

# 减少药物及氧化锌使用的取代方案对保育仔猪生长效益的影响-丹麦的最新研究 Rearing pigs without use of high level of ZnO and the low use of antimicrobials-The Danish approach

Nicolai Rosager Weber  
兽医博士DVM, PhD

# 演讲大纲 Outline of presentation

- 丹麦生猪生产概况 Brief description of the Danish pig production
- 丹麦的抗生素法规 Antimicrobial regulations in Denmark
- 丹麦锌的使用情况 The Danish zinc history
- 断奶仔猪不添加高剂量氧化锌的最新研究成果 Latest research results on weaning without high doses of zinc oxide





# 丹麦的生猪生产

# The Danish pig production

第六届猪业国际论坛

## 2020年丹麦的生猪生产 Danish pig production, 2020

- 3100个养猪场 3,100 farm units with pigs
- 100万头母猪→3300万头生猪 1 million sows → 33 million pigs
  - 1800万头出栏猪 18 million slaughtered in Denmark
  - 1500万头30kg猪只出口 15 million pigs exported at 30 kg



(丹麦农业和食品理事会 , 2020 Danish Agriculture & Food Council, 2020)

# 2020年丹麦生猪行业生产力

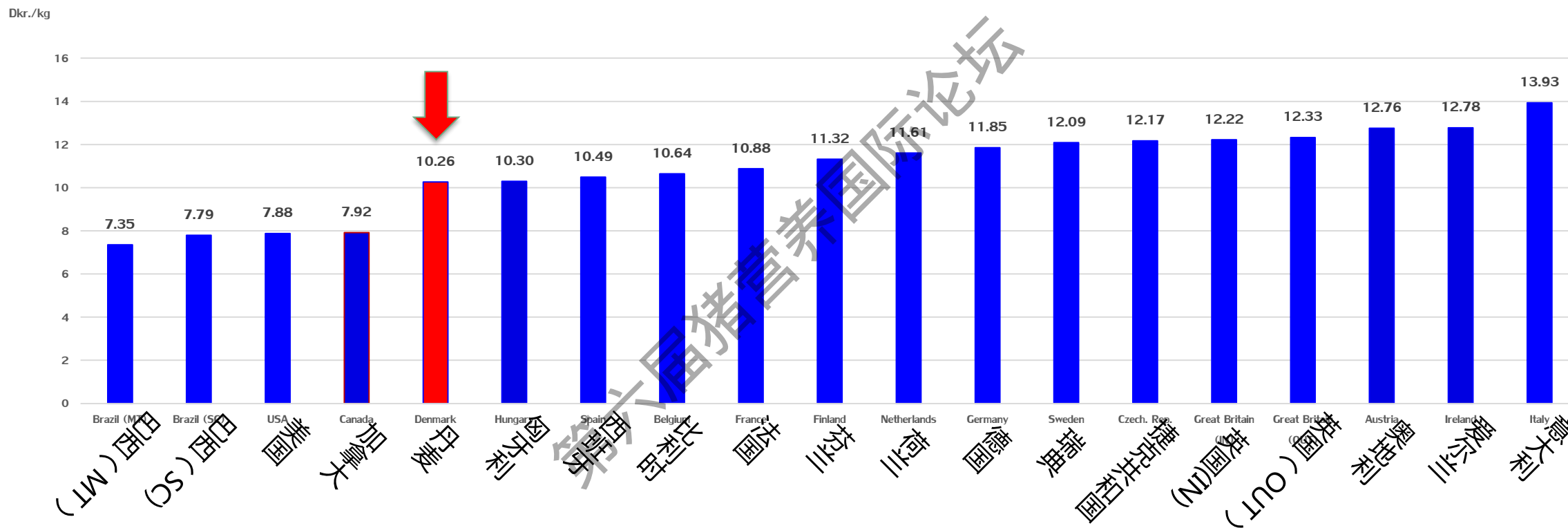
## Productivity in the Danish pig production industry, 2020

|                         | 关键指标 Key figures                                                                        | Average 2020 |
|-------------------------|-----------------------------------------------------------------------------------------|--------------|
| 母猪群 Sow herds           | 每头母猪每年断奶仔猪数 Weaned pigs per year per sow                                                | 33.9         |
|                         | 每窝产活仔数 Live-born pigs per litter                                                        | 17.7         |
| 保育阶段<br>Weaner period   | 7-30kg猪只平均日增重, g/d<br>Average daily gain 7-30 kg, gram per day                          | 461          |
|                         | 7-30 kg猪只的饲料转化率, FU/每公斤增重<br>Feed conversion ratio 7-30 kg, FU per kg weight gained     | 1.83         |
|                         | 7-30kg死亡率 Mortality 7-30 kg, %                                                          | 3.6          |
| 育肥阶段<br>Finisher period | 30-110kg猪只平均日增重, g/d<br>Average daily gain 30-110 kg, gram per day                      | 1030         |
|                         | 30-110 kg猪只的饲料转化率, FU/每公斤增重<br>Feed conversion ratio 30-110 kg, FU per kg weight gained | 2.65         |
|                         | 30-100kg死亡率 Mortality 30-100 kg, %                                                      | 3.4          |

2020年的平均生产成本-在欧洲有竞争力，但在美国/巴西没有竞争力

## Average cost of production, 2020

- Competitive in Europe, but not in the USA/Brazil



MT: 马托格罗索州 SC: 圣卡塔琳娜州 IN代表脱欧前, OUT代表脱欧后

Source: InterPIG 2020



# 丹麦的抗生素法规

## Antimicrobial regulations in Denmark

第六届兽药国际论坛

# 丹麦生猪行业的抗生素法规Antimicrobial regulations in the Danish pig production industry

- 只有有资质的兽医才能开抗生素处方 Antimicrobials can only be prescribed by certified vets
- 生长促进剂被禁止使用了20年了 Growth promoters banned for approx. 20 years
- 使用氨苄西林治疗需要临床诊断 Treatment with AB requires a clinical diagnosis
- 所有正规的猪群都有猪群健康证明 All professional pig herds = Herd Health Contracts
- 重点是减少食用动物中抗生素的使用 Focus on reducing antimicrobial use in food producing animals
- 丹麦养猪业庞大=抗生素的主要用户 Denmark has a large pig industry = Main user of antimicrobials



## 黄牌倡议 The Yellow Card Initiative

- 2010年由丹麦兽医和食品管理局成立 established in 2010 by the Danish Veterinary and Food Administration
- 抗生素使用阈值定义为每天每100只动物使用剂量 ( ADD ) Defines thresholds in Animal Daily Dose (ADD) per 100 animals per day
- 如果种群数量超过阈值=增加监管和费用 If a herd exceeds thresholds = increased supervision and fees
- 自2010年以来，阈值已经被下调了5次 Thresholds have been regulated down **fives times** since 2010
- “高风险” 抗生素的ADDs是不同的 Differentiated ADDs on “high risk” antimicrobials
- 如喹诺酮类3/ 4，头孢菌素和粘菌素=等级10 Quinolones, 3./4. g. Cephalosporins & Colistine = factor 10
- 四环素=等级1.5 Tetracyclines = factor 1.5

**被证明是减少抗生素使用和改变处方模式的非常有效的工具**

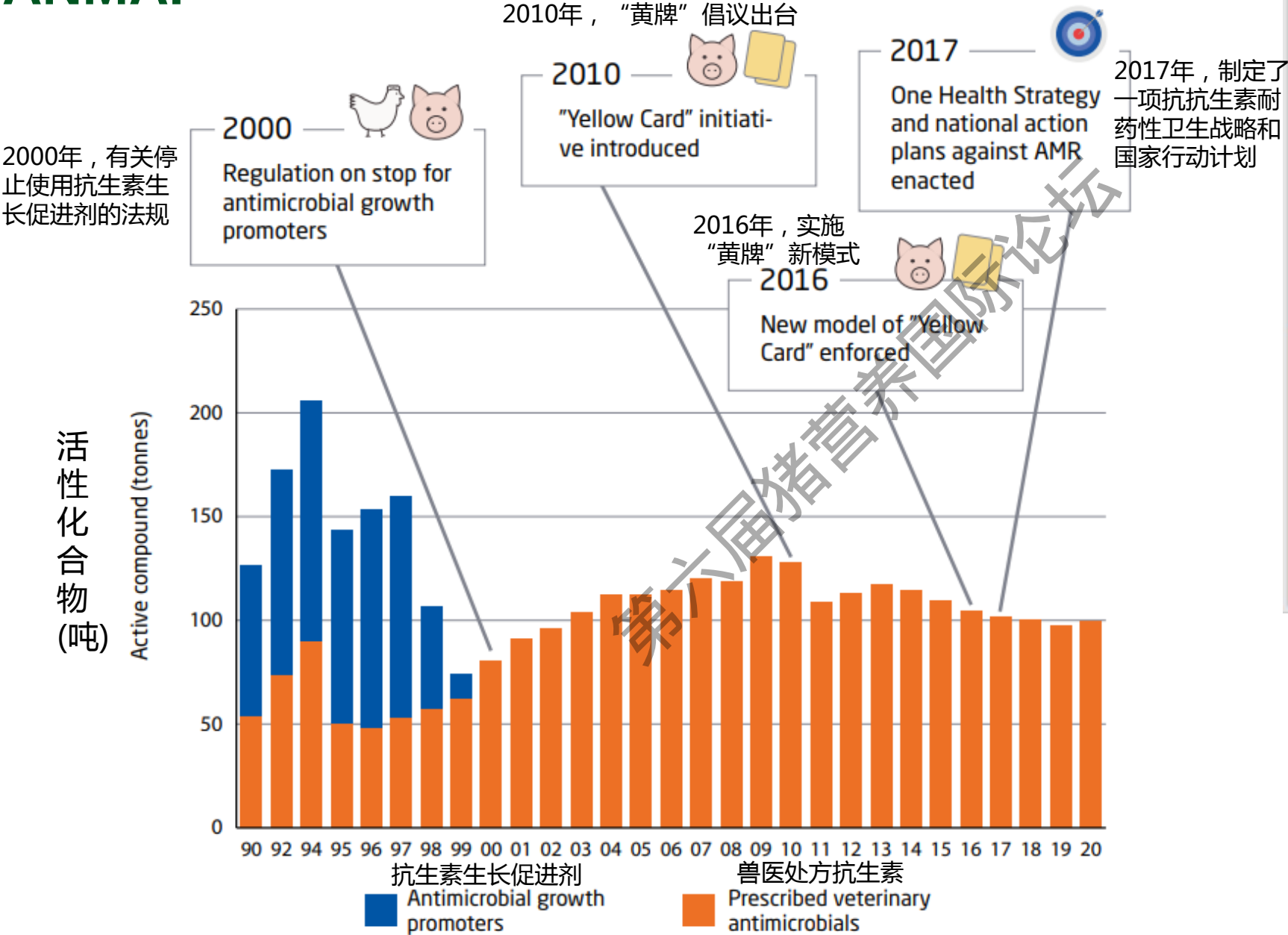
**Proven to be a very efficient tool to reduce antimicrobial use and change prescription patterns**



INNOVATION

# 丹麦抗生素耐药性综合监测和研究计划(DANMAP)

## DANMAP



DTU STATENS SERUM INSTITUT

CELEBRATING 25 years

### SUMMARY DANMAP 2020

Use of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from food animals, food and humans in Denmark

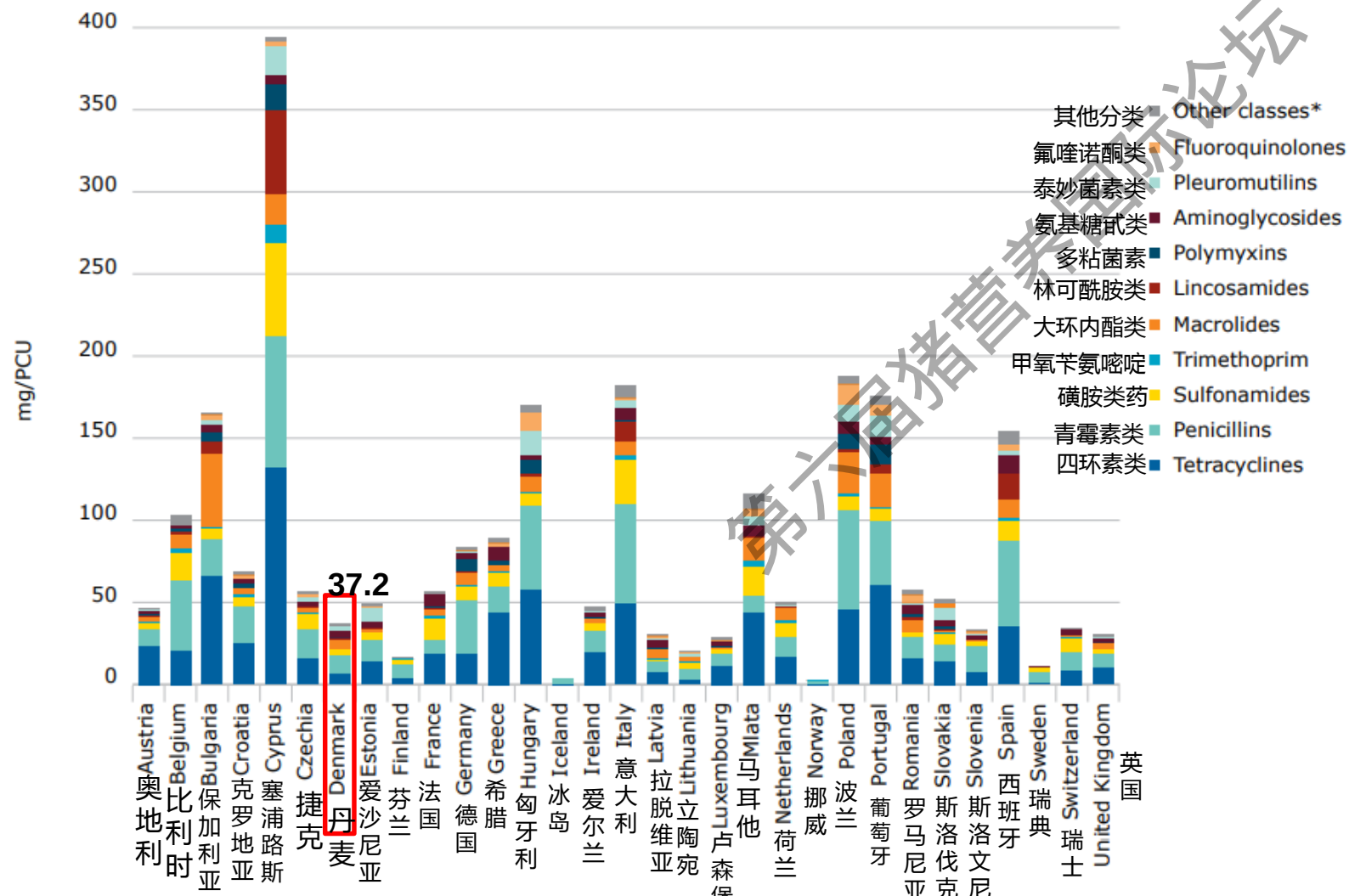
2020年DANMAP总结，在丹麦，抗生素的使用以及食用动物、食品和人类的细菌发生抗生素耐药性情况

Statens Serum Institut  
National Food Institute, Technical University of Denmark



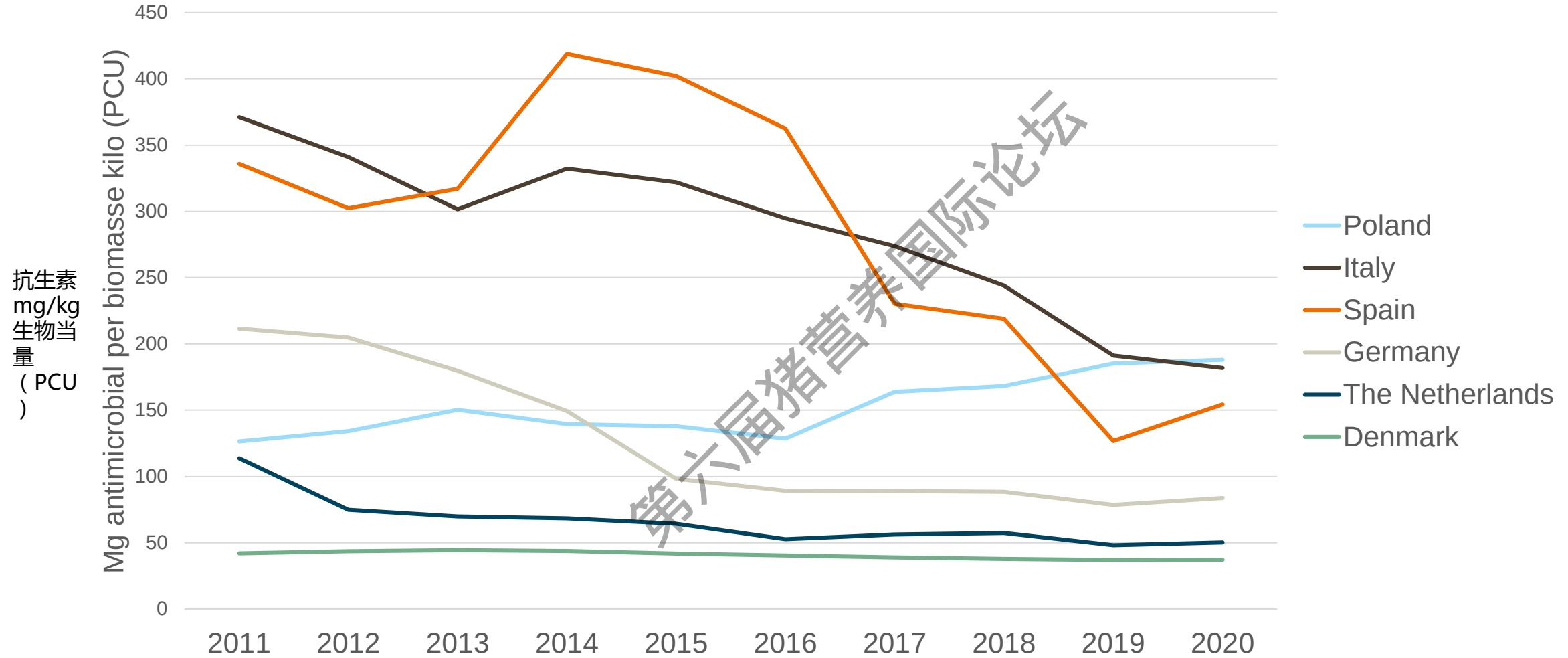
# 2020年欧洲抗生素销售情况

## Antimicrobial sales in 2020 in Europe



# 2011-2021年生产动物用抗生素的销售情况

## Sales of antimicrobials for production animals 2011-2020

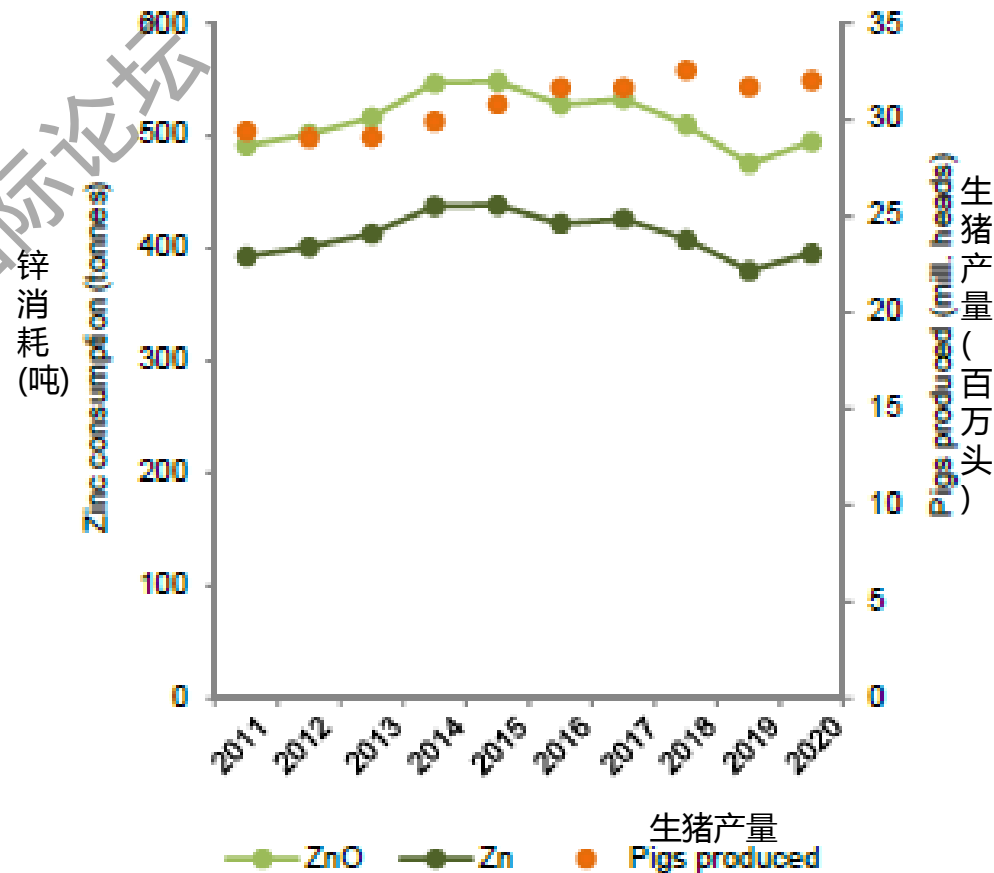


## 丹麦生猪生产中锌的药用价值

## Medicinal use of zinc in Danish pig production

- 自90年代早期以来通常用于断奶日粮  
Commonly used in weaner diets since the early 90's
- 2004年：处方用ZnO允许在仔猪断奶后腹泻中添加的最大量为2500ppm锌  
2004: Magistral ZnO allowed to control PWD – Max. level 2500 ppm Zn, requiring a prescription
- 2011年第一个注册的ZnO产品上市  
2011: First registered ZnO product marketed
- 2014年另外两种ZnO产品上市  
2014: Two additional ZnO products marketed
- 2022年6月所有的ZnO产品将被撤回  
June 2022: All marketed ZnO products will be withdrawn

图4.6. 丹麦，猪生产中药用锌-氧化锌(ZnO)和锌(Zn)的使用量  
(吨)  
Figure 4.6 Usage (in tonnes) of medical zinc - zinc oxide (ZnO) and zinc (Zn) - in the pig production, Denmark DANMAP 2020





断奶时不添加高剂量ZnO的最新研究成果  
Latest research results on  
weaning without high doses of zinc oxide

第六届猪营养国际论坛

断奶时无ZnO:多因素和复杂性 Weaning without zinc oxide: multifactorial and complex



## 饲喂：群居最好的工具

## Feeding: The best "tools" in the box

- 健壮的断奶猪-产奶量高的母猪  
Robust weaned pigs – sows with high milk yield
- 为分娩圈舍提供教槽料 Supply of creep feed in the farrowing pen
- **断奶后 After weaning**
  - Low protein 低蛋白
  - Low calcium 低钙
  - Feed raw materials 饲料原料
  - Additives 添加剂



## 测试断奶仔猪药用氧化锌替代品

## Testing alternatives to medicinal zinc oxide for weaners

1. 2,500 ppm zinc    2500ppm锌
2. 1,500 ppm zinc    1500ppm锌
3. 0 zinc    无锌
4. Seaweed from Ocean Harvest, Ireland  
爱尔兰海洋收获的海藻
5. 'MiyaGold' from Huvepharma  
来自制药公司的 'MiyaGold'
6. 'GærPlus' from Danish Agro (Yeast product)  
来自丹麦农业(酵母产品)的 'GærPlus'



### Conclusion 总结

- 2500和1500 ppm的药用锌对生产力的影响和抗生素的使用效果相同  
2,500 and 1,500 ppm medicinal zinc **identical effect** on productivity and AB use
- 0 ppm药用锌与海藻产品 ( miygold和GærPlus ) 效果一致  
0 ppm medicinal zinc identical to Seaweed, MiyaGold and GærPlus

# 减少断奶日粮中药用锌的剂量 Reduction driven by reduced dose of medicinal zinc in weaner diets

SEGES试验报告号. 1101(2017年) SEGES trial report NO. 1101(2017):

从2500ppm减少到1500ppm，对生产力的影响与使用抗生素相同  
2,500 ppm → 1,500 ppm zinc = same productivity and AB usage

在丹麦许多养猪场实施，从而减少了全国氧化锌的使用  
Implemented on many Danish pig farms resulting in a reduction in the national use of zinc oxide\*

很少有农场完全停止使用药用锌  
Few farms have fully phased out the use of medicinal zinc

根据调查问卷和现场兽医的报告

\*Based on questionnaire answers and reports from the field veterinarians

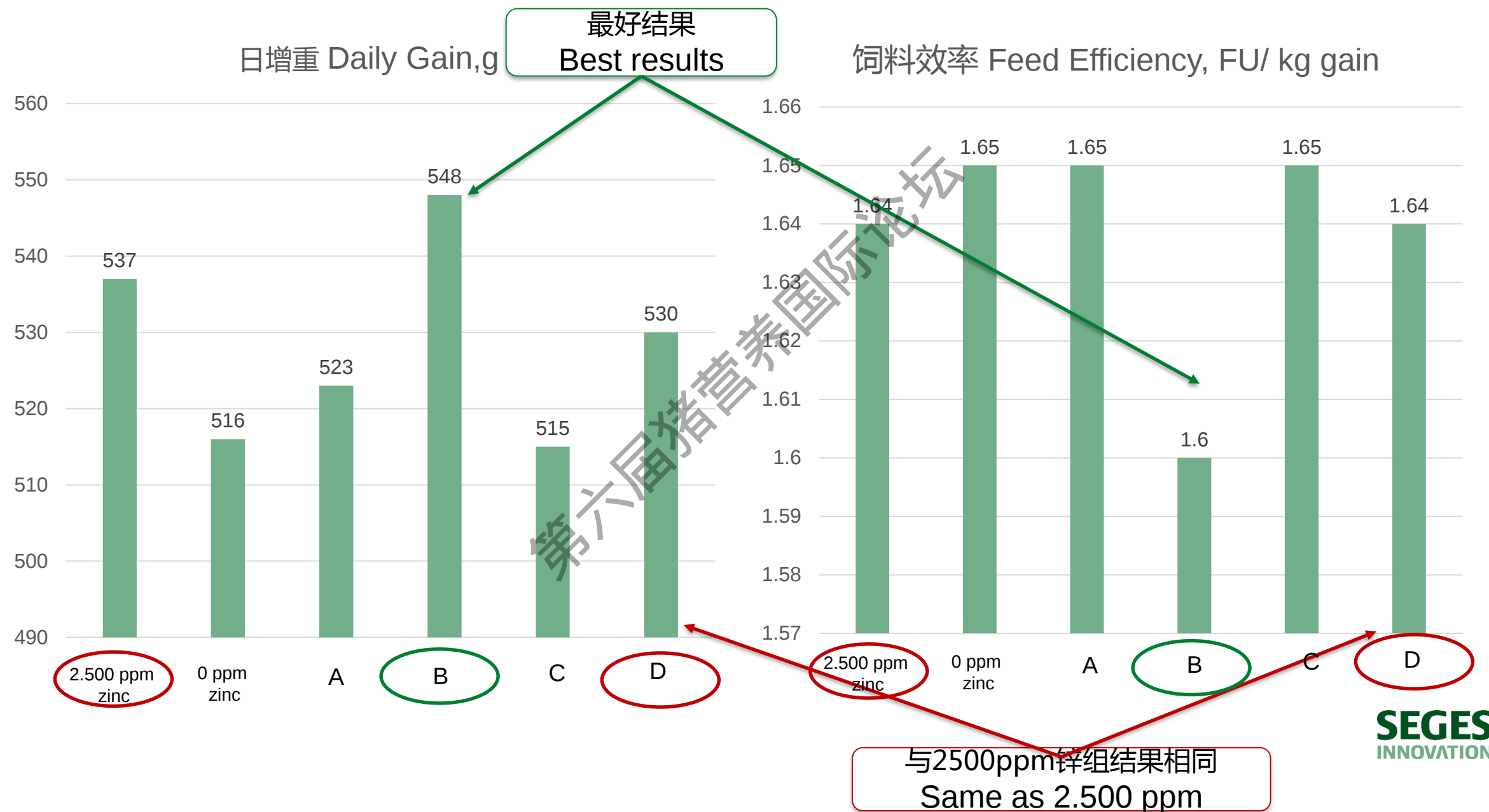


概念试验：从23个申请者中选出4种概念

Concept trial: The four concepts – selected from 23 applicants

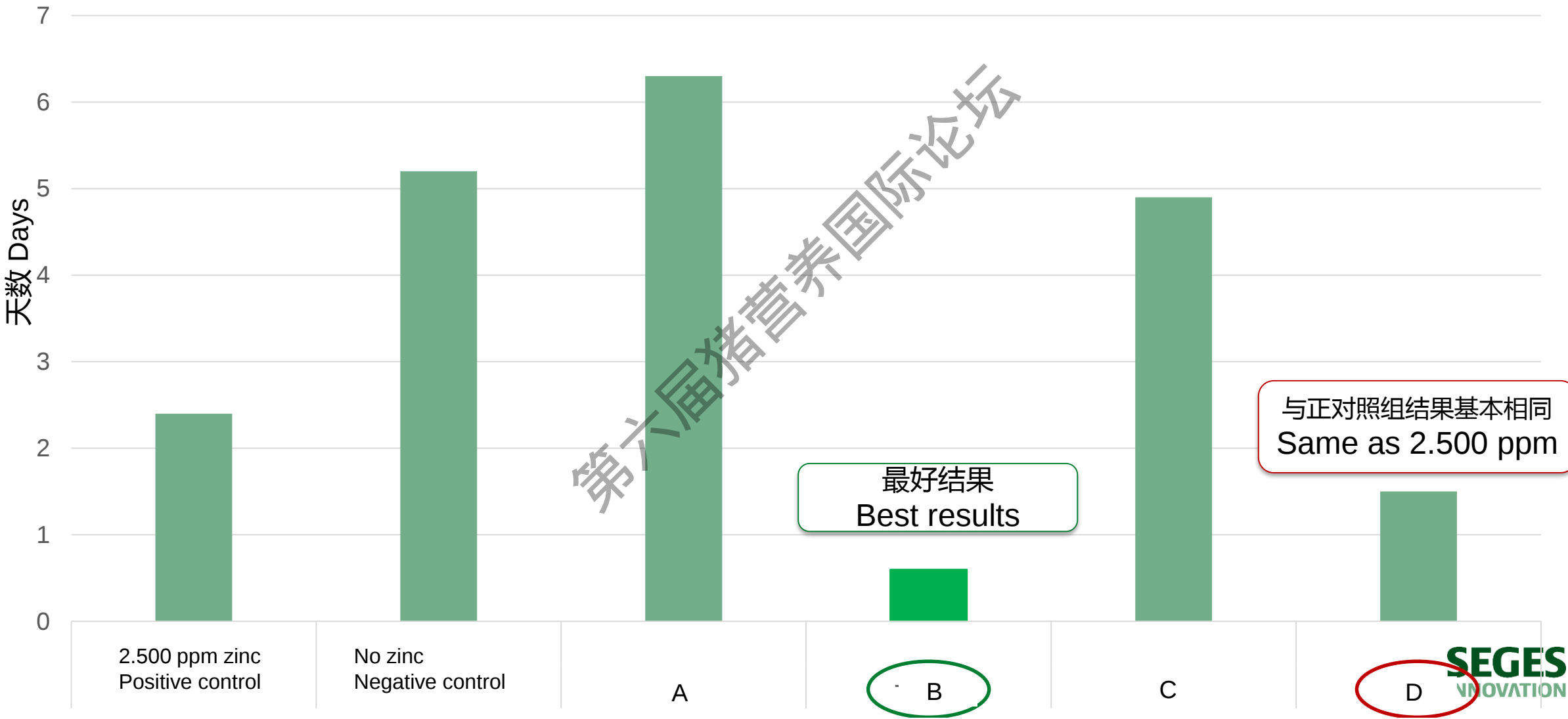
|                                         | Company<br>A | Company<br>B | Company<br>C | Company<br>D |
|-----------------------------------------|--------------|--------------|--------------|--------------|
| 降低蛋白 Reduced protein                    |              | X            | X            | X            |
| 增加苏氨酸/赖氨酸<br>Increased threonine/lysine |              | X            | X            | X            |
| 甘油单酯 Monoglycerides                     | X            |              |              | X            |
| 有机酸 Organic acids                       | X            | X            | X            | X            |
| 益生菌 Probiotics                          |              | X            | X            | X            |
| 纤维 Fibre                                |              | X            | X            | X            |
| 外源酶 Additional enzymes                  |              | X            |              | X            |
| 螯合矿 Chelated minerals                   |              |              |              | X            |
| 饮用水的补充<br>Addition to drinking water    |              | X            | X            |              |

# 6-30kg阶段的生产结果 Production results 6-30 kg



# 6-30kg阶段的腹泻治疗天数 Diarrhea treatments, days, 6-30 kg

每头猪腹泻治疗天数 Diarrhoea treatments, days, per pig



## 结论 Conclusion

- 无药用锌降低的产值约：每头猪0.26欧元 (0.31美元)  
No medicinal zinc lowered production value by **approx. € 0.26 (0.31 \$) per pig**

各概念试验对生产力或腹泻的影响：

Effect productivity or diarrhoea treatments by concepts:

- Company B > 2,500 ppm zinc.
  - Cost approx. € 1.1 (1.3 \$) per pig 每头猪成本约1.1欧元 (1.3美元)
- Company D = 2,500 ppm zinc.
  - Cost approx. € 0.9 (1.1\$) per pig 每头猪成本约0.9欧元(1.1美元)
- A和C公司与无氧化锌组结果无差异  
Company A and C - not different from **no** zinc oxide

# 展望 Perspective

锌不能被单一化合物所取代

Zinc cannot be replaced by a single compound

试验中观察到的影响

Effects observed in trials:

- 低蛋白含量 Low protein content
- 氨基酸组成 Amino acid profile
- 添加剂组合 Combination of additives
- 低钙含量 Low calcium content



第六届猪营养大会

# 为什么降低蛋白质？ Reduction of protein, why ?

- 减少后肠中未消化的蛋白质 Reduce undigested protein in the hindgut
  - 降低渗透性腹泻的风险 Reduced risk of osmotic diarrhea
  - 预防蛋白质发酵 Prevention of protein fermentation
    - 减少破坏结肠上皮、破坏黏膜功能和结构、增加绒毛萎缩的微生物代谢物(NH<sub>3</sub>, 胺)  
Reduce microbial metabolites (NH<sub>3</sub>, amines) which damage colonic epithelium, interrupt mucosal function and structure, and increase villous atrophy
  - 减少大肠杆菌的定植 Reduce colonization of E.coli
- 但对生产力有不利影响  
But **adverse** effect on productivity ☹



饲料中蛋白质含量对断奶仔猪的影响 Effect of protein content in feed for

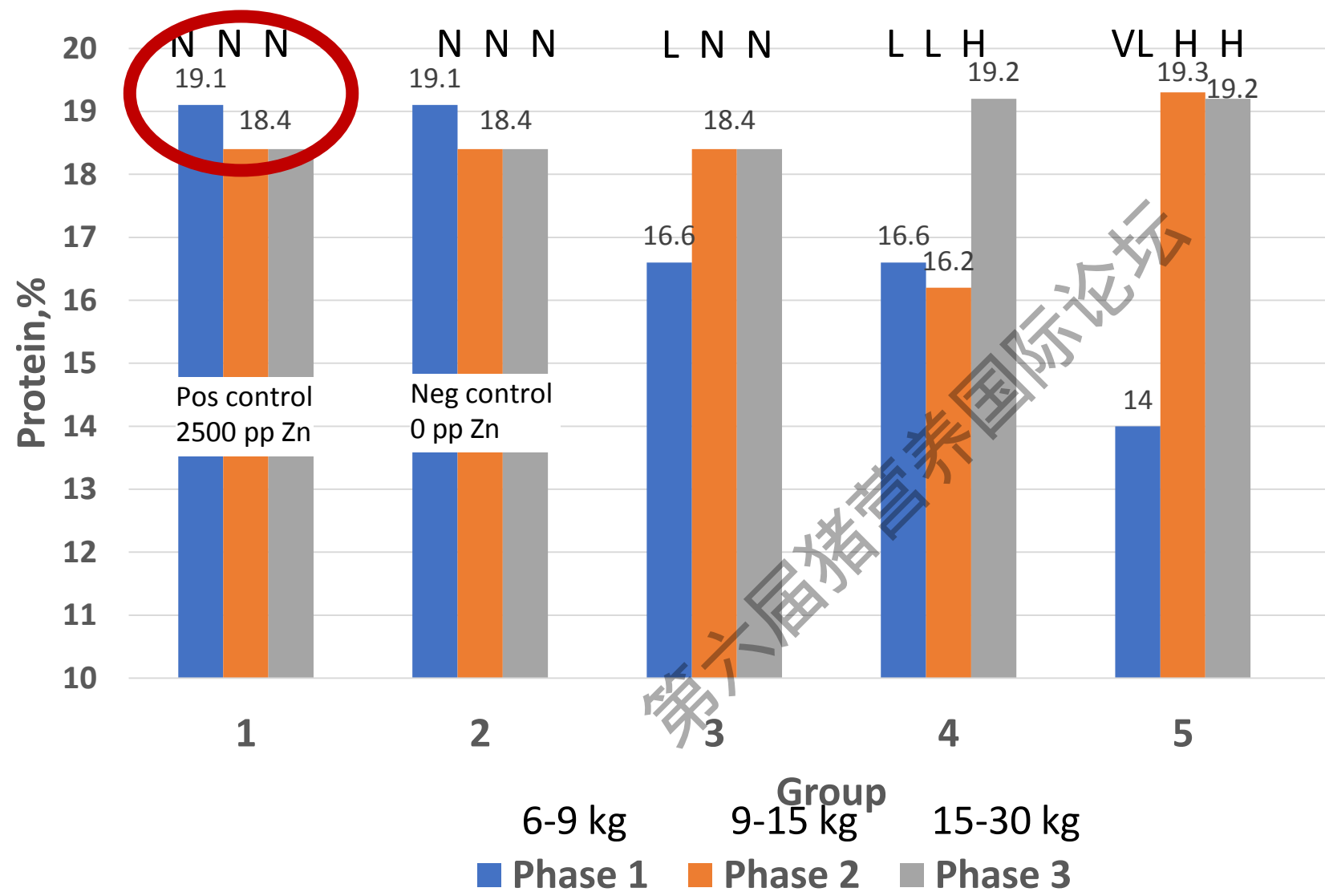
2个农场15000头4-7周龄断奶仔猪测试 Tested on 2 farms, 15,000 weaned pigs 4-7

| Gro                                                                                                                                                                              |              | 1 |                                                            |      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---|------------------------------------------------------------|------|
| 昂贵饲料<br>Expensive feed<br>每100kg50-65欧元 ( 42-45美元 )<br>50-65 euro (42-54\$) /100 kg<br>热处理谷物、大豆浓缩蛋白、奶粉、鱼粉<br>heat-treated grain,<br>soyaprotein conc.<br>milk powder<br>fishmeal |              |   | 便宜饲料 Cheap fe<br>每100kg30-35欧元<br>30-35 euro<br>谷物 or<br>豆 |      |
| 日增重                                                                                                                                                                              | day          | 4 |                                                            | NS   |
| 增重                                                                                                                                                                               | Gain (g/day) |   |                                                            | ** * |

降低腹泻 Reducing diarrhea  
蛋白质含量比质量更重要 Protein content more  
important than “quality”

(Trial rep. 740, 2006)

# 试验设计 Trial design 蛋白质水平 Level of protein



N=norm, L=low, H=high, VL=very low, M=middle  
N=正常, L=低, H=高, VL=极低, M=中等

降低蛋白作为药用锌的替代品

## Reduced protein as an alternative to medicinal zinc:

- 各阶段各组豆粕水平相同 Same level of soybean meal in all groups in each phase
  - 阶段1 ( 6-9kg ) Phase 1 (6-9 kg): 7% - (14.0-19.1% protein)
  - 阶段2 ( 9-15kg ) Phase 2 (9-15 kg): 14% - (16.2-19.3 % protein)
  - 阶段3 ( 15-30kg ) Phase 3 (15-30 kg): 21% - (18.4-19.2% protein)
- 降低日粮中蛋白 Reduction of protein in the diet
  - 减少大豆浓缩蛋白、土豆蛋白和鱼粉  
Reducing soya protein concentrate, potato protein and fish meal
- 每个处理75个重复(栏) 75 replicates (pens) per treatment
- 6800头, 25 ~ 27日龄断奶仔猪, 体重5.5 ~ 9.0 kg  
6,800 piglets weaned at 25-27 days, weight 5.5-9.0 kg
- 丹育 DLY杂交 DanBred DLY crosses



结果：6-30kg阶段，每头猪腹泻治疗天数  
Results: Diarrhoea treatments, days per pig, 6-30 kg

| 组别 Group              | 1<br>NNN + Zn     | 2<br>NNN          | 3<br>LNN | 4<br>LLH | 5<br>VLHH | 6<br>VLMH |
|-----------------------|-------------------|-------------------|----------|----------|-----------|-----------|
| 整阶段 Total, 6-30 kg    | 2.08 <sup>b</sup> | 4.19 <sup>a</sup> |          |          |           |           |
| 阶段1 Phase 1, 6-9 kg   |                   |                   |          |          |           |           |
| 阶段2 Phase 2, 9-15 kg  |                   |                   |          |          |           |           |
| 阶段3 Phase 3, 15-30 kg | 0.47              | 1.11              |          |          |           |           |

不添加2500ppm锌组超过50%的仔猪腹泻治疗天数增加了2天  
50% more treatments without 2500 ppm Zinc +2 treatment days

N=正常，L=低，H=高，VL=极低，M=中等  
N=norm, L=low, VL=very low, H=high, M=middle

结果：6-30kg阶段，每头猪腹泻治疗天数  
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| 组别 Group                      | 1<br>NNN + Zn     | 2<br>NNN          | 3<br>LNN          | 4<br>LLH          | 5<br>VLHH         | 6<br>VLMH         |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 腹泻天数 Treatments, days per pig |                   |                   |                   |                   |                   |                   |
| 整阶段 Total, 6-30 kg            | 2.08 <sup>b</sup> | 4.19 <sup>a</sup> | 3.75 <sup>a</sup> | 3.10 <sup>b</sup> | 3.68 <sup>a</sup> | 3.24 <sup>a</sup> |
| 阶段1 Phase 1, 6-9 kg           | 0.04              |                   |                   |                   | 0.11              | 0.17              |
| 阶段2 Phase 2, 9-15 kg          | 1.57              |                   |                   |                   | 2.10              | 1.65              |
| 阶段3 Phase 3, 15-30 kg         | 0.47              | 1.11              | 1.31              | 1.20              | 1.47              | 1.42              |

低蛋白日粮低于25%仔猪腹泻治疗天数增加了1天  
25% less treatments with low protein +1 treatment day

N=norm, L=low, VL=very low, H=high, M=middle  
N=正常，L=低，H=高，VL=极低，M=中等

# 结果：6-30kg阶段的生产力结果（6800头猪只） Results: **Productivity results, 6-30 kg** (6,800 piglets)

| 组别 Group                               | 1<br>NNN+Zn       | 2<br>NNN                | 3<br>LNN          | 4<br>LLH               | 5<br>VLHH         | 6<br>VLMH              |
|----------------------------------------|-------------------|-------------------------|-------------------|------------------------|-------------------|------------------------|
| 日增重 Daily gain, g/day                  | 520 <sup>a</sup>  | <b>519<sup>a</sup></b>  | 516 <sup>ab</sup> | <b>504<sup>b</sup></b> | 517 <sup>ab</sup> | <b>504<sup>b</sup></b> |
| 饲料转化率 Feed conversion, Kg feed/kg gain | 1.43 <sup>a</sup> | <b>1.44<sup>a</sup></b> | 1.44 <sup>a</sup> | 1.44 <sup>a</sup>      | 1.40 <sup>b</sup> | 1.42 <sup>ab</sup>     |

2019年试验报告1175  
Trial report 1175, 2019

N=norm, L=low, VL=very low, H=high, M=middle

N=正常，L=低，H=高，VL=极低，M=中等

## 我们发现了什么？ What did we find?

- 与不添加锌组相比，药用锌添加组仔猪的腹泻天数减少了50%  
**Medicinal zinc** diarrhoea treat. days reduced by **50%** comp. to no zinc
- 低蛋白组猪只腹泻天数减少了25% **Low protein** reduced diarrhoea treatment days by **25%**
  - 但是药用锌组效果更好 But medicinal zinc is better
- 低蛋白=低生产力 **Low protein = low productivity**
  - 在最后阶段，通过高蛋白部分补偿 Partially compensated by high protein in the last phase
- 最佳策略：低、低、高  
The best strategy: **Low Low High**
  - 抗生素组使腹泻天数减少了25% 25% **less** AB treatment days
  - 日增重减少了15g 15g **lower** daily gain
- SEGES建议：阶段1和阶段2的蛋白质含量推荐为17.5%  
New SEGES recommendation: **17.5% protein for phases 1 and 2**

## 降低蛋白试验2 Reduced protein trial 2

5个处理, 75个重复, 5600头猪  
5 groups, 75 replicates, 5,600 piglets

- 2个对照组 ( +/-药用锌 )      2 control groups (+ / - medicinal zinc)
- 2个低蛋白组 ( 17.5%蛋白 ) 在阶段1和2  
2 groups with **low protein** (17,5% protein) in phase 1 and 2
  - 新氨基酸组成      New amino acid profile
- 1个极低蛋白组 ( 15.5%蛋白 ) 在阶段1和2  
One group with **very low protein** (15,5% protein) in phase 1 and 2
  - 根据新标准添加异亮氨酸、亮氨酸、组氨酸、苯丙氨酸、酪氨酸  
Added isoleucine, leucine, histidine, phenylalanine, tyrosine according to new standards

## 蛋白试验2结论 Conclusion protein trial 2

33

- 药用锌与不添加锌组别相比减少了50%的腹泻  
Medicinal zinc = 50 % less diarrhoea compared to no zinc
- 极低蛋白组减少了65%腹泻（低-低-正常）  
65 % less diarrhea at very low protein (low-low-norm)
- 极低蛋白组：极低的日增重-40g  
Very low protein: very low daily gain - 40 g
  - 添加的合成氨基酸供应不足  
undersupply of synthetic added amino acids



# 降低蛋白质对腹泻的影响-试验总结

## Effect of reduced protein on diarrhoea – sum up from trials

| 水平 Level                                                                            | 1    | 2                 | 3                 | 4                 |
|-------------------------------------------------------------------------------------|------|-------------------|-------------------|-------------------|
| 粗蛋白 Protein %                                                                       | 19,0 | 17,5              | 16,5              | 15,0              |
| 克,可消化蛋白/包括哺乳母猪在内的营养单位<br>g dig. protein/FEsv                                        | 145  | 135               | 125               | 115               |
| 与水平1相比，腹泻治疗减少的百分比<br>% reduction in diarrhoea treatments<br>Compared to level 1     |      | 20                | 30                | 60                |
| 饲料价格相同的情况下，每头猪的毛利率减少量<br>Reduction in Gross margin per pig €/ \$<br>Same feed price |      | 0.13 €<br>0.16 \$ | 0.33 €<br>0.39 \$ | 1.47 €<br>1.75 \$ |

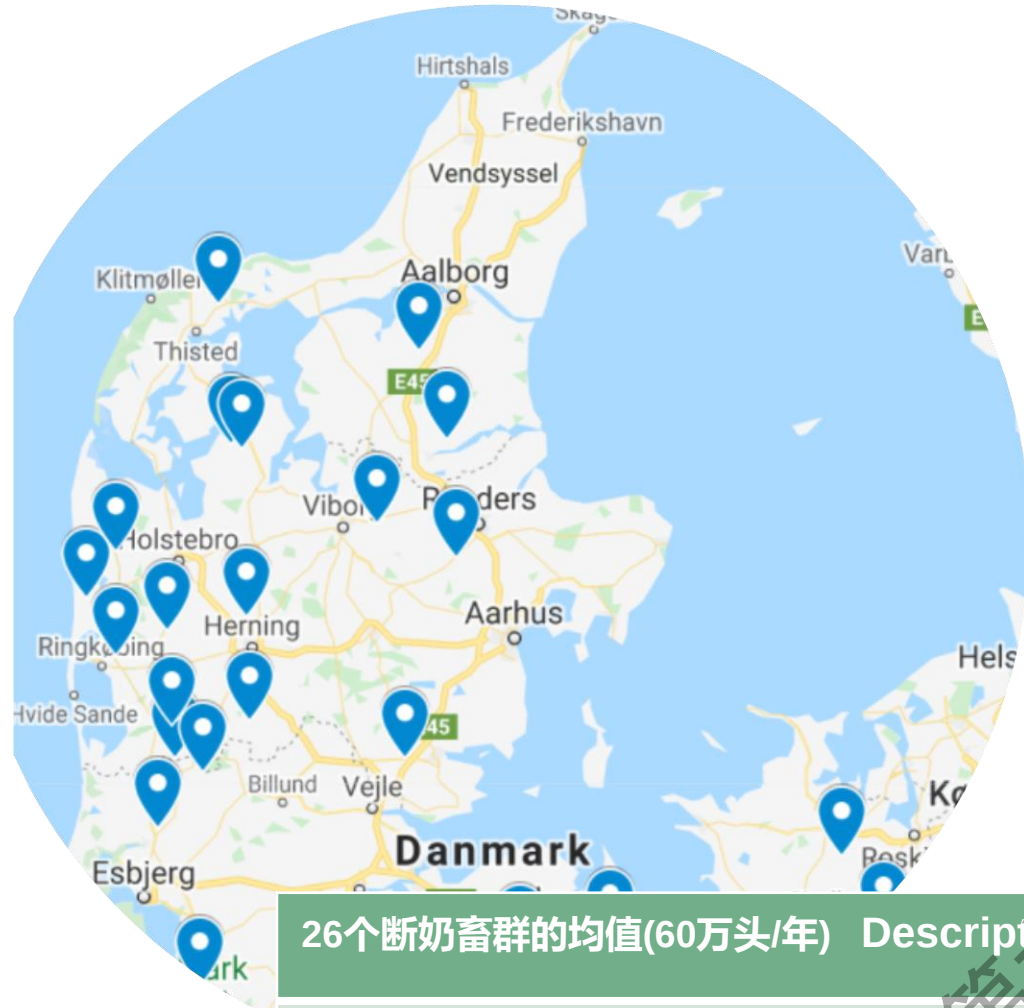


**现场经验：断奶时不添加药用锌**

**Field experiences:**  
**Weaning without medicinal ZnO**

# 丹麦农场的现场研究 Field study in Danish farms

36



目的 Purpose:

鉴定不添加药用氧化锌的断奶畜群特征

Identify features in weaner herds with no medical ZnO

数据：收集于2018-2019年的26个群，每群规模1650-80000头断奶仔猪

Data: Collected from 26 herds in 2018-2019 – 1650-80.000 weaners per herd

农场主采访 Herd owners interviews:

- 管理、畜群健康、饲料、卫生、人员等

Management, herd health, feed, hygiene, personnel etc.

- 抗生素使用—兽医统计数据库

Antibiotic usage –Vetstat

- 饲料配方—断奶日粮

Feed recipes – weaner diets

- 生产力报告

Productivity reports

26个断奶畜群的均值(60万头/年) Description, average from 26 weaner herds (600.000 weaners/year)

泌乳天数 Lactating days

29.4 days

断奶体重 Weaning weight

5.5-8.5 kg

日增重 Daily weight gain, 7 to 30kg

490g (2018年均重462g ) 490 grams (nat. avg. 2018 =462 grams)

断奶死亡率 Weaner mortality

2.2 % (nat. avg. 2018 =3.1 %)

# 常规方法-采食量 Common approaches – feed intake

| 断奶后提高采食量<br>Increase feed intake after weaning  | 农场数<br># farms |
|-------------------------------------------------|----------------|
| 地上额外投喂 Extra feeding on the floor               | 10             |
| 料槽中增加额外的饲喂空间<br>Extra feeding spaces in troughs | 5              |
| 额外的饮水空间 Extra drinking spaces                   | 4              |
| 乳制品的供应 Supply with milk products                | 3              |
| 粥样饲料 Gruel feed                                 | 2              |
| 其他措施 Other measures                             | 2              |
| 无特别措施 No special measures                       | 2              |



## 常规方法 Common approaches –



清栏后注意清洁和消毒剂的使用

Focus on cleaning & use of disinfectants after emptying:

断奶仔猪进入前注意干燥

Focus on drying out before weaners entering:

通过测量地板和存栏的温度来控制。

Control by measuring the temperature on floor and inventory.

受过培训的人员 Trained personnel

- 任职时间 Employment period:
  - 20/26群：断奶仔猪管理者任职 > 1年
  - 20/26 herds: Manager of weaners employed >1 year
- 经验 Experience:
  - 18/26群：作为断奶仔猪管理者管理断奶仔猪工作年限 > 3年
  - 18/26 herds: Manager of weaners has worked with weaners > 3 years



## 概念验证

# Test of concept

断奶时不加药用锌

weaning without medicinal Zn

- 优化断奶日粮 Optimized weaning diet
- 在断奶前后经常饲喂液体饲料  
Frequent feeding - liquid feed before and after weaning
- 断奶时减少仔猪混群 Reduced mixing of piglets at weaning

# 关注采食量 FOCUS on feed intake

## 分娩区 Farrowing section:

- 从7日龄开始，每天湿喂3-4次  
Wet feed 3-4 times/day starts from 7 days age
- 持续到断奶后的第7天 AND continues until day 7 post weaning
- 在分娩舍的料槽中提供 Provided in round troughs in farrowing unit

## 保育区 Weaner section:

- 在保育舍的长槽中提供 Provided in long troughs in weaning unit
- 采用带自动搅拌系统的进料小车进行混合  
Mixed in feed cart with automatic mixing system



## 结果 Results:

- 体增重没有差异 No difference in gain
- 分娩区 In the farrow section
- 或断奶后 Or after weaning
- 对腹泻治疗的影响  
Effect on diarrhoea treatments

| 处理 Group                                 | 对照<br>Control | 试验<br>Trial | P值<br>P-value |
|------------------------------------------|---------------|-------------|---------------|
| 栏舍治疗百分比 Treated pens, %                  | 77.1          | 29.4        | 0,0001        |
| 每头猪治疗天数 No. of treatment<br>days pr. pig | 3.1           | 0.9         | <0,0001       |

## 总结 Summary

其目标是在不增加抗生素使用的情况下找到具有成本效益的解决方案

**The goal is cost-effective solutions without increasing antibiotic usage**

- 对大多数丹麦畜群来说，这可不是件容易的事 Not an easy task for the majority of Danish herds
- 锌仍是丹麦控制仔猪断奶腹泻的常用方法 Zinc is still a common approach to control PWD in DK
- 锌使用量下降-减少剂量是主要驱动力 Zinc usage dropping – reduced doses is the main driver
- **工具 Tools:**
  - 降低仔猪日粮中蛋白质水平 Reduced protein levels in piglet diets
  - 关注断奶前后采食量 Focus on feed intake before and after weaning
  - 培训人员-知识和稳定性 Trained personnel – knowledge and stability

没有通用的解决方案 No common solutions

每个农场主需要了解对自己农场有效的方法！

– each farmer needs to learn what works at the farm!

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## 2022年零锌峰会 无抗健康断奶

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4. Feed additives 饲料添加剂
5. Immunity and gut health 免疫和肠道健康
6. Practical experiences 实践经验
7. Treatment of post weaning diarrhea 断奶后腹泻的治疗

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