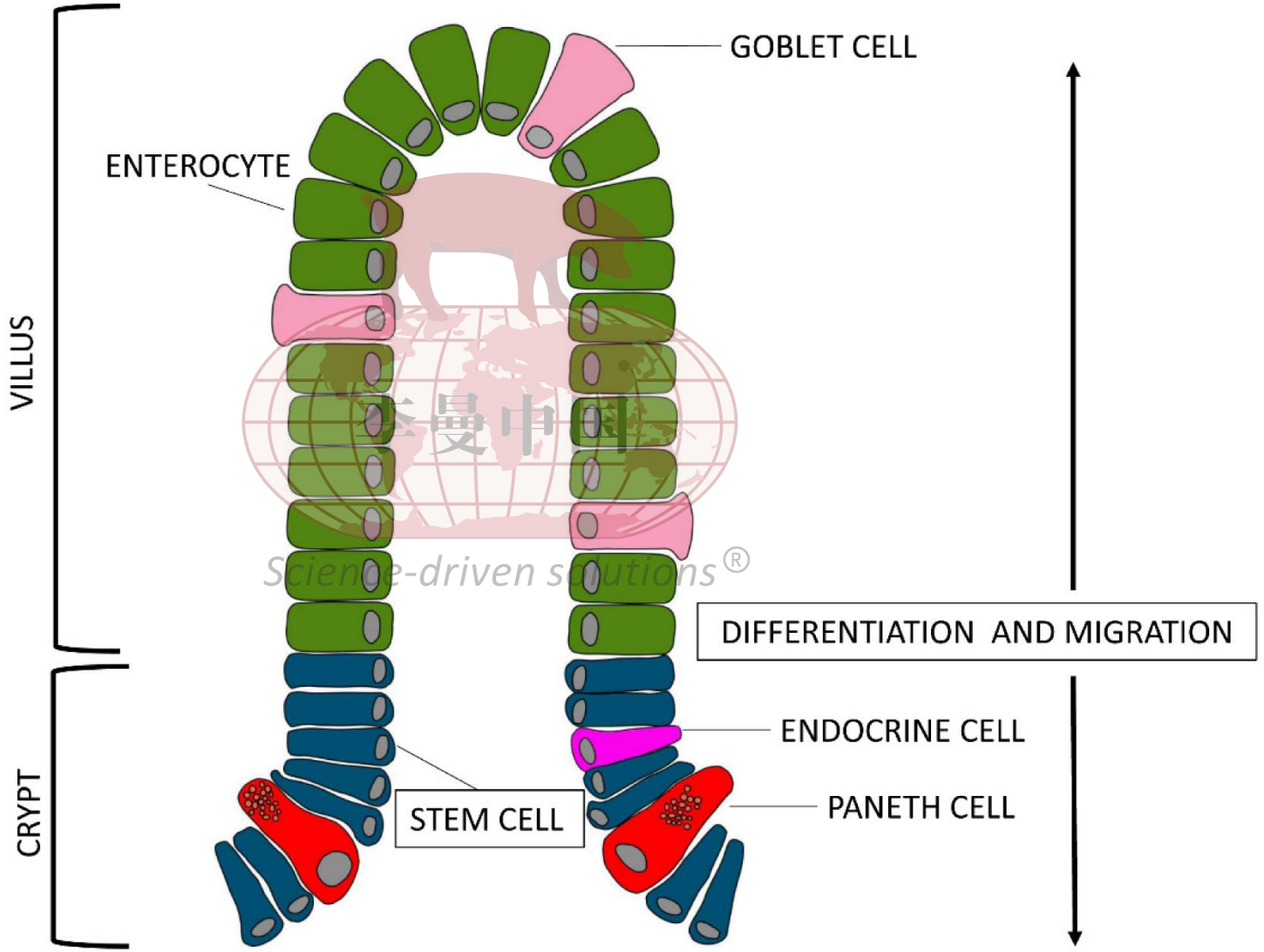
Why is there increased focus on feed intake?

- Low feed intake impacts immune function
  - Short term
  - Long term

Why is there increased focus on feed intake?

- Low feed intake impacts gut development

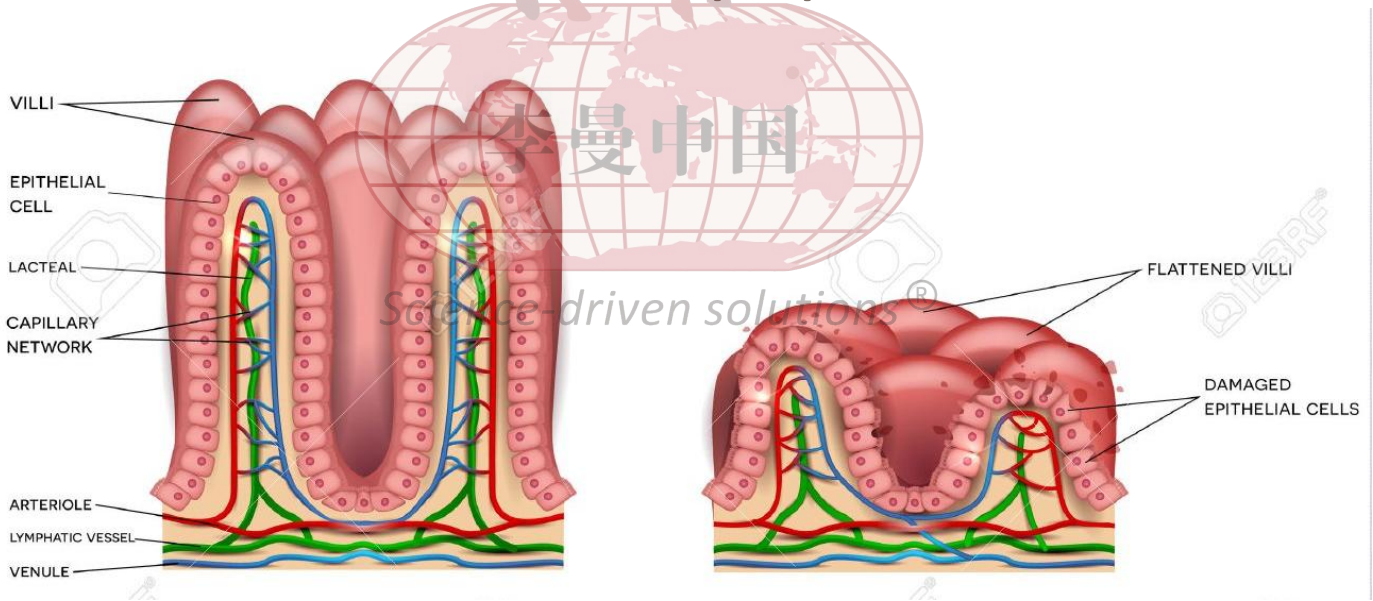
The ideal villi



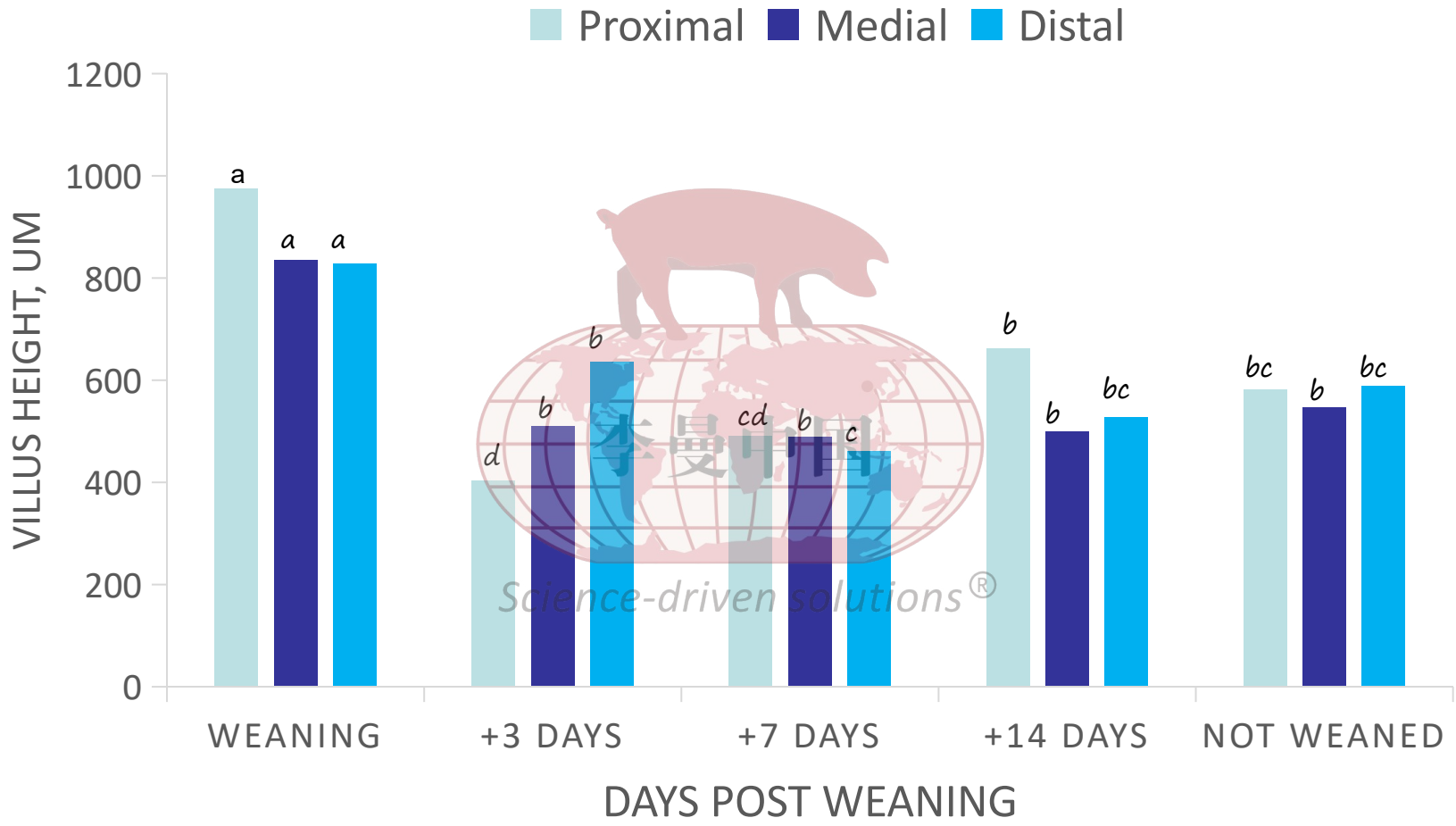
Source: Modina et al., 2021

In healthy gut, cellular mitosis is encouraged and apoptosis is down regulated

In the days and perhaps even weeks after weaning, mitosis is down regulated and apoptosis increases

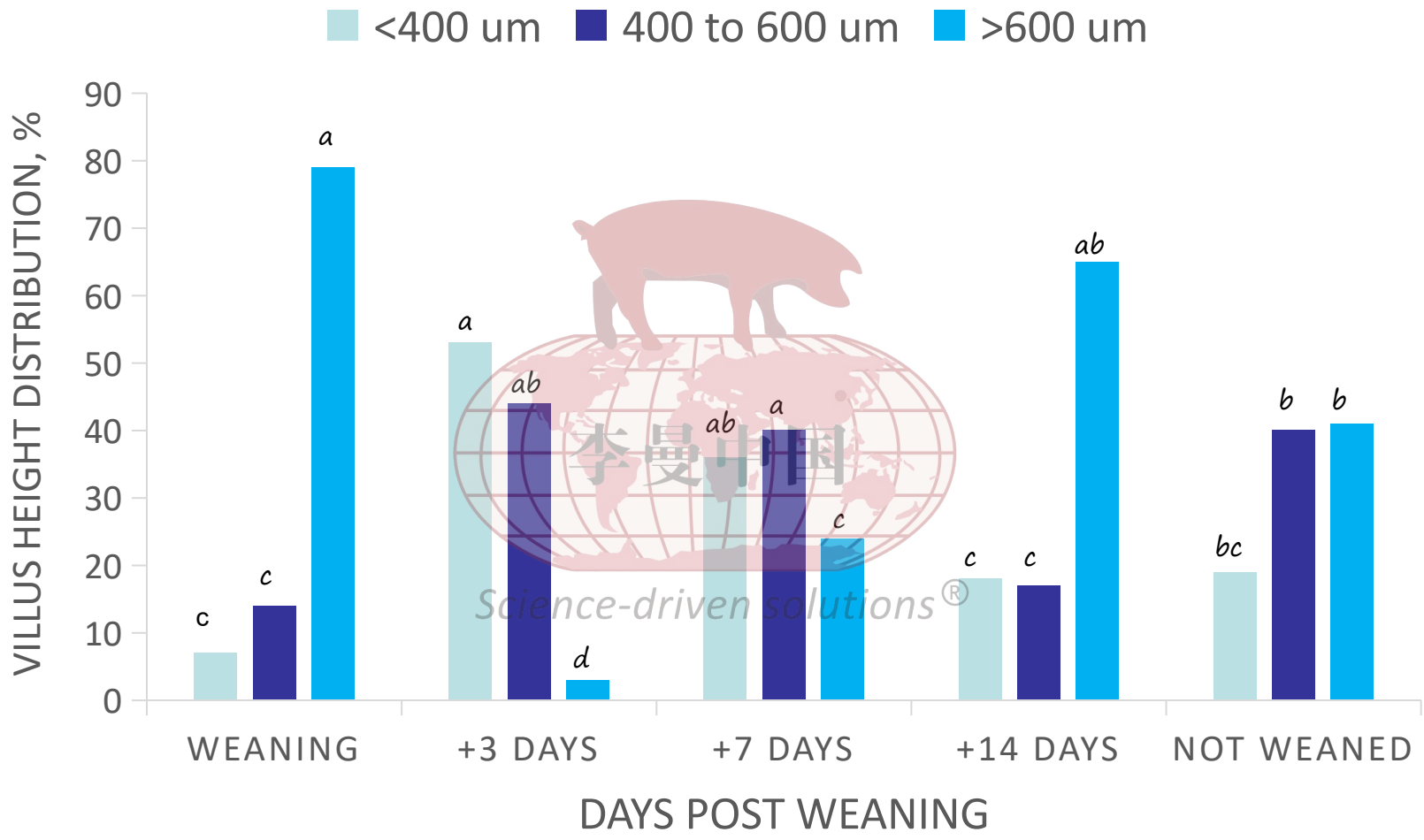


Impact of weaning on villus height in 3 sections of the small intestine in newly weaned pigs



Superscripts that differ within an intestinal section differ, P<0.05

Impact of weaning on proportion of villi within a height category in newly weaned pigs



Superscripts that differ within a villus height category differ, P<0.05

Source: Marion et al., 2002

Low feed intake also leads to chilling

Majority of pigs start

eating within 24 hours

of weaning.

But up to 30% take 24

to 60 hours!!

Energy metabolism in the 2 week old weaned pig

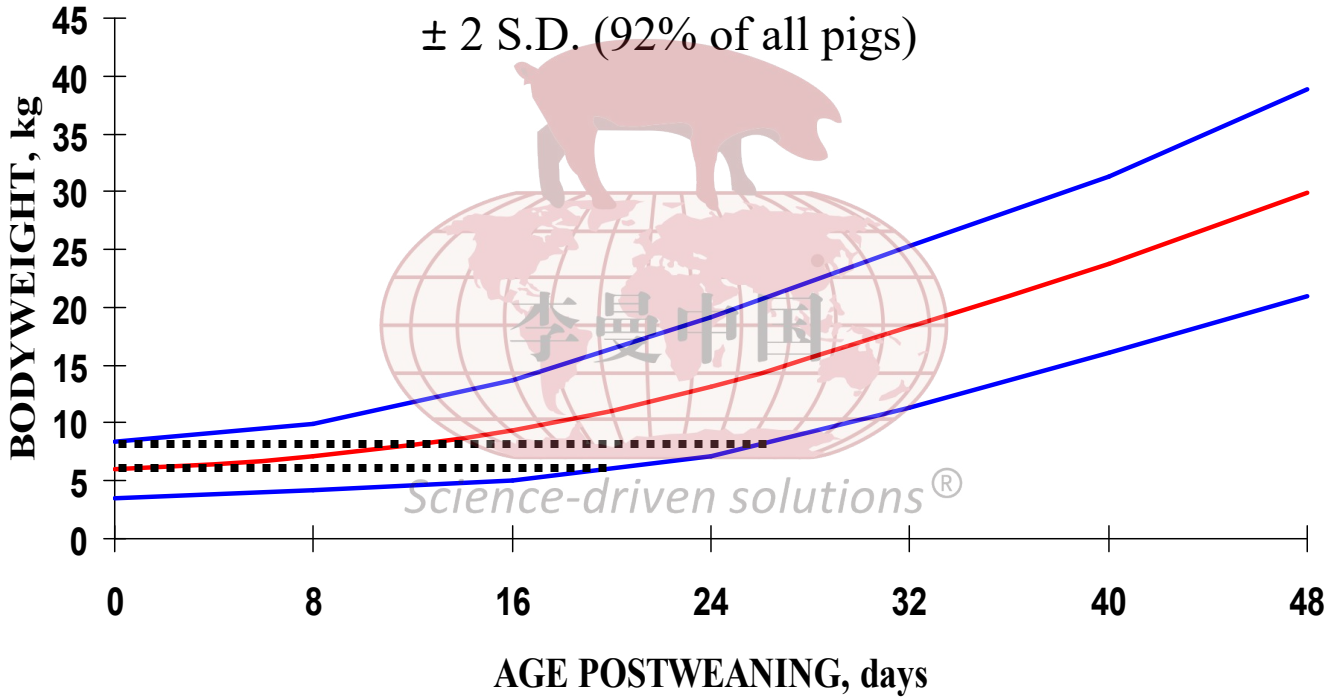
- When feed intake is twice maintenance requirements, heat loss is minimal at barn temperatures of 23°C and 28°C.
- When feed intake is at maintenance requirements, heat loss cannot be prevented – at any barn temperature (even 28°C)
- The lower critical temperature was 26.9°C at 1.0 times maintenance energy intake and 23.9°C at 2.0 times maintenance energy intake
- The efficiency of energy utilization was only 0.58 at 18°C and increased to 0.81 at 23°C
- Maintenance energy was determined to be:
  - 739 kJ/kg $BW^{0.75}$ at 18°C,
  - 615 kJ/kg $BW^{0.75}$ at 23°C
  - 550 kJ/kg $BW^{0.75}$ at 28°C.

Source: Close and Stanier, 1984

Local heating can reduce chilling and help the pigs overcome the effects of low feed intake

Source: Agroalimentaria

“Real” nursery growth curve



Encouraging nursery feed intake

1. Facilitate eating as a group, just as pigs eat while on the sow
   - ✓ Provide feed in the feeder and on a mat
   - ✓ 10 pigs per feeder space
     - ✓ Feeder space is “one” physical eating space with a minimum width of 1 inch per pig for nursery pigs and 2 inches for grow-finish pigs
       - ✓ Maximum occupancy of 80%

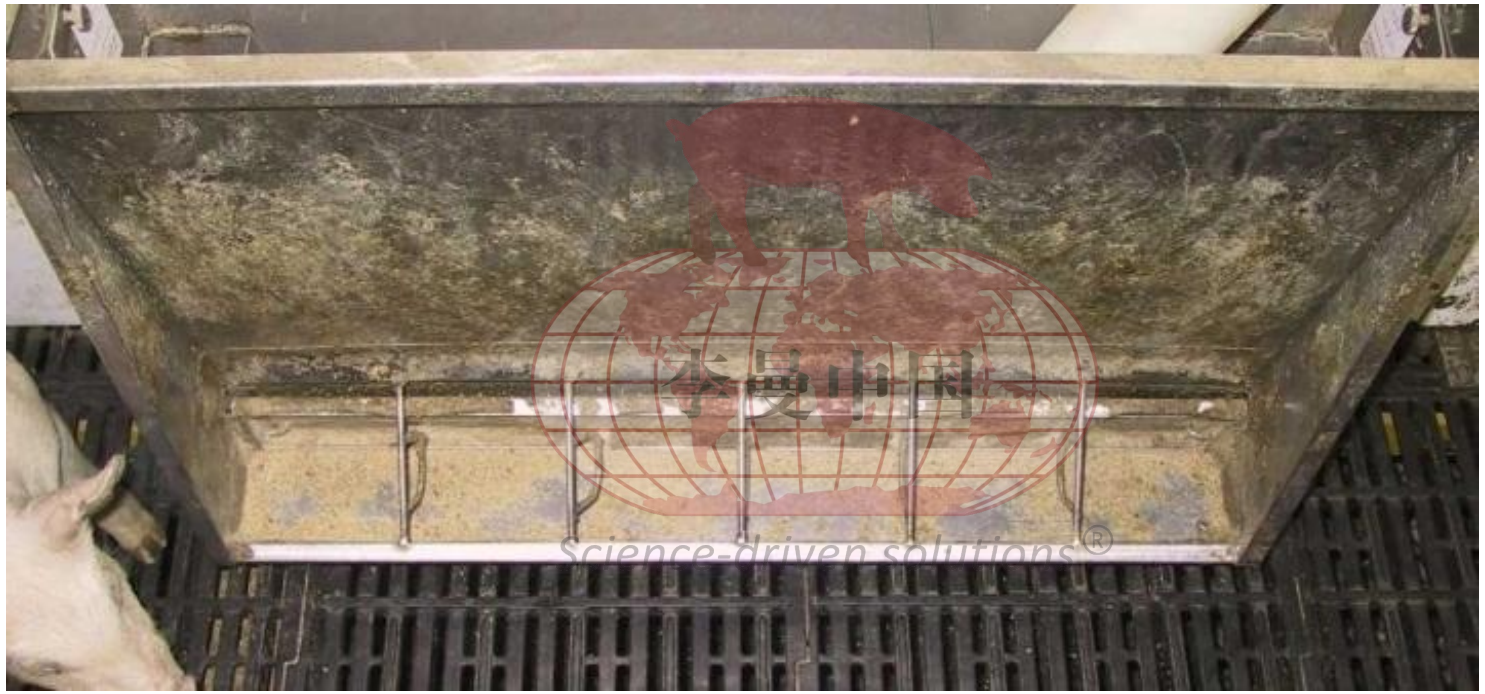
Impact of feeder gap adjustment on nursery pig performance

Trough coverage	6[1]	12[1]	37[1]	68[1]	92[1]	SEM
No. pigs	60	180	179	177	120	
No. pens	3	9	9	9	6	
Init. wt., kg	6.96	7.10	7.12	7.18	7.03	0.044
Final wt., kg[3]	27.91	28.97	29.55	29.50	29.56	0.093
Final wt – CV, %	14.0	12.8	11.4	12.3	13.4	
ADG, kg[2]	0.480	0.515	0.528	0.517	0.529	0.002
ADF, kg[2]	0.724	0.749	0.777	0.774	0.781	0.005
G:F	0.663	0.688	0.680	0.678	0.678	0.004
F:G	1.51	1.45	1.47	1.47	1.47	

[1] Mean percent of trough area covered with feed
[2] Effect of feeder adjustment significant, P<0.05
[3] Interaction between stocking density/group size and feeder adjustment significant, P<0.05.

10% trough coverage

40% trough coverage



Impact of feeder gap adjustment on nursery eating behaviour

Trough coverage	6[1]	12[1]	37[1]	68[1]	92[1]	SEM
No. pigs	60	180	179	177	120	
No. pens	3	9	9	9	6	
Feeding duration, min/d						
- Days 3 to 6[2,3]	142	118	125	116	116	4
- Days 39 to 42	97	90	85	79	75	6
Theoretical feeder space capacity						
- Days 3 to 6	9.1	11.0	10.4	11.2	11.2	
- Days 39 to 42	13.4	14.4	15.3	16.4	17.3	

1 Mean percent of trough area covered with feed
2 Effect of feeder adjustment significant, P<0.05
3 Interaction between stocking density/group size and feeder adjustment significant, P<0.05.

Mat feeding

- To encourage feed intake, provide feed at the time of weaning **in the feeder and on a mat**.
- Takes advantage of newly-weaned pigs' normal behaviours:
  - Eating small meals frequently
  - Eating in groups
  - Curiosity-driven rooting behaviour
- Continue for ~1 week after weaning
  - Repeat as many times a day as needed to keep feed continuously available
    - Small amounts multiple times per day is best
    - At least twice a day

Special care pens

- Separate pen(s) within the same room as their contemporaries
  - Do not want to mix ages
  - Should represent no more than 5 to 10% of the pigs in the room
- Objective is to meet the special needs of fall-behind pigs, and thus bring them back to become full value pigs
- Minimize stress to the lowest level possible
  - **Additional heat to compensate for low feed intake, illness**
  - Pigs requiring medical care can receive it most efficiently
    - Removes need to find them throughout the nursery
  - Perhaps provide higher quality feed (nutrient dense, highly digestible) perhaps medicated water through drinker as opposed to water line
  - Gruel feeding as needed and mat feeding as long as possible

Gruel feeding

- Providing mixture of feed and water to pigs
  - Generally directed to pigs not eating well
  - Most common in special care pens
- 2 to 2.5 parts water to 1 part feed
- Feeders: everywhere from sophisticated automatic systems to simple feeder/waterers (shown) to homemade

Walking the barn

- Perhaps the most important daily chore
  - Twice a day for first week after weaning if labour is available
- **Must walk in the pen, not past the pen**
  - Easy to miss pigs that are lethargic, have a cough, etc if they are not all required to get up and move around
- Want to see pigs up and moving, because you are looking for:
  - Lameness
  - Respiratory illness
  - Scours
- Objective is to 1) identify pigs that are not thrifty, 2) treat them with the 3) correct dose of the 4) correct medication as 5) early as possible, to be as effective as possible
  - Decide if the pig should be moved to a Special Care pen

Impact of feed budget management on nursery exit wt.

	Prior to Correction	Following Correction	Target
No. Turns	12	2	
No. Pigs	2,673	540	
Phase 1 diet, kg	0.4	2.0	2.0
Phase 2 diet, kg	15.4	18.8	17
Phase 3 diet, kg	23.7	22.3	24
Entry age, days	19.2	19.2	19
Exit age, days	71.2	72.2	72
Entry wt., kg	6.0	6.2	6.4
Exit wt., kg	30.5	34.2	35

The additional Phase 1 and 2 diets increased feed cost by $2.87/pig. The extra weight increased growout net profit by $13,000 in a 2,500 head finisher barn.

Barn environment

Room temperature

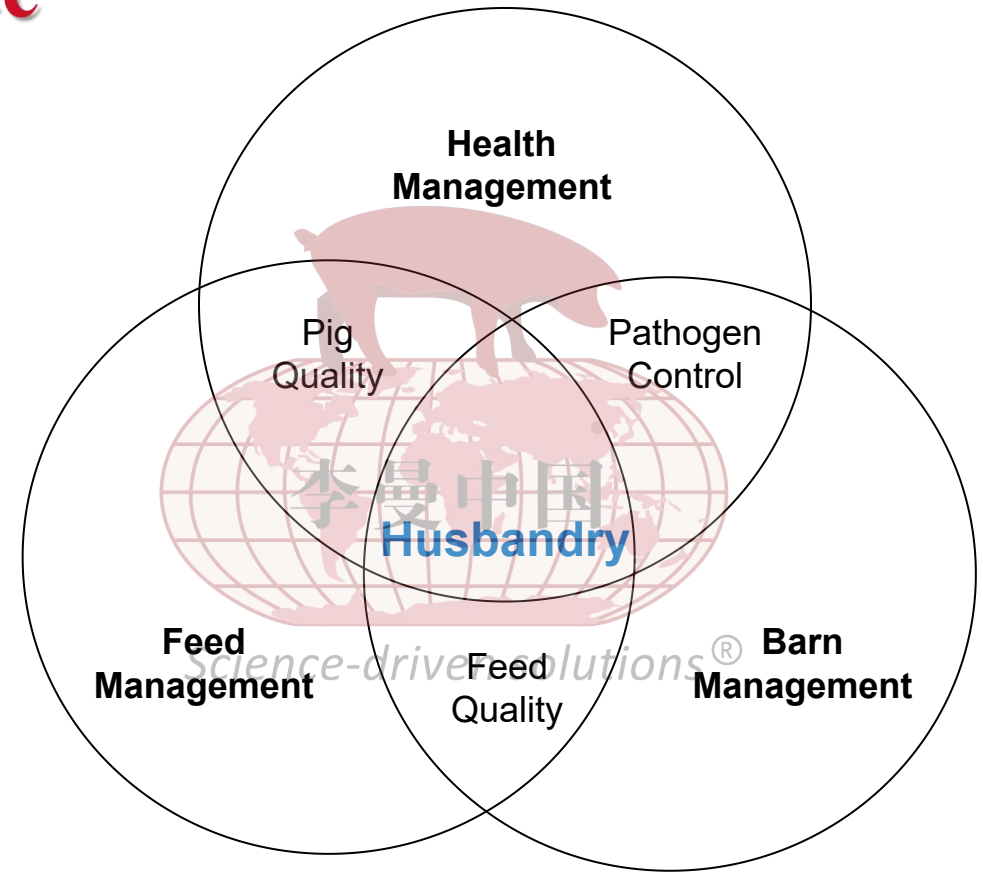
- Preheated and dry 1 day prior to fill
- Weaning: 29°C
- 2 weeks post-wean: 27°C
- 4 weeks post-wean: 23°C

- Recalibrate inlets prior to each fill

Importance of all-in-all-out

- Prevents transmission of pathogens from old to younger piglets
- Allows for creation of ideal thermal environment which is age and weight specific
- Eases implementation of feed budget

Convergence



Translational Animal Science, 2022, **6**, 1–44
https://doi.org/10.1093/tas/txac063
Advance access publication 16 May 2022
Review

Invited review: strategic adoption of antibiotic-free pork production: the importance of a holistic approach

John F. Patience[†,‡,1,] and Alejandro Ramirez[‖]

[†]Department of Animal Science, Iowa State University, Ames, IA 50011, USA
[‡]Iowa Pork Industry Center, Iowa State University, Ames, IA 50011-1178, USA
[‖]College of Veterinary Medicine, University of Arizona, Oro Valley, AZ 85737, USA

[1]Corresponding author: jfp@iastate.edu

ABSTRACT

The discovery of the use of antibiotics to enhance growth in the 1950s proved to be one of the most dramatic and influential in the history of animal agriculture. Antibiotics have served animal agriculture, as well as human and animal medicine, well for more than seven decades, but emerging from this tremendous success has been the phenomenon of antimicrobial resistance. Consequently, human medicine and animal agriculture are being called upon, through legislation and/or marketplace demands, to reduce or eliminate antibiotics as growth promotants and even as therapeutics. As explained in this review, adoption of antibiotic-free (**ABF**) pork production would represent a sea change. By identifying key areas requiring attention, the clear message of this review is that success with ABF production, also referred to as "no antibiotics ever," demands a multifaceted and multidisciplinary approach. Too frequently, the topic has been approached in a piecemeal fashion by considering only one aspect of production, such as the use of certain feed additives or the adjustment in health management. Based on the literature and on practical experience, a more holistic approach is essential. It will require the modification of diet formulations to not only provide essential nutrients and energy, but to also maximize the effectiveness of normal immunological and physiological capabilities that support good health. It must also include the selection of effective non-antibiotic feed additives along with functional ingredients that have been shown to improve the utility and architecture of the gastrointestinal tract, to improve the microbiome, and to support the immune system. This holistic approach will require refining animal management strategies, including selection for more robust genetics, greater focus on care during the particularly sensitive perinatal and post-weaning periods, and practices that minimize social and environmental stressors. A clear strategy is needed to reduce pathogen load in the barn, such as greater emphasis on hygiene and biosecurity, adoption of a strategic vaccine program and the universal adoption of all-in-all-out housing. Of course, overall health management of the herd, as well as the details of animal flows, cannot be ignored. These management areas will support the basic biology of the pig in avoiding or, where necessary, overcoming pathogen challenges without the need for antibiotics, or at least with reduced usage.