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不同理化及生物处理对饲料原料营养价值提升的评估

Use of Feed Technology to Improve the Nutritional Value of Feed Ingredients fed to Pigs

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前言 Introduction

- 推荐的粉碎粒度 Recommended 640 - 650 µm.
- 粉碎机的类型 Type of grinders
  - 对辊式粉碎机 Roller mills
  - 锤片式粉碎机 Hammer mills

结合 Combination

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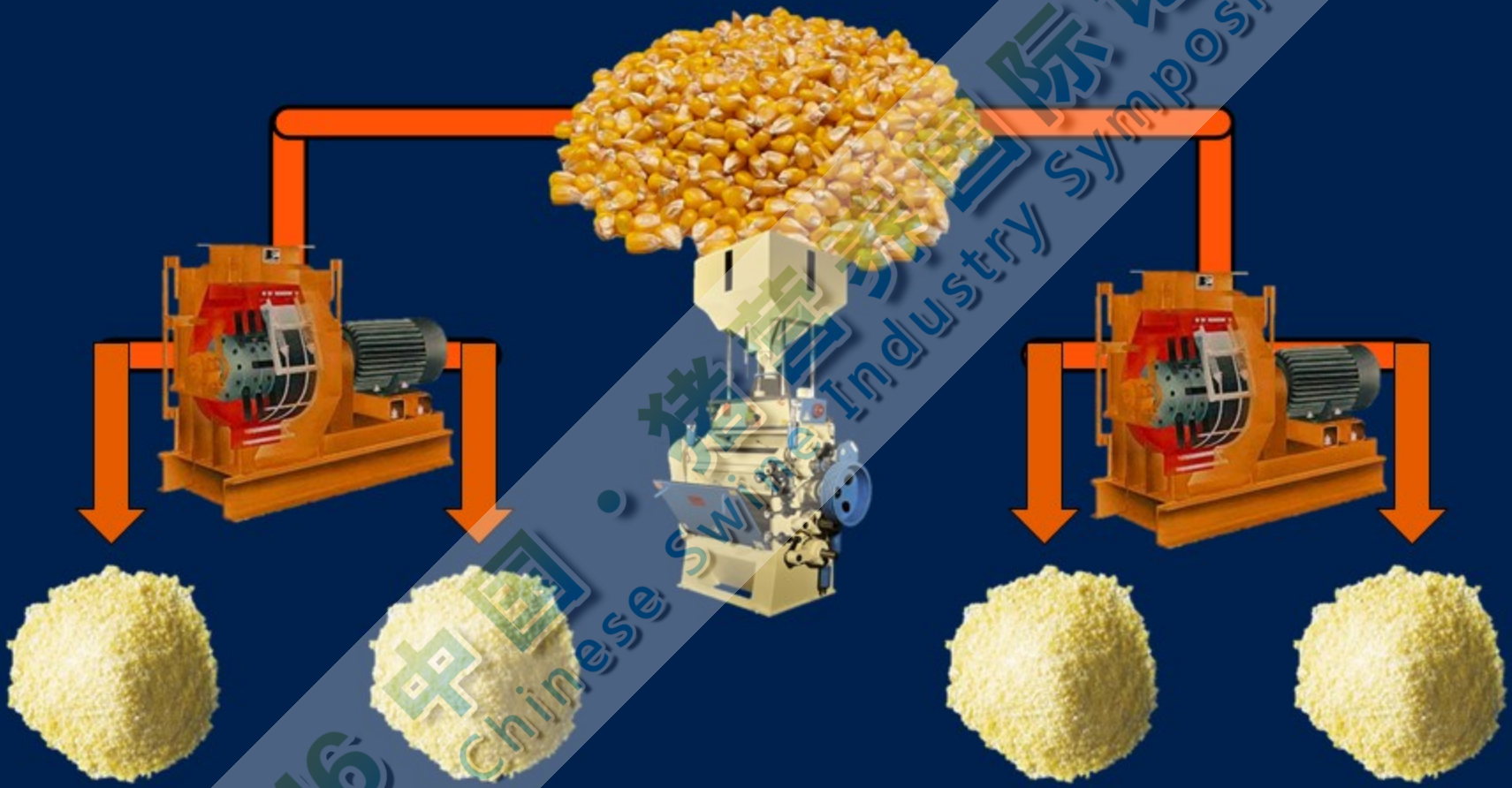
玉米加工过程 Corn Processing



339 µm | 485 µm | 677 µm | 865 µm

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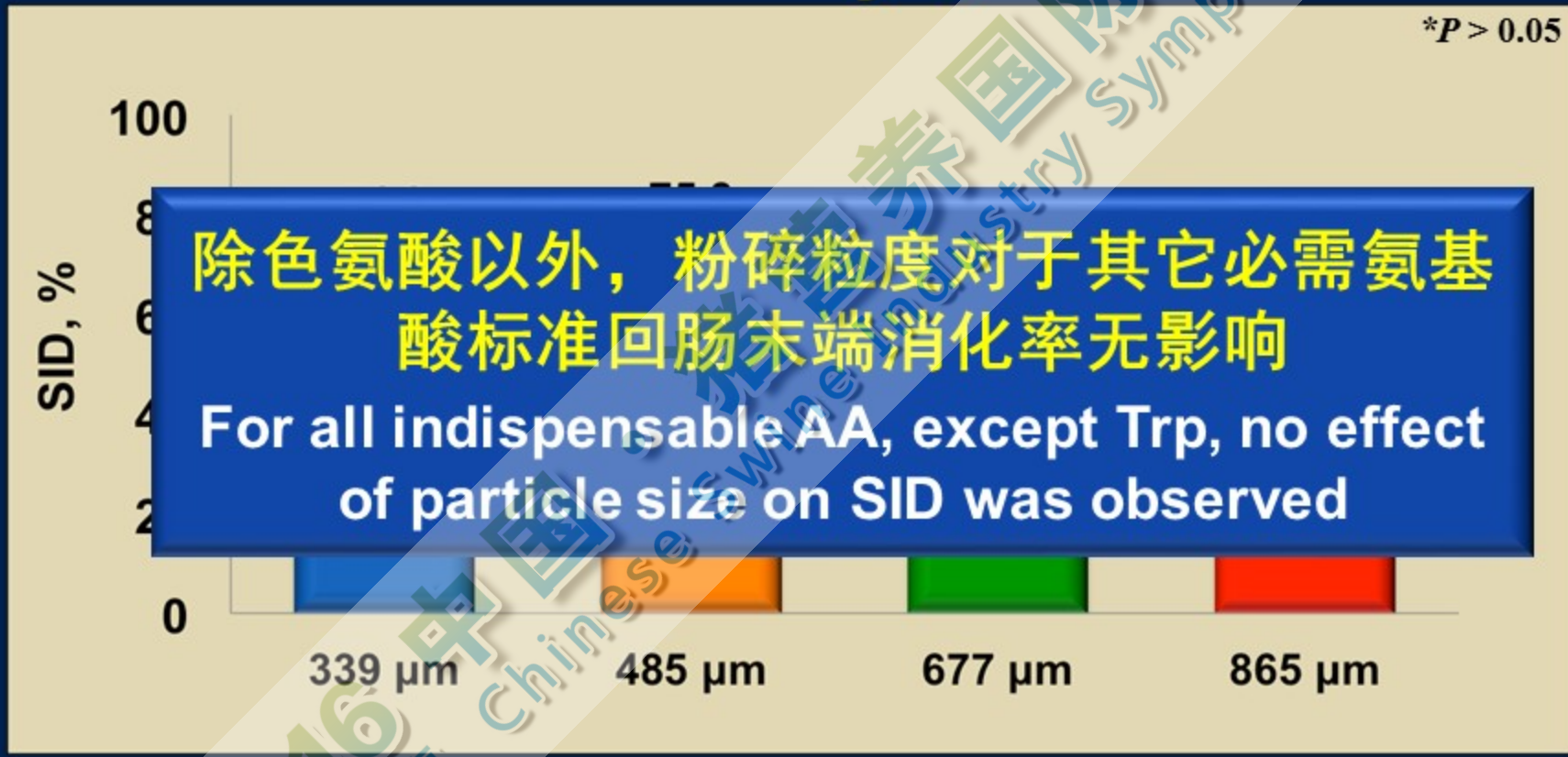
养分和能量消化率

Nutrient and Energy Digestibility

Rojas and Stein, Livestock Sci., 2015

赖氨酸标准回肠末端消化率，%
SID of Lys, %

*$P > 0.05$

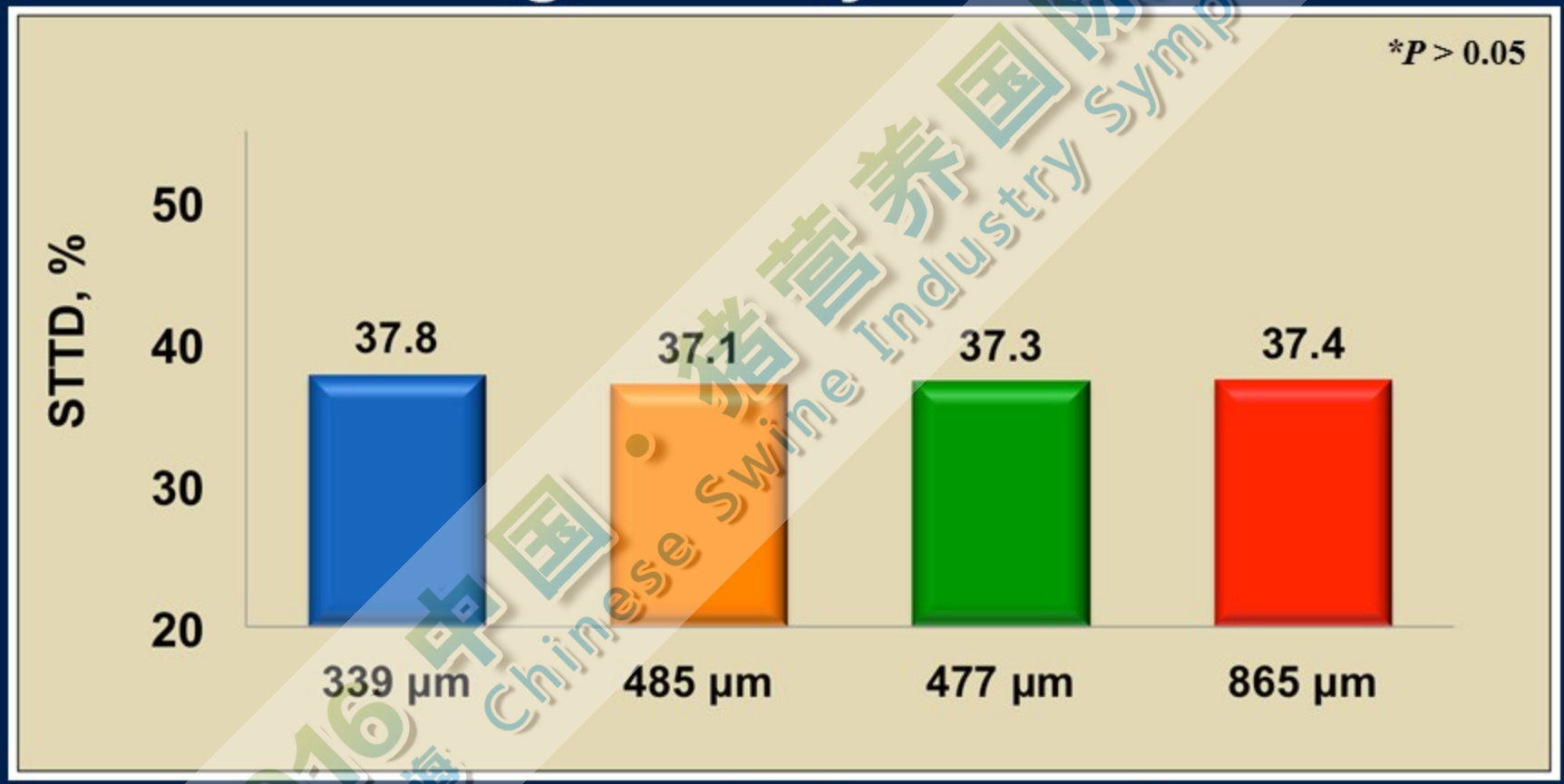


除色氨酸以外，粉碎粒度对于其它必需氨基酸标准回肠末端消化率无影响

For all indispensable AA, except Trp, no effect of particle size on SID was observed

Rojas and Stein, 2015

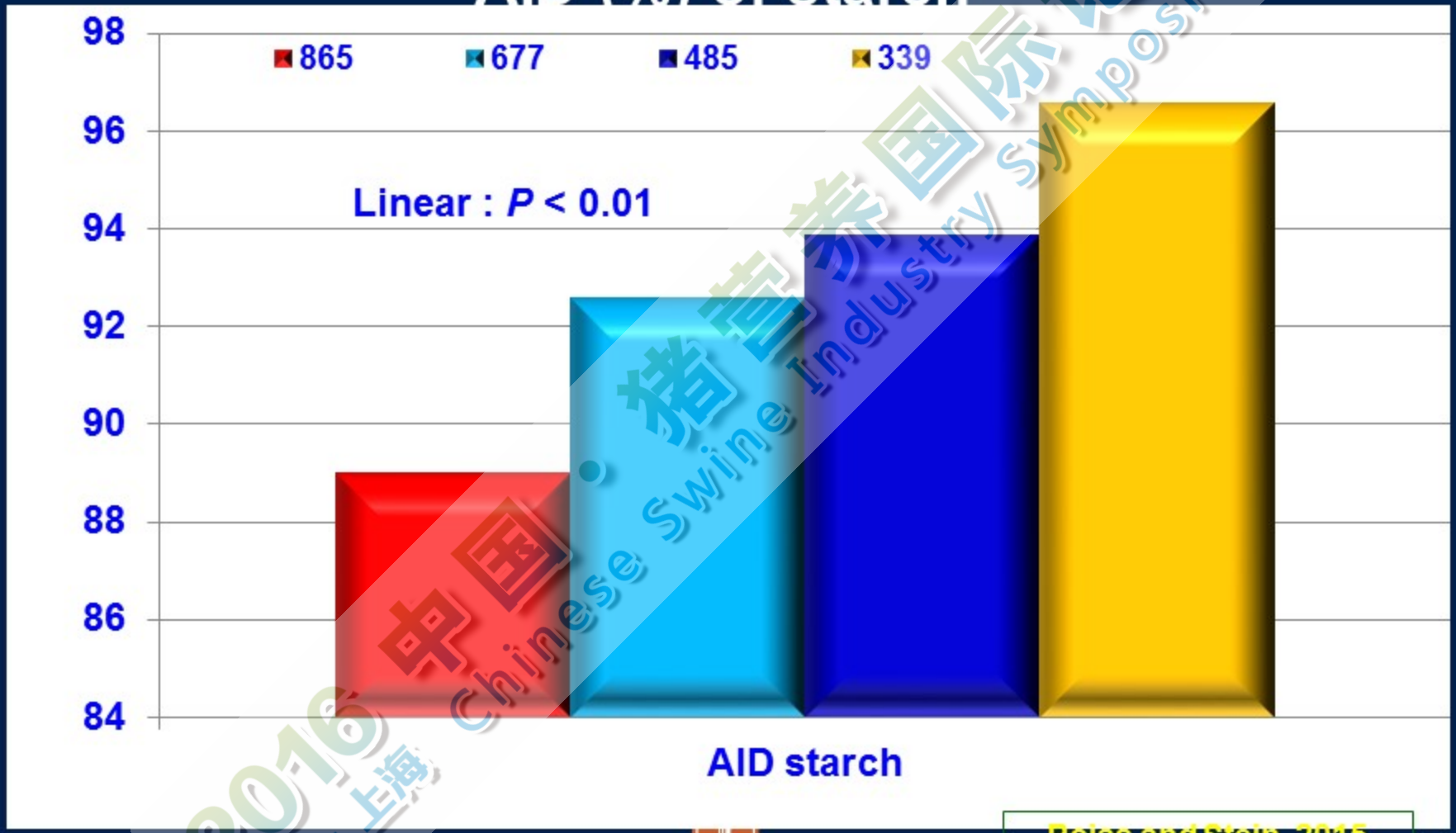
磷消化率，%
Digestibility of P, %



Rojas and Stein, 2015

淀粉表观回肠末端消化率（%）

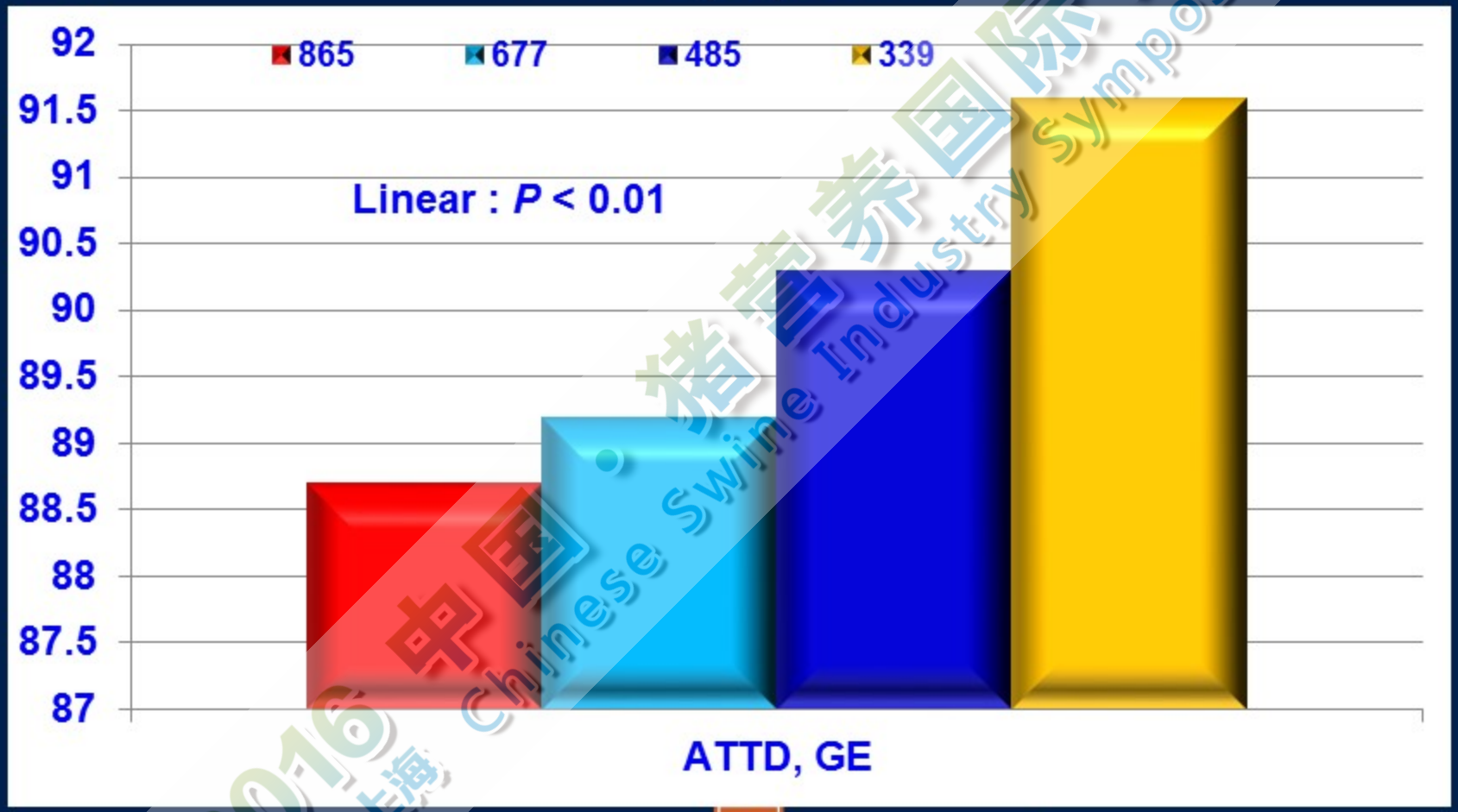
AID (%) of starch



Rojas and Stein, 2015

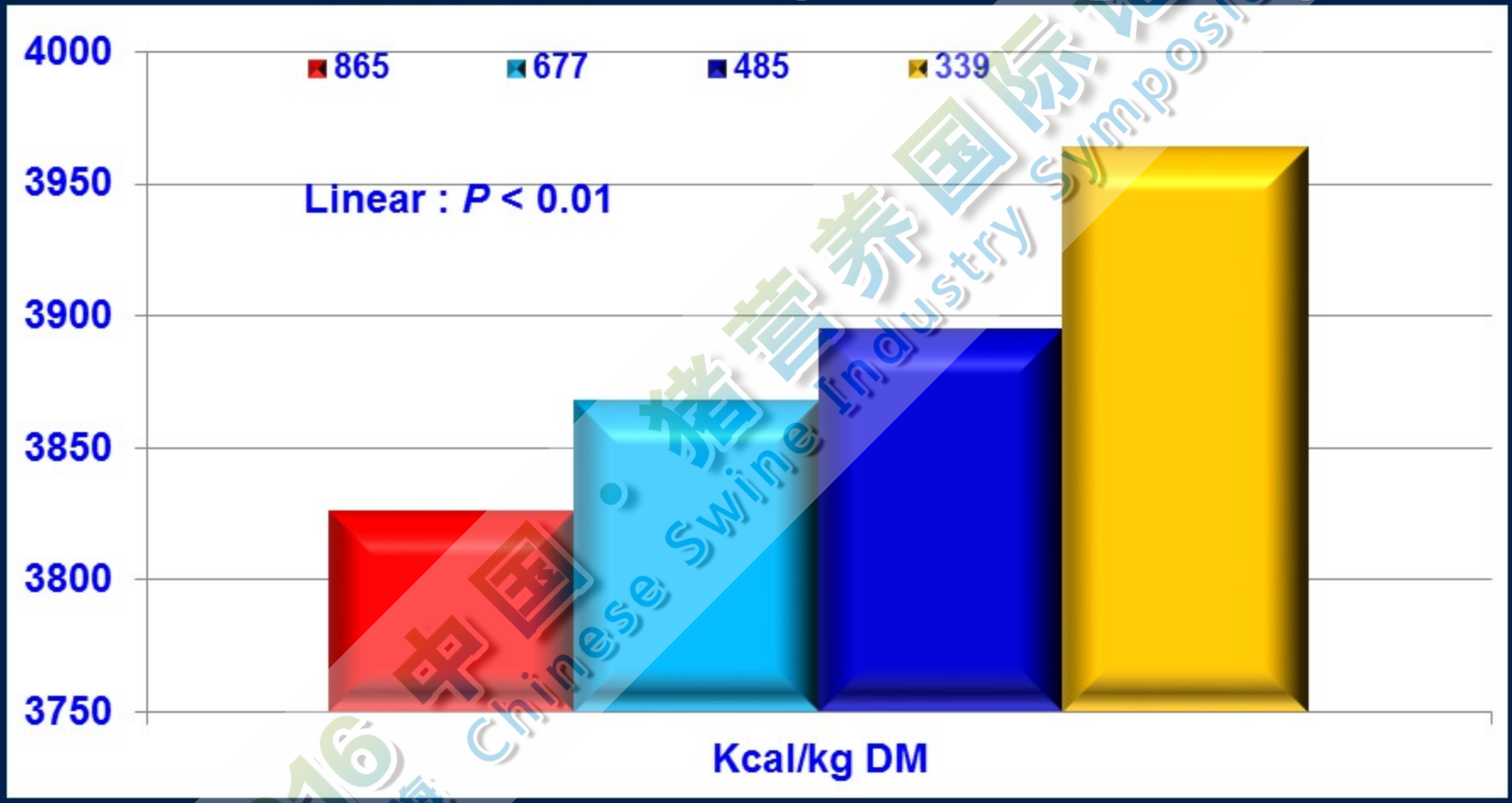
总能表观全肠道消化率(%)

ATTD (%) of GE



Rojas and Stein, 2015

代谢能 ME (Kcal/kg DM)



Rojas and Stein, 2015

生长肥育试验
Growing-Finishing Exp.

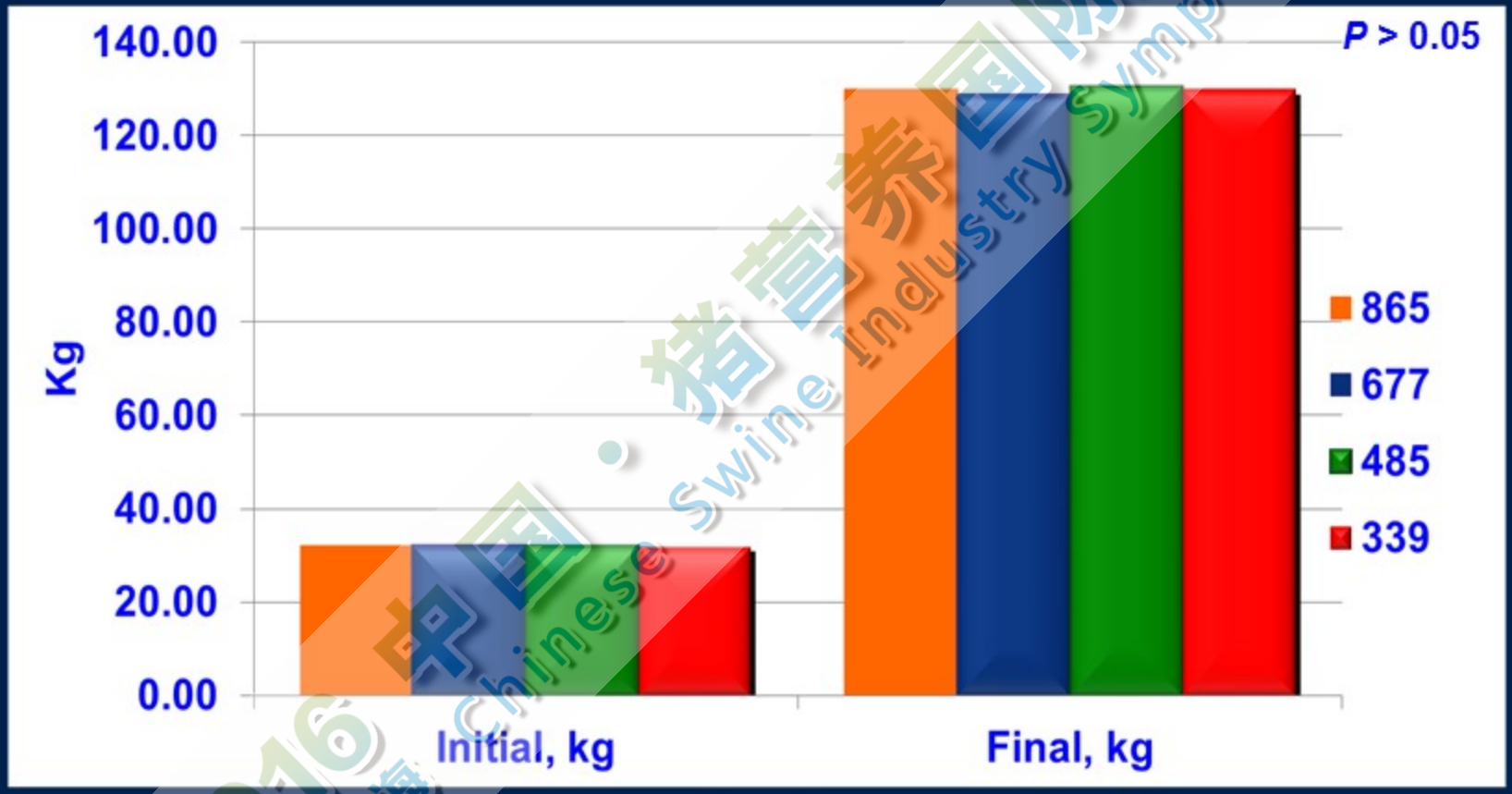
玉米 Corn grain	阶段1 Phase 1		阶段2 Phase 2		阶段3 Phase 3	
	大豆油 SB oil[1]	代谢能 ME[2]	大豆油 SB oil	代谢能 ME	大豆油 SB oil	代谢能 ME
865 µm	3.6		3.7		3.9	
677 µm	3.1	3,396	3.2	3,412	3.3	3,426
485 µm	2.8		2.9		2.9	
339 µm	2.0		2.0		2.0	

[1]Values in %
[2]Values in kcal/kg

材料与方法
Materials & Methods

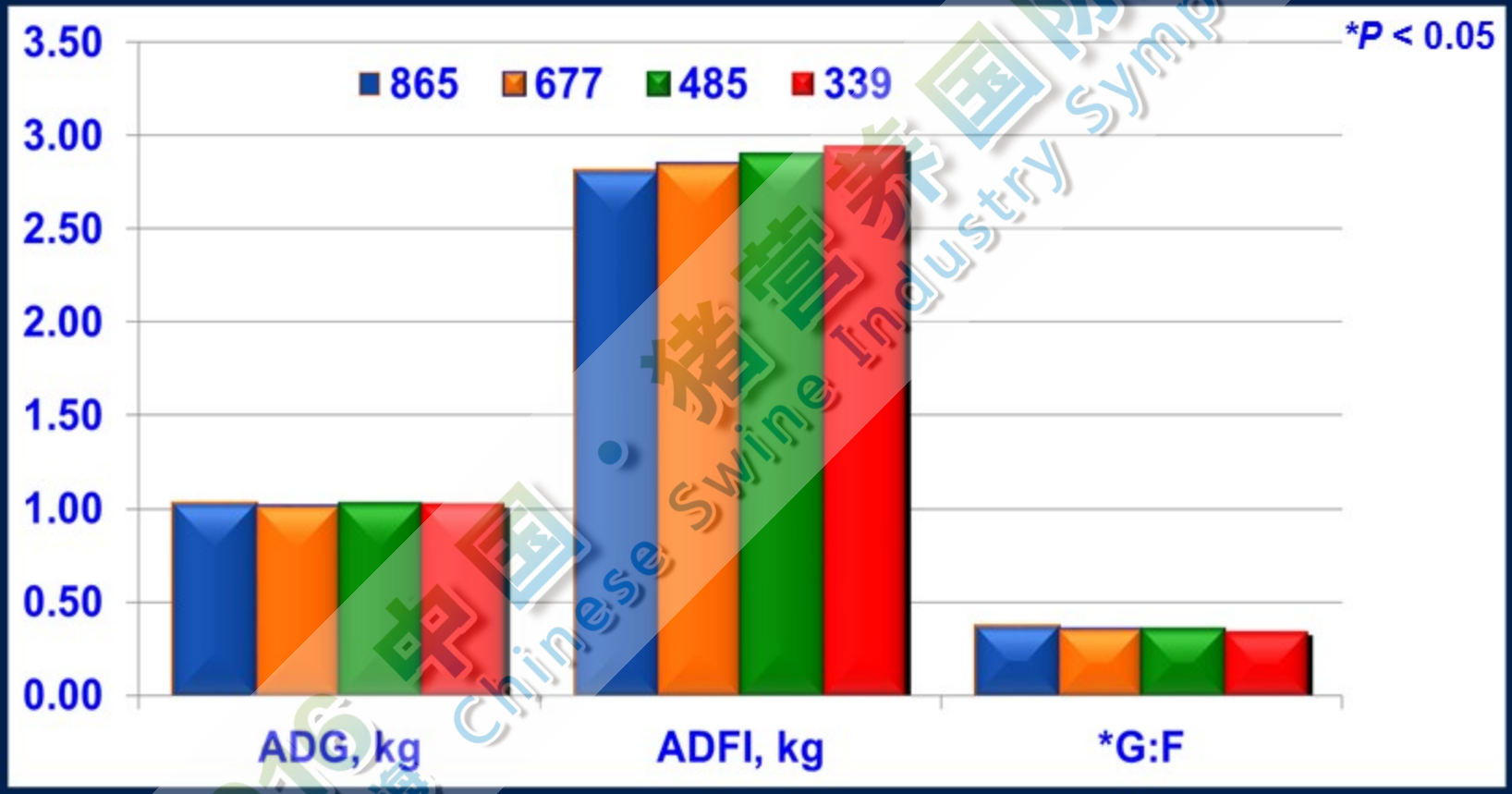
- 72头猪 72 pigs (初始体重 initial BW: 32.0 kg)
  - 公母各半 36 gilts and 36 barrows
- 每个处理18头猪 18 pigs/treatment
- 3-阶段饲养 3-phase feeding program
  - 阶段1 Phase 1 (32 to 62 kg)
  - 阶段2 Phase 2 (62 to 94 kg)
  - 阶段3 Phase 3 (94 to 129 kg)

总体生长性能
Overall Performance



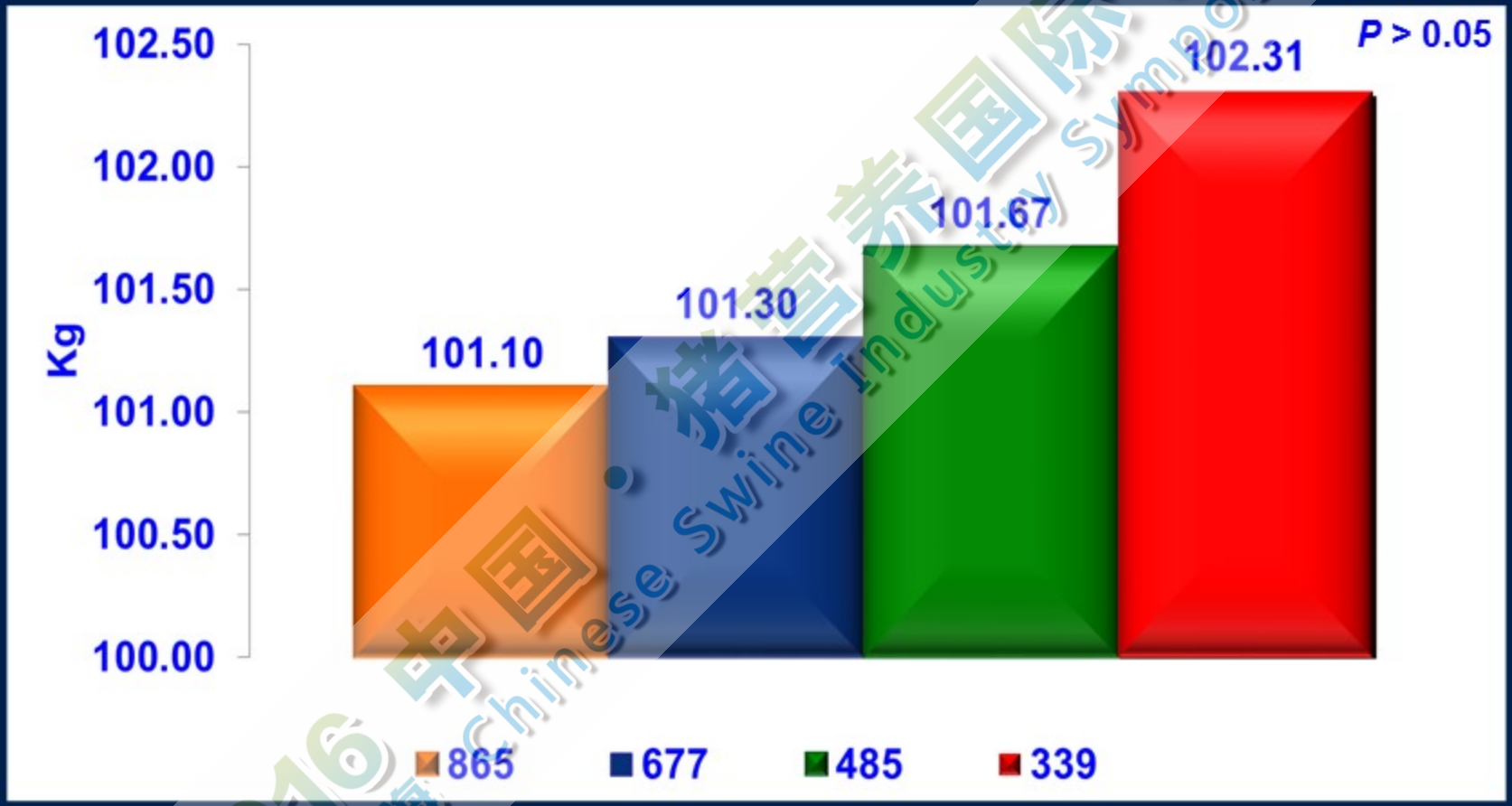
Rojas and Stein, 2016a

总体生长性能
Overall Performance



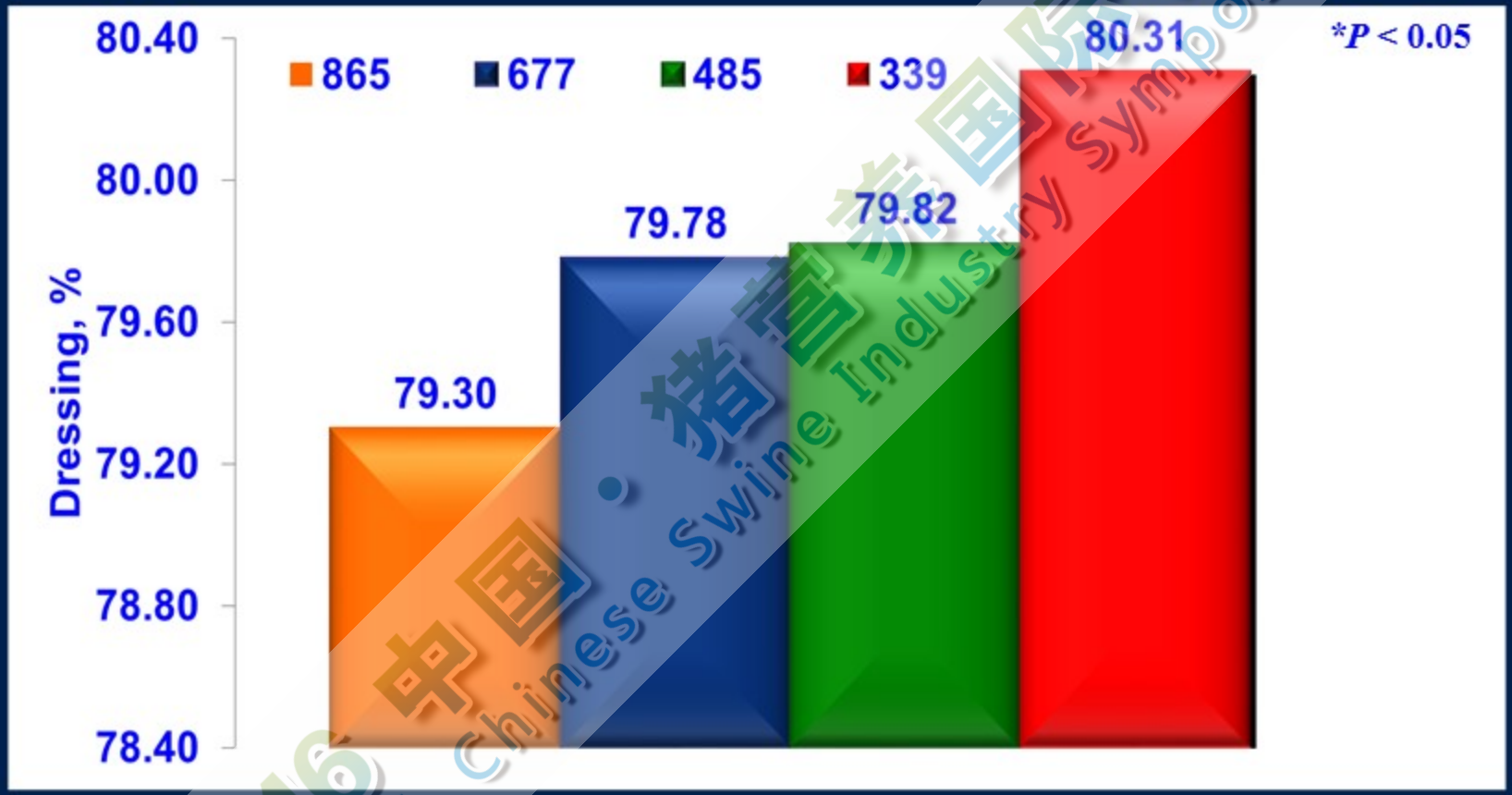
Rojas and Stein, 2016a

胴体重 Hot Carcass, wt



Rojas and Stein, 2016a

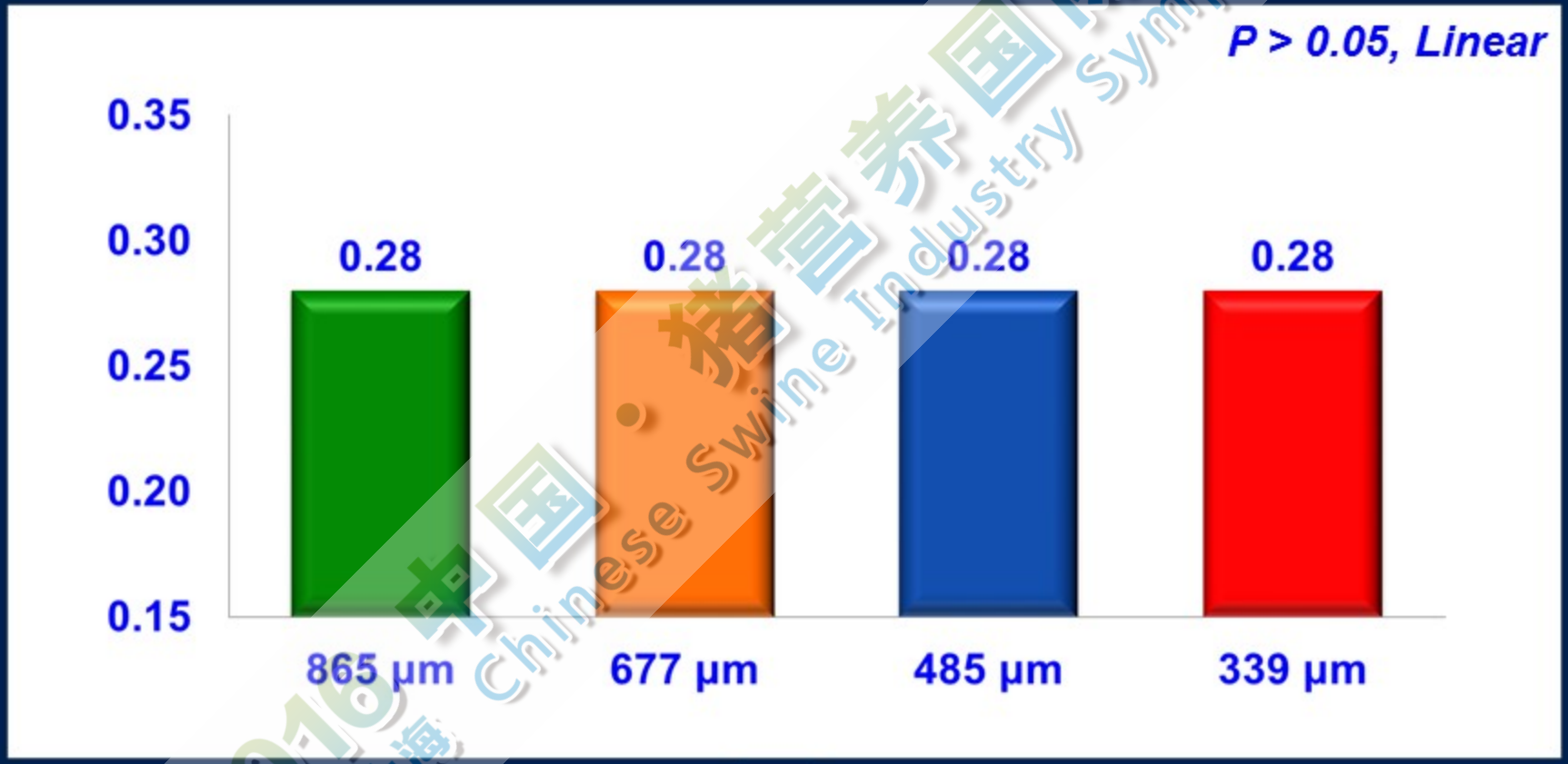
Dressing, %



Rojas and Stein, 2016a

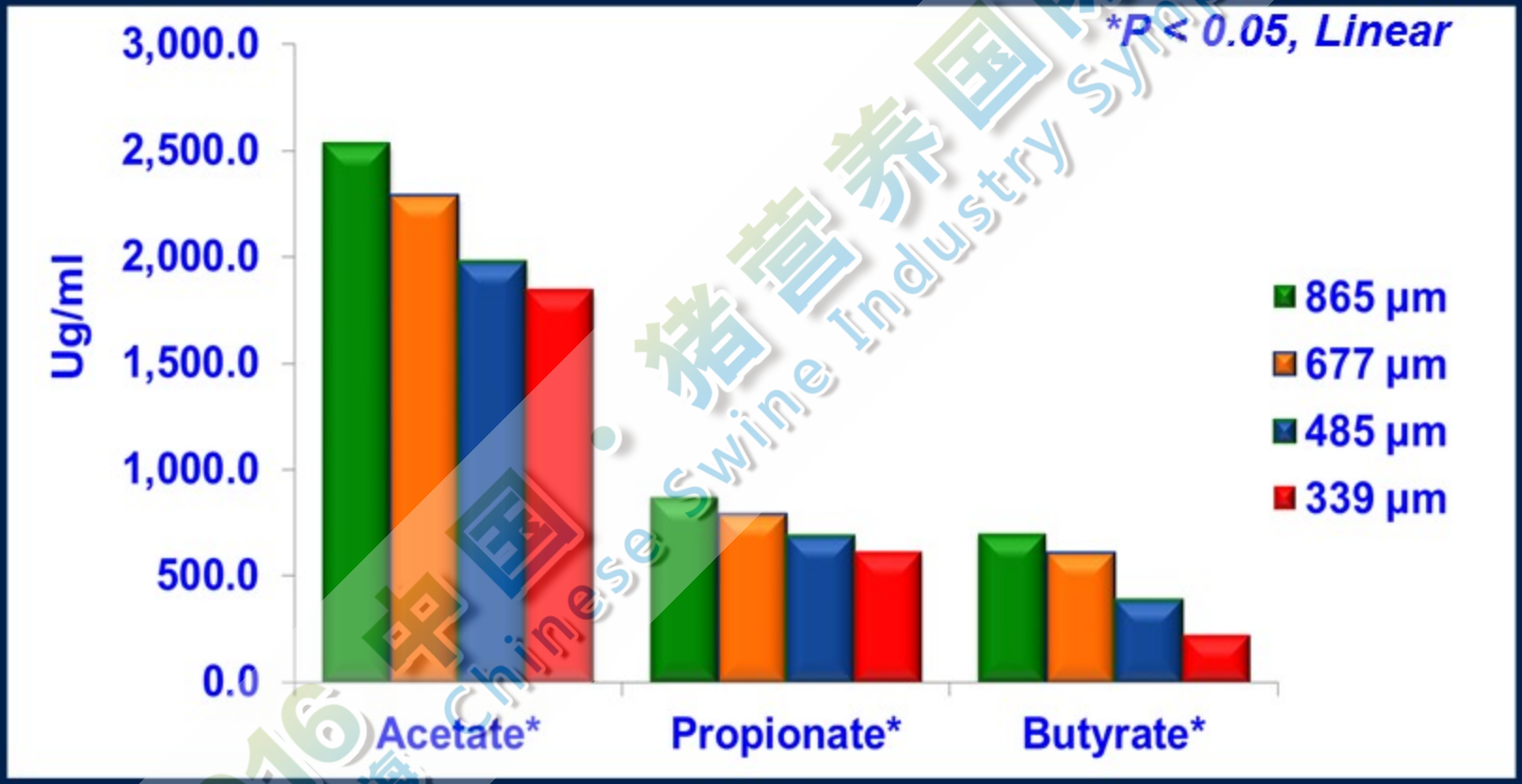
料重比

G:F Based on HCW



Rojas and Stein, 2016a

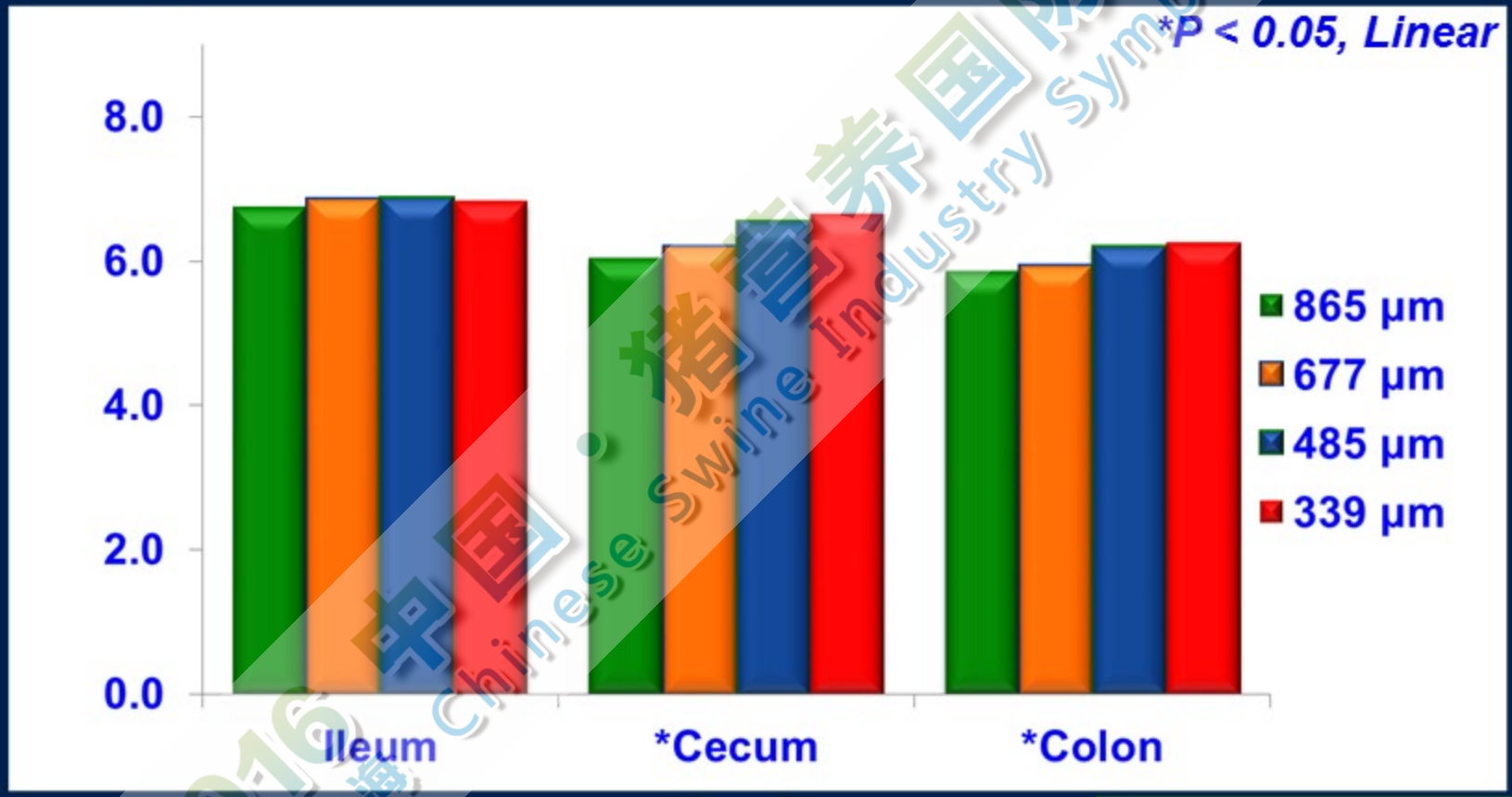
盲肠短链脂肪酸含量
SCFA in Cecal Contents



Rojas and Stein, 2016a

小肠pH

pH in Intestinal Contents



Rojas and Stein, 2016a

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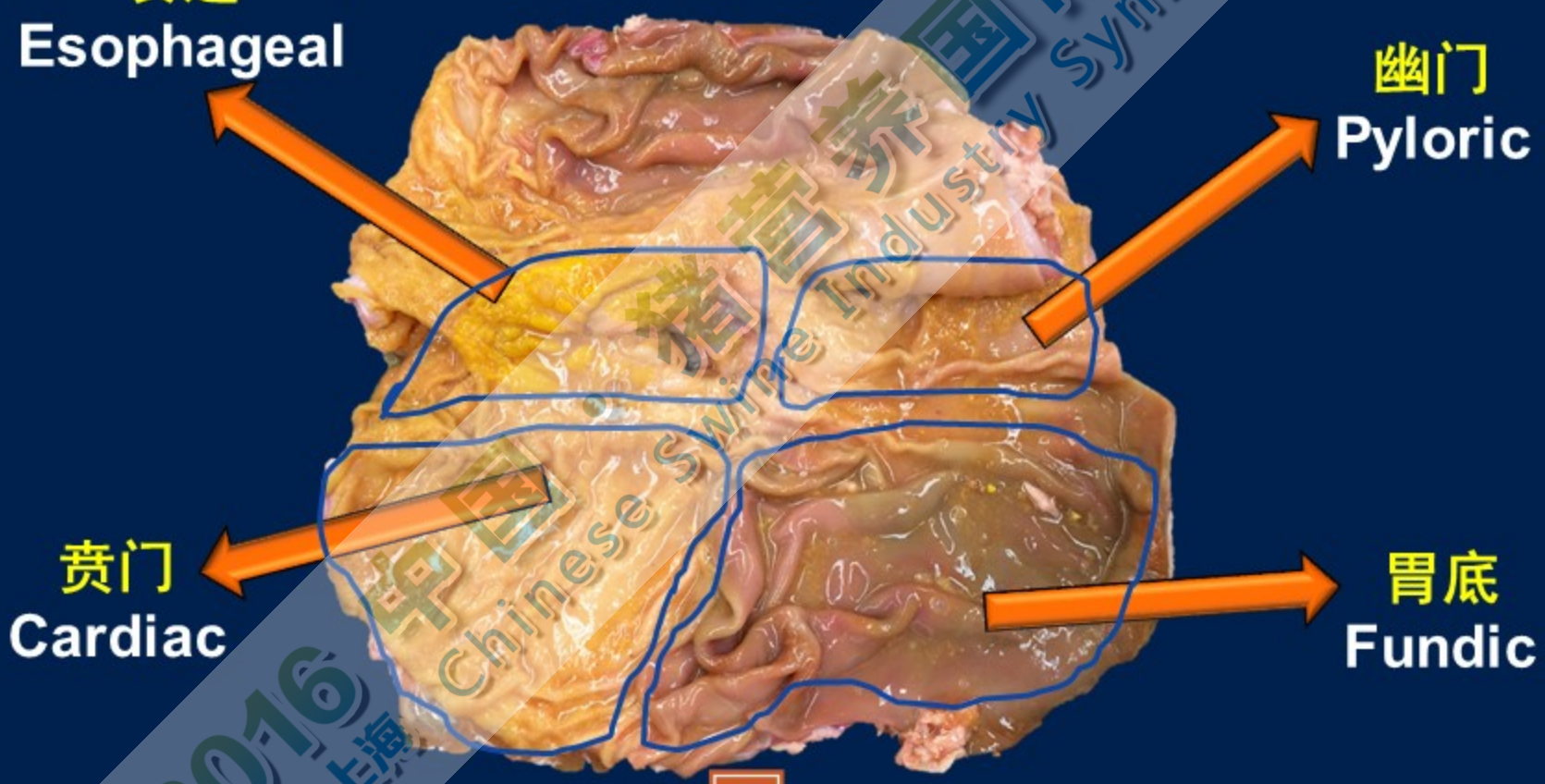
胃部分区 Stomach Regions



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食道损伤评分

Esophageal Lesions Score

正常
Normal

轻度损伤
Minor

中度损伤
Medium

重度损伤
Major

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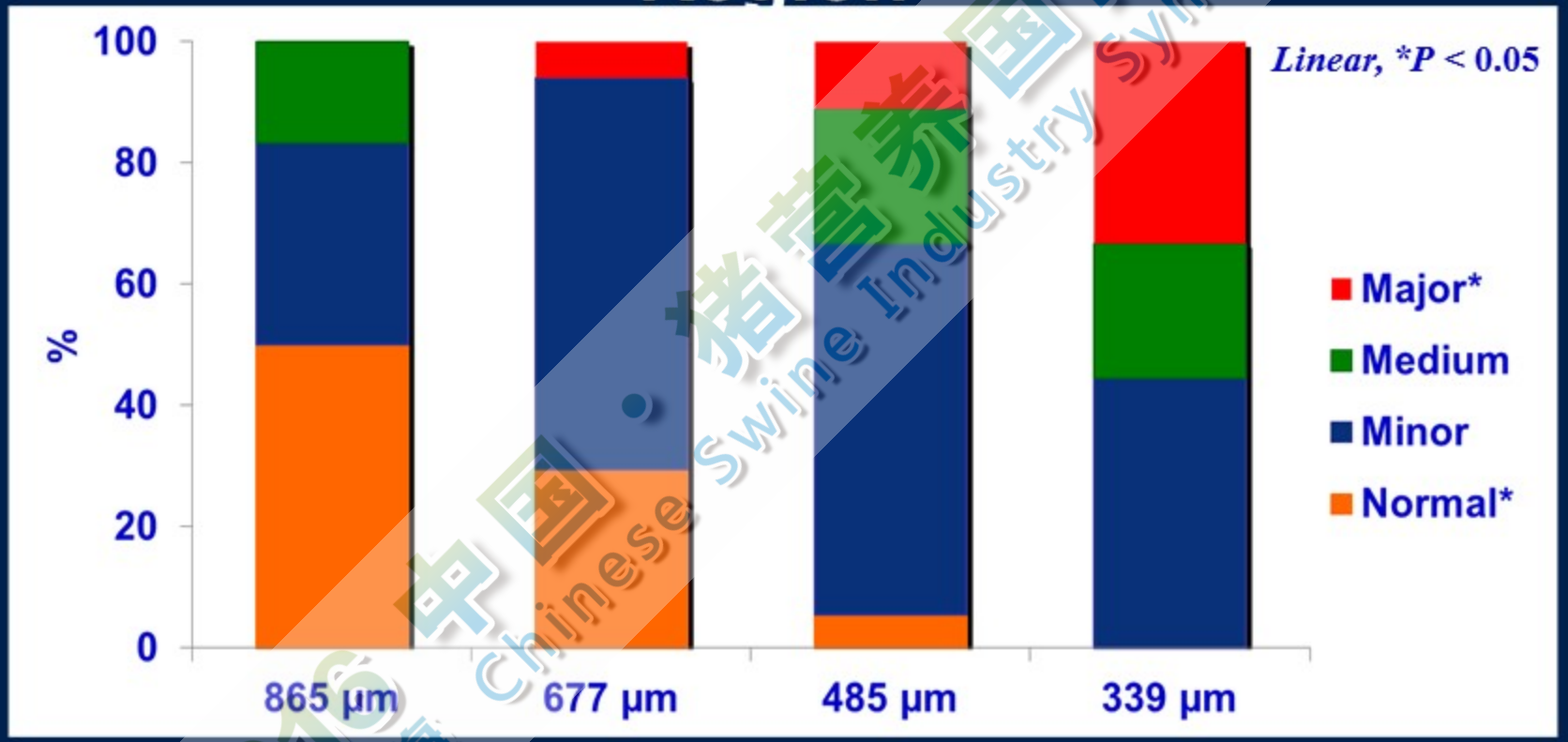
食道损伤频率

Frequency of Lesions in the Esophageal Region



Rojas and Stein, 2016a

生长肥育试验结论
Conclusions on GF Pigs

- 当粉碎粒度减小时，日粮中所需脂肪含量也相应降低 Less fat needed in diets with reduced particle size
- 料重比无差别 No change in G:F based on HCW
  - 可以降低饲料成本 Will reduce diet costs
- 降低饲料在消化道流动性 Reduced flowability of feed
- 增加胃角质化风险 Increase in stomach keratinization
  - 或许不总有实践意义 May not always have practical implications

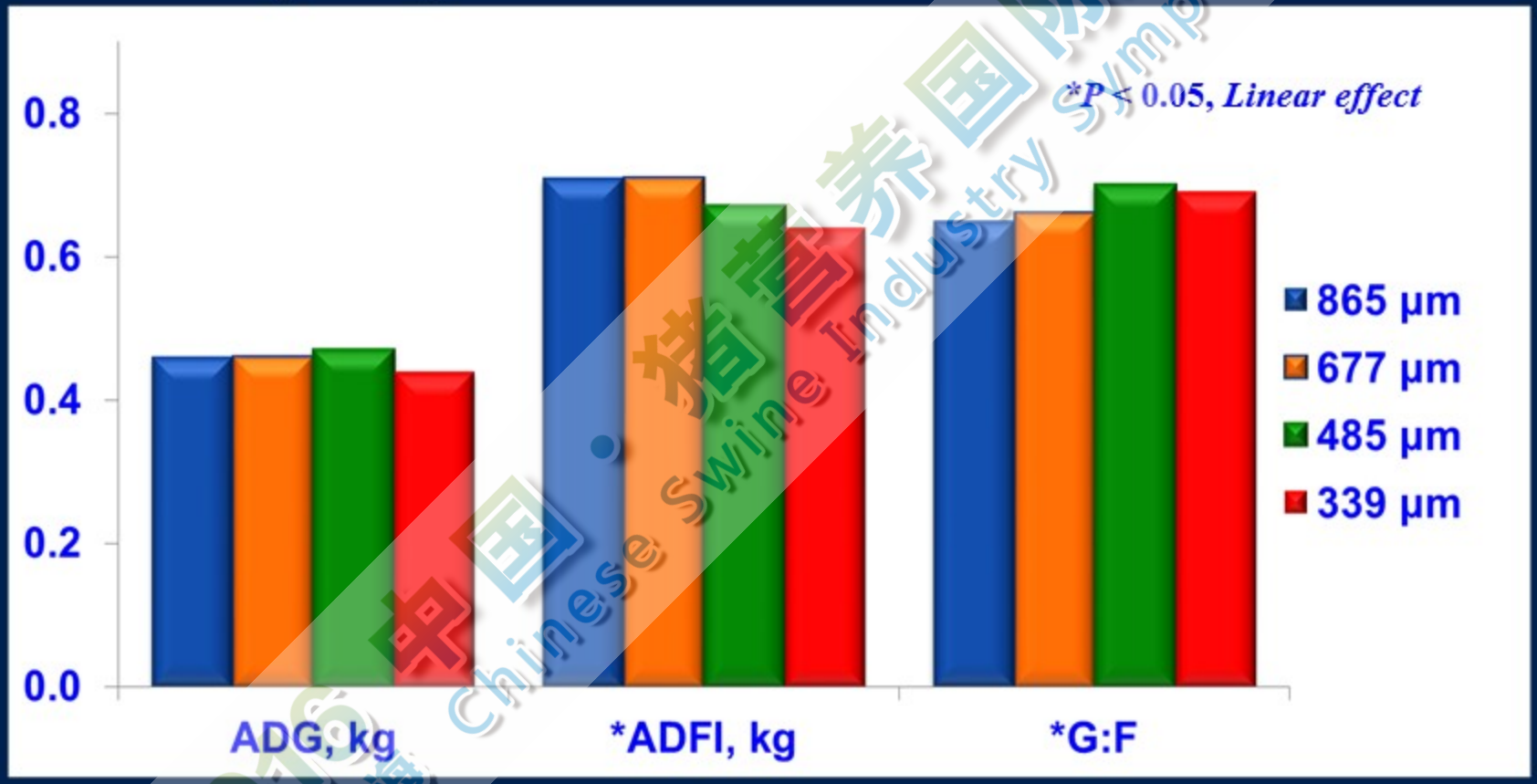
断奶仔猪试验
Weanling Pig Exp.

玉米 Corn grain	试验1 Exp. 1		试验2 Exp. 2	
	大豆油 SB oil[1]	代谢能 ME[2]	大豆油 SB oil[1]	代谢能 ME[2]
865 µm	1.00	3,269	3.86	3,413
677 µm	1.00	3,290	3.45	
485 µm	1.00	3,306	3.16	
339 µm	1.00	3,343	2.43	

*玉米–豆粕–鱼粉日粮
Corn-SBM-fish meal diets

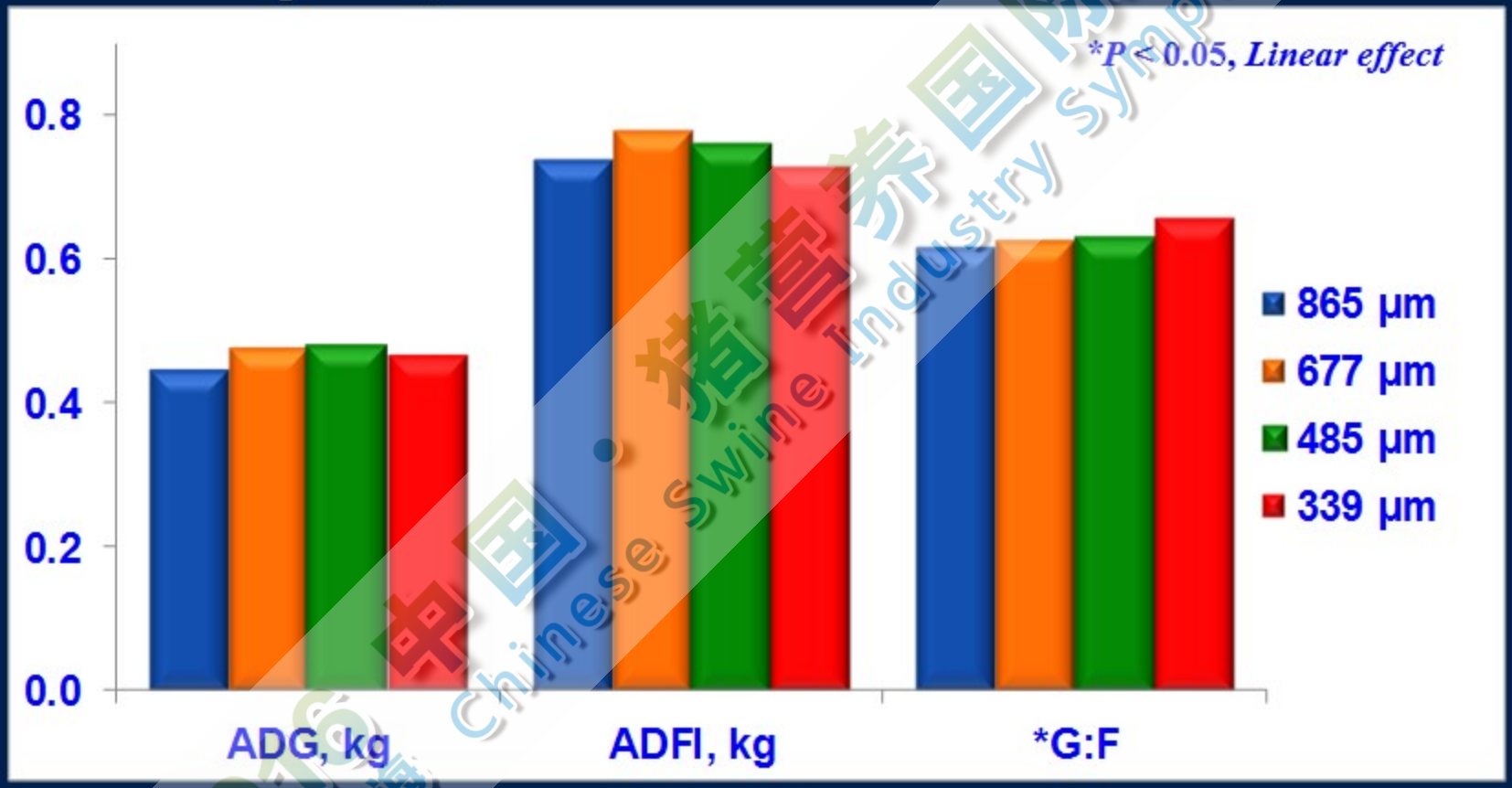
[1]Values in %
[2]Values in kcal/kg

试验一，生长性能
Exp. 1, Growth Performance



Rojas and Stein, 2016b

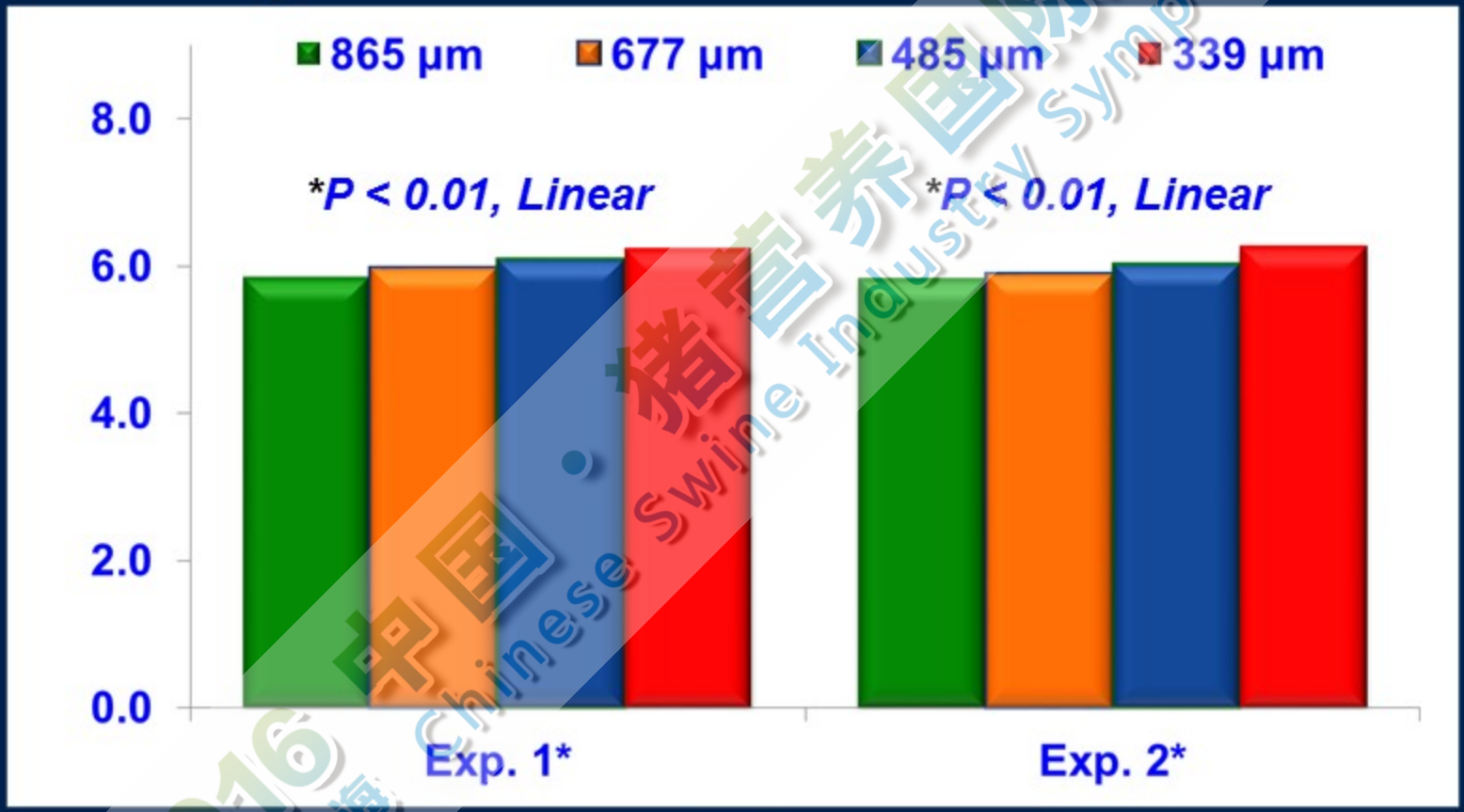
试验二，生长性能
Exp. 2, Growth Performance



Rojas and Stein, 2016b

结肠pH

pH in Colon Contents



Rojas and Stein, 2016b

结论 Conclusions

- 如果日粮中玉米的粉碎粒度为369 μm，较更大的粉碎粒度，料重比将提高
- If diets contain corn ground to a particle size of 369 μm rather than a greater particle size, G:F of pig is improved
- 当玉米粉碎粒度减小时，或许可以降低日粮中所需脂肪含量
- Inclusion of dietary fat may be reduced if corn is ground to a finer particle size

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不同纤维水平下，膨化和制粒对猪日粮中能量和养分消化率的影响

Effects of extrusion and pelleting on energy and nutrient digestibility in diets with different levels of fiber fed to pigs

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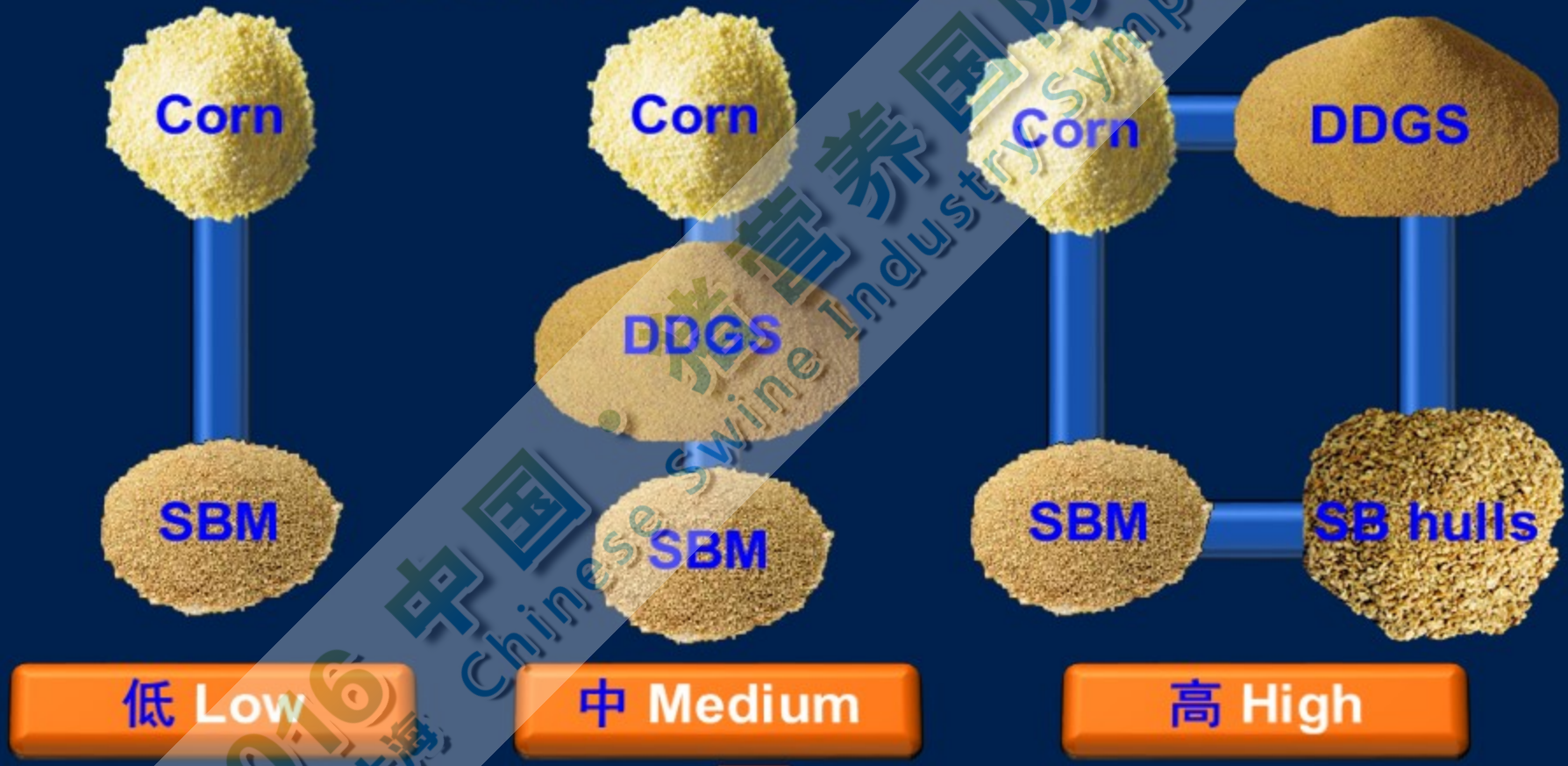
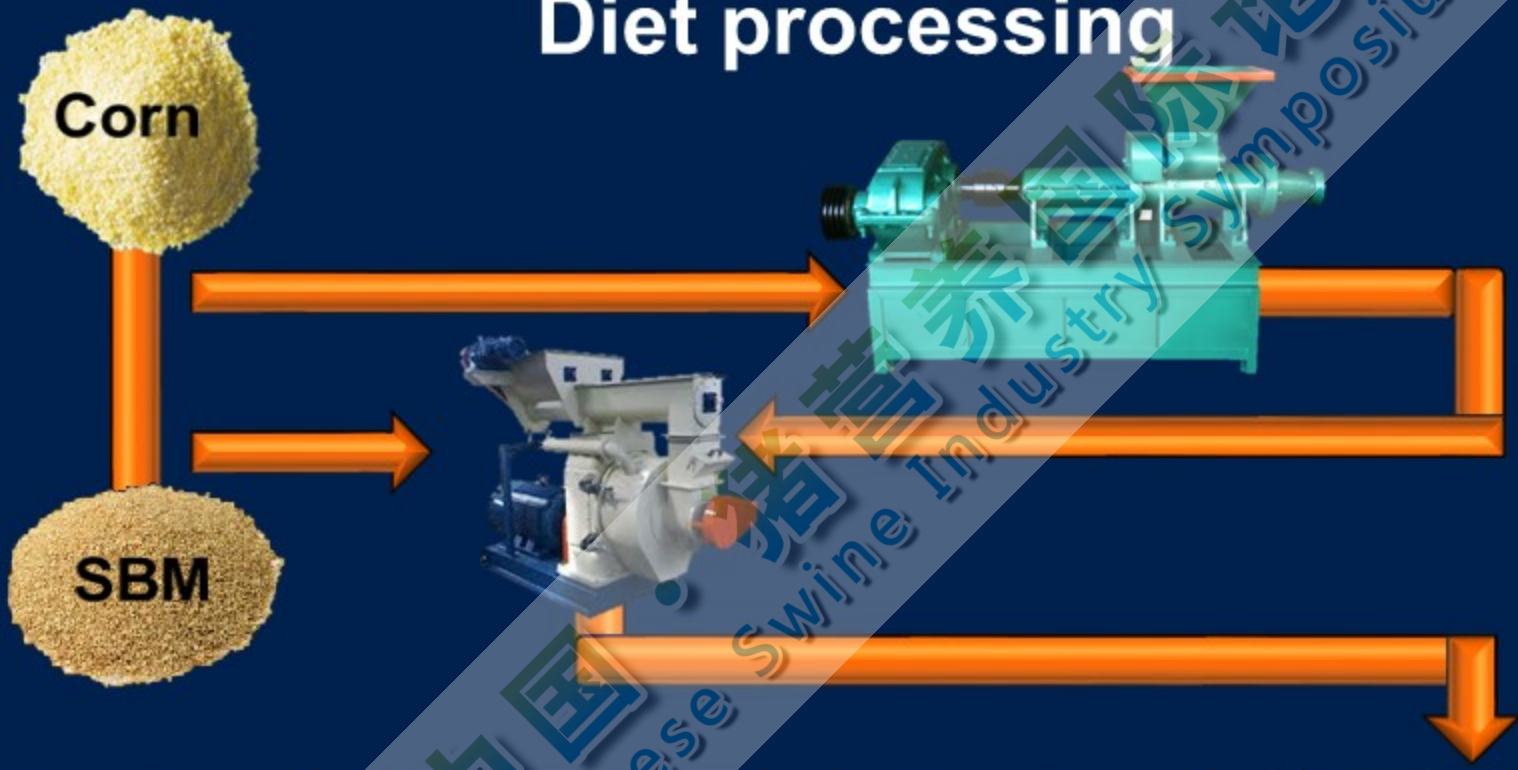
日粮：不同纤维水平

Diets: different levels of fiber



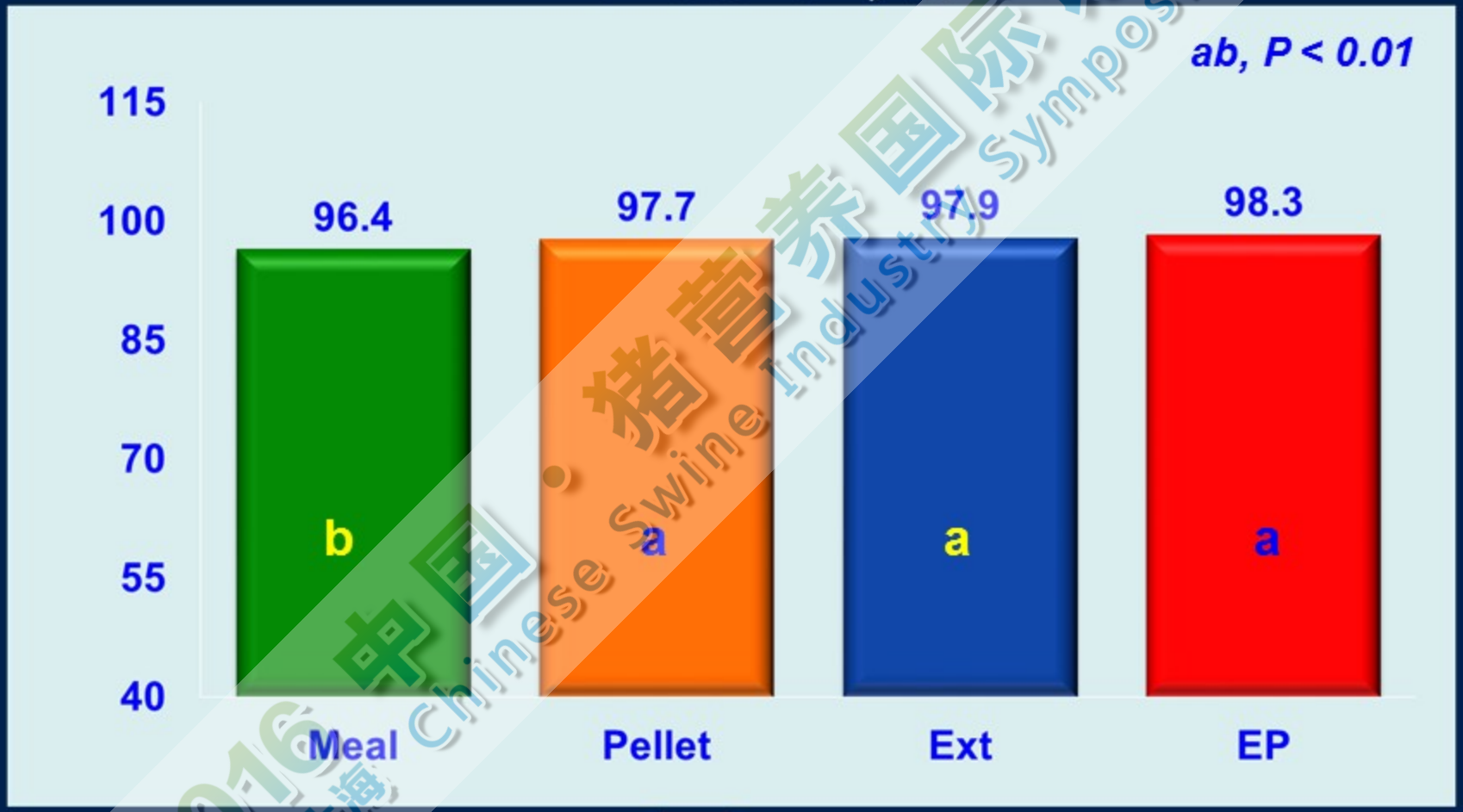
日粮加工过程
Diet processing



粉料 Meal	制粒 Pelleted	膨化 Extruded	制粒并膨化 Extruded and pelleted

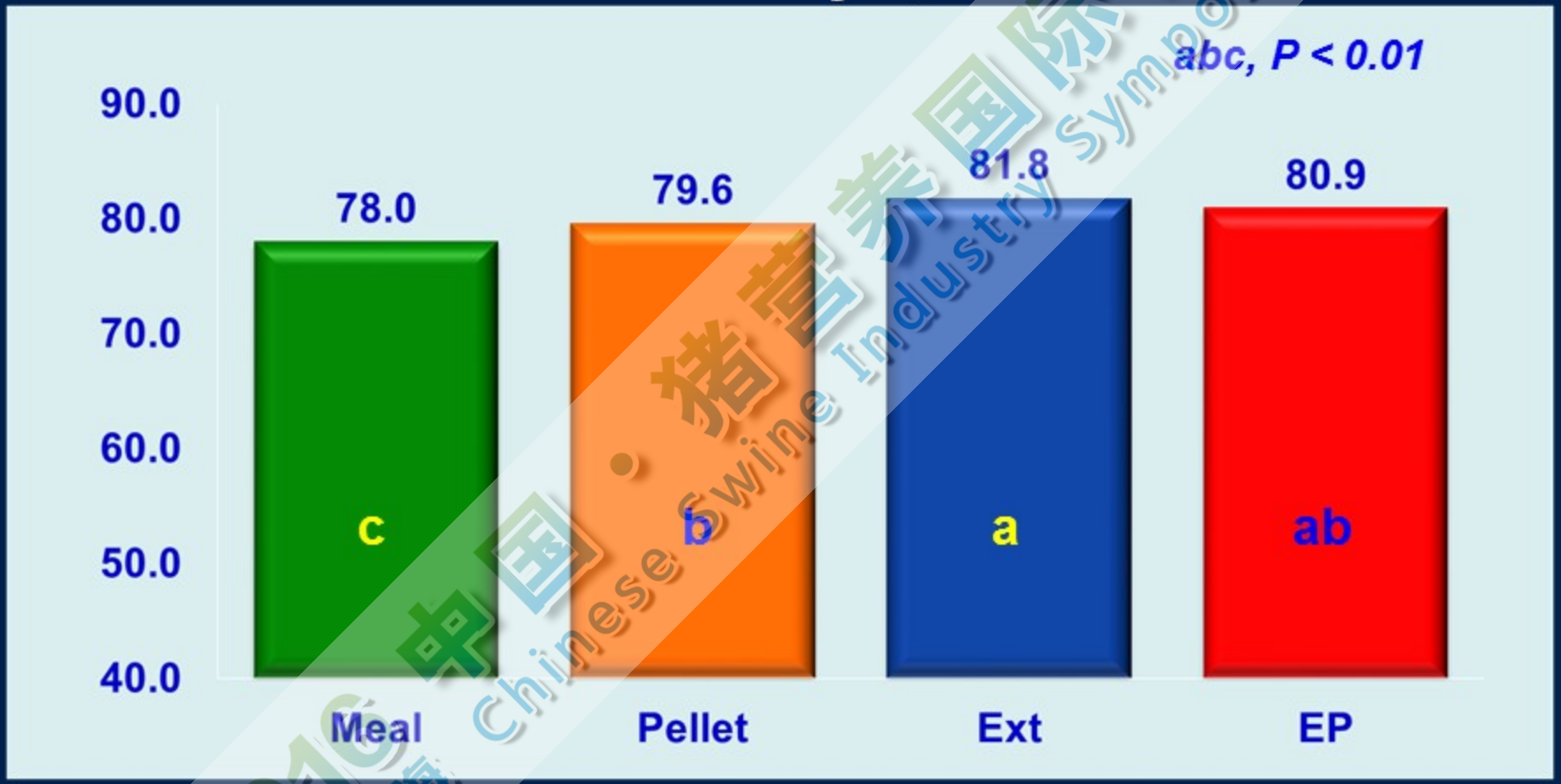
淀粉表观回肠末端消化率，%

AID of Starch, %



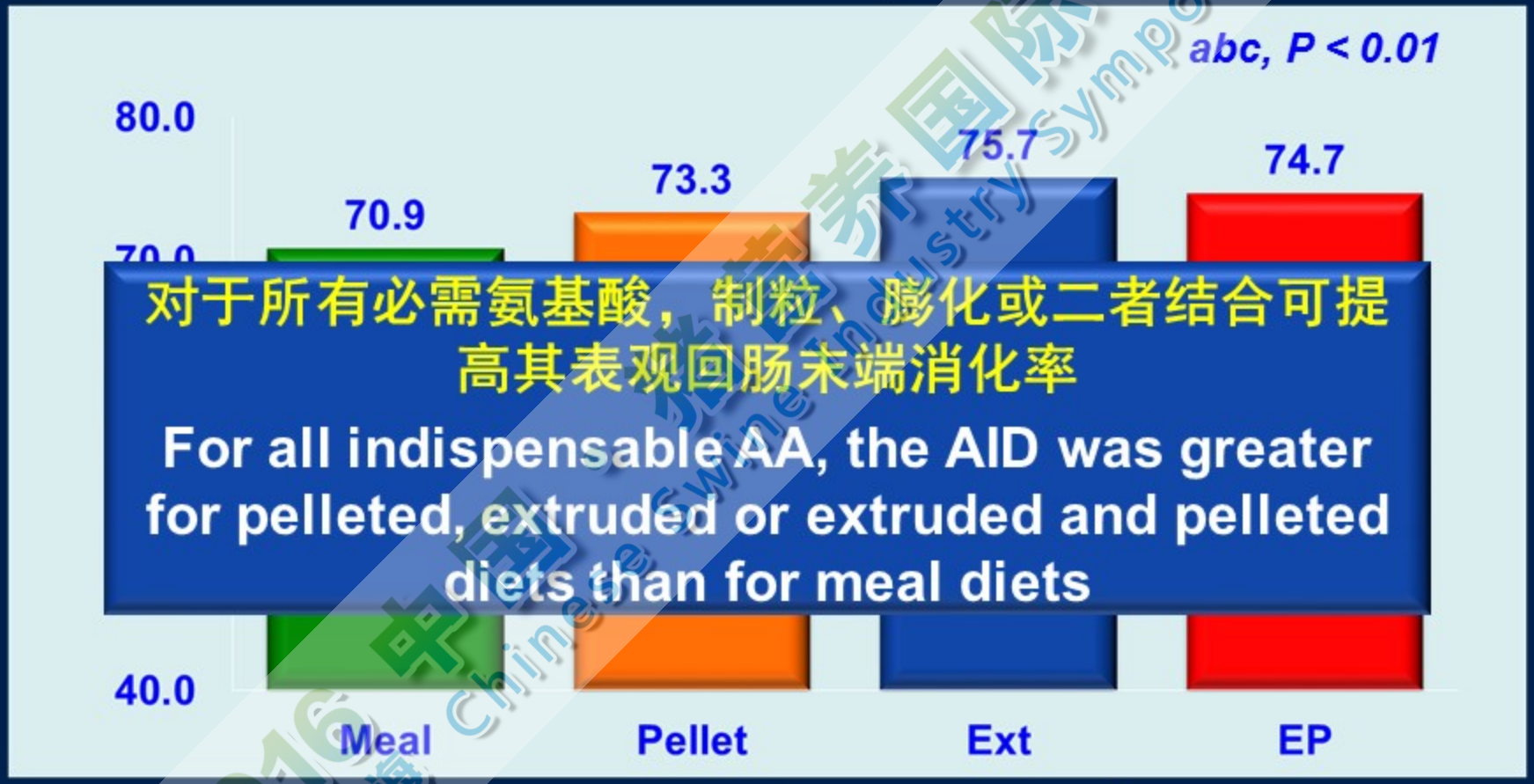
Rojas and Stein, 2016c

赖氨酸表观回肠末端消化率，%
AID of Lys, %



Rojas and Stein, 2016c

苏氨酸表观回肠末端消化率，%
AID of Thr, %

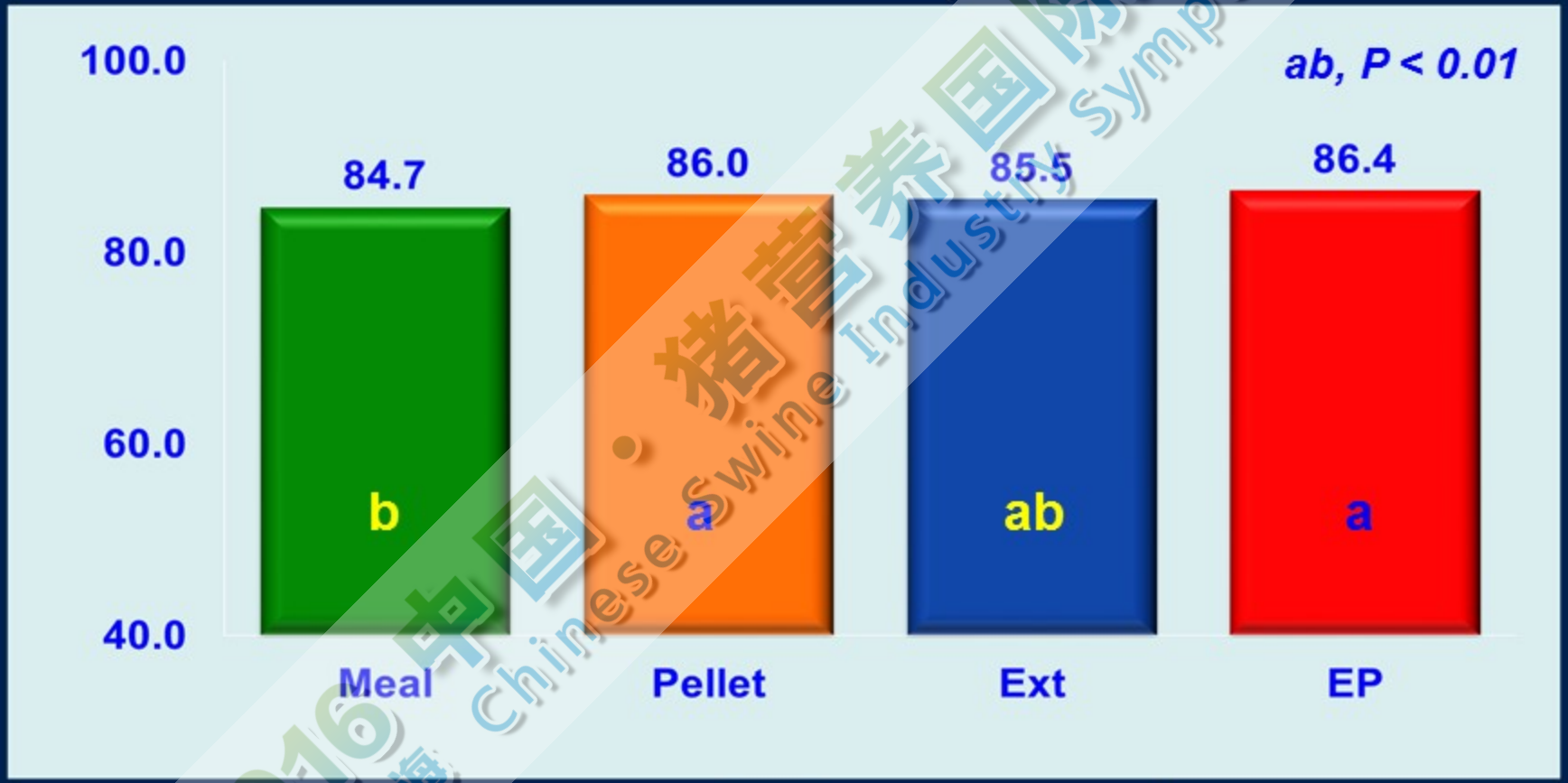


对于所有必需氨基酸，制粒、膨化或二者结合可提高其表观回肠末端消化率

For all indispensable AA, the AID was greater for pelleted, extruded or extruded and pelleted diets than for meal diets

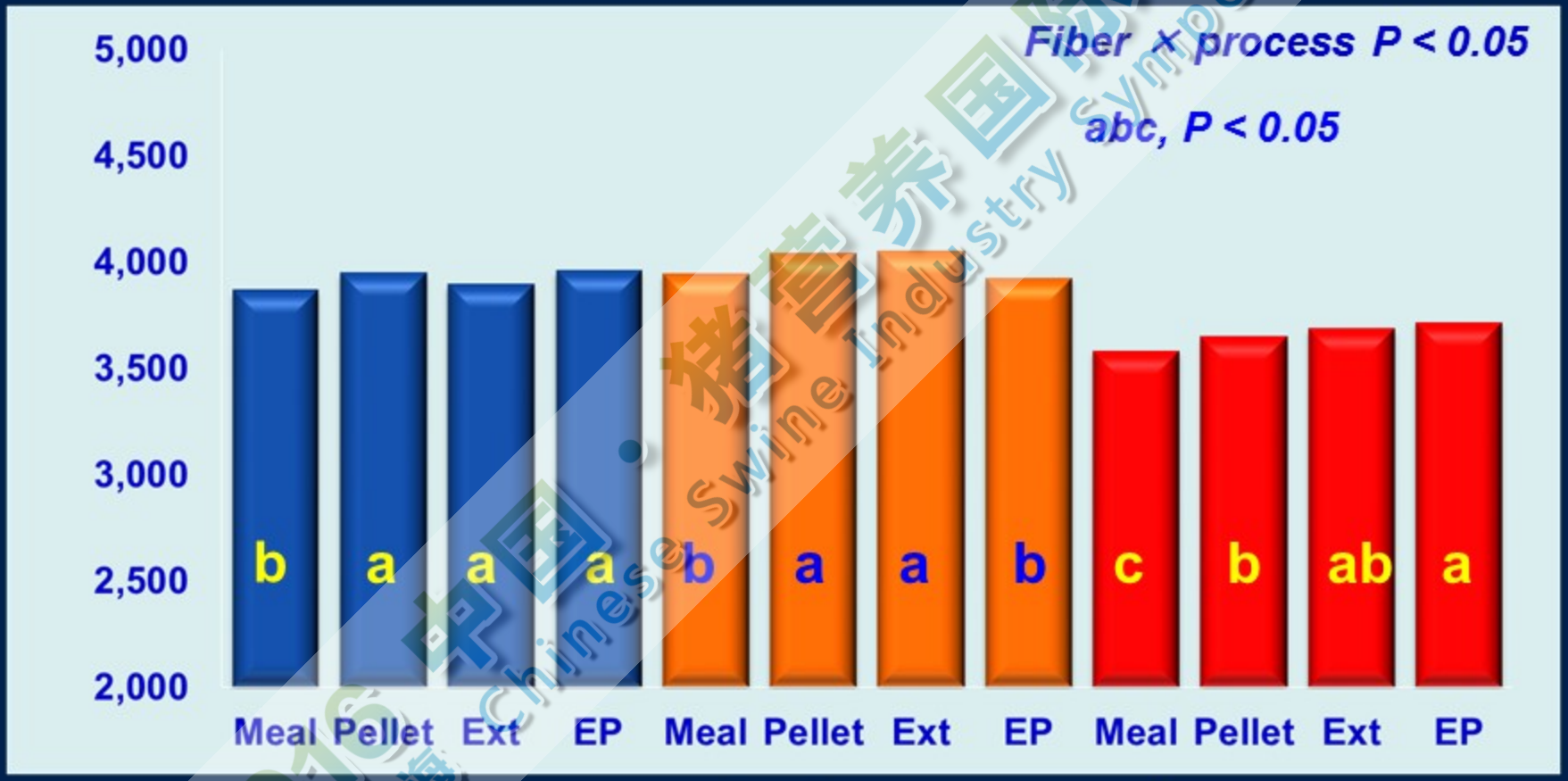
Rojas and Stein, 2016c

总能表观全肠道消化率，%
ATTD of GE, %



Rojas and Stein, 2016c

代谢能 ME, kcal/kg DM



Rojas and Stein, 2016c

推论 Implications

- 制粒、膨化或二者结合可以提高能量利用率
  Energy utilization may be improved by pelleting or extrusion or by the combination
- 无论日粮纤维水平高低，此优势均可获取
  The advantage is obtained regardless of fiber level in diets
  - 但在高纤维水平的日粮中能量利用率的提高更显著
    But may be greater in high fiber diets

Acknowledgement

致谢

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