



# Impact of Nutrition and Inflammation on Gilts and Sows

李曼中国

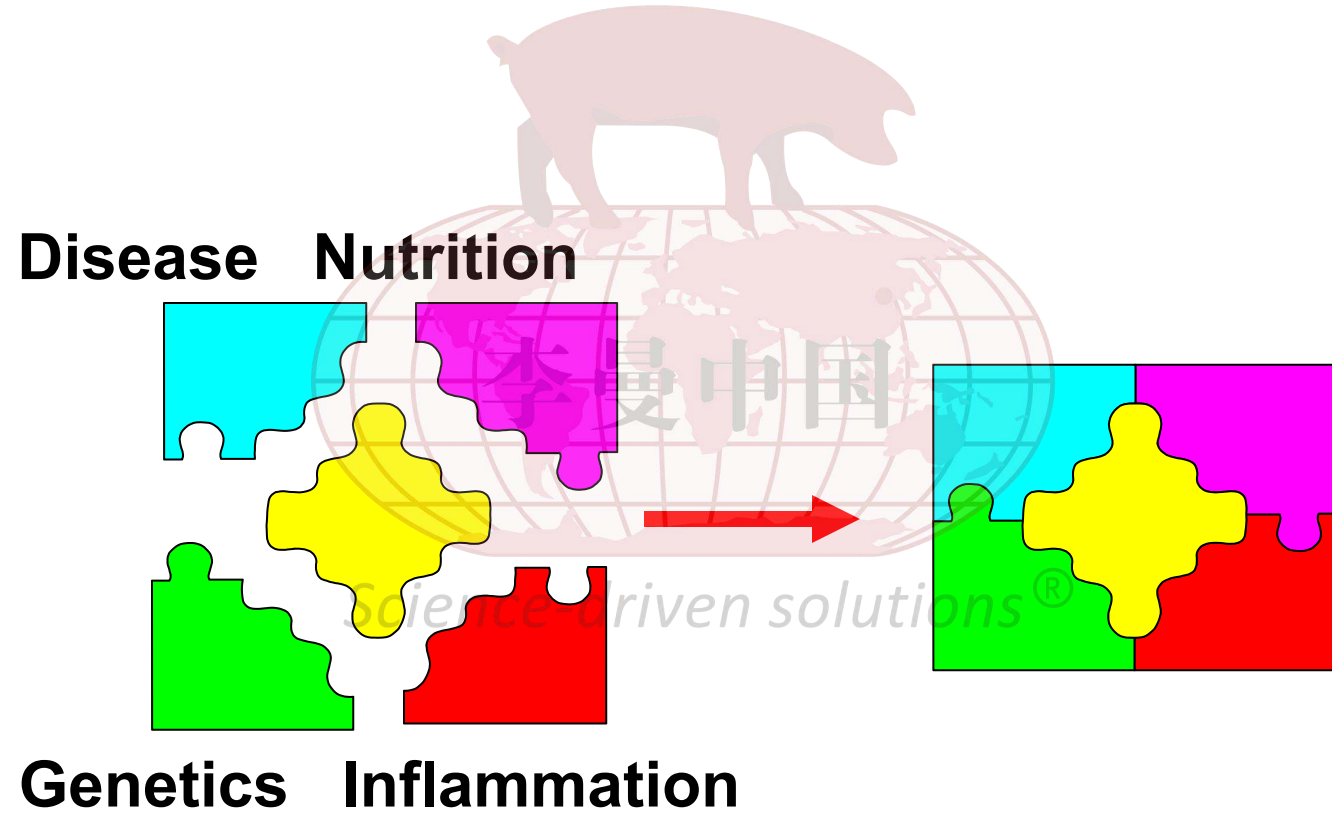
Mark E. Wilson, PhD Reproductive Physiology  
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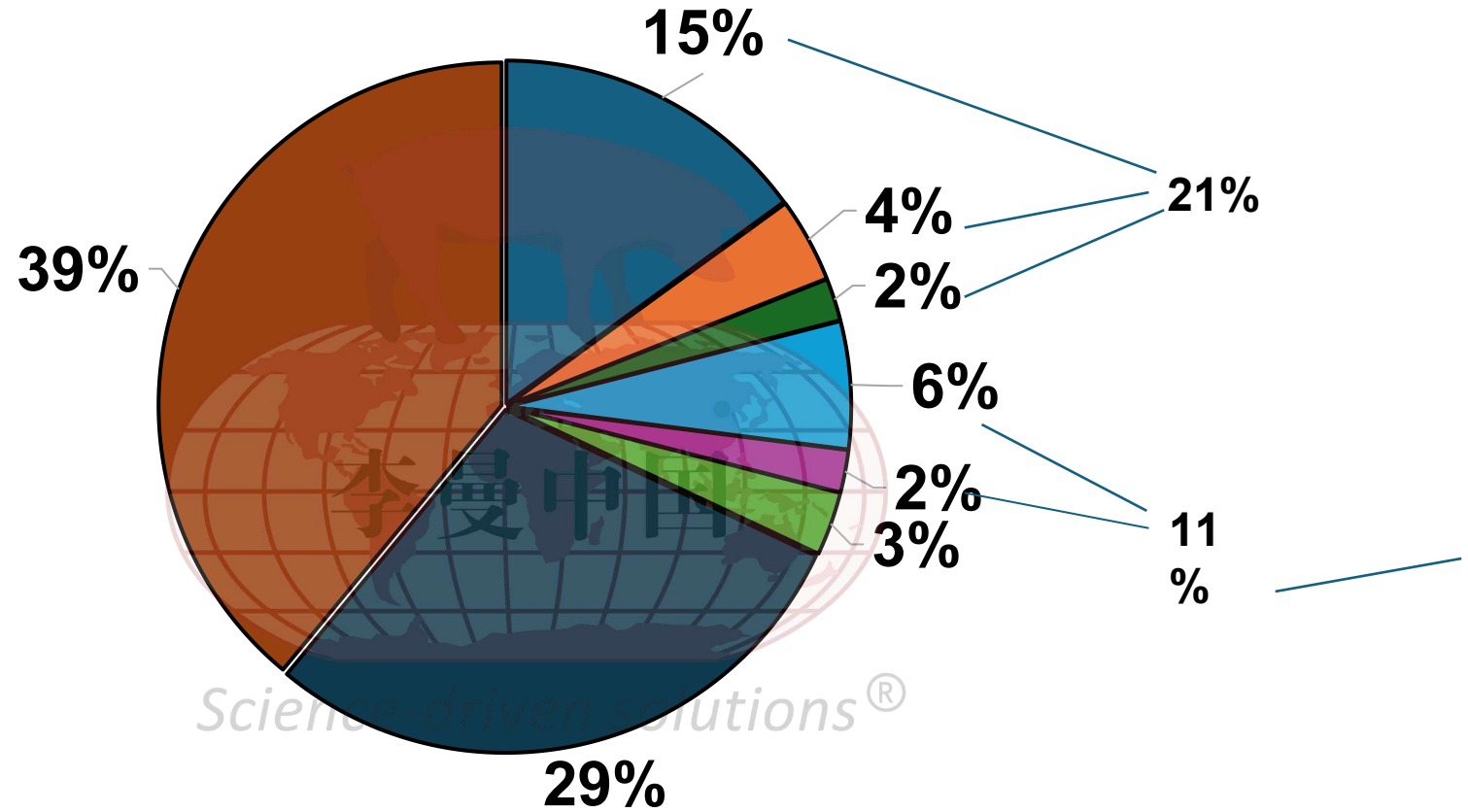
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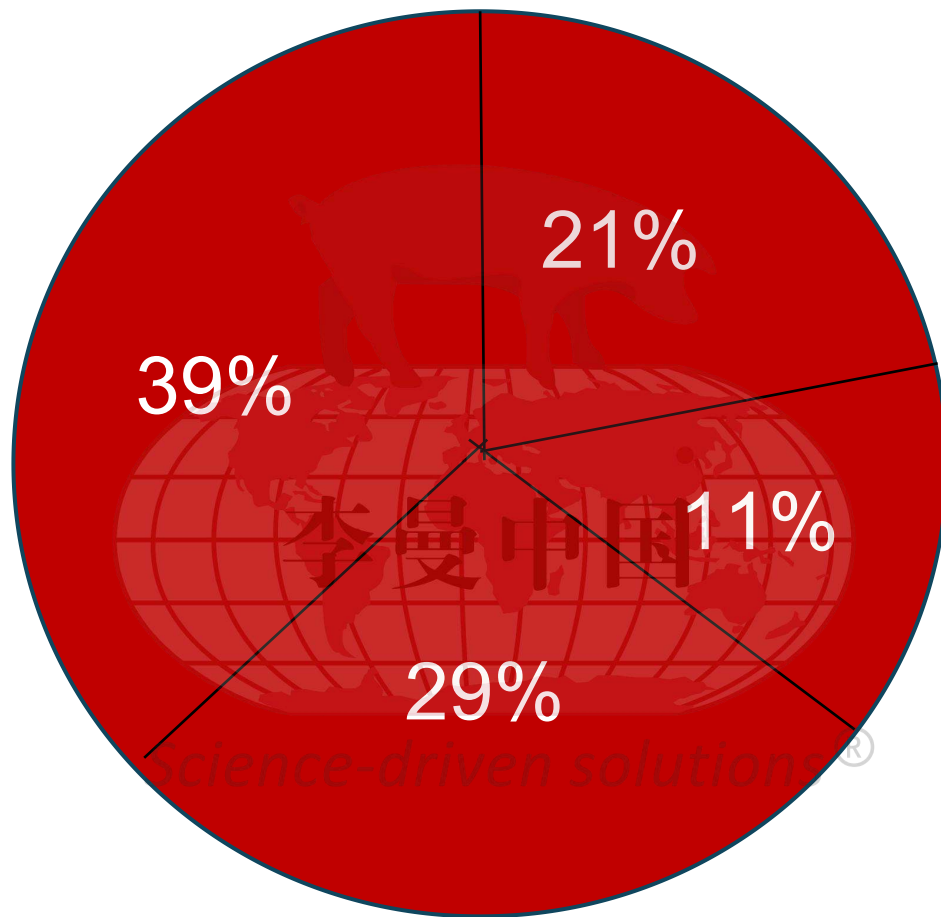
# Reproductive Success has a lot of pieces to the puzzle



# Causes Of Sow Mortality



Iowa pork industry center. 2019. Sow mortality project #17-224, update 3-1-19. [www.ipic.iastate.edu](http://www.ipic.iastate.edu).



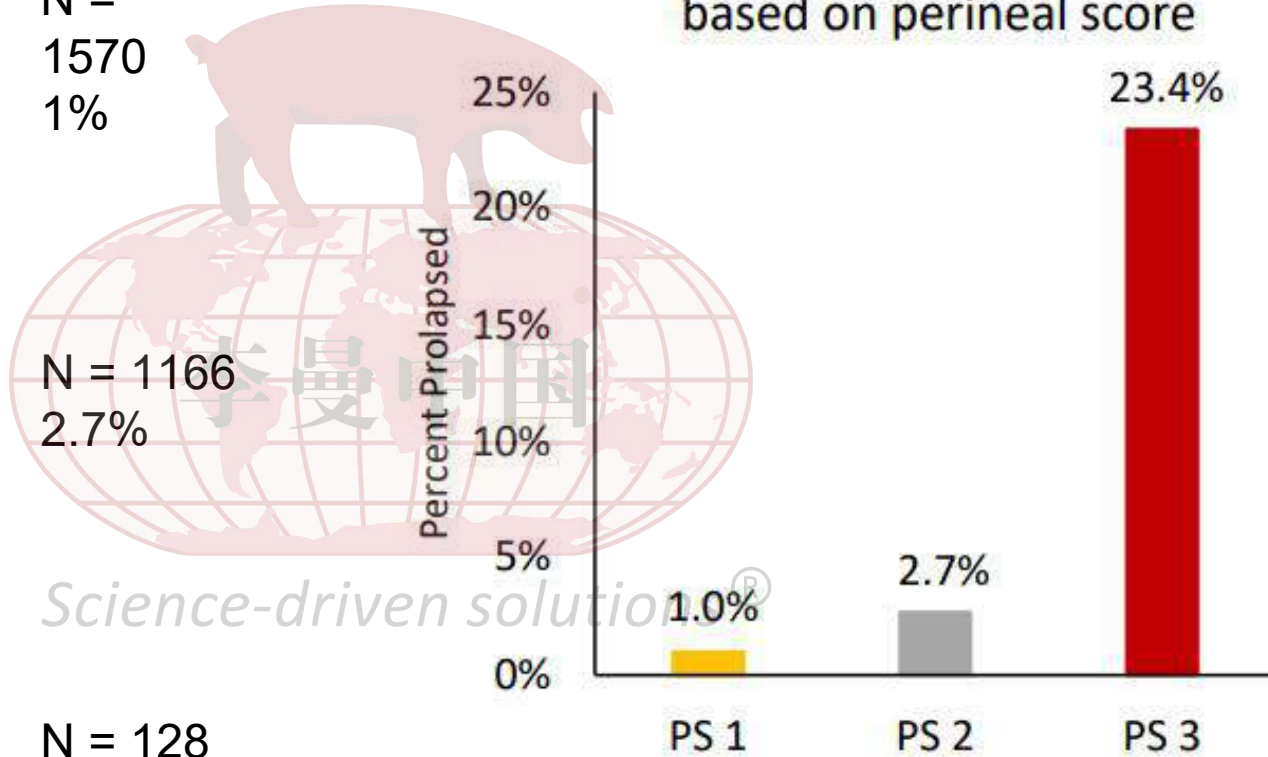


N =  
1570  
1%

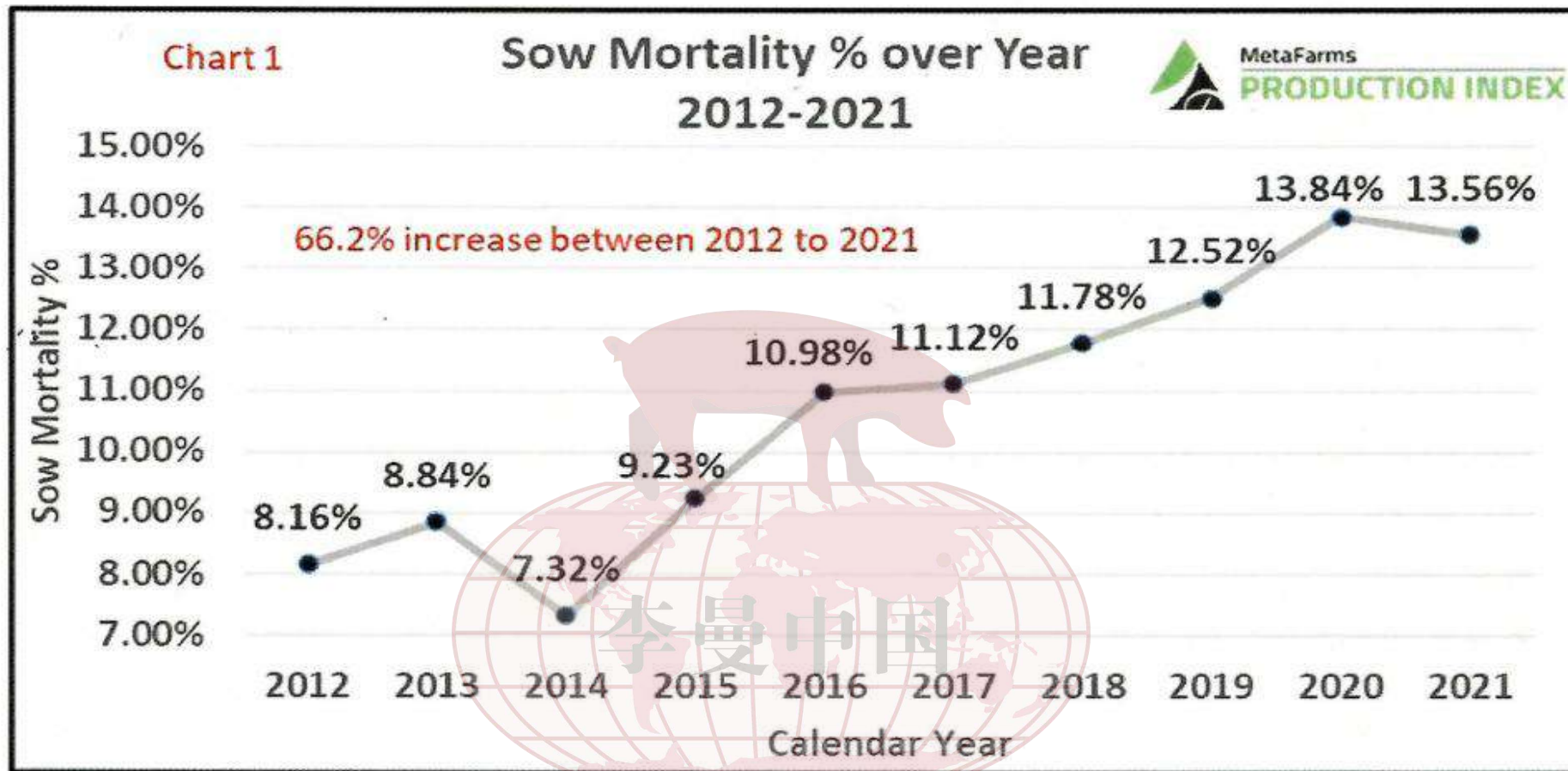
N = 1166  
2.7%

N = 128  
23.4%

Percent of sows that prolapsed based on perineal score



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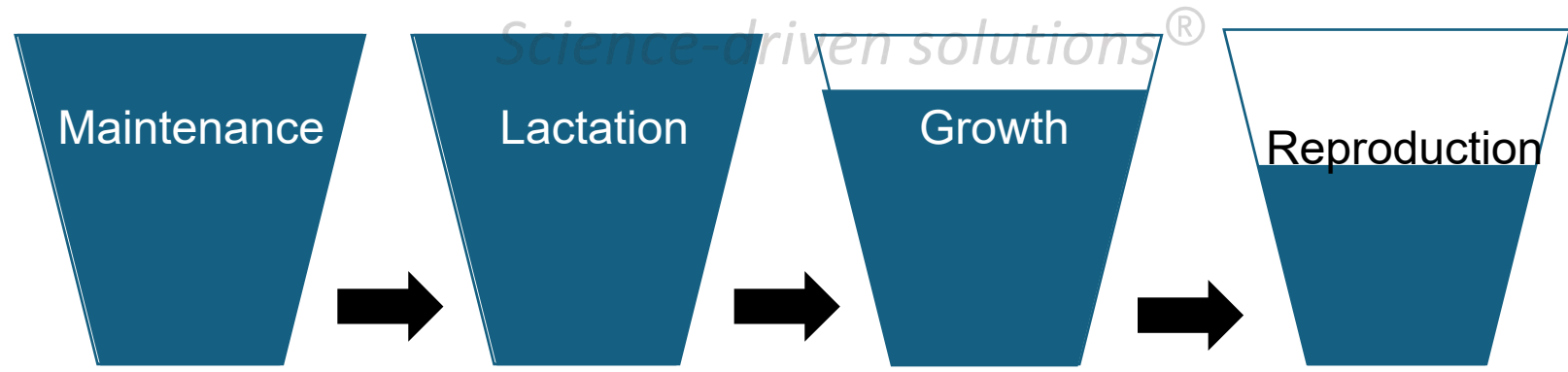
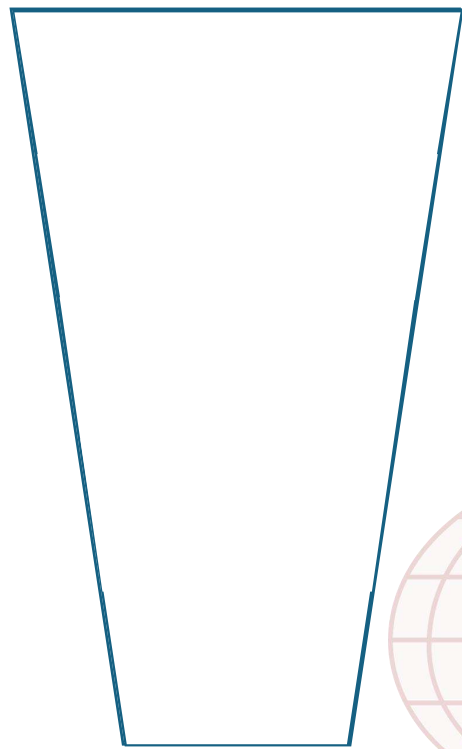
**Death Loss 14.73%**

# Goal

- Minimize body weight losses in lactation
- Improve birth weights
- Decrease wean to estrus interval

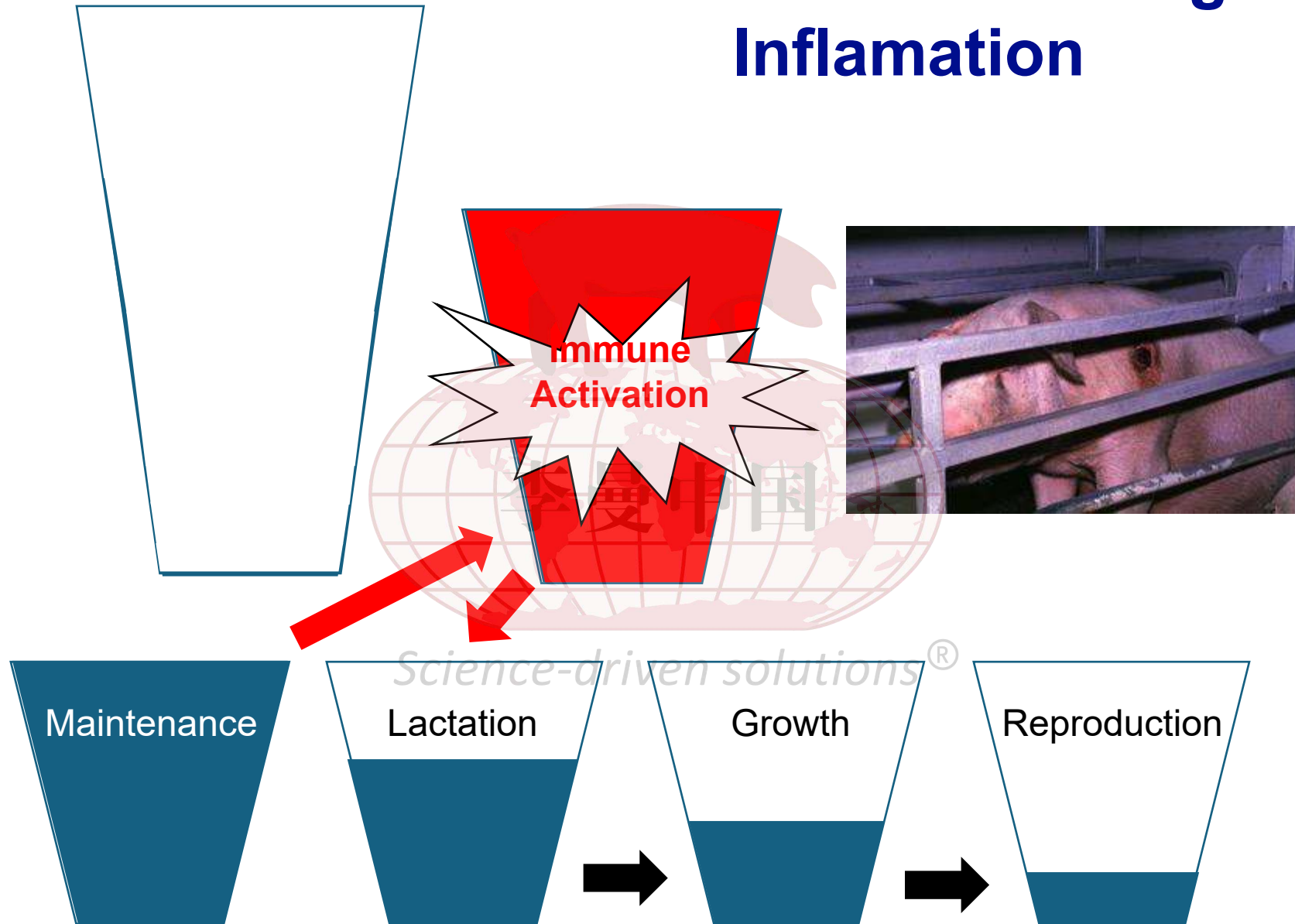


# Nutrient Partitioning 1<sup>st</sup> Parity Sow

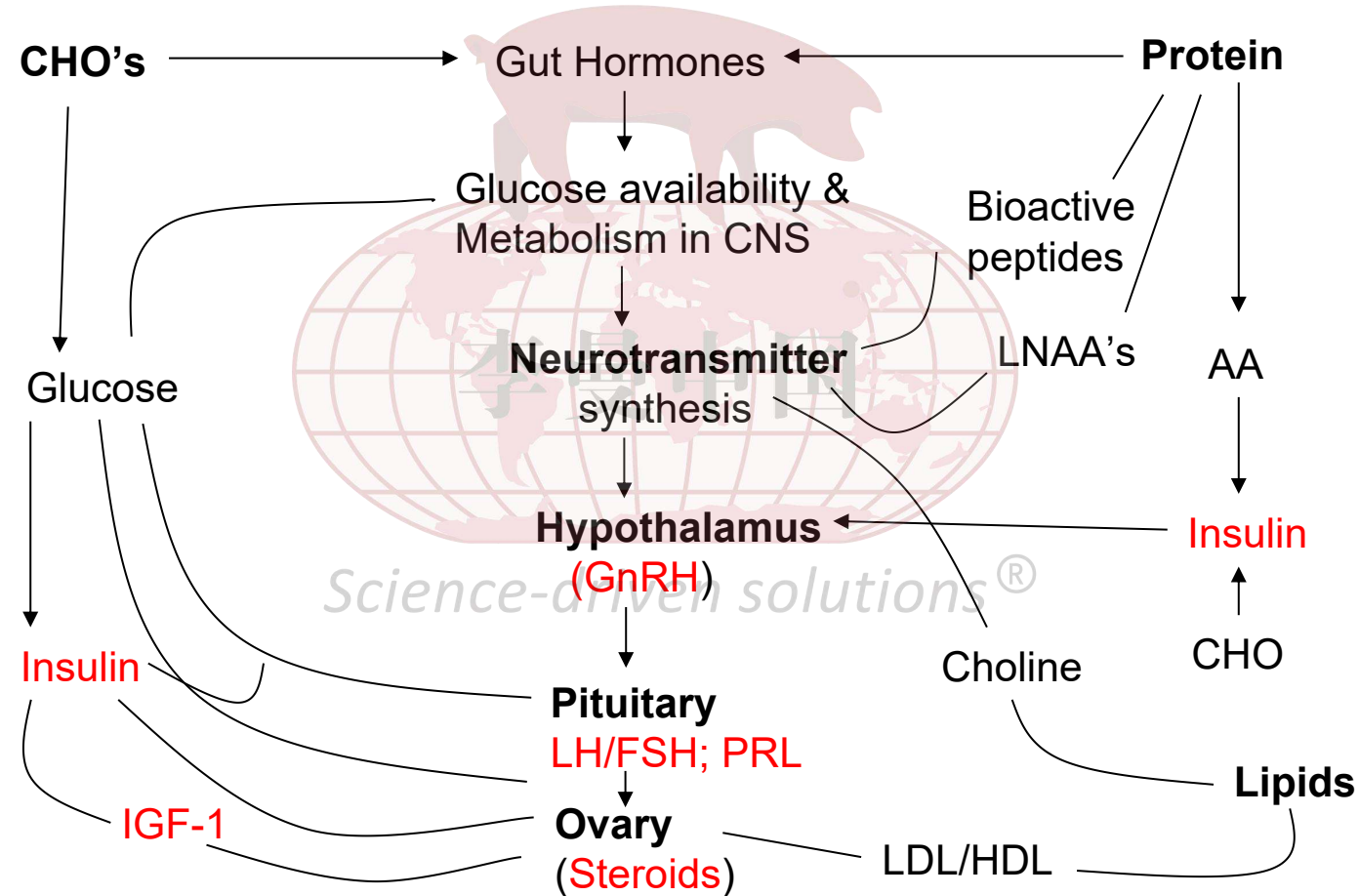




# Nutrient Partitioning Inflammation

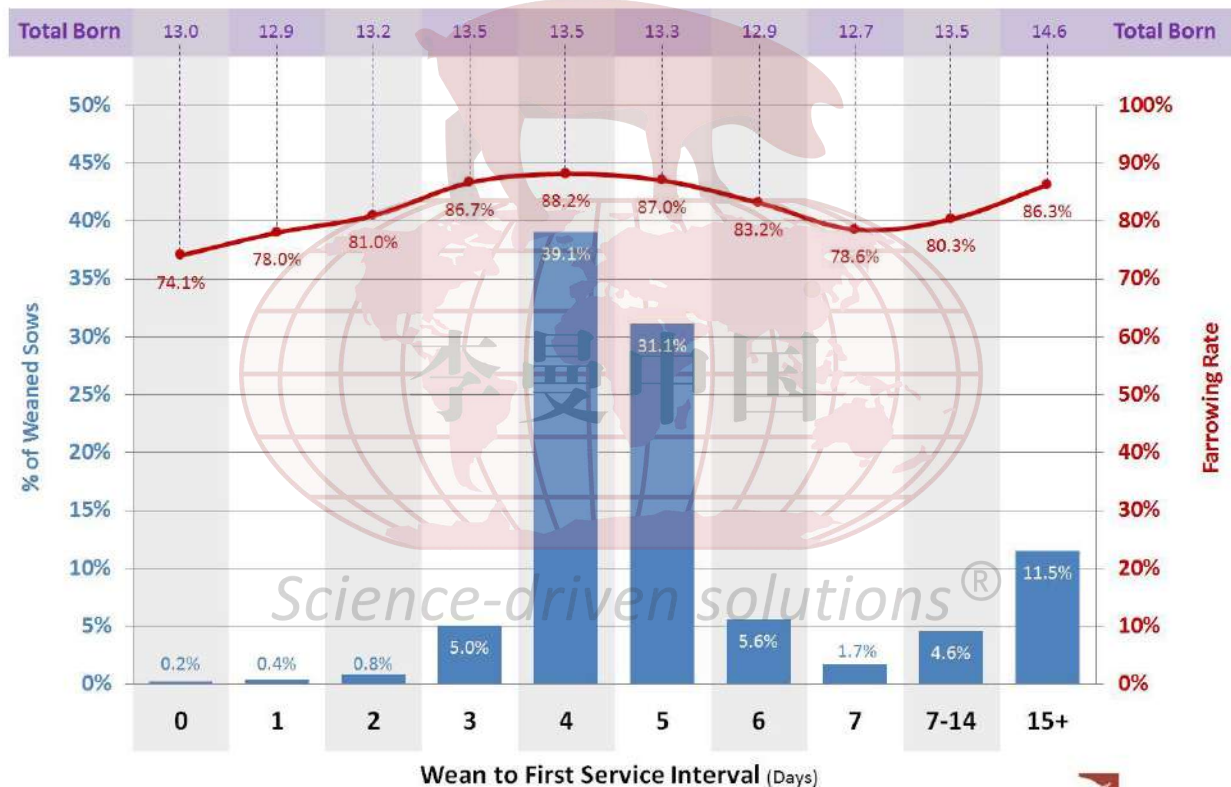


# Nutrition pathways that may impact hormone production





# Wean to First Service Interval Impact on Farrowing Rate and Total Born



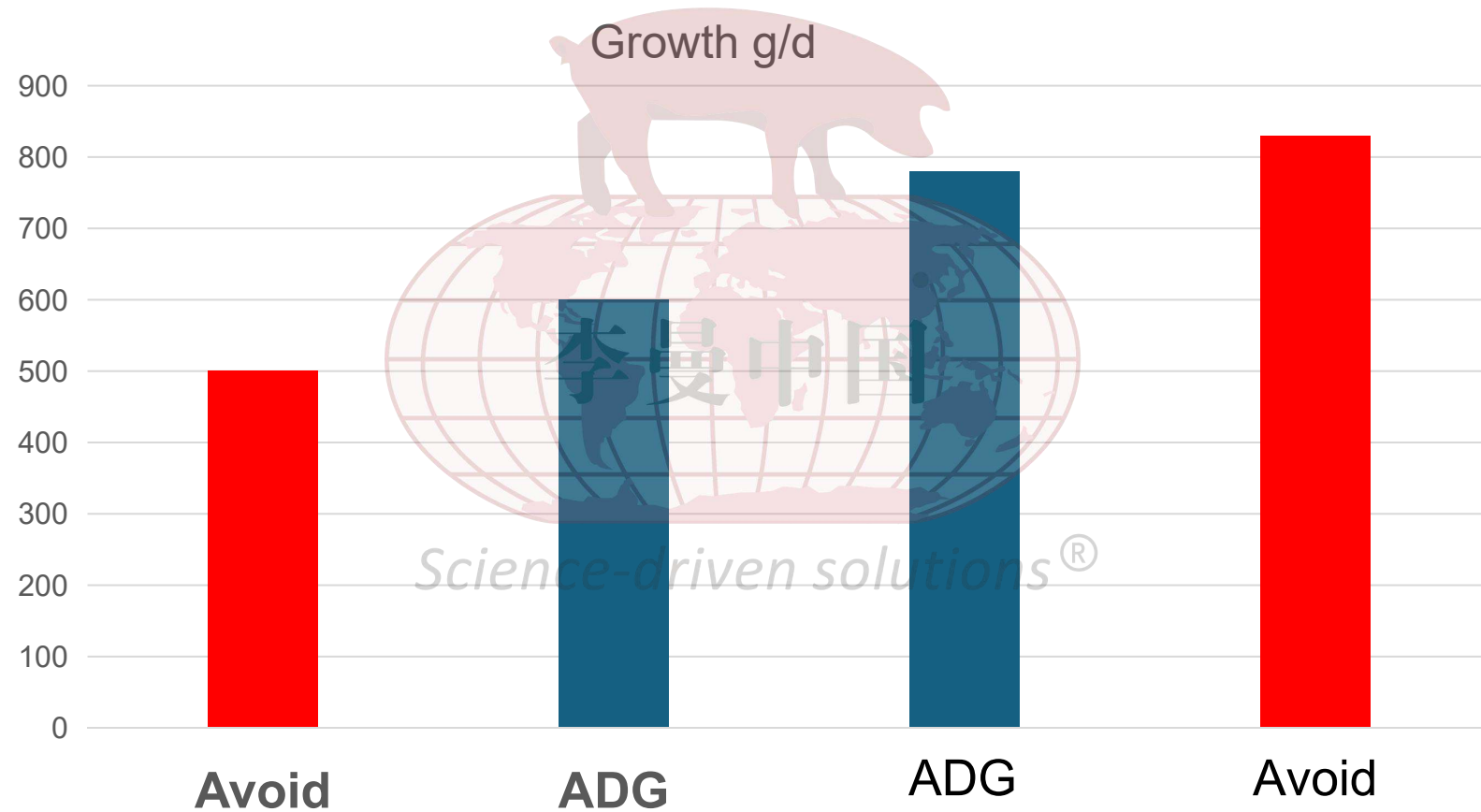
PigCHAMP data from 2010–2013 representing over 3 million records.

Steve Terlouw, 2018



2017.01.24

# Avoid Gilts With Growth Rates Less Than 600 g/d And Greater Than 800 g/d



# Injury and Inflammation

Clotting mechanism activates

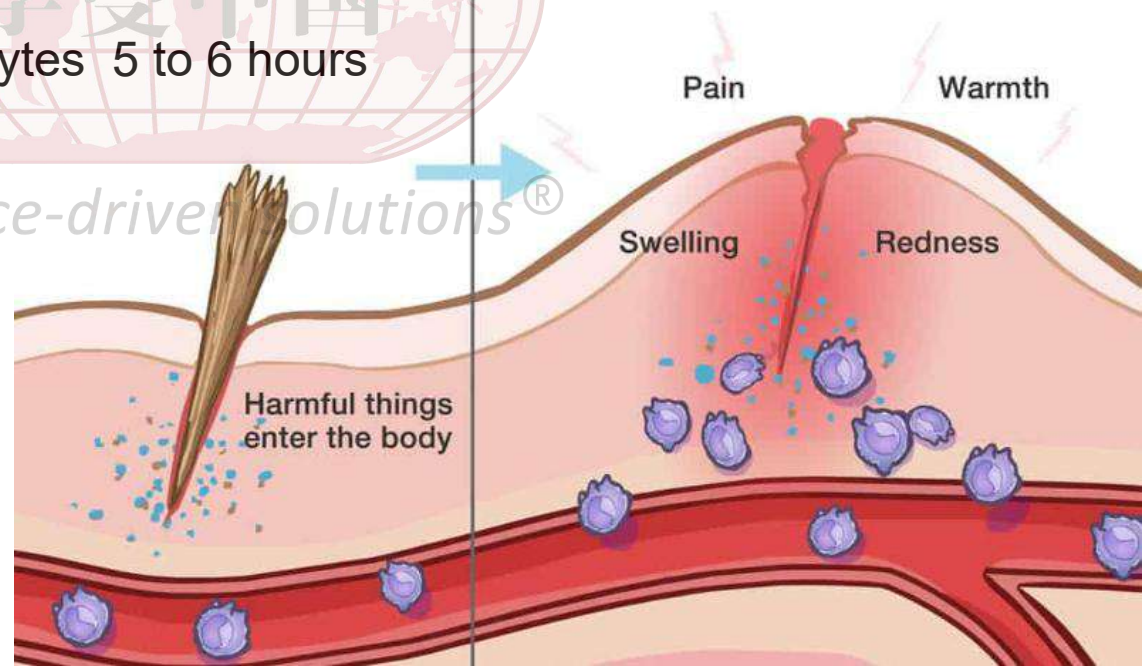
Increased blood flow

Increased capillary permeability

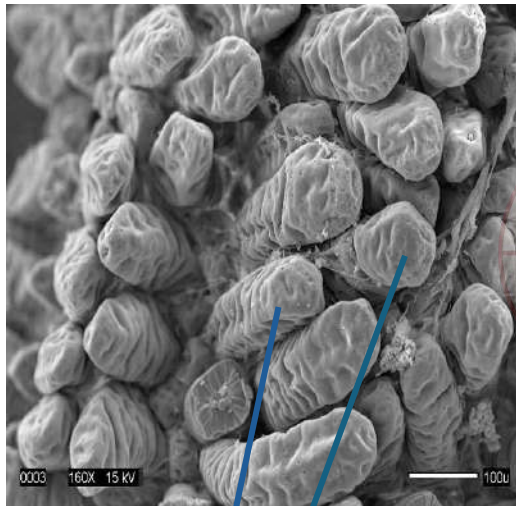
Enhanced influx of phagocytic cells

- ❖ Neutrophils arrive in 30 -60 minutes
- ❖ Macrophages and lymphocytes 5 to 6 hours

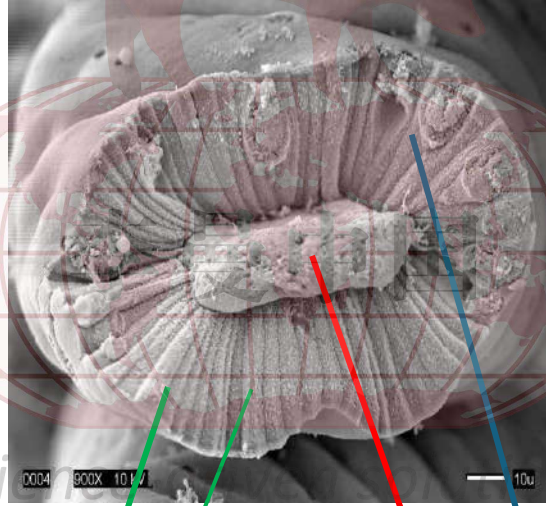
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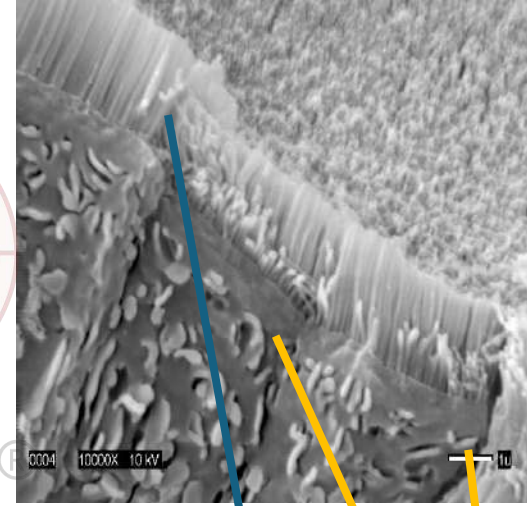
# Intestinal anatomy



Villi

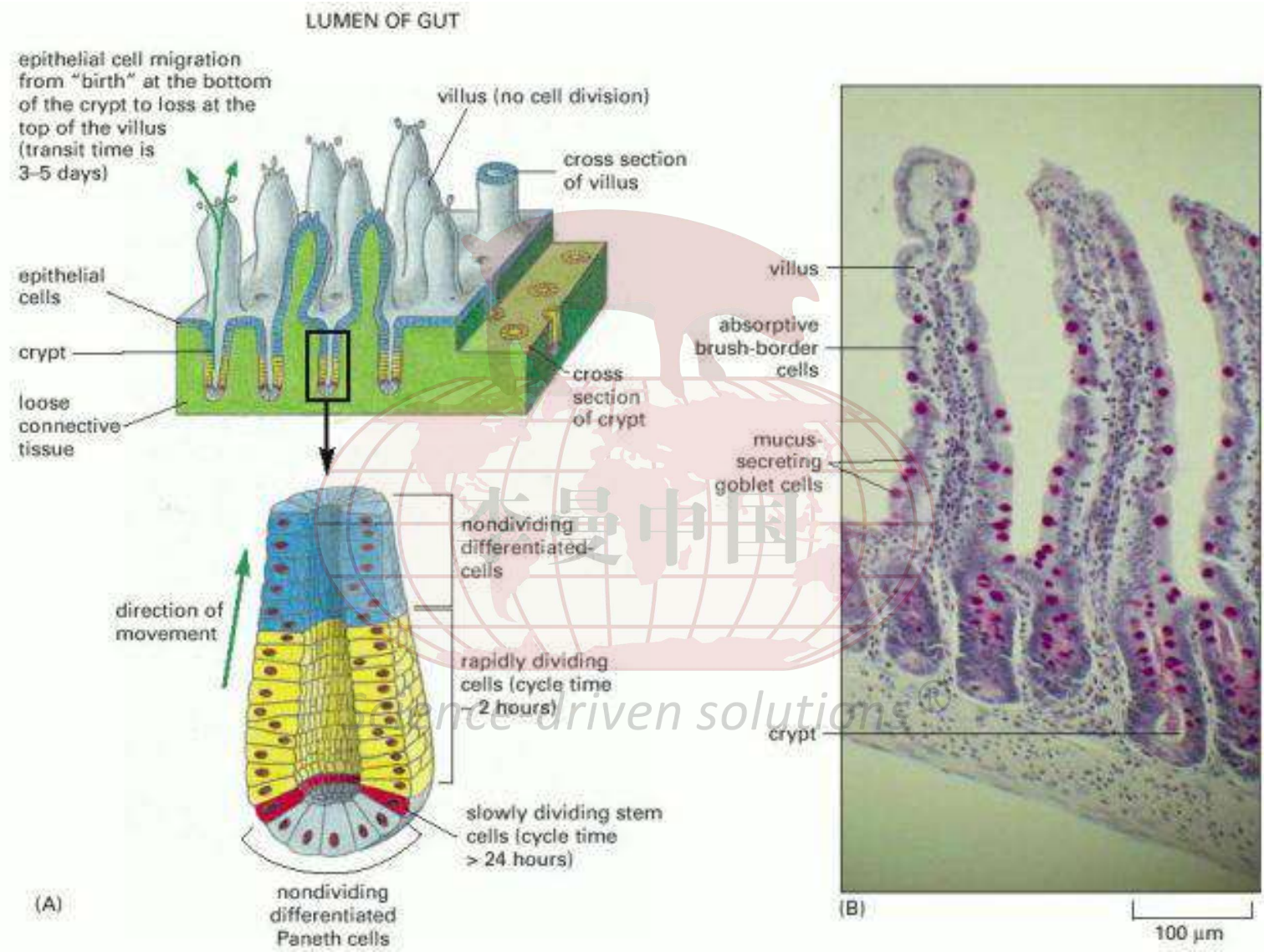


Enterocyte  
Capillary Bed

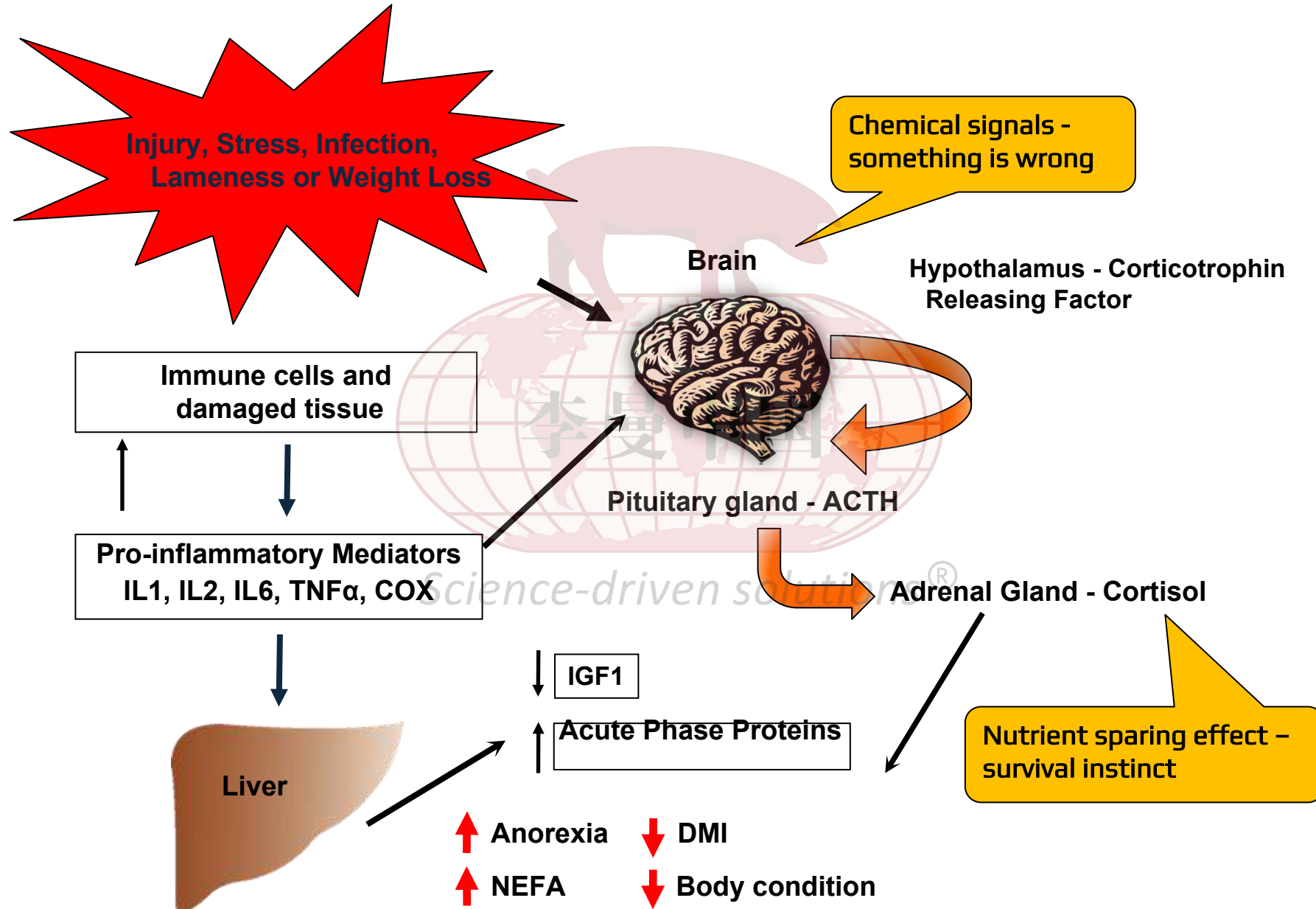


Micro Villi  
Tight Junction

Goblet Cells – Mucus production



# Inflammatory Response





# Inflammation In The Reproductive Tract

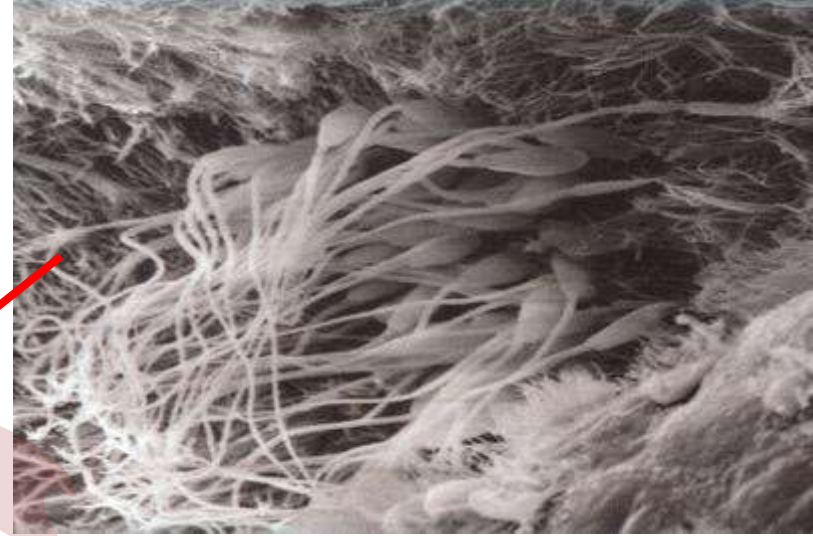
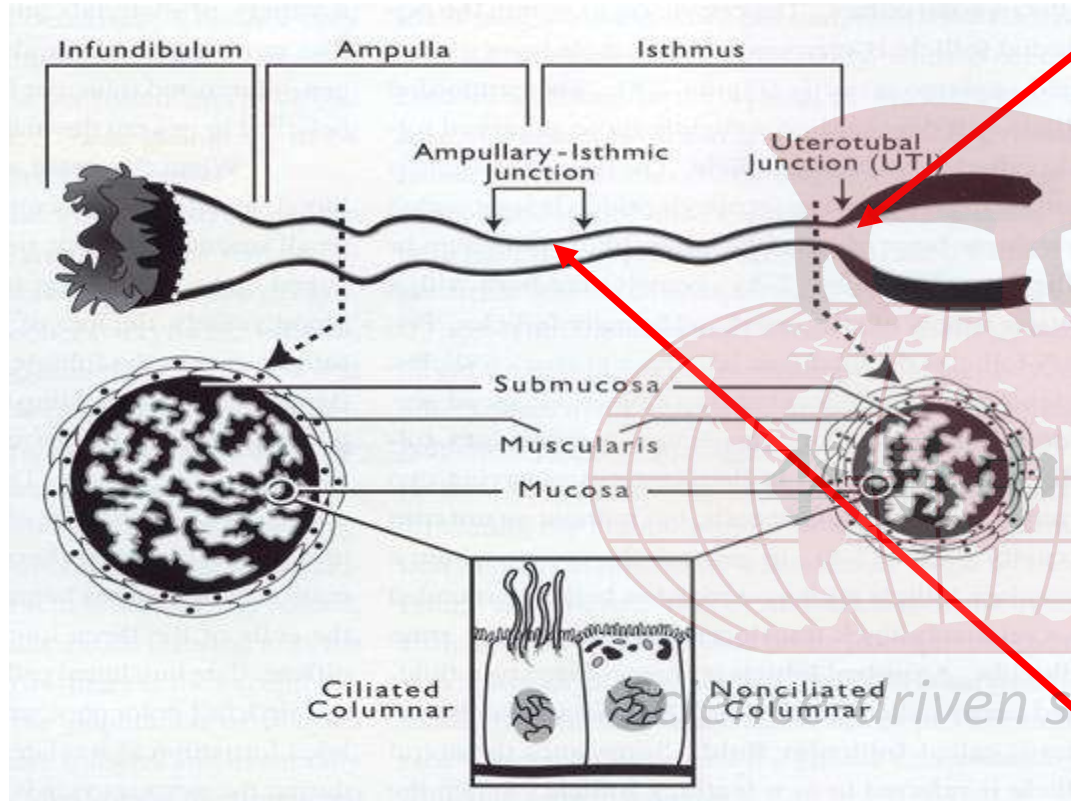


# Inflammation is Stealing Nutrients While You Are Not Looking

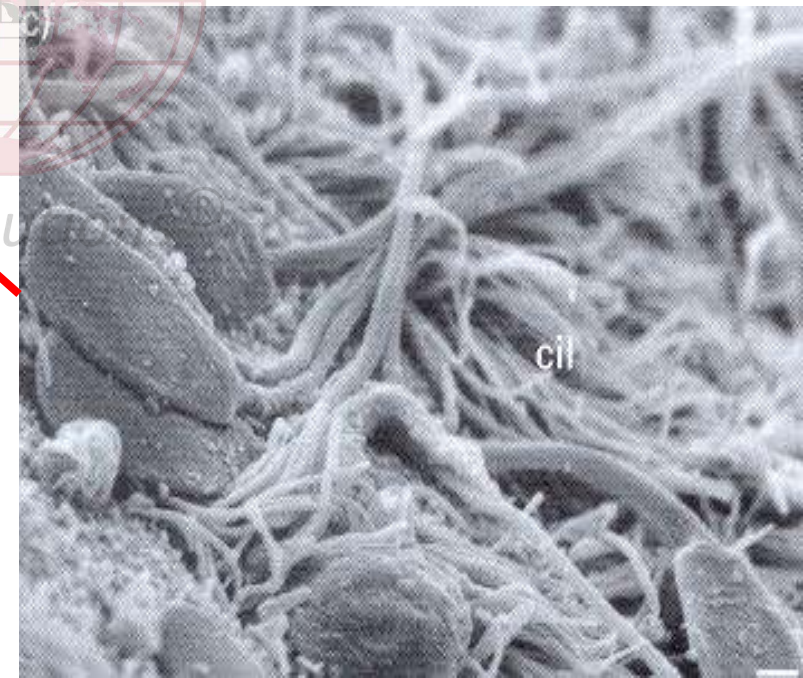


**23 % increase in energy partitioning  
to the immune system**

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Photos: Martinez, 1999



Sperm cells at the ampulla-isthimus Junction (oviduct).

The effect of oocyte age on fertilization rate  
and litter size (Hunter, 1988)

Est. age of oocyte (hr)	Fertilization rate %	Litter size <sup>a</sup>
0	90.8	12.0
4	92.1	11.7
8	94.6	8.7
12	70.3	6.8
16	48.3	4.8
20	50.9	5.0

<sup>a</sup> Estimated at day 25 post mating

The effects of the interval between insemination and ovulation on Fertilization rate and embryo viability (Soede, et.al., 1995a)

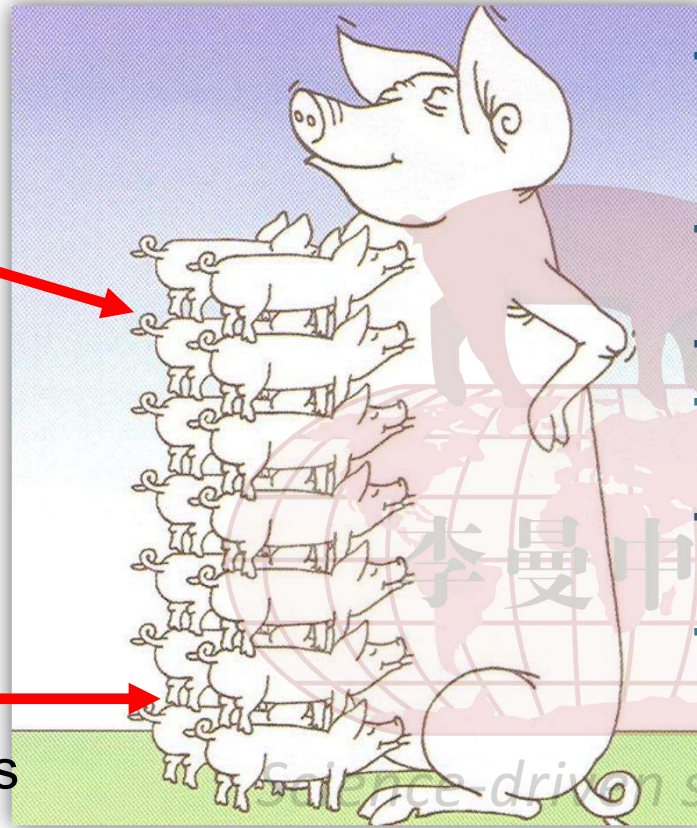
	Interval between insemination and ovulation	Sows with >90% Normal Embryos	Fertilization %
Insemination	48-40	17	29
Pre-ovulation	40-32	14	37
	32-24	47	47
	24-16	79	79
	16-8	83	94
	8-0	86	93
Insemination	0-8	54	75
Post-ovulation	8-16	53	62



## Prolactin (PRL) and progesterone concentrations near the time of farrowing influences colostrum yield in primiparous sows

Highest in anterior teats

Lowest in posterior teats



- Piglets born more than 1 hour after onset of farrowing

- Colostrum stimulates development of reproductive organs

- Measure immunocrits estimates immunoglobulins

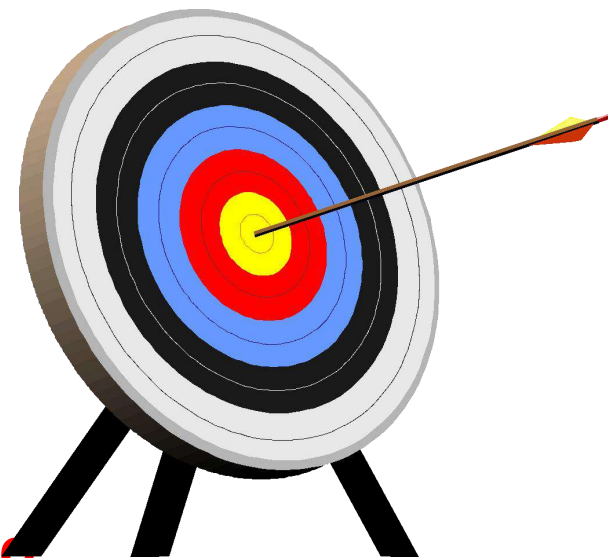
- Low birth weights < 1.13 kg have lower immunocrits

- Litters with more than 15 pigs have reduced immunocrits

- **Colostrum yield was greater in the high PRL/P4 compared with low PRL/P4 sows (4.11 vs 3.48 kg,  $P < 0.05$ )**

# Targets For Gilts

- >140 kg at second estrus
- 2<sup>nd</sup> estrus prior to 1<sup>st</sup> mating
- Early detection of onset of estrus (heat no service)
- % weaned gilts converted to parity 2
- > 60 pigs per sow lifetime
- > 16 pigs total born
- < 10 kg body weight loss after farrowing **Goal 5-7 kg**



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# *Summary*

- *Sow productivity variation is very high under commercial conditions*
- ***Greatest opportunity - improving retention of  $P_0$  and  $P_1$  females***



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