

# BABY PIGS (BIRTH TO WEANING)

## INTRODUCTION

### 1. Goals for Nursing Piglets

Item	Poor	Average	Goal
Survival rate, %	< 80	80 to 90	> 90
Weaning wt., lb			
3 weeks	< 9	9 to 12	> 12
4 weeks	< 11	11 to 16	> 16
5 weeks	< 14	14 to 20	> 20
6 weeks	< 20	20 to 25	> 25

### 2. Genetic Abnormalities

- Anatomical defects, which can be due to genetics or environmental factors, occur in at least 1% of newborn pigs!
- A. Skeletal: 1) *Hydrocephalus* - A accumulation of fluid in the brain & an enlarged brain cavity, 2) *Kinky tail*- A flexed, crooked or screw tail caused by fusion of vertebrae, 3) *Various leg defects* - Spraddle legs, no legs, bent legs, polydactyly (extra toes), syndactyly, etc.
- B. Urogenital: 1) *Scrotal hernia* - Intestines drop into the scrotum, 2) *Umbilical hernia (or rupture)* - Intestines protruding through the belly wall, 3) *Cryptorchidism* - One or both testicles retained in the body cavity, 4) *Hermaphrodite* - Females possess a portion of male sex organs, etc.
- C. Others: 1) *Atresia ani* - No rectal opening (males die within a few days without surgery, but females can defecate through an opening from the rectum into the vagina), 2) *Inverted or blind nipples* - Unfunctional nipples, 3) *Myoclonia congenita or tremors* - A rhythmic twitching of the neck and legs, etc.

### 3. General Information on Nursing

- A. Nursing: 1) Lasts only an avg. of 24 seconds at a time, and 2) An average “nursing interval” is  $\approx$  52 minutes (. . . but varies somewhat!).
- B. Anterior and posterior teats:

#### 1) Position of teats & weight of piglets (kg): (Unknown)

Item	1st	2nd	3rd	4th	5th	6th	Rear
At birth	1.41	1.29	1.31	1.32	1.34	1.31	1.25
At 6th wk	10.7	9.7	9.2	8.7	8.8	8.2	8.5

- 2) Anterior teats have four advantages: 1) Larger milk supply, 2) Lower incidence of mastitis, 3) Greater release of oxytocin (?), and 4) Lower incidence of being kicked.

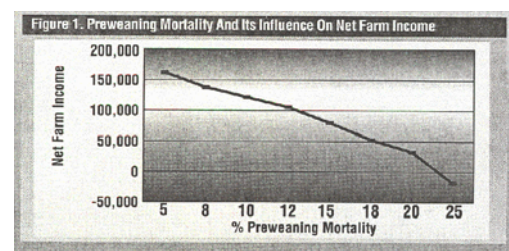
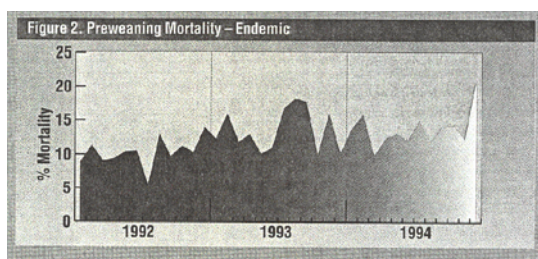


#### 4. Changes in Milk Composition After Parturition

Hour:	0	12	15-24	27-48	72-120
Solid, %	30.2	20.8	19.6	21.2	21.8
Protein, %	18.9	10.2	7.2	6.9	6.8
Fat, %	7.2	7.2	7.7	9.5	10.4
Lactose, %	2.5	3.4	3.7	4.0	4.6
Ca, %	.05	.06	.07	.11	.16
P, %	.11	.11	.12	.30	.14

### LOSS OF BABY PIGS

#### 1. Prewaning Mortality & its Effect on Net Farm Income [NHF 41(3):7]



- “**Opportunity costs**” of neonatal mortality in the U.S. has been estimated to be \$193,748,000 in 1990 [Muirhead, 1992. Feedstuffs 64(37):10]!

#### 2. Causes of Baby Pig Losses

##### 1) NAHMS data [Muirhead, 1992. Feedstuffs 64(7):12]

Days:	1-3	4-7	8-14	15-21	22-28	29+	% Total
Scour	5.1	18.0	16.4	10.4	12.2	10.5	10.8
Nervous system	0.3	0.3	0.5	0.3	1.5	0.7	0.3
Deformities	1.4	0.5	0.3	0.2	0.5	0.2	0.9
Lame/joint	0.8	1.3	1.6	5.6	4.2	5.3	1.5
Respiratory	0.2	0.5	0.7	1.6	1.8	3.7	0.5
Laid on	57.5	32.1	28.8	27.1	24.1	19.3	43.2
Starvation	14.7	27.9	23.6	18.8	17.7	16.0	19.9
Others	12.3	5.5	8.1	10.3	13.5	11.9	9.8
Unknown	7.7	13.9	20.0	25.7	24.5	32.4	13.1

- 2) “Crushing/starvation” account for > 60% of losses in pigs born alive, thus possible to wean 2 or more pigs/sow/year (a commonly quoted No.) by good management practices!

#### 3. Birth Weight & Age of Pigs

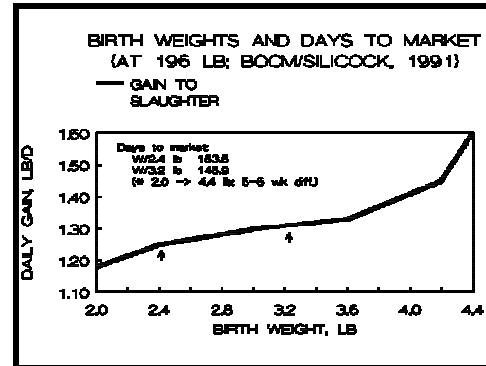
##### 1) Birth weight & survival rate: (Reese, 1986. HFM/Nov. pp 30-33)

- a) Pigs weighing 3 to 3½ lb or more at birth have a better chance of survival!
- b) Smaller pigs have a higher “surface area” relative to body weight (∴ lose heat rapidly), and do not compete well for milk.

Pig wt, lb	% Survival
1.0	16
1.5	39
2.0	59
2.5	74
3.0	86
3.5	95



- 2) Birth weights and pig performance - See a figure [Gadd, 1992. NHF 37(4):64]
- 3) To enhance survival rate & pig performance, should make attempts to ↑ birth weight of pigs by (e.g.):
  - a) Maintain a proper condition of sows during gestation (not too thin, but not too fat) . . . birth weights are partly dependent on feed intake of sows during gestation.
  - b) May want to provide an extra feed during late gestation, especially during winter or when an average birth weight is less than 3 lb.



- 4) Age and death loss - ≈ 65% of post-farrowing deaths occurs between 0-4 d (greatest in the 1st day), thus extra time & management during this period can ↑ survival rate greatly!

## PROCESSING BABY PIGS

### 1. Reasons for Processing

- 1) Birth weight - A reflection of type of breeding stocks in the herd and management skills during gestation.
- 2) Clipping needle teeth - To avoid injury to both the sow and pigs.
- 3) Tail docking - To avoid a tail biting in the confinement system.
- 4) Iron injection - To prevent anemia.
- 5) Ear notching - For a permanent identification, which is important in determining performance of pigs, identifying parents, selection, etc.
- 6) Castration - To avoid a "boar taint (odor)" in pork that is offensive to many people.

☞ There are some data indicating that the baby pig survival rate can be increased by delaying the processing until 3 days of age (vs day 1)! [1992. Feedstuffs 64(43):12]

### 2. Boar Pork? An Alternative to Castration!?

- Feeding boars to a slaughter weight is extremely popular in some parts of the world (e.g., Australia & U.K.).

#### A. Why?

- 1) Boars gain faster than barrows or gilts - Perhaps 10 to 15% better?
- 2) Better feed efficiency vs barrows or gilts - Perhaps 20% better?
- 3) Percent carcass lean (protein & water) - "Barrows < gilts < boars!"

☞ Thus, raising boars to market weight can be advantageous in terms of both animal welfare & production!

#### B. Why not?

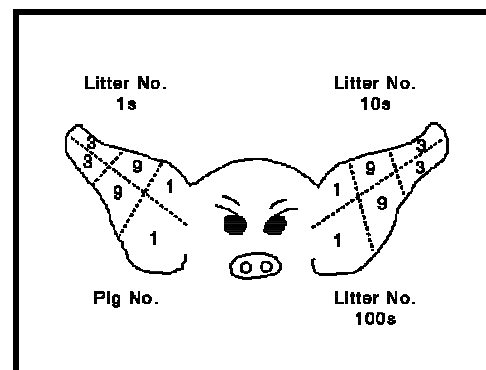
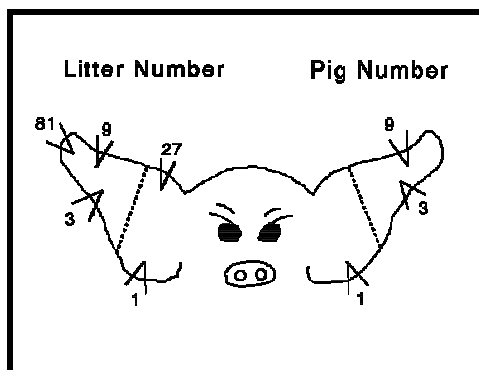
- 1) "Boar taint or odor" during cooking:



- a) Caused by: (1) A particular group of steroids, especially by 5- $\alpha$ -androstenone, which has an intense “urine-like” odor, and (2) Skatole (3-methyl-indole), which is a product of “intestinal degradation” of amino acid, tryptophan, which has an intense “fecal odor.”
  - ☞ Attempts to inhibit synthesis of steroids such as “immunization” against 5- $\alpha$ -androstenone & the use of specific “inhibitors” have not been successful!
- b) The “taint”  $\uparrow$  as the  $\sigma^7$  reach puberty, thus to avoid the problem, pigs must reach market wt before reaching their sexual maturity! Can be done by using:
  - (1) A lighter market wt. (But, in the US, a trend towards “heavier” wt.!)
    - (2) Fast-growing pigs. (e.g., Pigs in the UK can reach 220-230 lb in  $\approx$  150 days because of breeding & nutrition programs!)
  - ☞ Even then, there is some risk,  $\therefore$  there is a need for practical testing methods at the packing plant!
- 2) Possible management problems such as: a) Need for a split-sex feeding, b) need for more facilities (& also different types?), c) need to keep boars in uniform peer groups, and d) physical risks associated with handling boars.
- 3) “Consumer acceptance” - An ultimate deciding factor!?
- ☞ Actually,  $< 10\%$  of market weight  $\sigma^7$  are affected (in one e.g., 6% with a slight odor & only 1% with a strong odor), thus perhaps, more of “perception problems?!”

### 3. Ear-Notching Systems

- Most commonly used system and one example of alternatives:



### WAYS TO SAVE MORE PIGS

#### 1. Present at Farrowing to:

A. Assist sows if necessary, B. remove mucus from pigs, C. wipe pigs dry, D. place pigs under the zone heat, E. assist pigs in nursing . . . , etc.

#### 2. Reduce Chilling



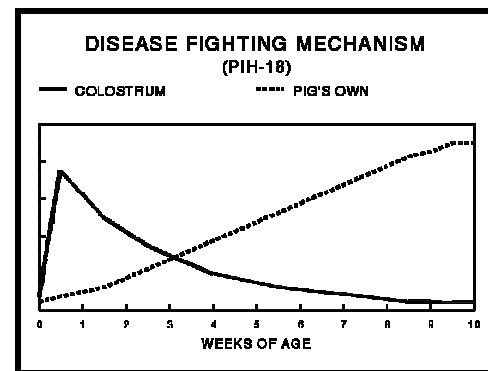
- A. Provide a zone heat before farrowing.
- B. Provide a solid area under the zone heat, which can prevent air movements from the underneath - Can use a mat or plywood on the slotted floor.
- C. Use a hover or creep box, which is inexpensive and effective vs ↑ the temperature of the whole room, and ↑ the temperature of the whole room can be stressful to sows.
- D. Additional heat lamp(s) during farrowing? (Reese, 1986. HFM/Nov. pp 30-33)

Item	Side	Side+Rear <sup>a</sup>
No. Born alive	11.4	11.6
No. at 7 days	9.2	10.1
Survival, %	80.7	87.1

<sup>a</sup>Placed a lamp in the rear only during farrowing (European data).

### 3. Make Sure Pigs Receive Colostrum

- A. Pigs are born with a very little disease resistance.
- B. Newborn animals can absorb intact proteins (Ig or antibodies) by pinocytosis.
- C. Their ability to absorb antibodies ↓ rapidly after birth, and “closure,” a loss of this ability, can occur:
  - 1) 24 to 36 hr after birth in pigs.
  - 2) 2-3 days in cattle.
  - 3) Humans - Earlier than animals, or may not be able to absorb intact proteins?



- ☞ Important to make sure that piglets receive colostrum soon after birth!

### 4. Supplemental Milk or Milk Replacers

- A. Using the stomach tube, may want to give smaller, weak pigs 15 to 25 ml of milk or milk replacer periodically during the first few days.
- B. The first dose should be colostrum from the sow or stored:

Effects of dosing pigs (< 2 lb) with a 15-ml of milk replacer once or twice/day for 7 days: (Krider et al., 1982)

Item	Control	Supplemented
No. of pigs	69	69
No. surviving	34	51
Survival, %	49	74

- ☞ ∴ can save more pigs, but labor intensive!

- C. Additional benefits of milk replacers:

- 1) Sows with large litters, i.e., nursing more pigs than the No. of functional nipples.
- 2) Lost a sow. i.e., for orphan pigs and(or) fostered pigs.



- 3) Low milk production for various reasons.
  - 4) Early weaning.
5. **Provide a Safety Zone** - i.e., the use of crates, guard rails, creep boxes, etc.
  6. **Cross-fostering**
    - A. Equalize litter size based on: 1) the number of pigs, 2) the number of functional teats, and 3) milking ability of the sow.
    - B. Transfer “larger pigs” within 2-3 days.
  7. **Keep Farrowing House Clean and Dry**
    - A. Depopulation/disinfection & pig performance: (Reese, 1986. HFM/Nov. pp 30-33)

Item	Before <sup>a</sup>	After <sup>b</sup>
Pig wt. at 8 wk, lb	24.6	30.5
Survival, %	81.7	86.3

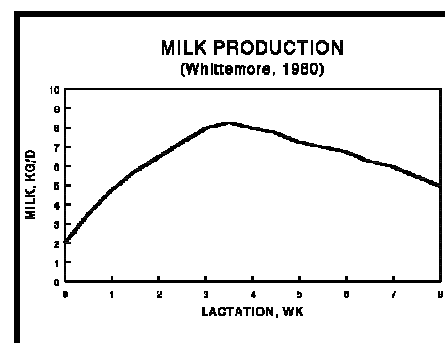
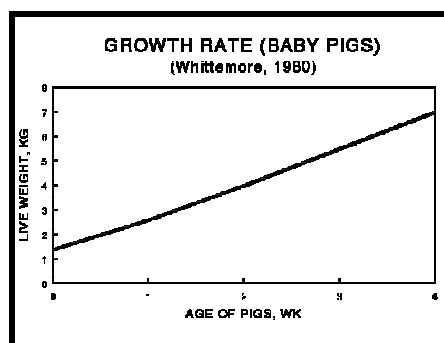
<sup>a</sup>Farrowing house operated continuously; <sup>b</sup>Depopulated, disinfected & restocked.

☞ Unsanitary conditions predispose baby pigs to various health problems!

- B. “Raised crates/floors” - Data from commercial operations indicate 24% lower death loss and 0.4 more pigs/litter by using raised crates/floors!
8. **Fats/Oils to Sows During Late Gestation** - Can increase body reserves of baby pigs, and also improve the quality of milk.

### CREEP FEEDING

1. **Growth Rate of Pigs and Milk Production:** (Whittemore, C.T. 1980)

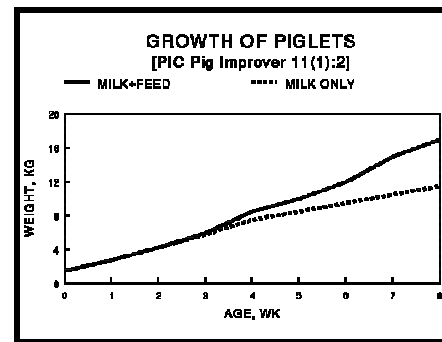
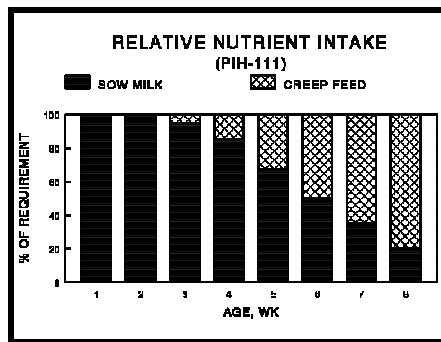


☞ The Bottom Line?

- 1) Piglets grow linearly after birth, ∴ the nutrient requirement also ↑ linearly!
- 2) Milk production peaks at 3rd or 4th week and starts to decline thereafter.
- 3) Thus, weaning at 3½ to 4 weeks of age or later, piglets need additional nutrients! (If weaning pigs at younger age, the value of creep feed is questionable!)

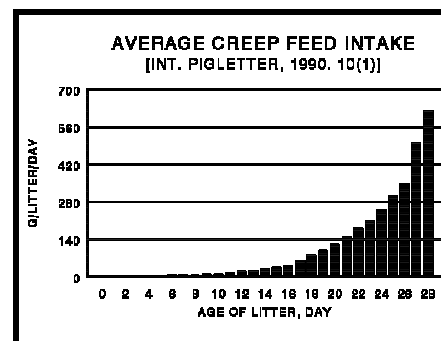
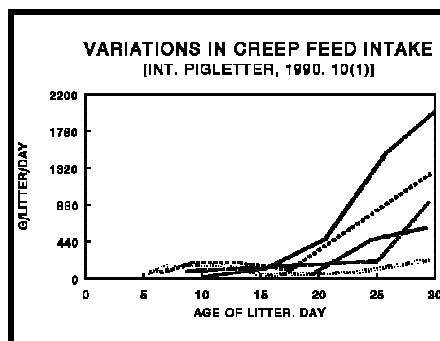


## 2. Relative Intakes and Growth of Piglets



## 3. Creep Feeding & Post-Weaning Scours

- A. Creep feed may cause scours because of allergic reactions/hyper sensitivity because of some proteins & carbohydrates in soybean meal - Considerable variations among individuals on adverse effects & also may depends on the type of creep feed!
- B. To avoid such problems and benefit pigs, pigs should consume > 400 grams of creep feed before weaning.
  - Creep feed consumption? Considerable variations in creep feed intake [1990. Int. Pigletter 10(1)] & average creep feed intake [1990. Int. Pigletter 10(1)]:



- Consuming only 10 to 15 g/day before weaning at day 21, but increases to 50 to 60 g/day by day 28!

## 4. Type of Creep Feed Required (See a box)

## 5. For a Successful Creep Feeding

- A. Try to provide fresh feed! - 1) Change feed frequently, i.e., don't feed too much at once, and 2) to encourage intake, feed small amounts in a shallow pan or on the floor several times/day during the first week or so.

- B. Use fresh, palatable and digestible ingredients:

For 3 to 5 kg pigs (NRC, 1998)

Lysine, %	1.50
Protein, %	26
Calcium, %	.90
Phosphorus, %	.70



- 1) Special ingredients include milk products (skim milk or edible whey), fish meal, oat groats, fats/oil, etc.
- 2) If it's not possible to keep various fresh ingredients, probably better to buy a complete diet or a base mix containing several special ingredients - More cost effective?!

### BABY PIG ANEMIA

☞ Two major problems in nursing piglets are: baby pig anemia & baby pig scours! (Also, “clostridial enteritis?”)

#### 1. Iron Deficiency

- With deficiency of Fe, pigs can not produce enough hemoglobin, thus reducing the oxygen carrying capacity, which can cause anemia!

#### 2. Signs of Anemia

- A. Chronic - Poor growth, listlessness, rough hair coat, wrinkled skin, paleness of the mucous membranes, pale ears and snout in white pigs, etc.
- B. Acute - Labored breathing (thumps) & sudden death due to oxygen shortage.
- C. Hemoglobin concentrations - “Normal, 10 to 12 grams” & “Anemic - ~ 5 grams/100 ml.”

#### 3. Why is Iron so Important for Pigs?

A. Low body storage in the newborn pig:

- 1) Pigs are born with only 40 to 50 mg of Fe.
- 2) Need 7 to 16 mg of absorbed Fe/day, ∴ “deplete” body stores very quickly!

B. Low iron content of colostrum and milk:

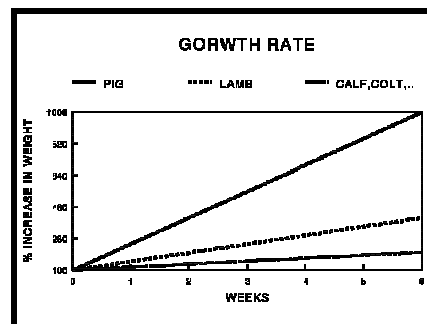
- 1) Fe content of colostrum - 2 ppm.
- 2) Fe content of milk - 1 ppm.
- 3) Thus, pigs receive no more than 1 mg/day from milk vs the requirement of 7-16 mg.

C. No contact with soil in the confinement, i.e., no Fe from soil through rooting.

D. Rapid growth rate:

- 1) Pigs will double their weight during the 1<sup>st</sup> week.
- 2) Weigh up to 5 times or more by 4th week.
- 3) ∴ a rapid ↑ in the Fe requirement because of ↑ plasma volume.

Body tissue iron content in various species (ppm Fe, fat-free basis):		
Species	Newborn	Adult
<b>Pig</b>	<b>29</b>	<b>90</b>
Cat	55	60
Rabbit	135	60
Human	94	74



#### 4. Prevention

- A. Treating sows (Fe injection or feeding high levels) has been unsuccessful in ↑ body Fe stores of pigs.



**B. Oral supplementation:**

- 1) Can be done by placing clean soil in the pen, swabbing sow's udder with Fe solution, placing Fe preparations in the pen, or dosing pigs with Fe solution.
- 2) But, absorption rate is very low & it is labor intensive!

**C. Parenteral supplementation (injection) - Most commonly used method & to be effective, must use a proper “form, amount & method!”**

**1) Method:**

- a) Intramuscularly in the ham or neck - May leave a permanent stain in the muscle, ∴ the neck might be a better site!
- b) Clean the site with 70% ethyl alcohol.
- c) Use a clean syringe and 20 gauge disposable needle (1/2 to 1” long).
- d) To prevent run back, pull the skin slightly to one side before injection.

**2) Amount:**

- a) Weaning before 3 weeks - 100 mg might be adequate.
- b) Beyond 3 weeks - May need about 150 to 200(?) mg. (According to some, giving 200 mg at once may be toxic!)

**3) Form:**

- a) Considerations include: (1) Adequate Hb formation throughout the nursing period by a single injection, (2) Compatible with body fluids and tissues, and non-toxic, (3) Does not cause pain, and (4) Effective dose of Fe with a minimal volume.
- b) Iron-dextran and iron-dextrin complexes are best forms in the market.

**☞ Mixing your own solution?**

- “Ferrous sulfate” is available (i.e., can be utilized by pigs efficiently) and economical & “ferrous carbonate” is intermediate in availability, but “ferric oxide” is not available.

## **BABY PIG SCOURS (COLIBACILLOSIS)**

### **1. Introduction**

- A. A general intestinal disorder of newborn pigs, and also known as “White Scours.”
- B. Prevalent during the suckling period.
- C. *E. coli* seem to be 1° responsible, but other bacteria/viruses can cause this disorder.

### **2. Signs**

- 1) Yellow to white, watery or pasty feces.
- 2) Tails are wet and hang straight.
- 3) Emaciated, dehydrated, depressed and reluctant to nurse.

☞ May affect the entire litter & “surviving pigs” often become pot-bellied and unthrifty!



### 3. Conditions That Can Make Pigs More Susceptible

- A. Lack of colostrum/antibodies.
- B. Chilling can reduce defense mechanism.
- C. Insufficient milk/nutrients.
- D. Filth and dampness can lead to the exposure to a large No. of microorganisms.
- E. Iron deficiency anemia.

### 4. Treatment

- A. Promptly treat with antibacterial drugs, and should treat the entire litter.
- B. Effectiveness of drug(s) may differ from one herd to the next & from one time to the next in the same herd.

☞ *It is possible that organisms develop a “resistance” to a certain drug or drugs, thus reducing the effectiveness of drugs in some herds!*

### 5. Prevention (Probably the best treatment!)

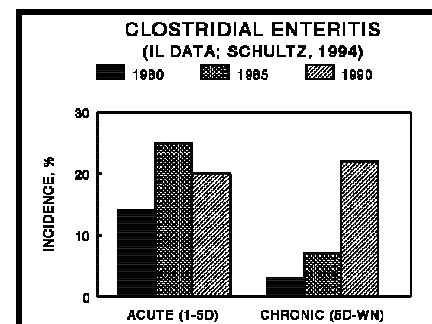
- A. Good sanitation programs to reduce the number of *E. coli* such as: 1) Use “all-in, all-out,” 2) Disinfect facilities & equipment, 3) Provide adequate ventilation, 4) Use an efficient manure removal system, etc.
- B. Good nutritional and health programs for the breeding herd, which can lead to the production of vigorous pigs & good milk production.
- C. Good management of baby pigs such as: 1) Make sure pigs receive colostrum, 2) Use a supplemental heater, hover, creep box & others to avoid chilling, 3) Be sure to give supplemental iron, 4) Minimize stress during processing, etc.
- D. If the incidence is high, vaccinate sows and gilts during the late stage of gestation . . . Pigs can receive antibodies from colostrum/milk!

## CLOSTRIDIAL ENTERITIS

- References: Schultz, 1994. Large Anim. Vet. 49(1):4 & Pork'97 (<http://www.porkmag.com/heal22.htm>)

### 1. General

- A. A diarrheal disease of suckling pigs caused by *Clostridium perfringens*:
  - 1) Anaerobic gram positive spore forming bacteria.
  - 2) Classified based on their ability to produce toxins - Types A, B, C, D & E:
    - a) Type C can produce toxins that can cause a highly fatal enteritis.
    - b) Type A is also associated with diarrhea, but milder & not fatal.



☞ Can be difficult to control because they may resist some types of disinfectants, sunlight, and drying, which normally kill most bacteria.



B. Becoming more prevalent & costly to producers:

- 1) Up to 25% of diarrhea in preweaning pigs may be caused by *C. perfringens*. (3rd behind *E. coli* and rotavirus.)
- 2) In Iowa, may be costing \$4 mil/year, and may be greater if lower weaning weight, survival rate and rate of weight gain are considered.
- 3) Acute cases may have declined in recent years, but a chronic form has increased, especially true for pigs between 5 days of age weaning.

**2. Pathogenesis & Signs**

A. Pathogenesis:

- 1) Pigs obtain organisms from surroundings (e.g., feces or contaminated skin of sows that are intestinal carriers) within minutes to a few hours after birth.
- 2) Infection is established immediately in the small intestine, especially in the jejunum.
- 3) Toxins can be lethal & necrotizing (i.e., i.v. injection can be lethal & induce skin necrosis): a)  $\alpha$  toxin - lecithinase & b)  $\beta$  toxin - proteinaceous & seems to be the 1<sup>o</sup> factor causing intestinal necrosis.

B. Clinical signs:

- ▶ "Onset" varies between & within litters, and can be characterized by acute deaths and bloody diarrhea.

1) Peracute form:

- a) Become sick in the 1st or 2nd day of life, and are subject to crushing by the sow:
- b) Often collapse & die with no external signs of diarrhea, or a blood stained or bloody diarrhea may be observed.

2) Acute form:

- a) May survive to the 2nd or 3rd day of life, and may show a reddish brown liquid feces with strands of gray necrotic debris.
- b) Become weak & make only feeble attempts to nurse before dying.

3) Subacute form:

- a) May show a persistent non-hemorrhagic diarrhea and remain active & alert, but progressively more emaciated & dehydrated, and may die 5-7 days after birth.
- b) Feces are soft & yellow at first, progressing to a clear liquid containing flecks of gray necrotic debris.

4) Chronic form:

- a) Show intermediate but persistent diarrhea for a week or more, and feces are yellowish gray in color.
- b) Remain active but become progressively emaciated, and eventually die or being culled.



### **3. Treatment & Prevention**

- A. Once clinical signs are evident, little can be done to alter the development of lesions.
- B. Thus, prevention becomes much more important:
  - 1) Vaccination of sows to acquire high levels of colostral antibody - Mid-gestation (7-10 weeks) & again at 2-3 weeks before farrowing might be more effective vs usual “5-and-2-weeks-before” practice!
  - 2) Assist pigs to acquire colostrum during the first 24 hours.
  - 3) Prevent exposure: a) Thorough cleaning & disinfection of the farrowing facilities, b) washing sows before moving in, etc.
  - 4) Include antibiotics in sow diets (2 wk before to 3 wk after parturition) may clean up intestinal tracts of the sow. [e.g., 250 g bacitracin methylene disalicylate (BMD)/ton.]
  - 5) In the event of “outbreak,” subcutaneous injection and(or) oral administration of Type C antitoxin within 2 hours of birth may provide some protection, but labor intensive & costly.