



# 优化母猪繁殖力

朱稳森博士 E. Wayne Johnson DVM

2021.04.09

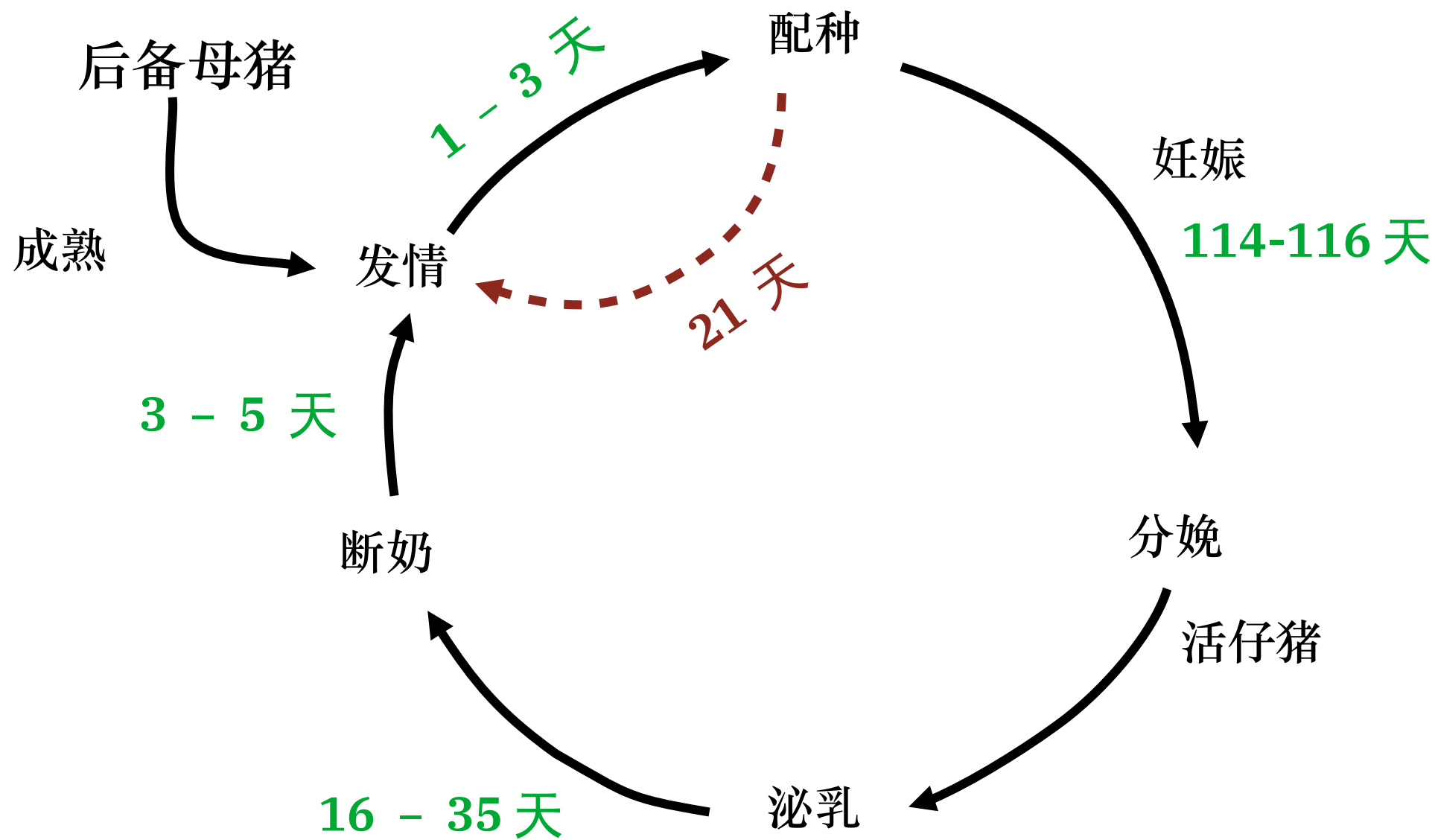
广州



恩睿康

Enable

# 母猪生殖周期



# Preparation of the Female

## 为雌猪做准备工作

---



- Gilts should be selected from productive females.  
后备母猪应从高产量的雌猪中选择。
- White breeds (Landrace, Large White, Chester White, Welsh)
- have higher productivity.
- Colored breeds may add durability and disease resistance.  
白品种（长白，大白，切斯特白，威尔士）有较高的产量。  
有色品种可增强耐力和抗病能力。
- Breeding program should be designed to maximize heterosis.  
育种计划应为最大化杂种优势而设计。

# Preparation of the Female

## 为雌猪做准备工作

---



Body weight at mating	Pigs born in parity 1	Total pigs parities
115 kg (255 lbs)	7.1	51.0
125 kg (275 lbs)	9.8	59.2
135 kg (300 lbs)	10.3	60.4
145 kg (320 lbs)	10.5	63.1
155 kg (340 lbs)	10.5	54.2

# Heterosis and Complementarity

---

Complementarity 补偿优势

Take advantage of differences between lines.

品系间的优势互补

Heterosis 杂种优势

Recovery from inbreeding depression

克服近交劣势

## Maternal Body Type 母本体型

---

Maternal lines should be rather “Square” in appearance, with a large hip area but not too much “round” muscle.

Bulging round muscle is a reflection of small internal bone dimension.

母本体型应该外观方正，后躯发达但没有圆形肌肉，大块圆形肌肉是内部骨架小的反映。

“Square” styled female lines tend to have more pigs at birth, larger pigs at weaning, and fewer difficulties in farrowing.

母本方正体型，产子数更多，断奶体重更大，分娩困难较少

In China there is a tendency to select for muscling not for soundness.

下面的图片中有一些近乎完美的个体，中国的选种倾向于选择肌肉量，而不是结实度

# 母本体型？

No ✘



利穆赞

OK ✔



荷斯坦



# Round Oak Rag Apple Elevation



*“His daughters  
had great legs  
and feet.”*

脚和腿



# Landrace



脚和腿

大白 x 长白



大长二元 母猪  
( F1 )

Duroc  
杜洛克

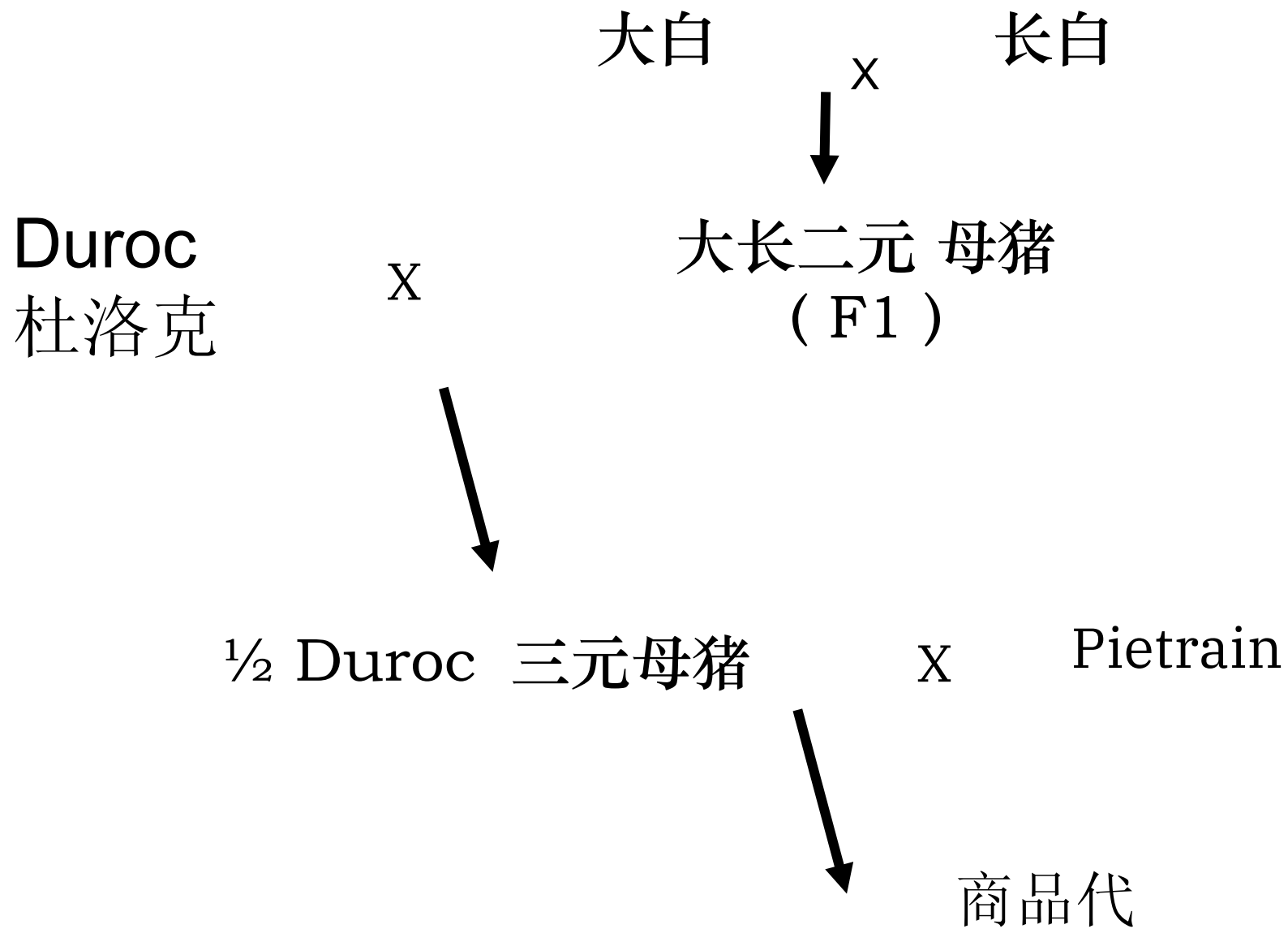
x



商品代

# Duroc







# Pietrain



“皮特兰”

欧洲花猪



“Pied”



大白 × 长白

Duroc  
杜洛克

X

大长二元 母猪  
( F1 )

$\frac{1}{2}$  Duroc 三元母猪 × 长白

$\frac{1}{4}$  Duroc 四元母猪 × 大白

**Rotational Cross Gilts**  
旋转的育种程序





OK ✓



No ✗



No ✗







Figure 5. A pig with a common defect—small inside toes.



Figure 7. Cracks and ulcers on the bearing surface of the foot.





**Even front toes with slight spread, good slope and cushion to the pastern allows the foot to set squarely on the floor surface.**



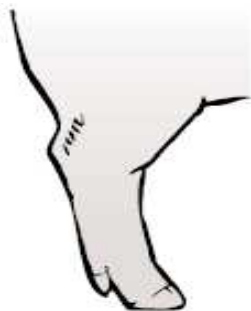
**Even rear toes with slight spread, good shape and cushion to the pastern allows the foot to set squarely on the floor surface.**

**OK ✓**



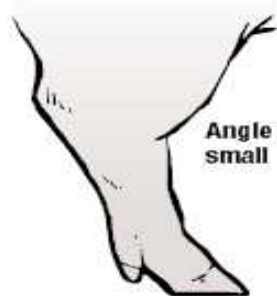


# Side view of rear leg



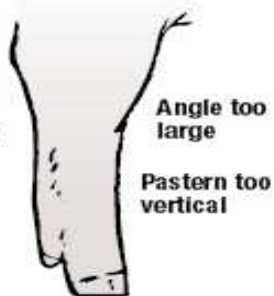
Normal

• ok



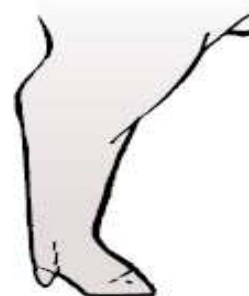
Sickle-hocked

• X



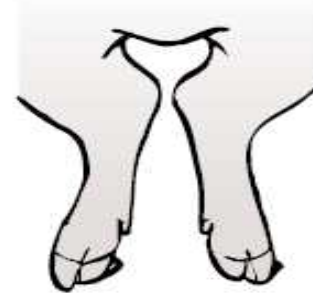
Post-legged

• X



Weak pastern

• ok



Cow-hocked

• X

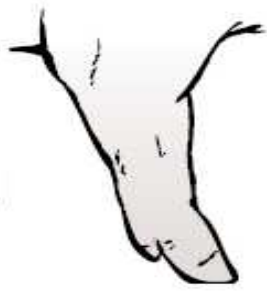


Weak rear pasterns are considered undesirable. In severe cases, damage to hocks and dew claws can result.



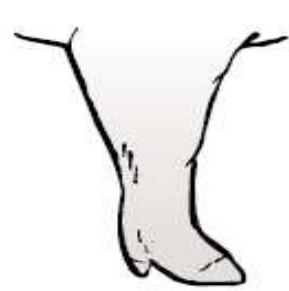
When the angle of the hip, stifle and hock is too large, the animal is described as "post-legged."

## Side view of front leg



Normal

• ok



Weak pastern

• ok



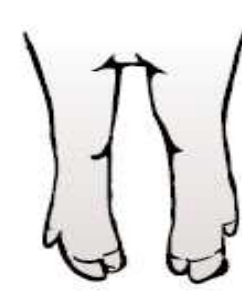
Buck-kneed

• X



Splay-footed  
(toes pointed out)

• X



Pigeon-toed  
(toes pointed in)

• X



This side view shows normal (good) front leg structure. Note how the front legs slope from the shoulder.



This is an example of soft (weak) front pasterns. Note the full dew claw touching the floor.



Straight front legs often cause knee joints to buckle, often called "buck-kneed."

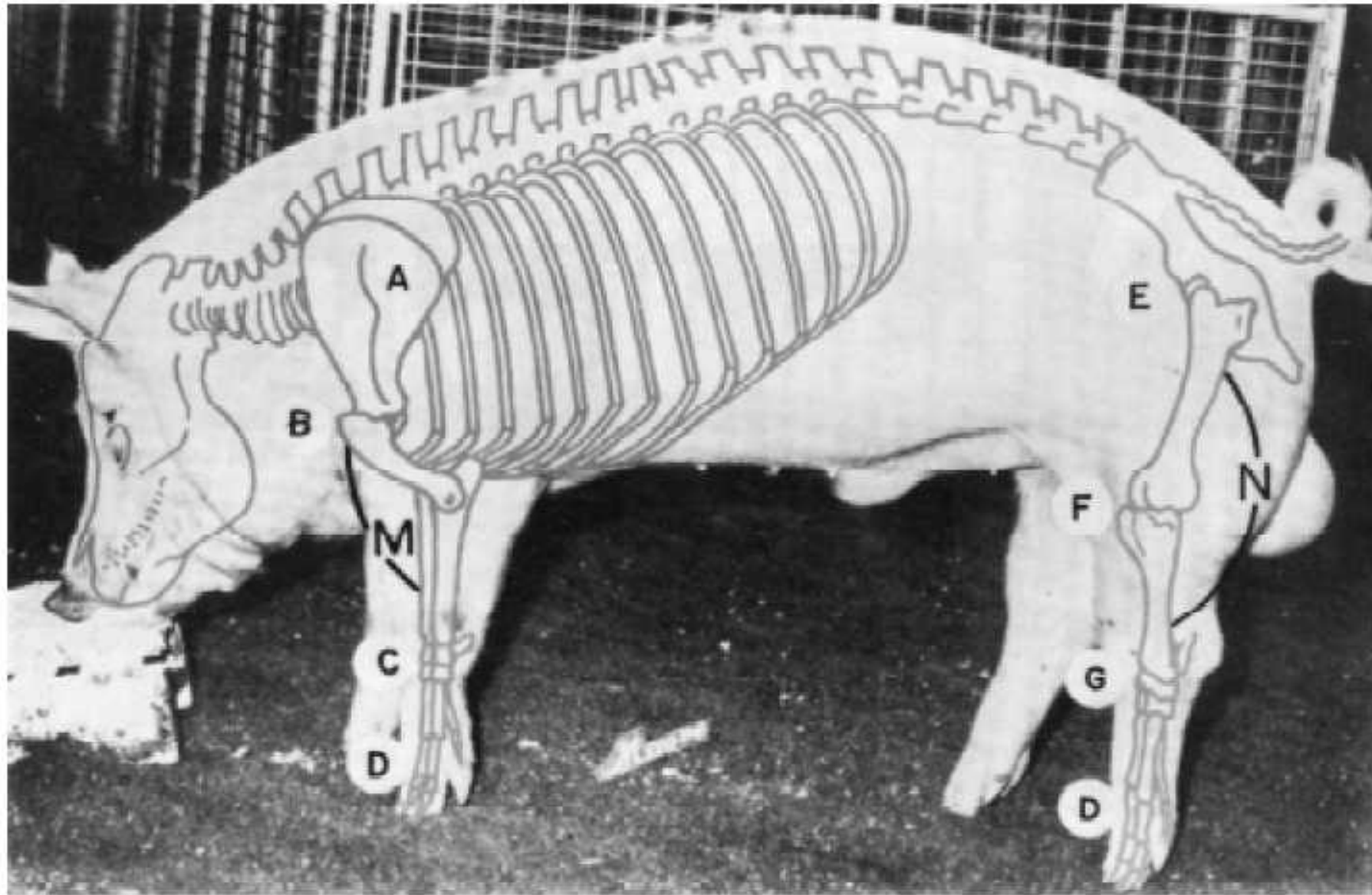


Figure 1. Undesirable front and rear leg structure.



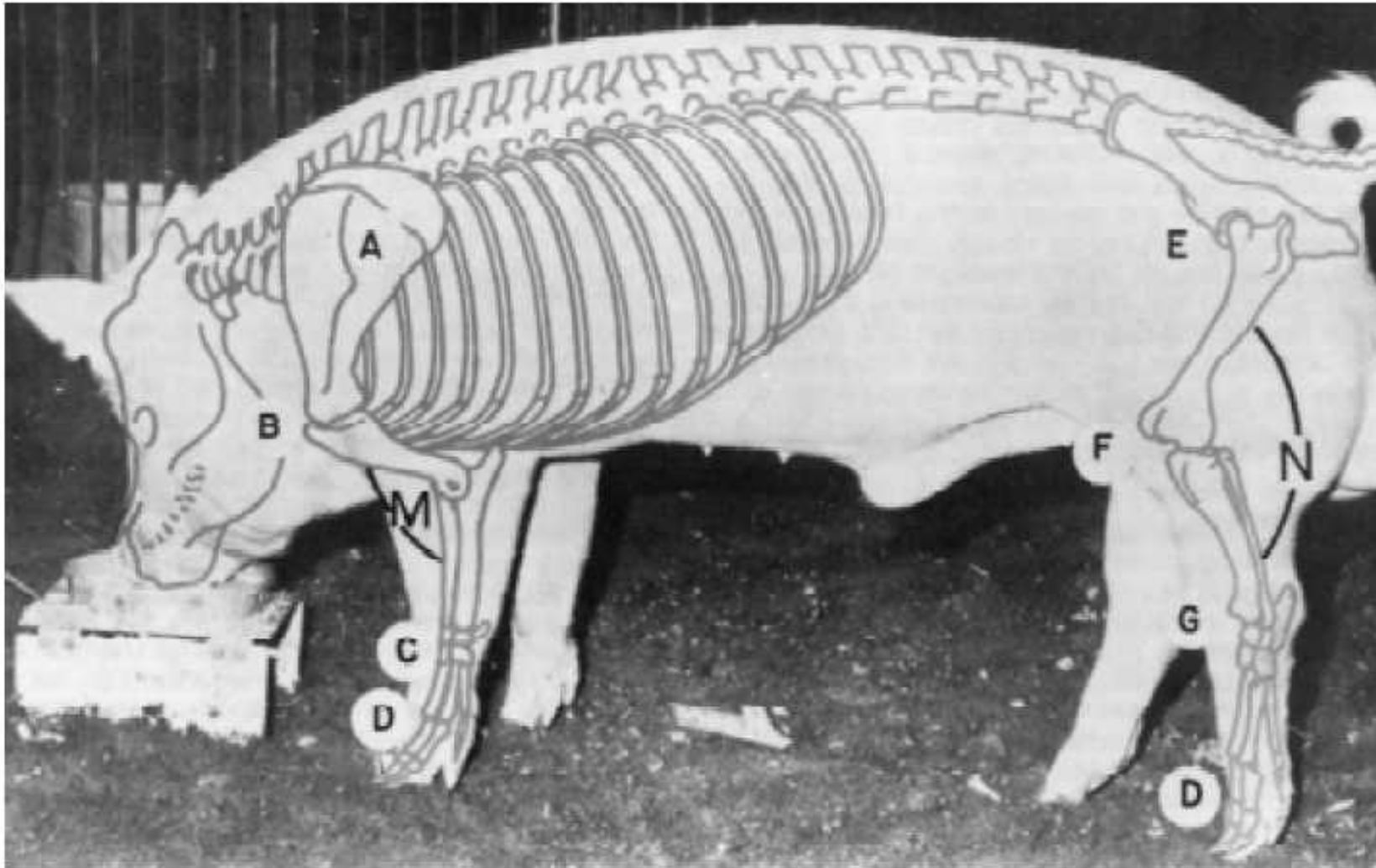


Figure 2. Desirable front and rear leg structure.



Structural defects are highly heritable and are transmitted to the offspring, resulting in sows with unsoundness.  
结构缺陷高度可遗传，可传给后代，而导致母猪结实度欠佳





- This spraddle-legged sow had a poor foot and leg conformation and is now a serious problem as she cannot get up on her own.
- 这头母猪趾蹄结构不良，出现八字腿，不能站立，成为严重问题







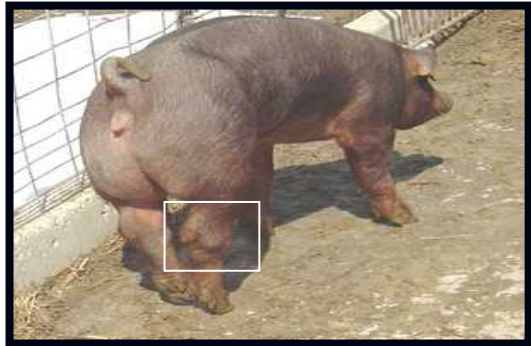
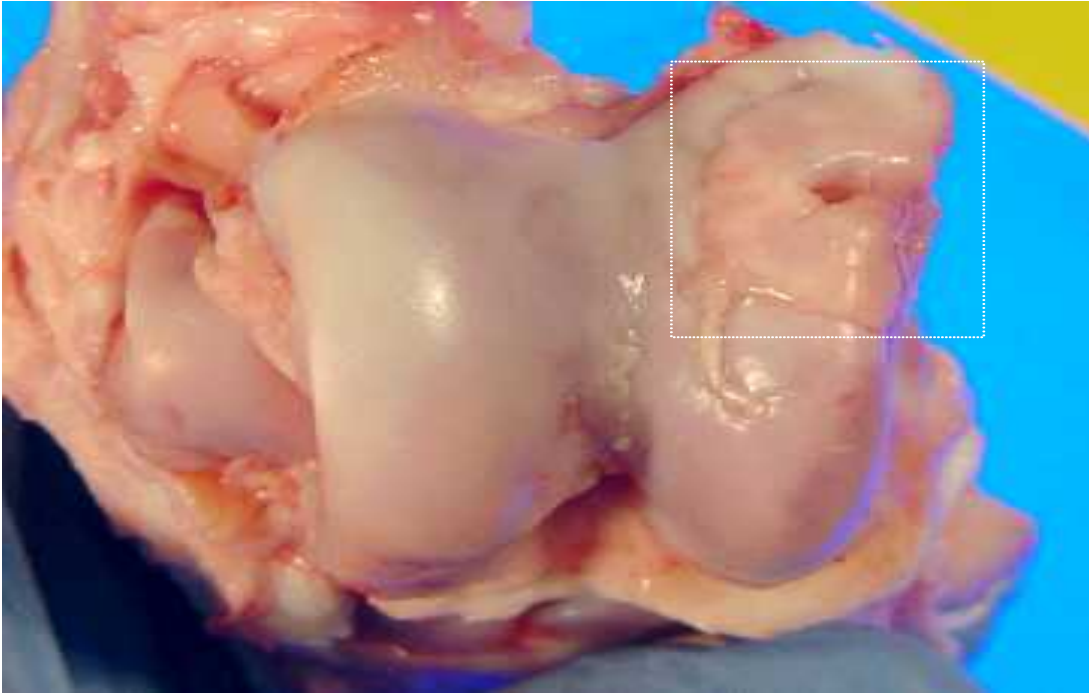
- Severe hock joint capsule swelling due to OCD.



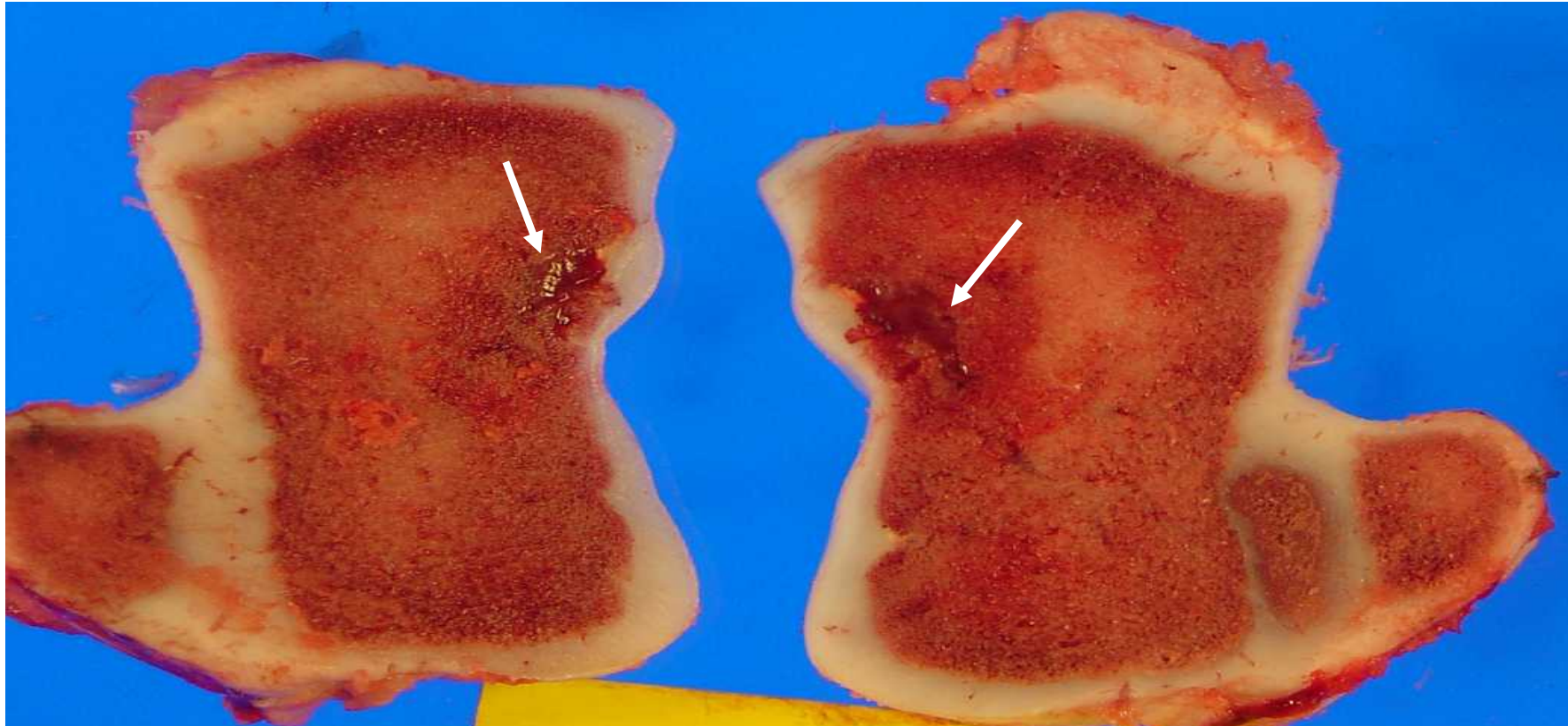


- Close-up view shows
- swelling of hock joint.



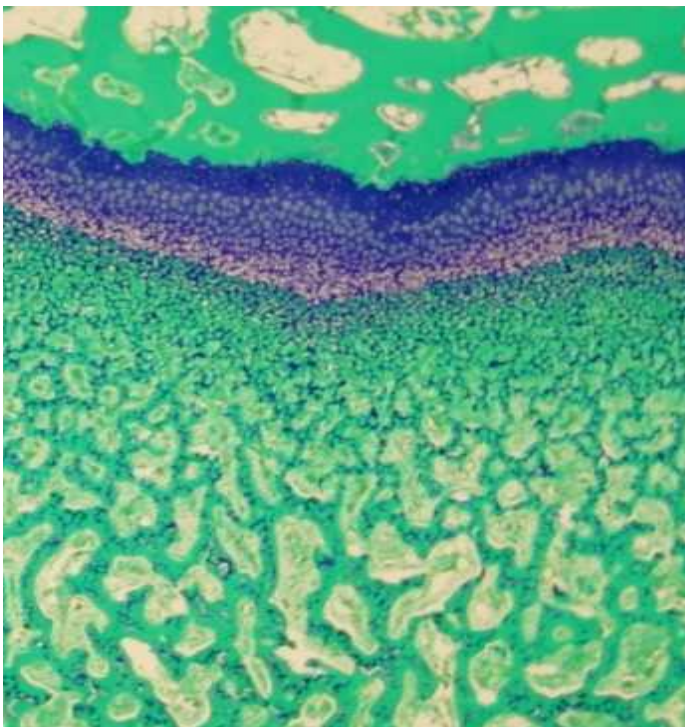


- Talar tarsal bone with Grade 5 OCD lesion
- from the pig seen in the previous slide.

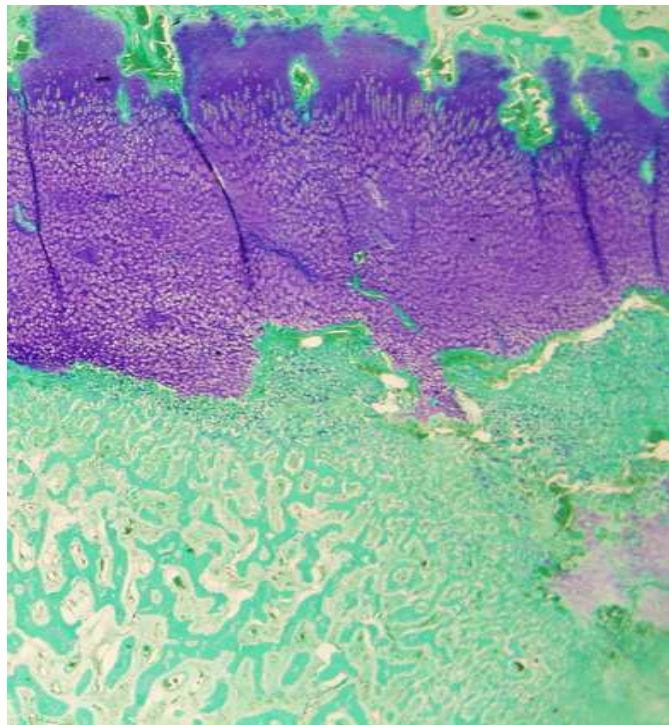


- Hemorrhage and Necrosis of Bone underlying failed cartilage.
- 骨软骨病，更色





**+B**



**- B**

骨软骨病 - 硼 (B) 缺乏病





生物素缺乏



Dry, flaky, “ichthyosis” (fish-scale) skin lesions.  
Severe biotin deficiency.

生物素缺乏





Beginning of recovery after 11 days supplementation with 500 ppb biotin in gestation diet.

Old dead ichthyotic skin peeling off revealing healthy pink skin beneath.

Yongning, Beijing municipality.



Complete recovery after 30 days supplementation with 500 ppb biotin in gestation diet. Some fly bites are visible on otherwise healthy skin. No visible ichthyosis.

Yongning, Beijing municipality.



# Gilts – No Estrus 母猪——不发情

---

Inadequate Stimulus  
Poor Heat Checking  
Severe Mange  
Too Low Nutrition Plane  
Seasonal Infertility  
Genetics  
Mycotoxins

刺激不够  
发情检测不过关  
严重疥螨病  
营养水平太低  
季节性不孕  
遗传基因  
霉菌毒素

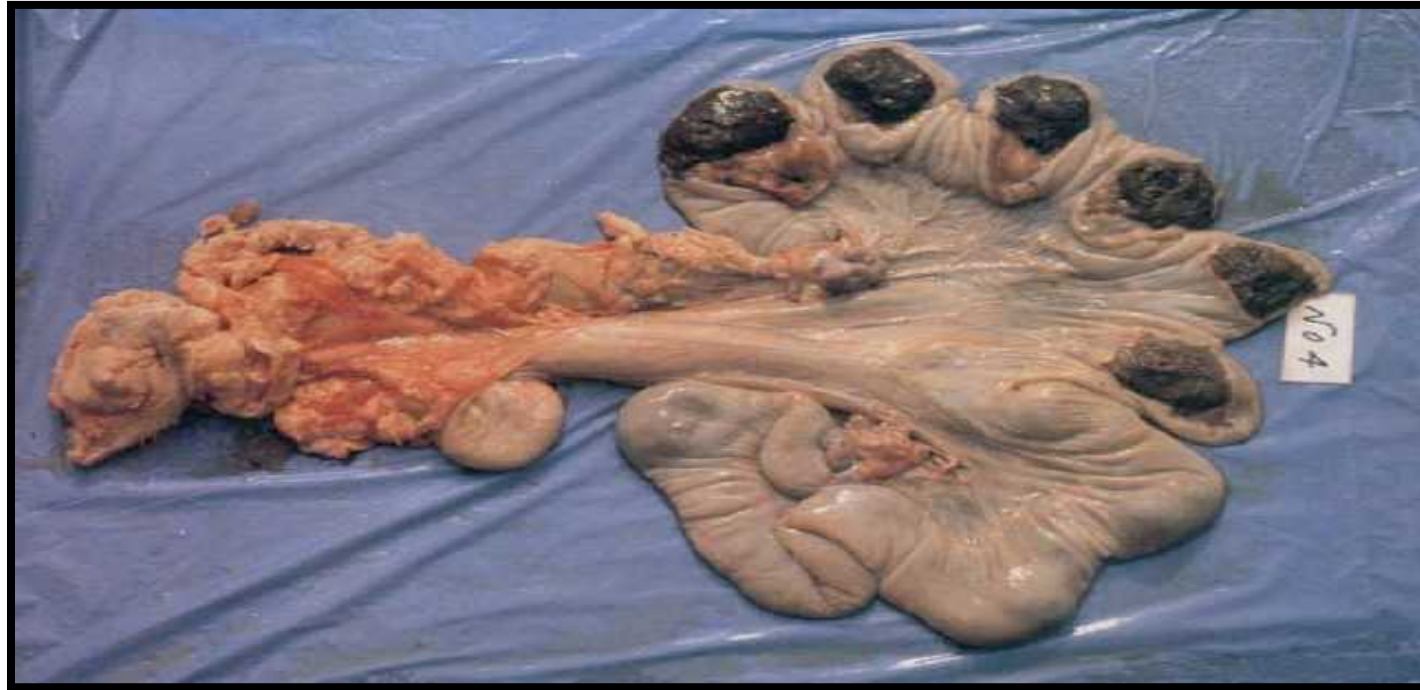


- Mummies can be caused by several different
- viral infections
- 几种不同病毒感染均可导致木乃伊



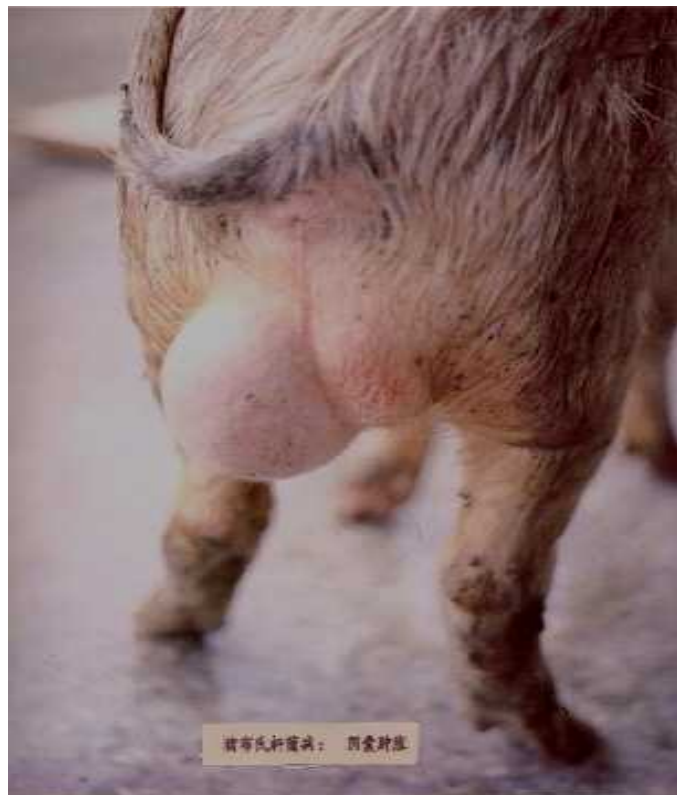
- Parvovirus, Enterovirus, CSF, JEV, Pseudorabies, PRRS
- Encephalomyocarditis virus, Influenza virus can cause
- mummies.
- 细小病毒，肠病毒，猪瘟病毒，日本乙脑病毒，伪狂犬病病毒，蓝耳病病毒，脑心肌炎病毒，流感病毒均可致木乃伊





Mummies. This sow could have false pregnancy, and fail to farrow.

木乃伊—该母猪可能显示假妊娠而不能分娩



Brucellosis  
布氏杆菌病



JEV  
日本脑炎





## Mummies, Weak, Dead Pigs at Birth

木乃伊、弱仔、死胎

Viral Infection

– 病毒感染

Sow too fat

– 母猪太肥

Nutritional Deficiencies

– 营养不良

Leptospirosis, other Bacteria

– 钩端螺旋体病，其他细菌

Mycotoxins

– 真菌毒素

Infectious Anaemia

– 传染性贫血

# Sow Not in Pig 母猪未妊娠



Viral infection

病毒感染

Seasonal Infertility

季节性不孕

Stress 应激 -

Heat , Cold , Mixing , Crowding

热、冷、混群、拥挤

Nutrition

营养

Bacterial Infection

细菌感染

## Temperature Control

### 温度控制

Sunshades

遮阴

Ridge Ventilation

屋脊通风

Fans

风扇

Drip or Spray Cooling

滴水或喷雾降温

Evaporative cooling

蒸发致冷

Industrial Air Conditioning

大型空调



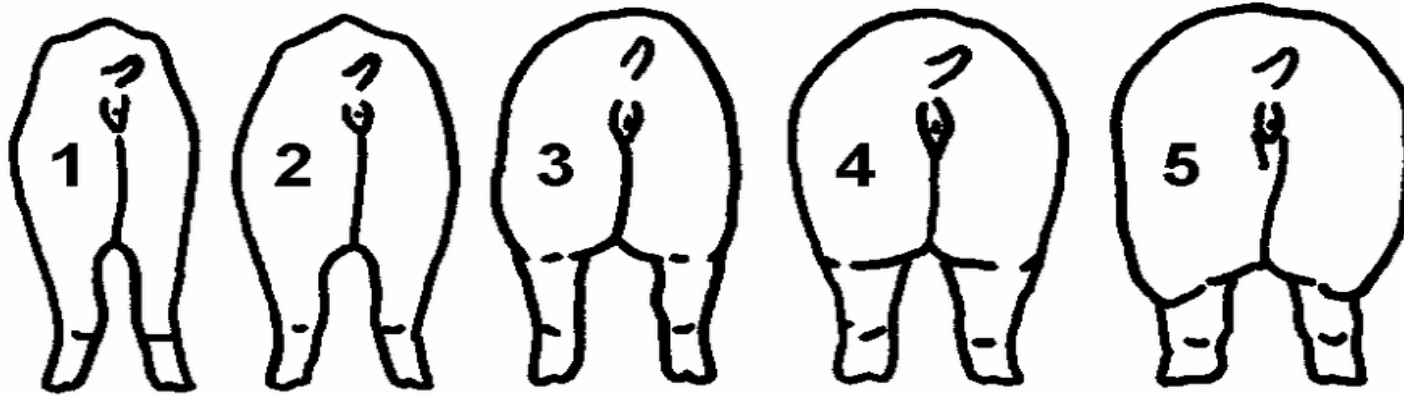


出血性胃溃疡。  
这些溃疡与饲料粉碎太  
细有关。  
饲料粒度直径应为  
600 至 800 微米才会  
有最佳饲料效率并可以  
避免溃疡发生。

**Bleeding gastric ulcer in pars esophageal.  
These ulcers are associated with feeds too finely ground.  
Feed should be ground at 600 to 800 microns  
for best efficiency and avoidance of ulcers.**

# • Body Condition Scores

- < 15 mm
- 15-18 mm
- 18-20 mm
- 20-23 mm
- > 23 mm
- (< 0.6 in)
- (0.6-0.7 in)
- (0.7-0.8 in)
- (0.8-0.9 in)
- (> 0.9 in)

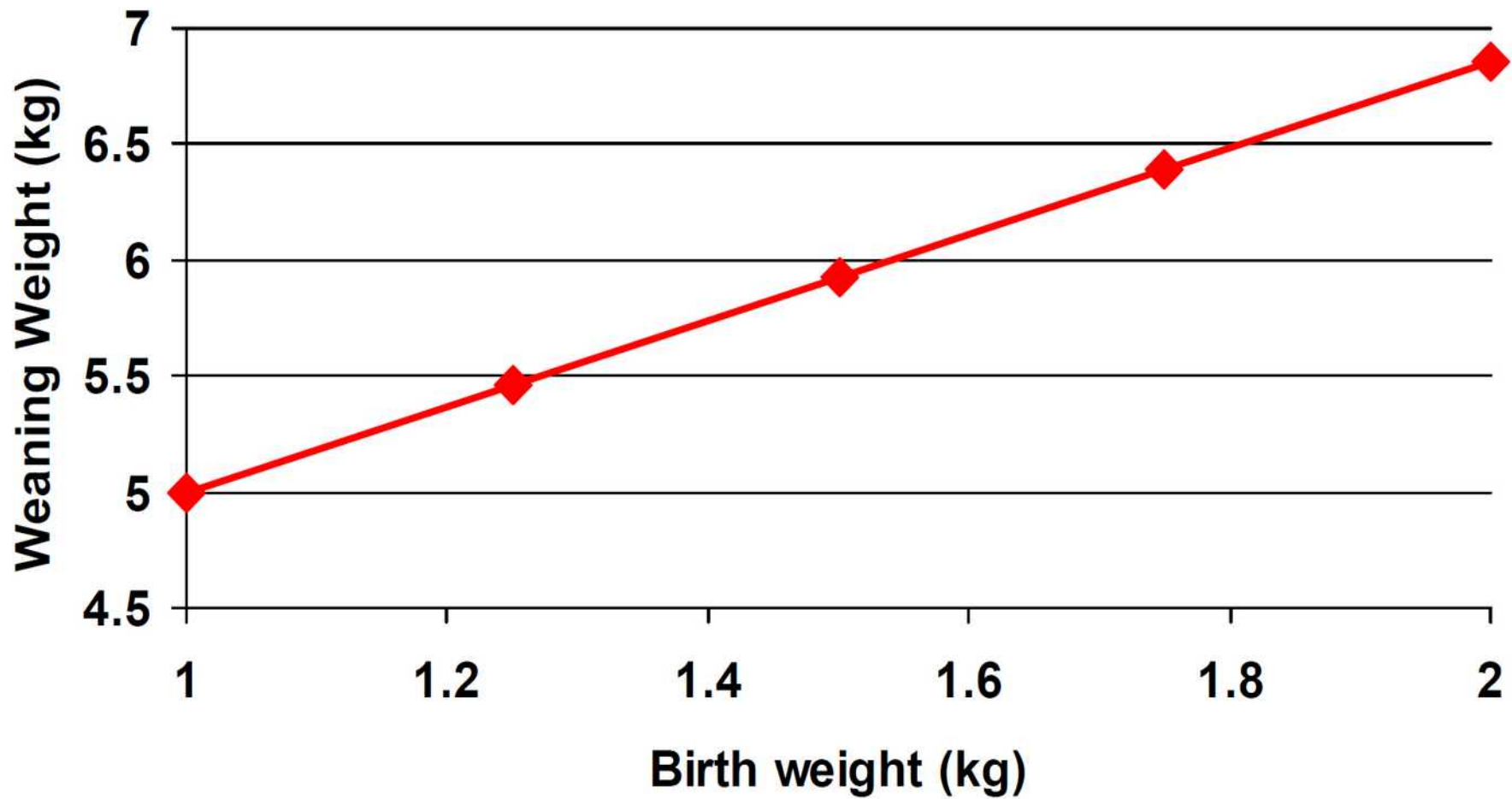


Score	Condition	Detection of ribs, back bone, "H" bones, and "pin" bones
1	Emaciated	Obvious
2	Thin	Easily detected with pressure
3	Ideal	Barely felt with firm pressure
4	Fat	None
5	Overly fat	None

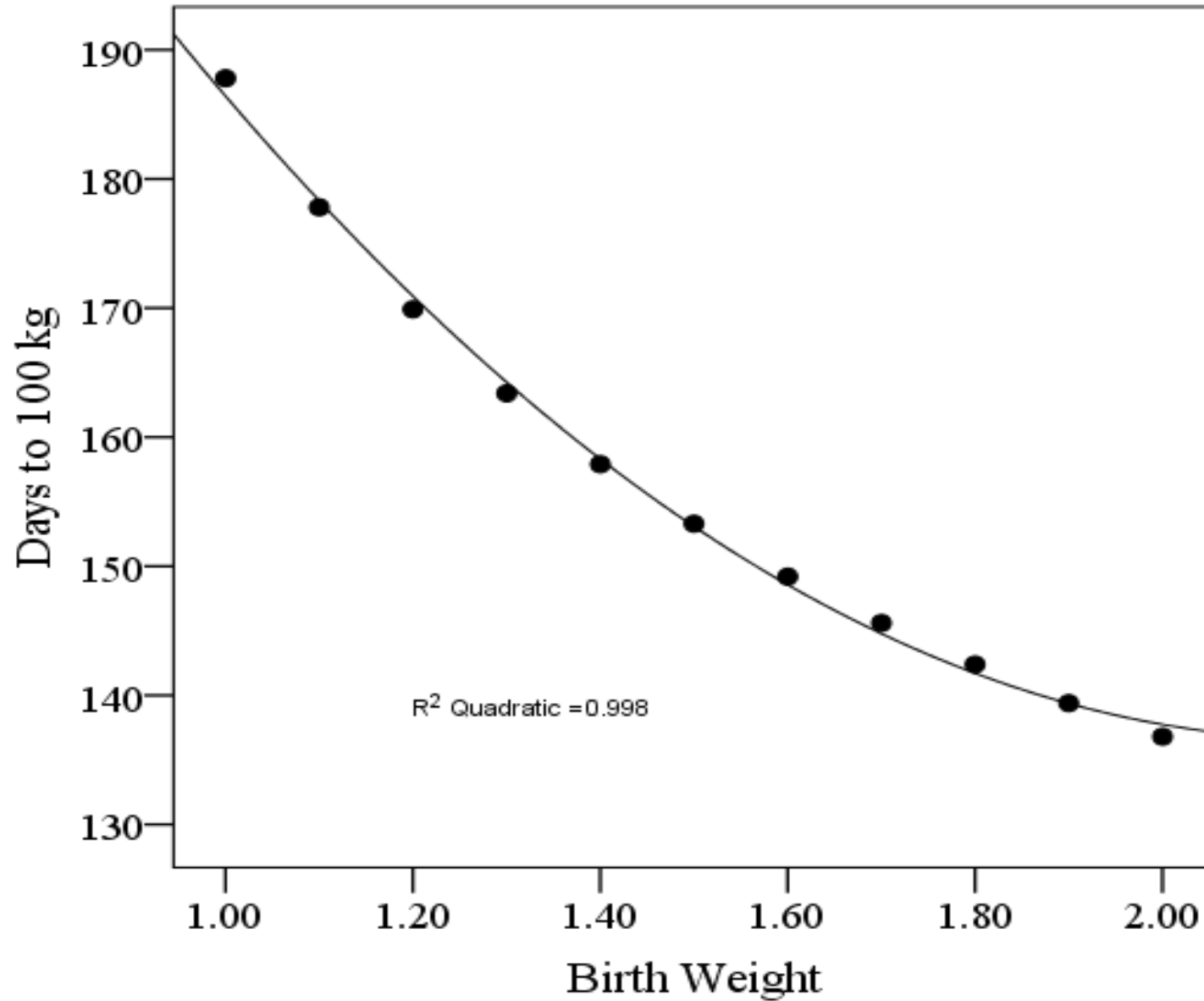








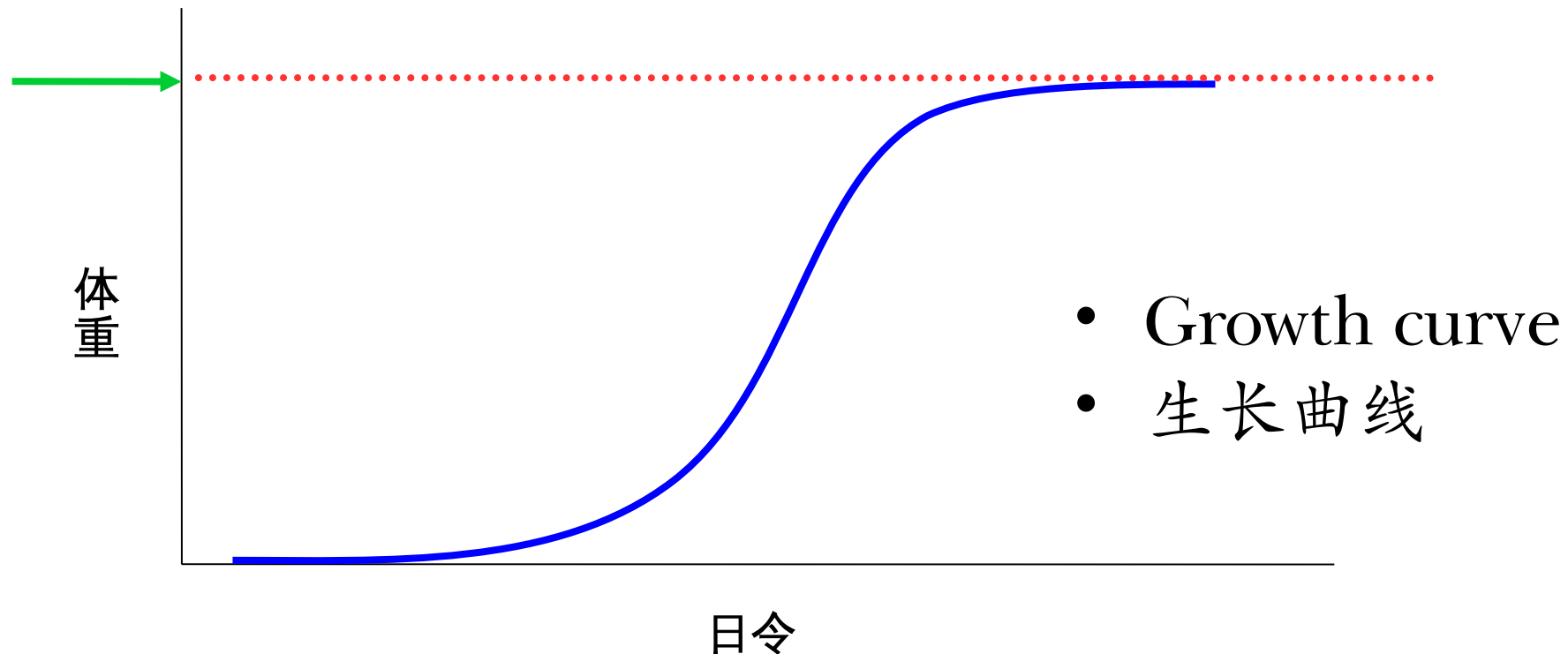
# Effect of birth weight on days to 100 kg



Nielsen, B. et al 2002

# Mature Body Size 成熟体格

The weight and height and length of the animal when it reaches final maturity.

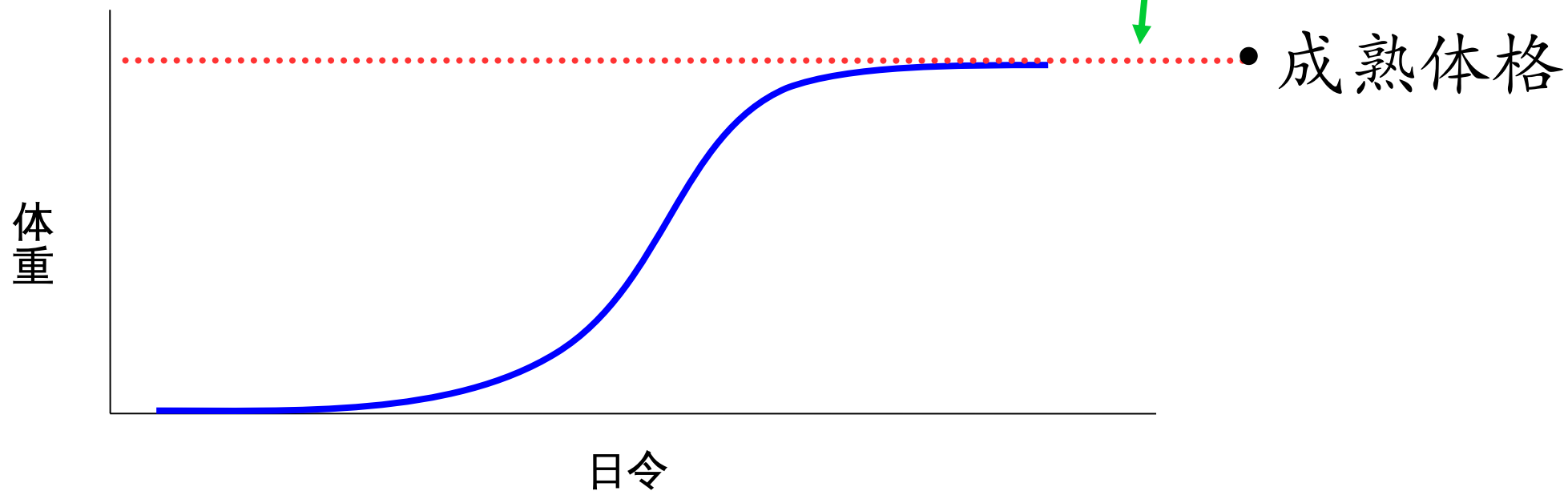


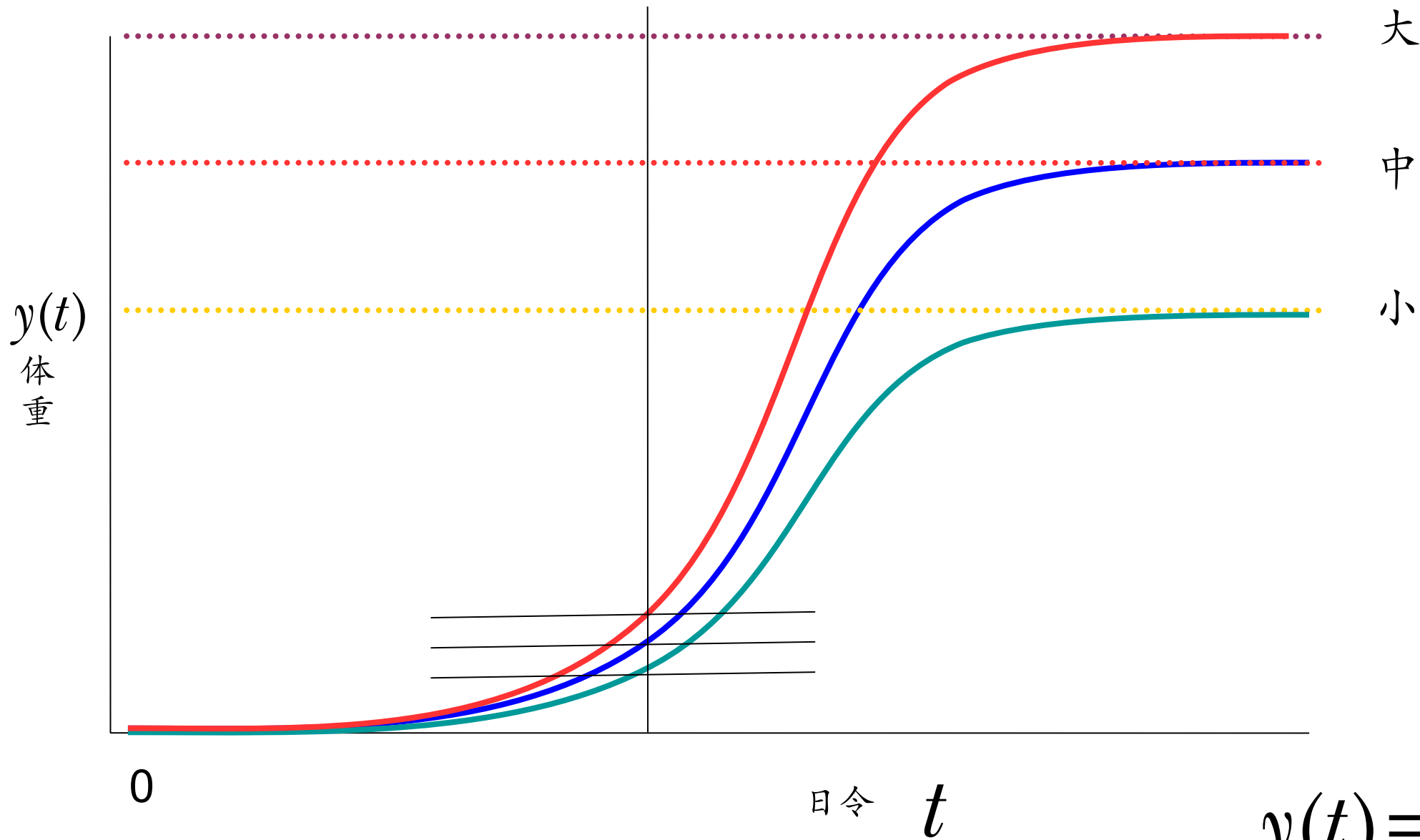


$$y(t) = A e^{-c t}$$

---

Body weight and growth are a function of Mature Body Size





$$y(t) = A e^{-c t}$$

# Birth Weight is *Genetically Controlled*

TABLE 3. HERITABILITY ESTIMATES AND APPROXIMATE STANDARD ERRORS

Trait	Heritability	Approximate standard error
Number born	.26	.12
Number born alive	.20	.11
Litter birth weight	.54	.13
Average pig birth weight	.65	.13
Number at first creep	.28	.12
Litter weight at first creep	.17	.11
Average pig weight at first creep	.22	.12
Number at weaning	.30	.12
Litter weaning weight	.15	.11
Average pig weaning weight	-.02	.10
Litter weaning weight adjusted for age and number	-.01	.10



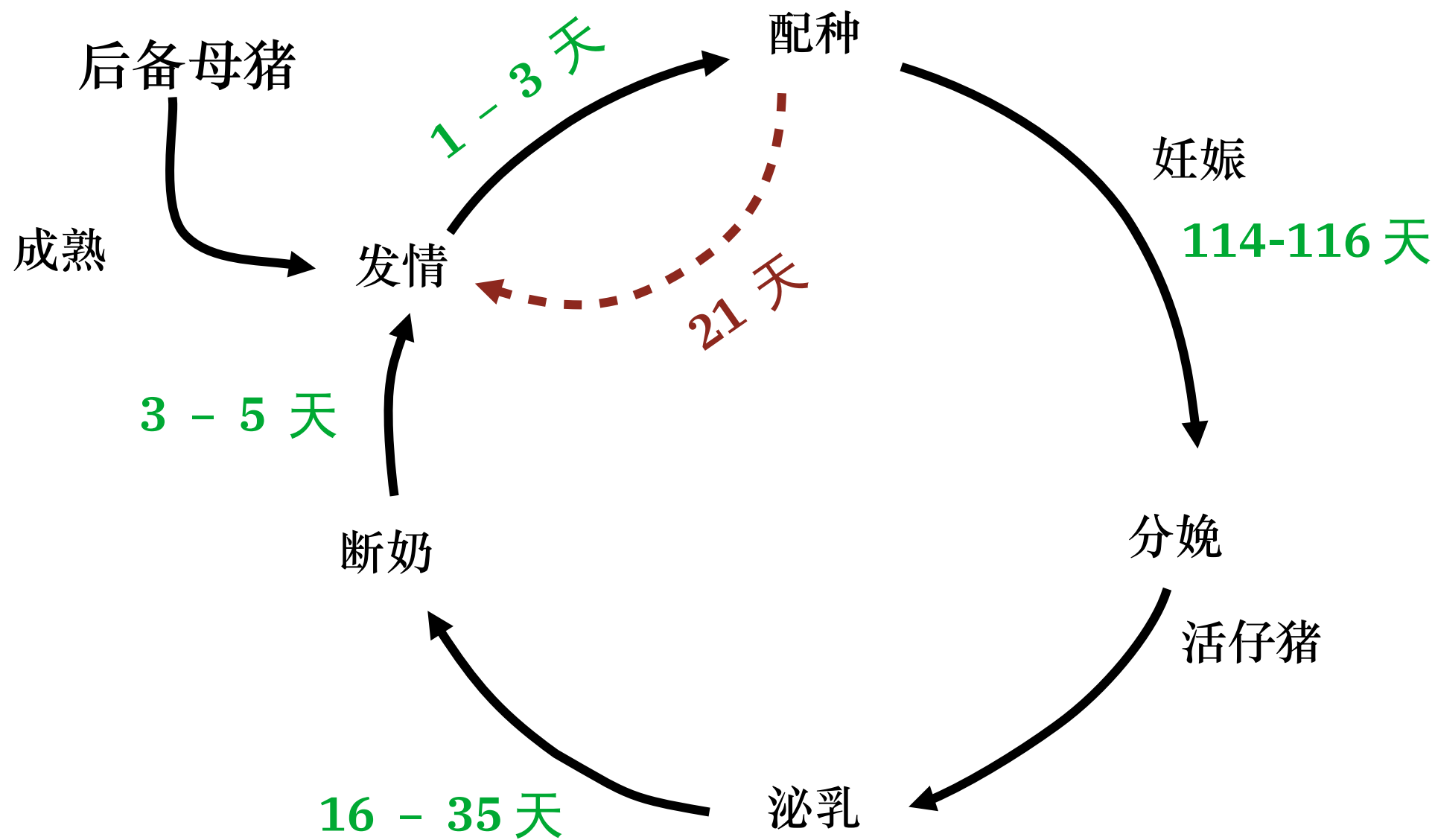
母猪和公猪— 750 to 1000 ml / 分钟

怀孕母猪： 8 至 12 升每天

哺乳母猪： 8 至 25 升多每天



# 母猪生殖周期



# Goal of Biosecurity

## 生物安全的意义

Protect the boars from production problems.  
预防公猪生产问题

Protect the sow herds served by the boar stud.  
保护接受公猪群配种的母猪群体

# Separation of Farm from the Outside World.

## 猪场与外部隔离

Clean Area  
洁净区

The world  
(Dirty 脏)



平遥



The World (dirty)

外界 (脏)

*Local control (dirty)* 局部控制 (脏)

*Farm courtyard* 猪场院子

*Animal area*  
生产区域

- Six Compartment Exchange System
- 六段分隔系统

**IF?...WHY?**  
如果? ...为什么?

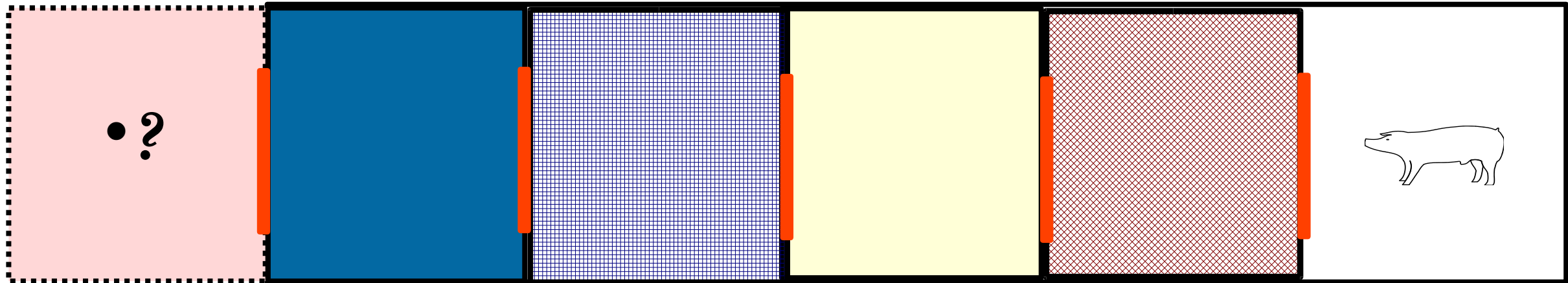
Dirty  
脏

Shower  
洗澡

• Courtyard  
• 场内院子

• Shower  
• 洗澡

• Clean  
• 干净



- **Farm Entry**
- 进入猪场

# 猪场[厂]的非洲猪瘟输入项

猪肉

Feedstuffs  
饲料相关物品

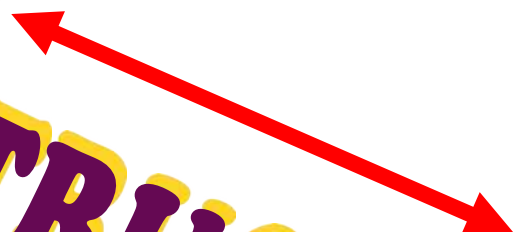
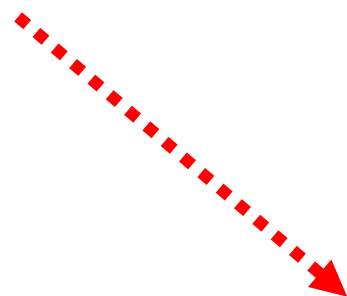


**TRUCKS**

**TRUCKS**

**TRUCKS**

**TRUCKS**



## Cleaning 清洁

NaOH, TSP, and similar alkaline agents are useful in cleaning but are corrosive to aluminum.

氢氧化钠，磷酸三钠，和类似的碱性物质对清洗很有帮助，但对铝有腐蚀性。

Hot water improves speed and effectiveness of cleaning.

热水可以提高清洗的速度和效率

Wood is very difficult to clean and its use should be avoided.

木头很难清洗干净，应该避免使用木头。



# Approvable Disinfectants for ASF

## 可核准的 ASF 消毒剂

Peroxymonosulfate Potassium salt  $\text{KHSO}_5$  (MPS, PMPS)

过一硫酸氢钾盐  $\text{KHSO}_5$  (MPS, PMPS)

Caro's acid  $\text{H}_2\text{SO}_5$  is neutralized with potassium carbonate to produce a safe product. 卡罗酸  $\text{H}_2\text{SO}_5$  和碳酸钾中和生产的安全产品

Is a powerful oxidizer. 一种强氧化剂

Effective at 0.5% actual MPS. 实际 MPS 含量 0.5% 就有效

Commercial products are combination of MPS and a surfactant such as dodecyl benzene sulfonate, a detergent.

商业产品会在过一硫酸氢钾中添加表面活性剂，比如十二烷基苯磺酸钠，一种去污剂

Inactivates ASF in 10 minutes. 10 分钟灭活 ASF

# Major Health Problems Commonly Transmitted by Semen or Contamination of Semen

## 经常通过精液或者精液的污染而传播的主要健康问题

PRRS 蓝耳病

Pseudorabies 伪狂犬病

Porcine Epidemic Diarrhea 流行性腹泻病

PED/TGE-like related coronaviruses 类 PED/TGE 的相关冠状病毒病

Classical Swine Fever 猪瘟

Swine Dysentery?? (perhaps not... but...?)

猪痢疾?? (也许不是....., 但是.....?)

Brucella suis and Leptospirosis (Historically)

(历史来看, 猪布鲁氏菌病和钩端螺旋体病)

