



How Lame!?

Strategies to Reduce Losses Associated with Lameness in Swine Production

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Right Leg Disease

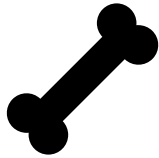
First a story

Lameness → The Framework

Framework of understanding



↓
Components



Bone



Joints



Muscle

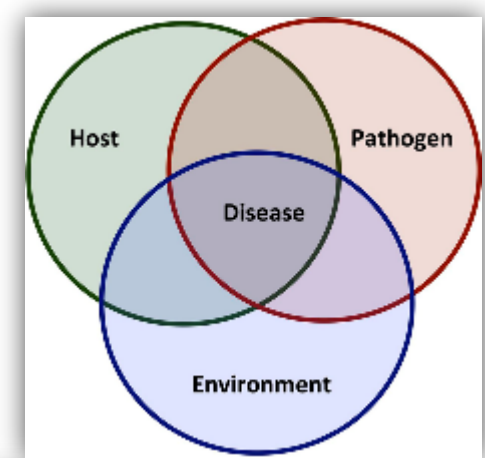


Nervous

Systems affected

- Skeletal system
 - Bone and joints
- Muscular system
 - Weak muscles
 - Heart issues
- Nervous system
 - Nervous
 - Spinal cord
 - Brain

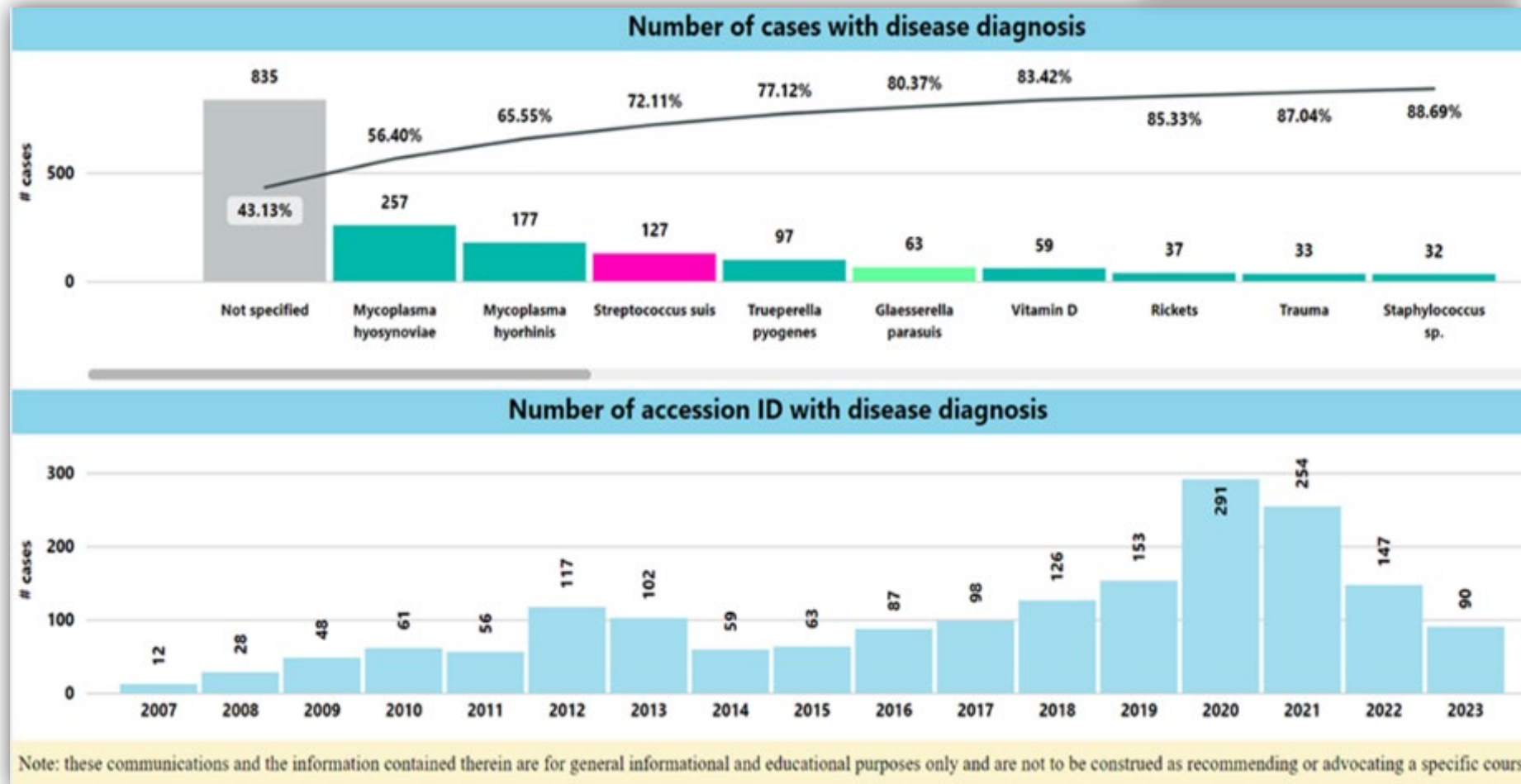
Lameness → Associated Factors



ISU VDL Data

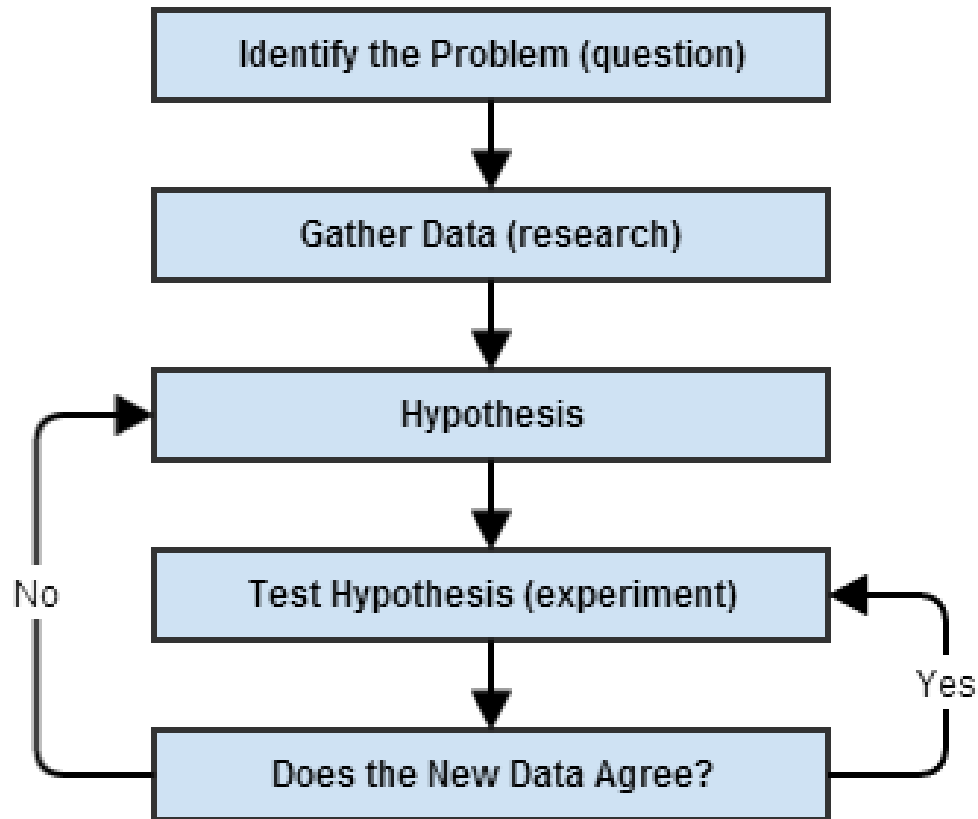
Factors that influence

- Growth
- Genetic
- Nutrition
- Environment
- Management practices
- Time of year
- Other disease pressures



Lameness → The Investigation

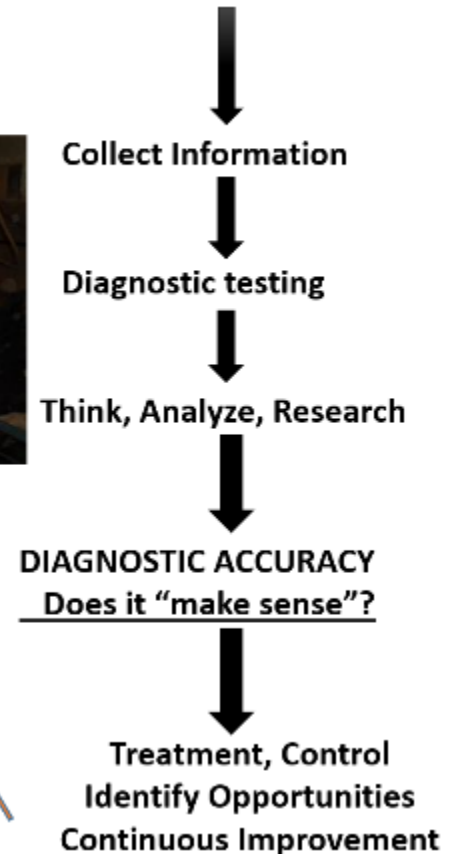
The Scientific Method

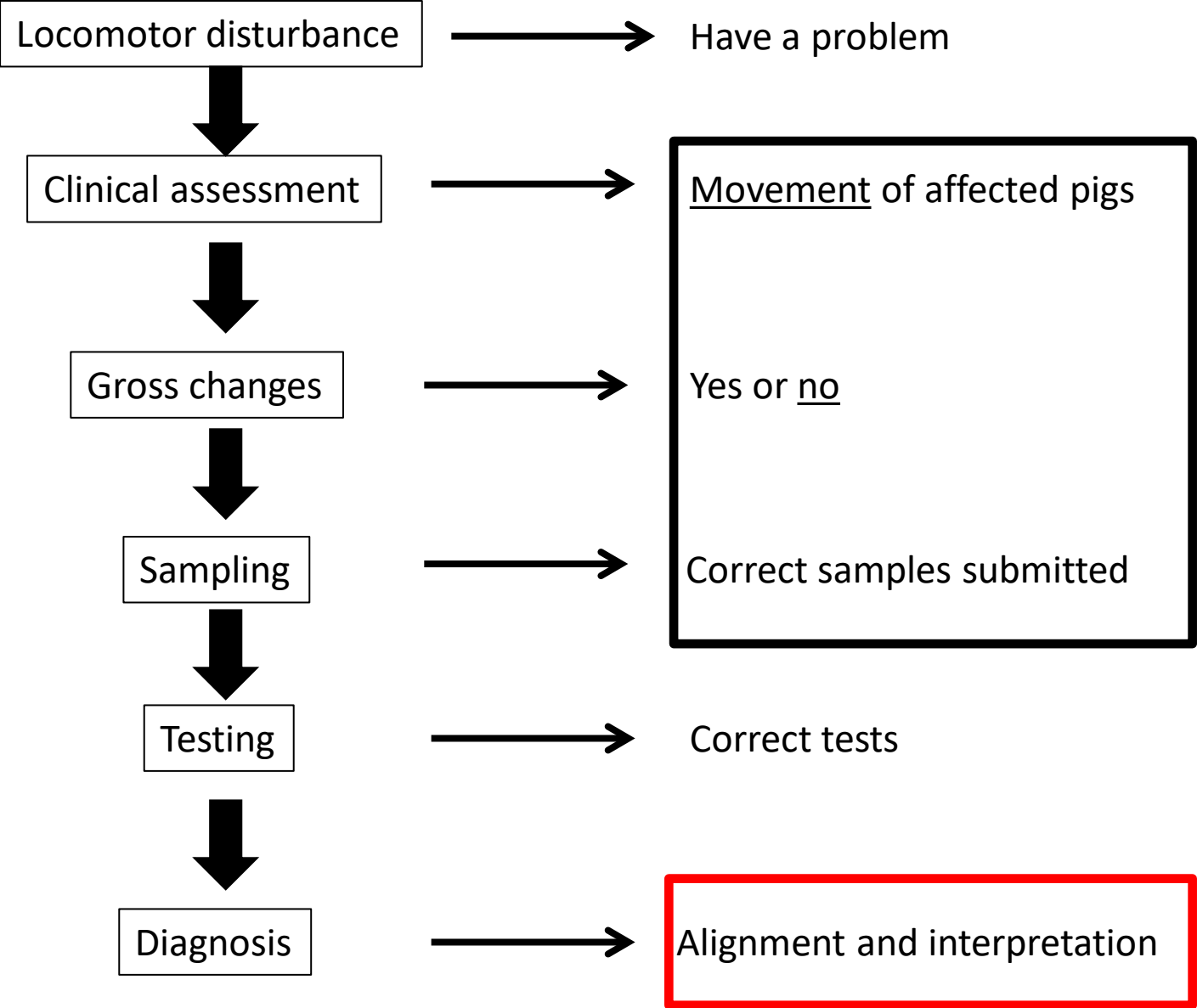


Achieving an ACCURATE DIAGNOSIS IS A **PROCESS**



Refine
Repeat
process





Lameness → Clinical Assessment



Posture

Weight distribution

Flow issue?

Sporadic Animal issue?

Numerous Animals affected?

Lameness → Diagnostic Tests

Urine Testing

Table 3. Swine urine assessment parameters for potential differentiation of metabolic bone disease concerns. (Adopted from Hagemoser et al.¹)

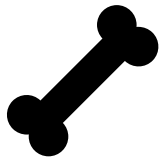
Parameter	Urine Sampling	
	Values	Potential Issues
Calcium : creatinine ratio	<0.025	Calcium deficiency
	>0.25	Phosphorus deficiency
Phosphorus : creatinine ratio	>1.0	Calcium deficiency
	<1.0	Normal
Calcium : phosphorus ratio	>1.0	Phosphorus deficiency
	<0.05	Calcium deficiency



Liver Stores



Culture



Quality

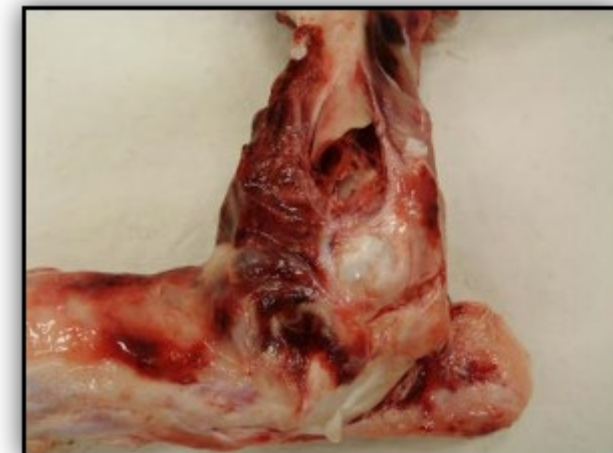
Bone	
	Normal range
Bone ash (dry weight)	58-62%
Bone density	1.4-1.5 g/ml.
Bone ash Calcium	32-39%
Bone ash Phosphorus	13-22%



Serum Analytes



Gross lesions



Diagnosis

“The art or act of identifying a disease from its signs and symptoms”

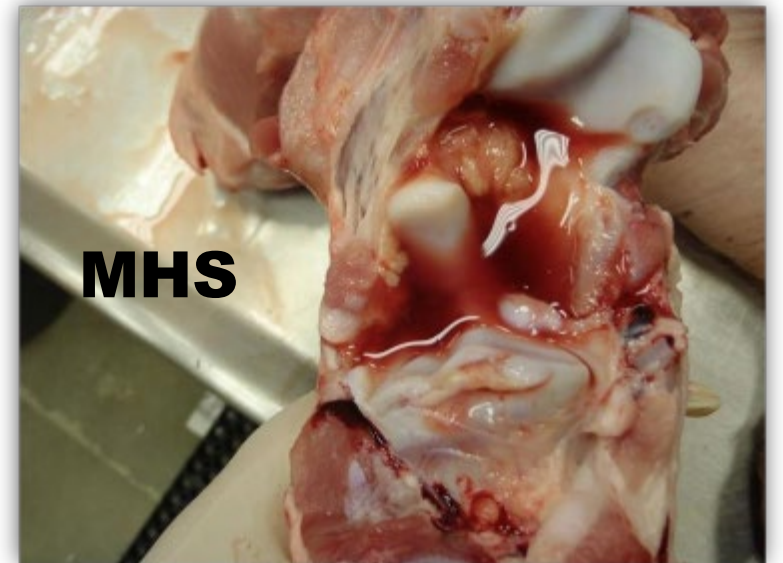
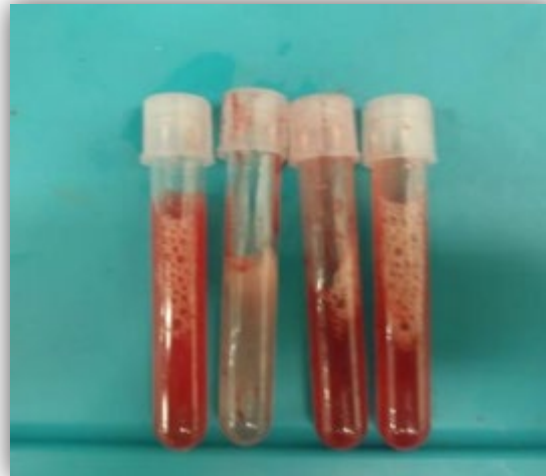
- **Clinical Diagnosis**
 - Diarrhea, pneumonia, arthritis.....
- **Pathological Diagnosis**
 - Atrophic enteritis, suppurative bronchopneumonia.....
- **Etiologic Diagnosis**
 - Rotavirus enteritis, Mycoplasma pneumonia
- **Laboratory Test Diagnosis**
 - Positive, negative, equivocal and magnitude
- **Herd diagnosis** / multifactorial / risk factors
 - Sanitation, flooring, nutrition, infections

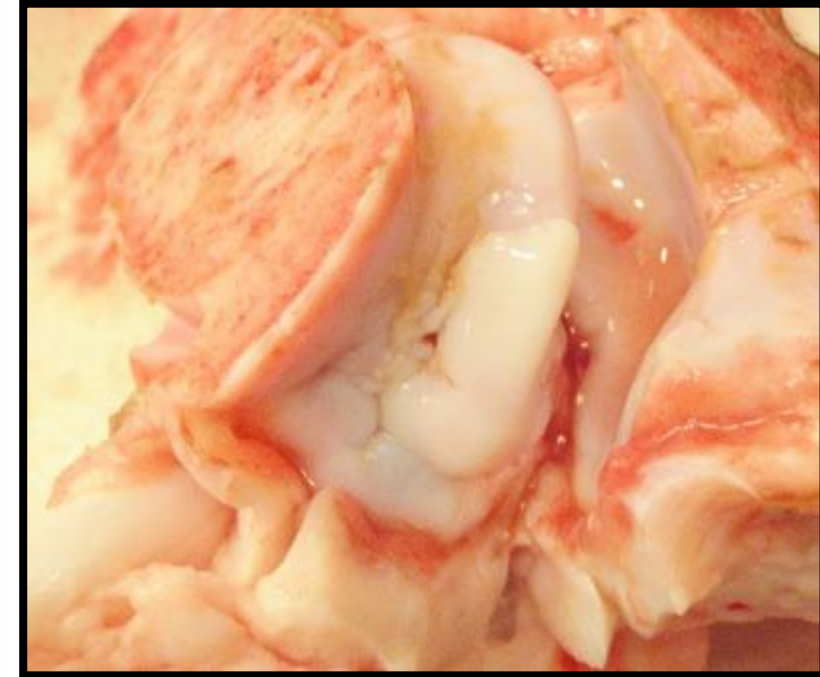
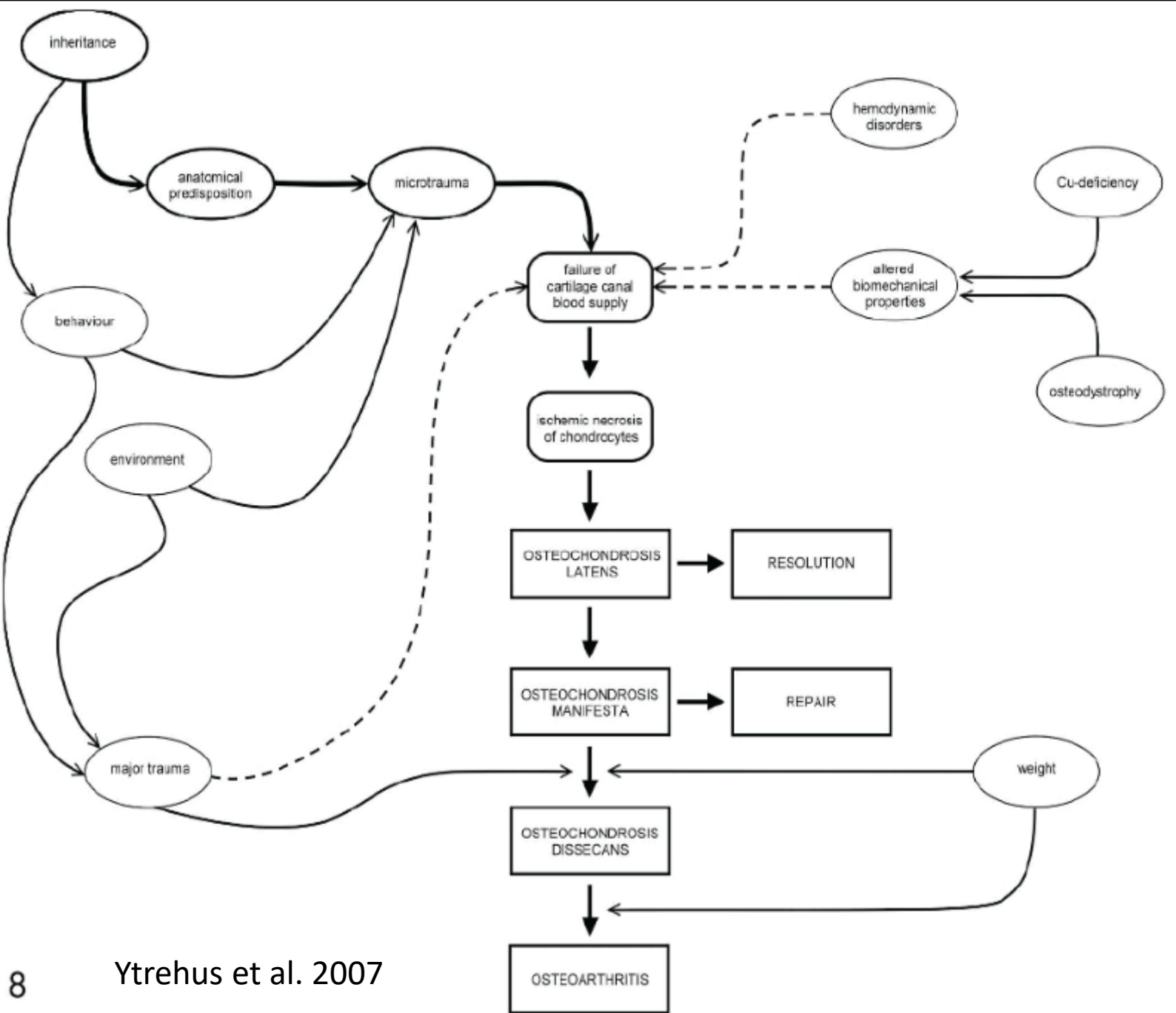
Who makes the diagnosis?

**CORRELATION
≠
CAUSATION**

Lameness → Common Etiologies

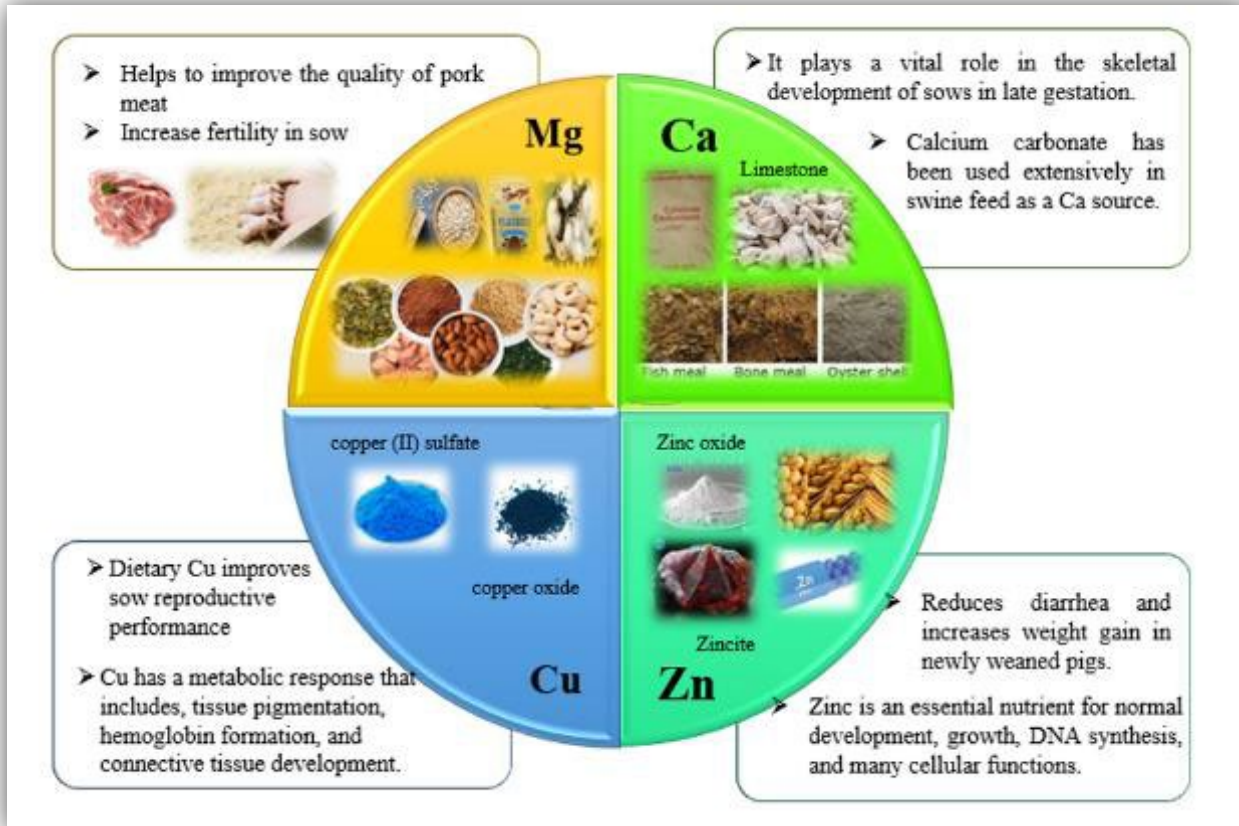
- Osteochondrosis dissecans (OCD)
- Nutritional bone disease
 - Calcium, phosphorus, vitamin D, etc.
- Mycoplasma spp.
 - Mycoplasma hyosynoviae and Mycoplasma hyorhinis
- Trauma
- Bacterial sepsis
 - *Glaesserella parasuis*
 - *Streptococcus suis*
 - etc.





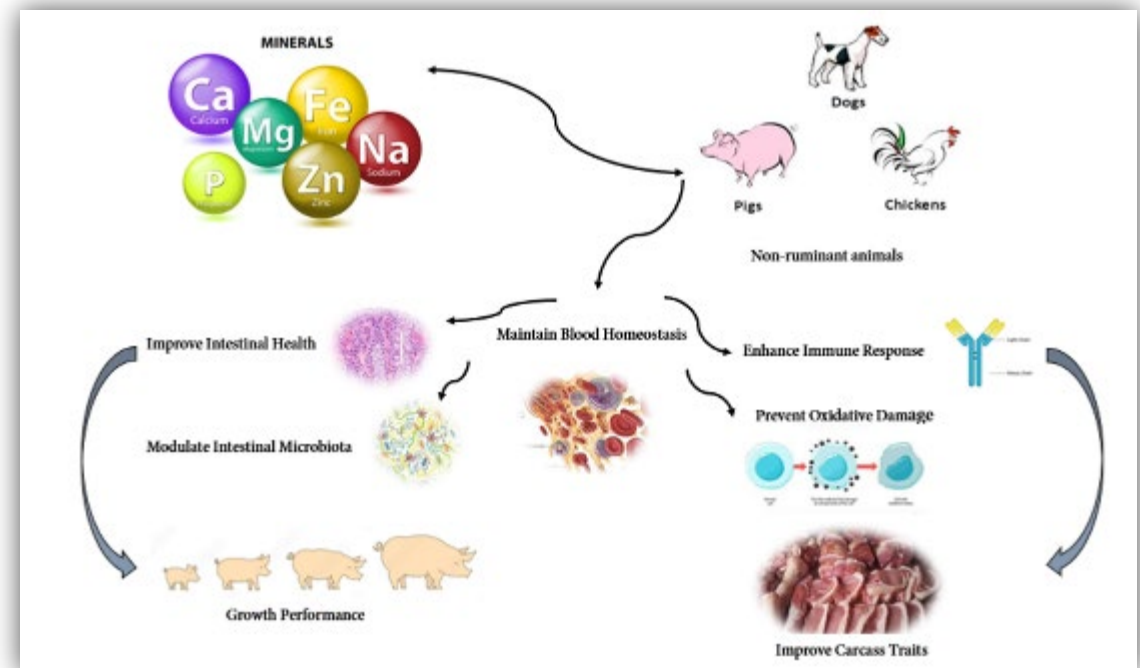
Nutritional Concerns

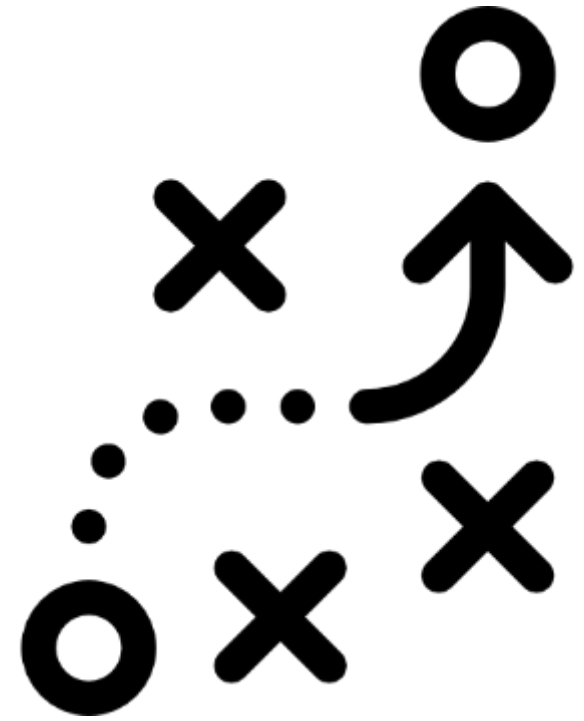
MULTIFACTORIAL AND COMPLEX



Most common mechanisms of **metabolic bone disease**:

1. Inadequate dietary supplementation of vitamin D₃
2. Inadequate absorption of phosphorus due to low phosphorus in diet, phosphorus bound to phytate and therefore unavailable, and inadequate or ineffective phytase usage
3. Imbalance of feed calcium to phosphorus ratio; improper formulation of Ca:P ratio in diet (should be roughly 1.2:1)
4. Inadequate dietary calcium can also contribute to rachitic lesions, though these are also often confounded by accompanying osteoporosis.





Strategies

Implies you have a diagnosis or at least a working hypothesis

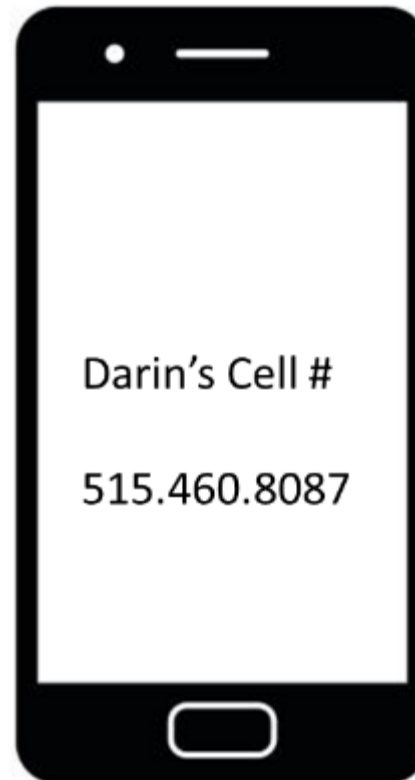
Team Assembly

PRODUCTION TEAM

Veterinary Team

NUTRITION TEAM

Diagnostic Team



Who's on your team?

Understand your Pig

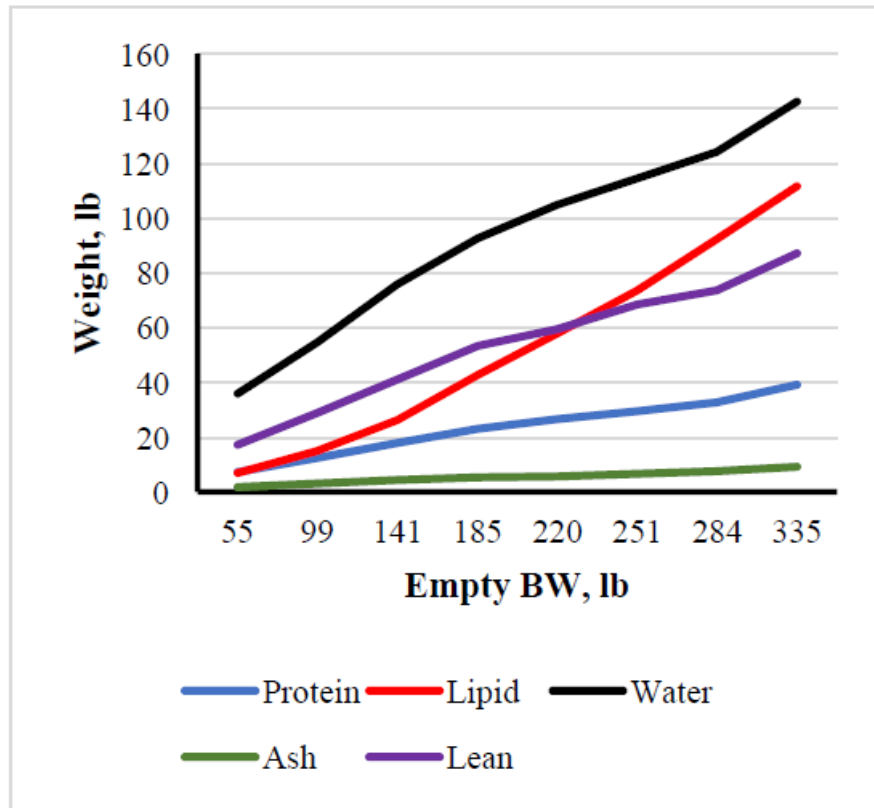
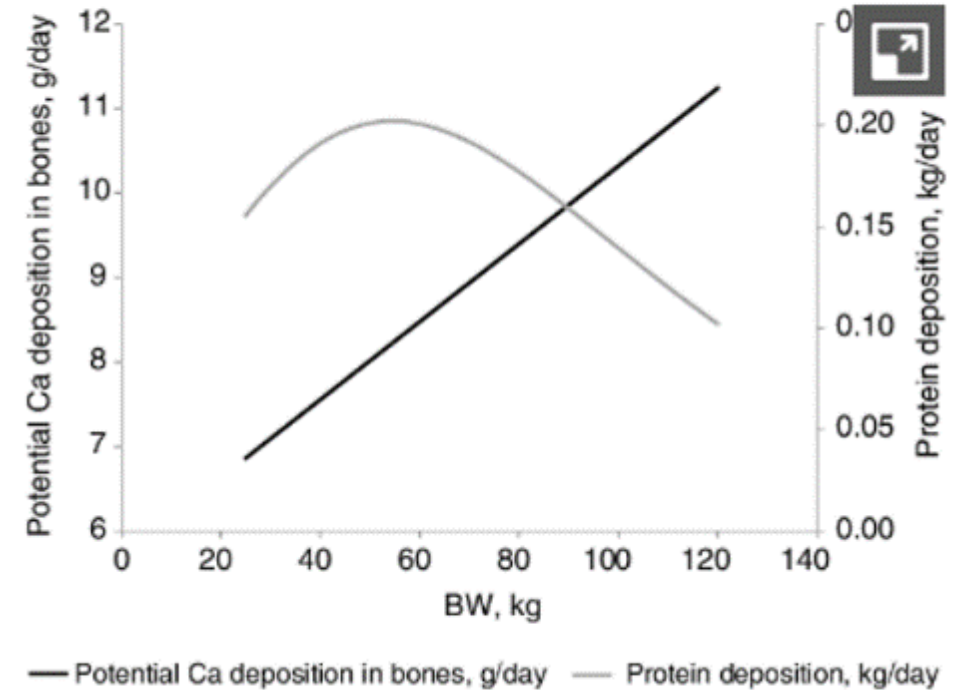


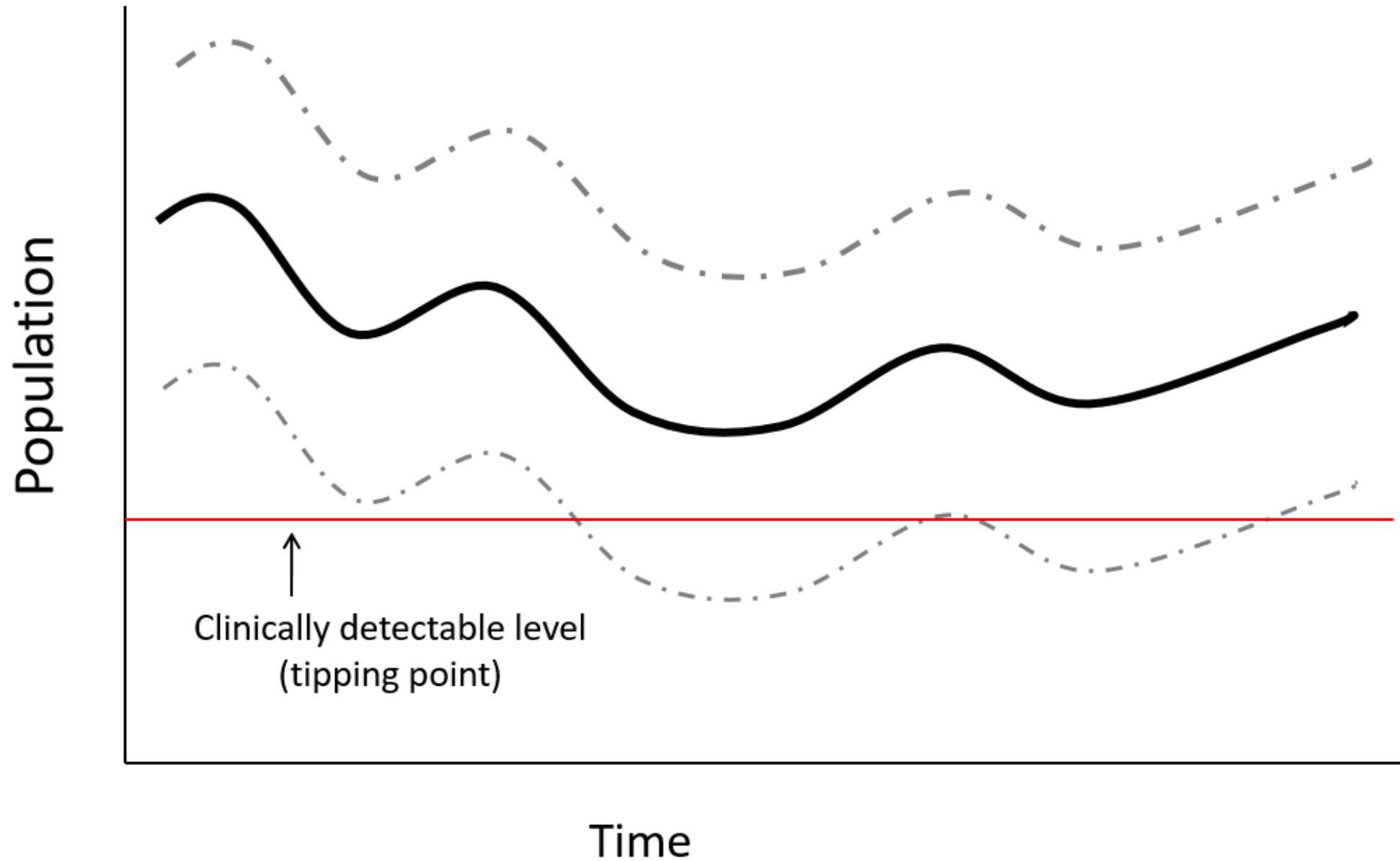
Figure 3. Changes in chemical body composition with increasing body weight (Adapted from Wagner et al., 1999).



When are issues occurring?

What processes changed?

If you see some lameness; where the rest of the population at?



Case scenario #1

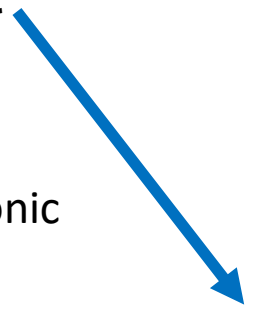
Multiple pigs

Acute



Postweaning swollen joint

Chronic



Sporadic



Infectious

Population based

Medications or Vaccine

Infectious

Individual pig

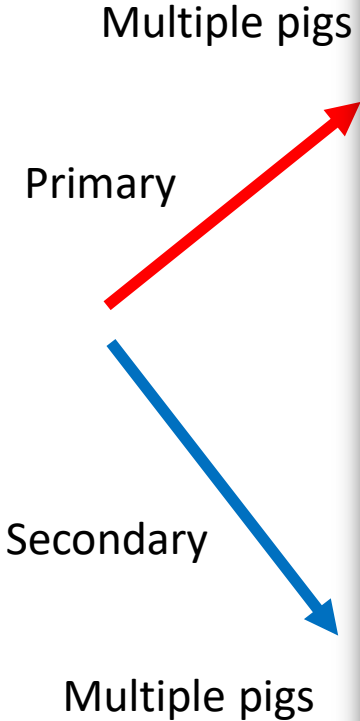
Management → Navel infection

Management → Fighting

Management → Process hygiene

Case scenario #2

Finishing lameness



Infectious

Population based

Medications or Vaccine

Non-Infectious

Population based

Management

- Trauma
- Energy/growth
- Conformation

Focal disturbance of bone formation associated with vascular compromise (blood supply failure)



All pigs have some degree osteochondrosis

Requires more investigation

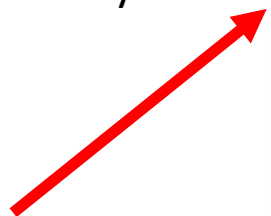
- Growth Rate
 - Weight vs bone strength
 - Dietary Energy (high caloric intakes)
 - Cooler weather
 - High health
- Trauma/Management
 - Dropping at processing
 - Dropping at vaccination
 - Transportation related
 - Flooring (plastic to concrete)

Generally resolve if diet is adequate

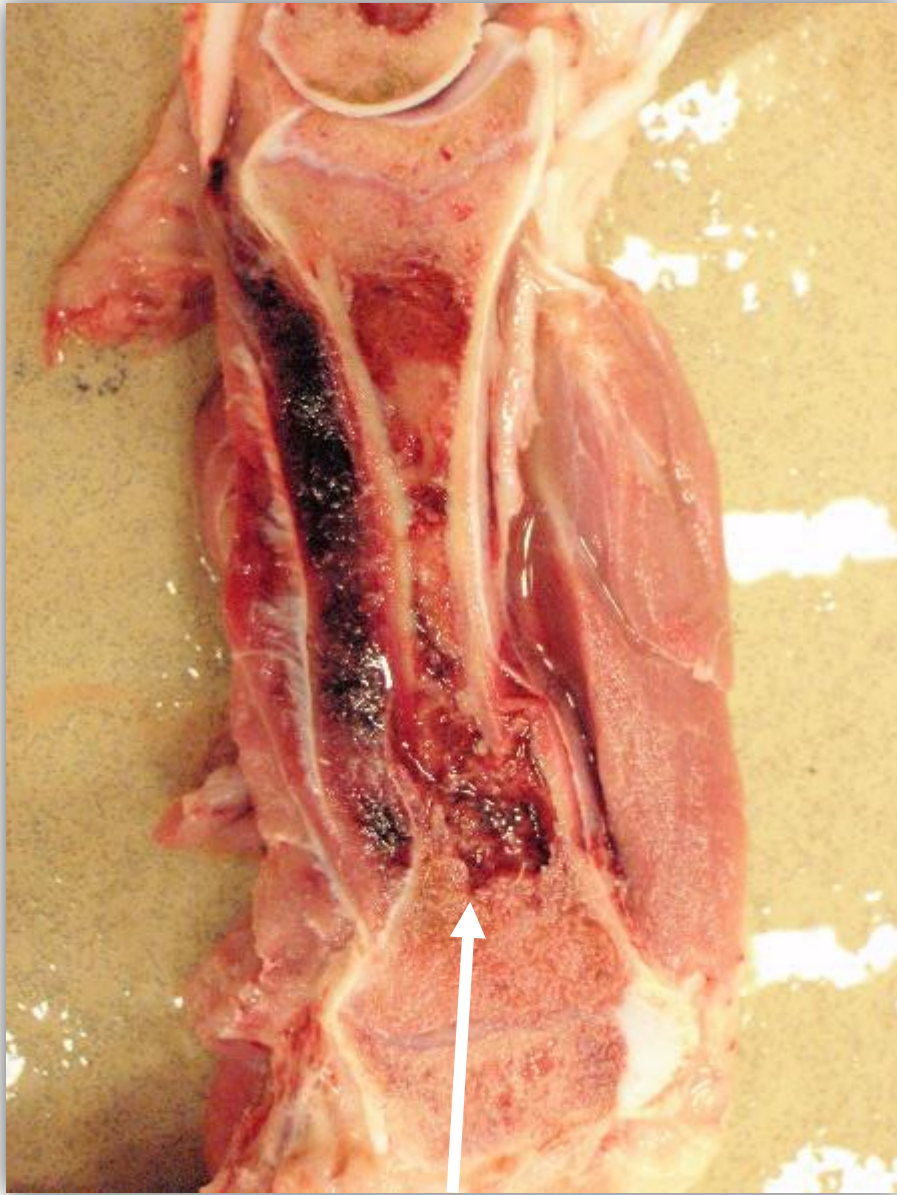
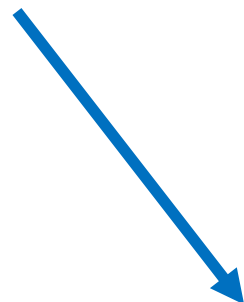
Case scenario #3

Finishing lameness

Primary



Secondary



Bone Fracture

Trauma

Management issues

Non-Infectious

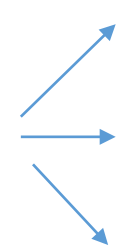
Population based

Nutritional

Ratios

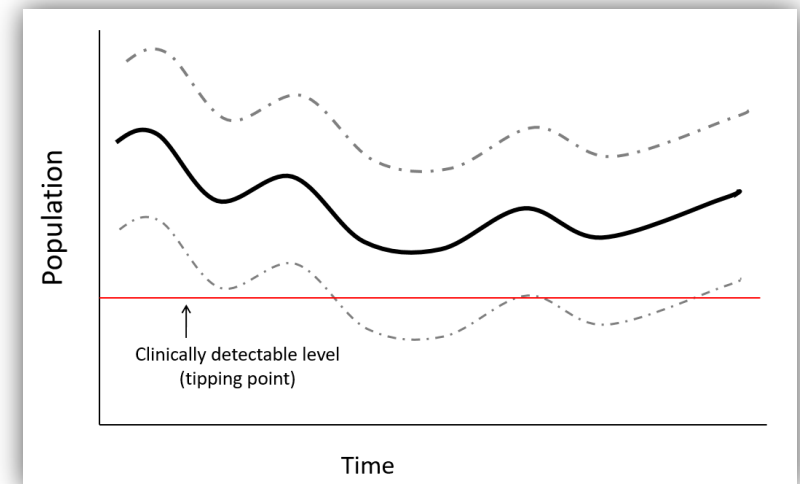
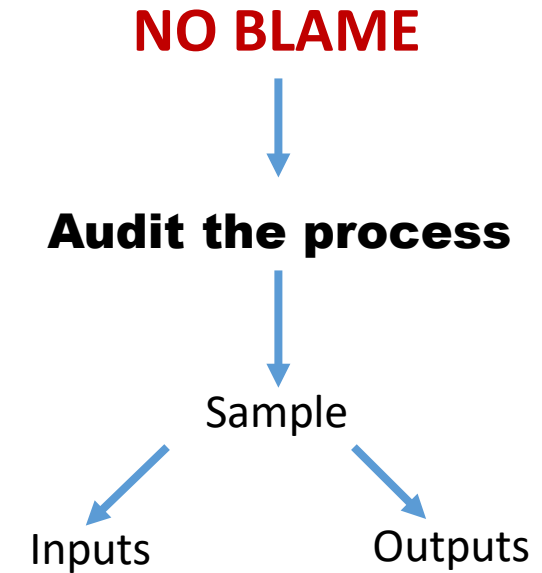
Composition

Deficiency



Nutritional

- Never intentional
- Difficult to investigate
- Emotional ties
- Evidence is already consumed
 - Feed no longer around (likely weeks past)
- Sporadic incidence
 - Random mixing error (on-time evident)
- Consistent issue
 - Mill mixing issue
 - Premix inclusion issue
 - Storage degradation issue



Case scenario #4



Sow Lameness



Case scenario #4

- Sow lameness = headaches
- ~\$23 million to the swine industry (2010 estimate)
- Trauma, fighting and environmental conditions are important
 - Mixing
 - Open pens and pen design
 - Ratio of sows to gilts in pens
 - ESF timing
- “Outbreaks” desire investigation
 - Nutritional changes (ingredient)
 - Binder additions



Strategy

Biotin

Zinc

Copper

Adequate Ca & P

Strategies (maybe more advice)

- Open joints during field necropsies; no matter the disease issue
- Assess rib breaking strength at necropsy (make it a habit)
- Watch clinical animals move; localize the issue
- Serum, liver urine and feed included in all lameness investigations
- One submission doesn't often solve/find the issue
- Ask for help from those who have knowledge experience
- Do necropsy events in a flow to hone in
- Invite a diagnostician → they like getting out to the lab!

Strategies (maybe more advice)

- Don't least cost any diet
- Big ingredient changes need analysis (no assumptions, test it)
- Understand vitamin storage for clients
- Old crop (carryover) issues in fall (mycotoxins)
- Gilt diets → make robust, have them entry the farm ready to succeed

Questions?

Thank you