
ZAMIVET 80

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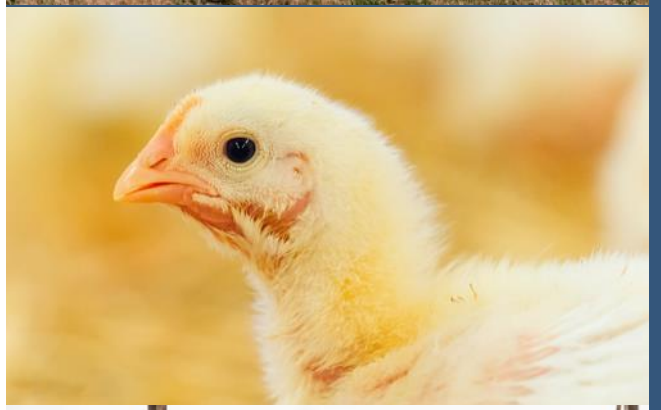
80g/1kg enramycin

Overview

1. Enramycin
2. Chemical Structure
3. Mechanism of action
4. Activity Spectrum of Anti-Infectives
5. Overview : Benefits of enramycin
    - Disease Control
    - Performance Improvements
    - Environmental Benefits
    - Other Benefits
6. Summary
7. What is a veterinary feed directive (VFD)?
8. Product Introduction – ZAMIVET40
9. Applications
10. Quality Indicators

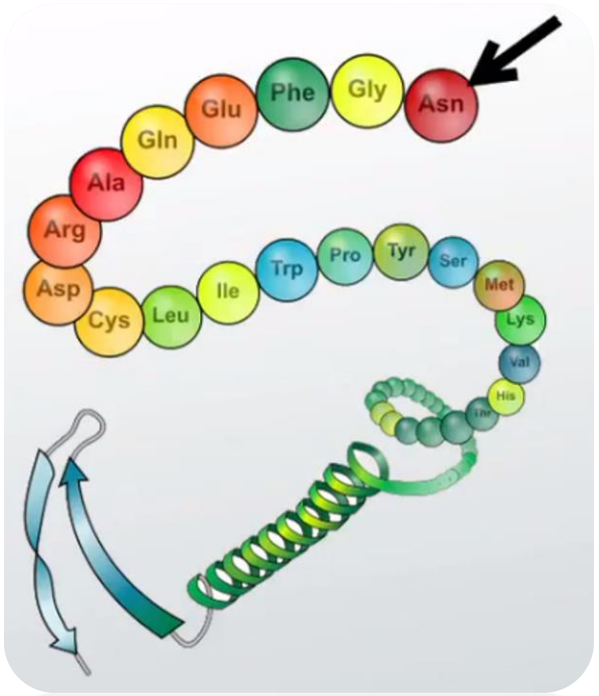


Polypeptide Antibiotic

Polypeptide

- a chain of amino acids linked together by peptide bonds

Amino acids



Polypeptide Antibiotic

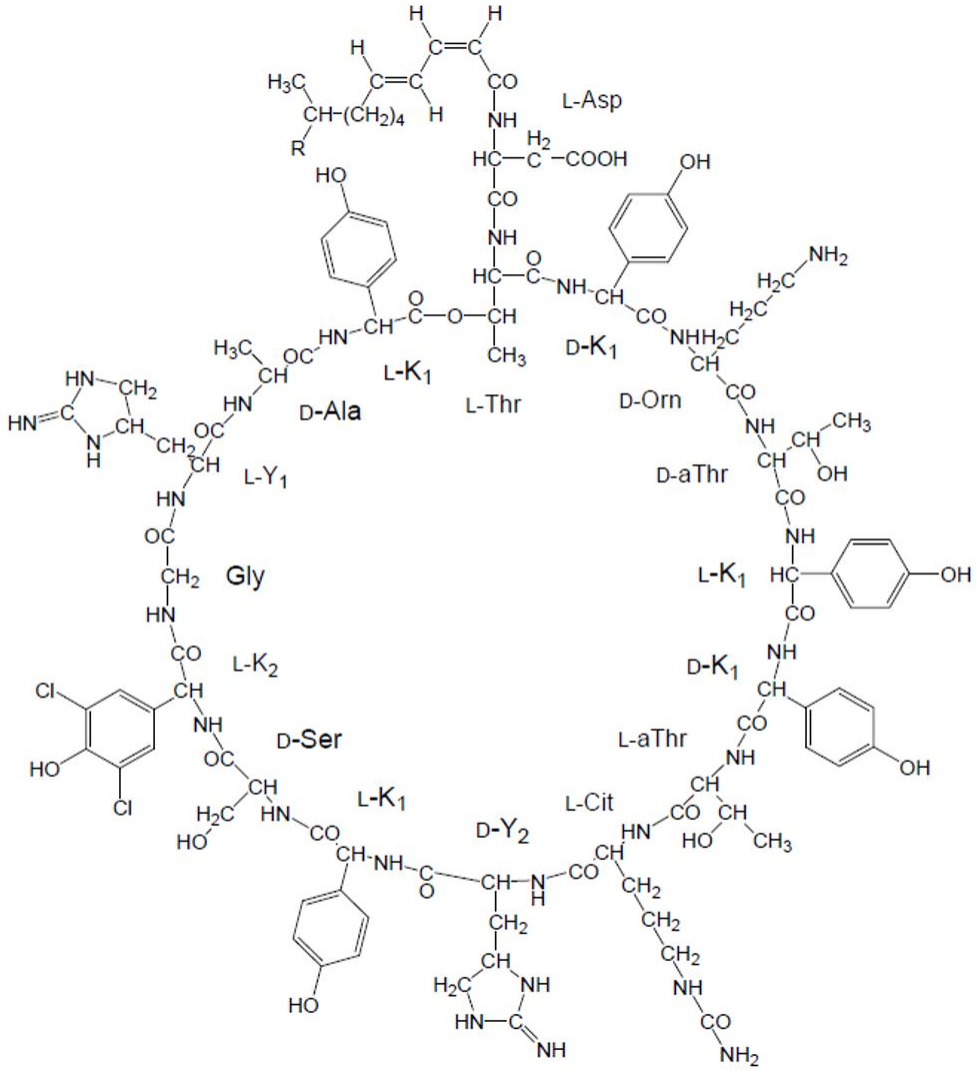
Non-ribosomally synthesized peptides

- Largely produced by bacteria, fungi, and streptomycetes
- Major component of the natural host defense molecules of these species.
- Anti-infective and antitumor antibiotics

Enramycin

Enramycin is a polypeptide antibiotic produced by *Streptomyces fungicidus*

Chemical Structure

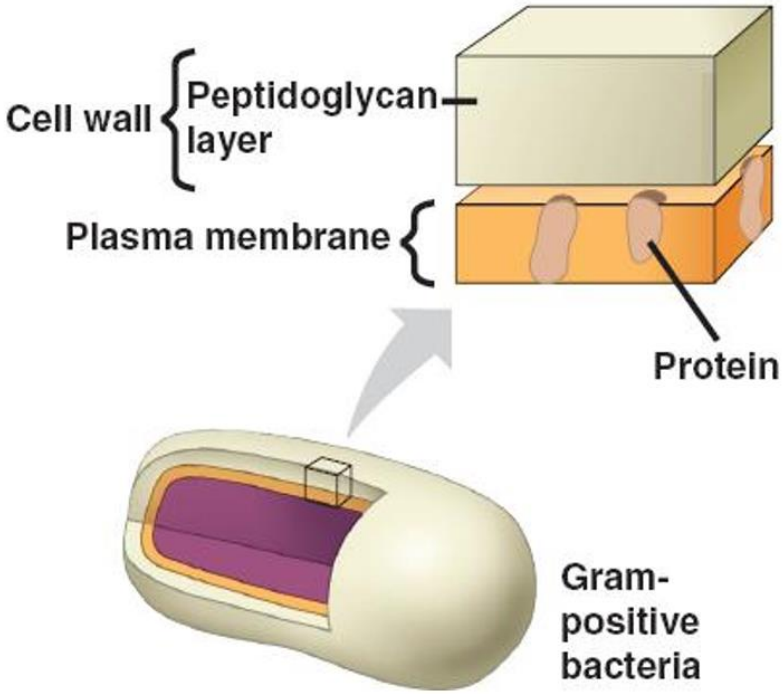


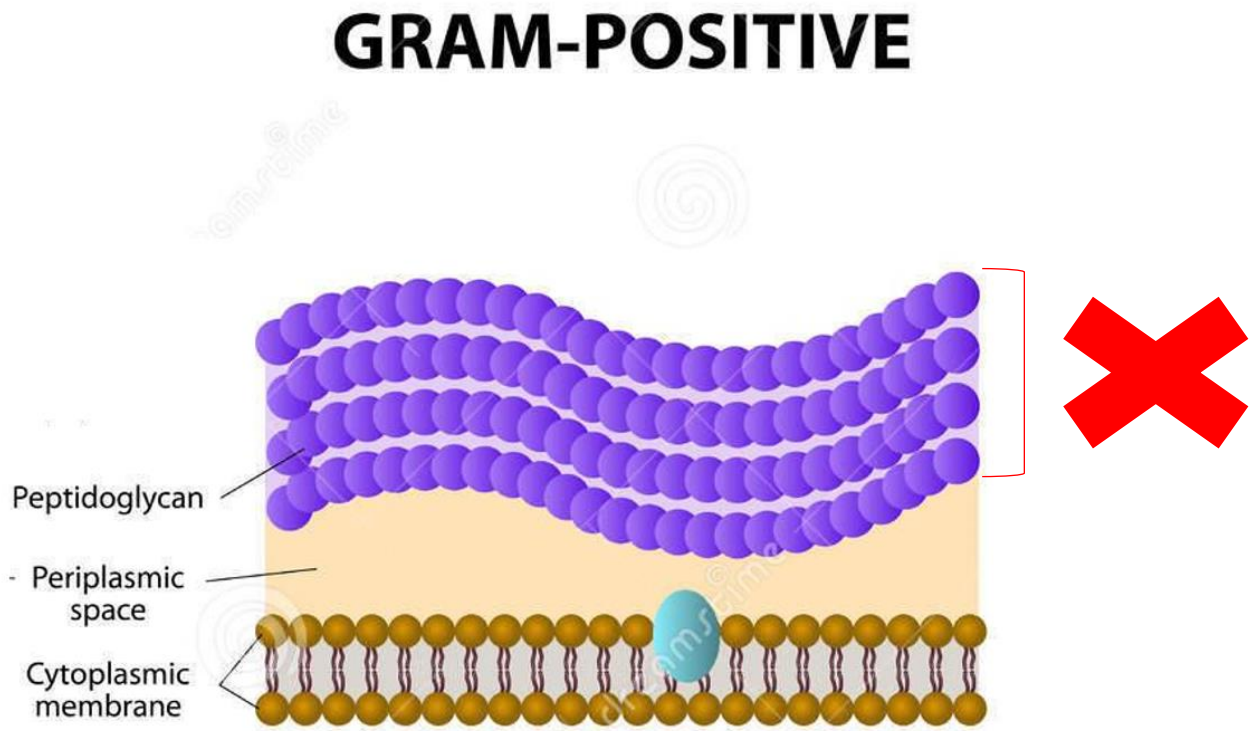
Enramycin

Mechanism of action

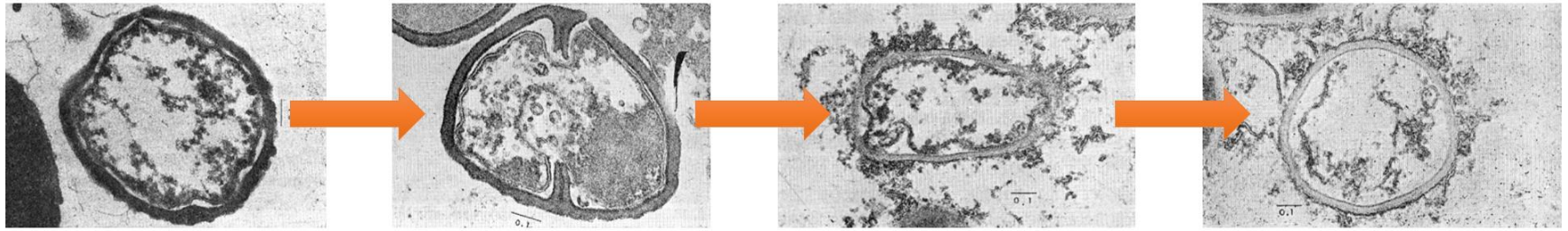
- Acts as a MurG inhibitor involved peptidoglycan synthesis in Gram positive bacteria.
- MurG catalyzes the transglycosylation reaction in the last step of peptidoglycan biosynthesis.
- Inhibition of this step greatly compromises cell wall integrity leading to cell lysis.
- Active within the gastrointestinal tract where it modifies the intestinal flora and maintains the integrity of the gut.

Bacterial Cell Wall





Mechanism of action

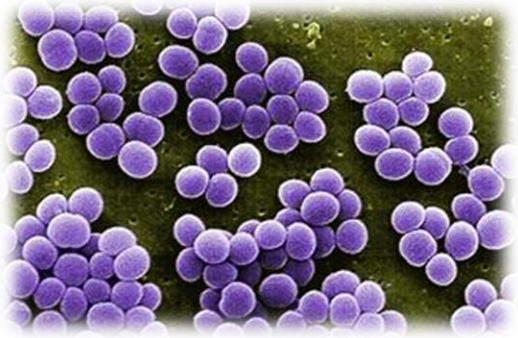


Compromises cell wall integrity leading to cell lysis

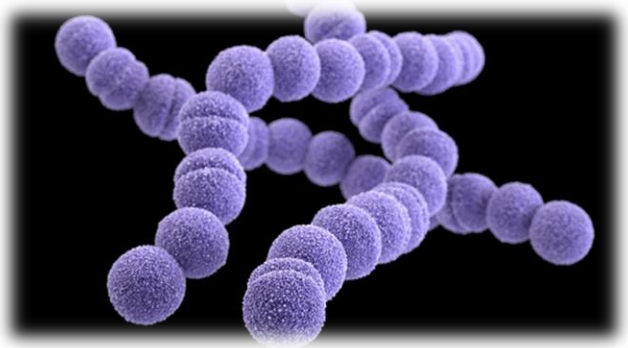
Matsumoto et.al (1973)

Activity Spectrum of Anti-Infectives

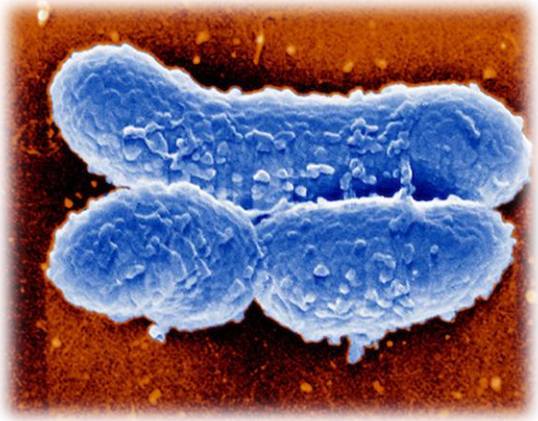
Gram Positive



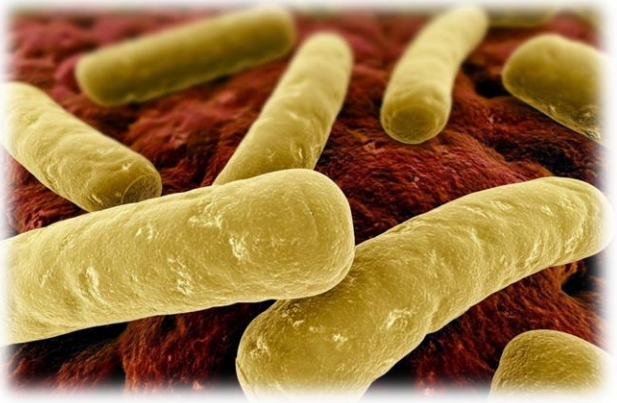
Staphylococci



Streptococci



Corynebacterium



Clostridium

Enramycin

- Not absorbed from the intestinal tract
- High safety margin
- No cross-resistance between enramycin and other available antibiotics
- No detectable residue in tissues

Overview : Benefits of Enramycin

1. Disease Control
2. Performance Improvements
3. Environmental Benefits
4. Other benefits

Disease Control

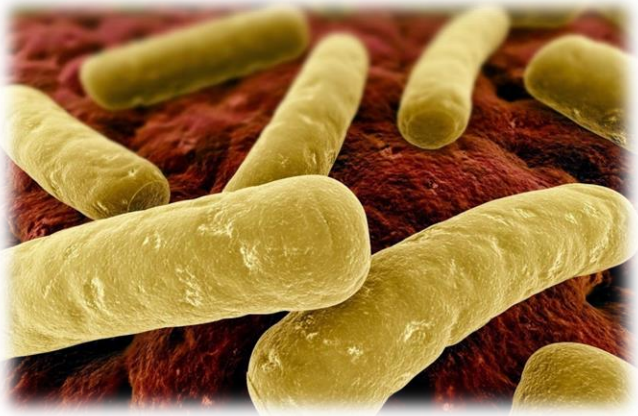
Disease Control

- Necrotic enteritis in poultry
- Clostridial enteritis in piglets
- Swine dysentery

Disease Control
Poultry

Necrotic Enteritis

- Necrotic enteritis (NE) is an enteric bacterial disease of poultry caused by *Clostridium perfringens.*
- Necrotic enteritis in poultry is caused by *Clostridium perfringens type A & C.*
- The disease is characterized by damage to the intestinal mucosa by toxins produced by *Clostridium perfringens.*
- Mild or subclinical form of NE is associated with poor growth and feed utilization.



Clinical Signs & Lesions

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Reduced in feed & water intakes

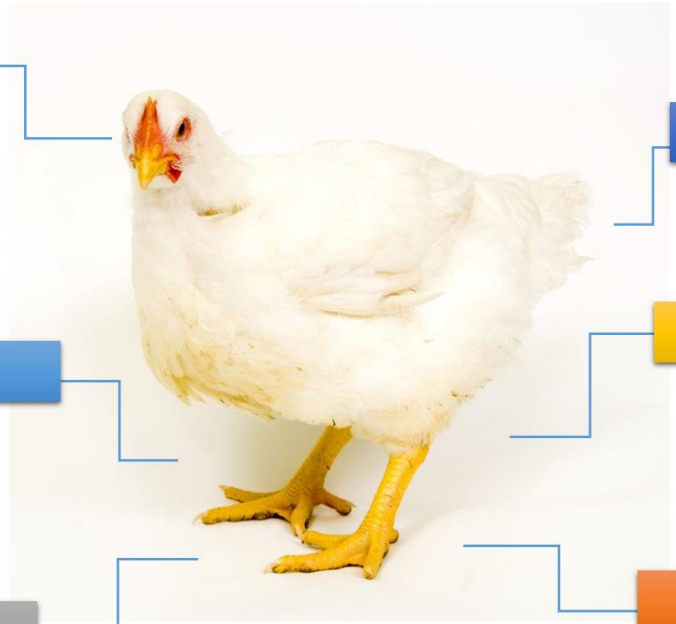
Dull & depressed

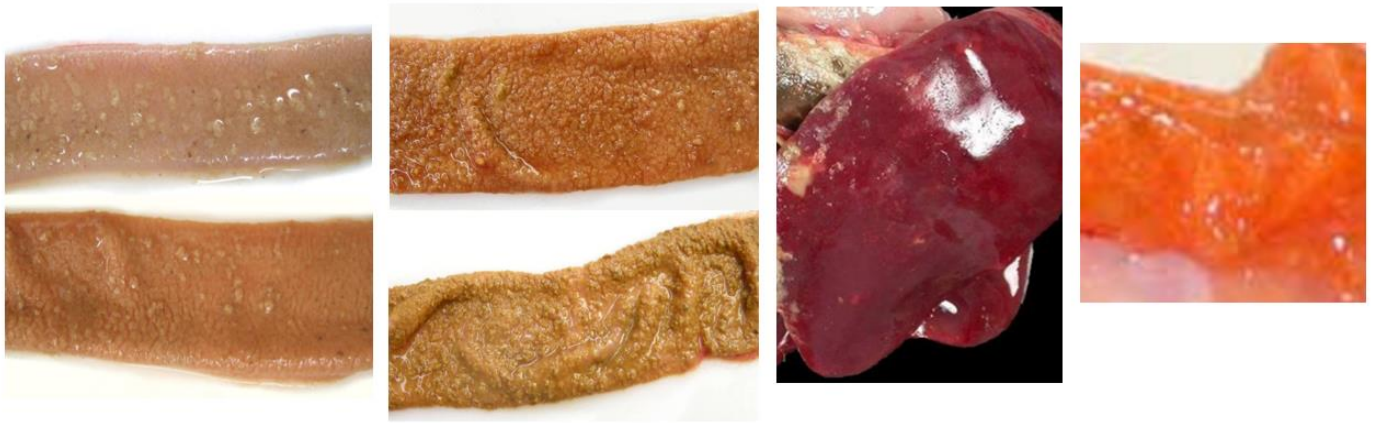
Huddling

Reluctant to move

Ruffled feathers

Diarrhoea





Various Predisposing Factors for Necrotic Enteritis

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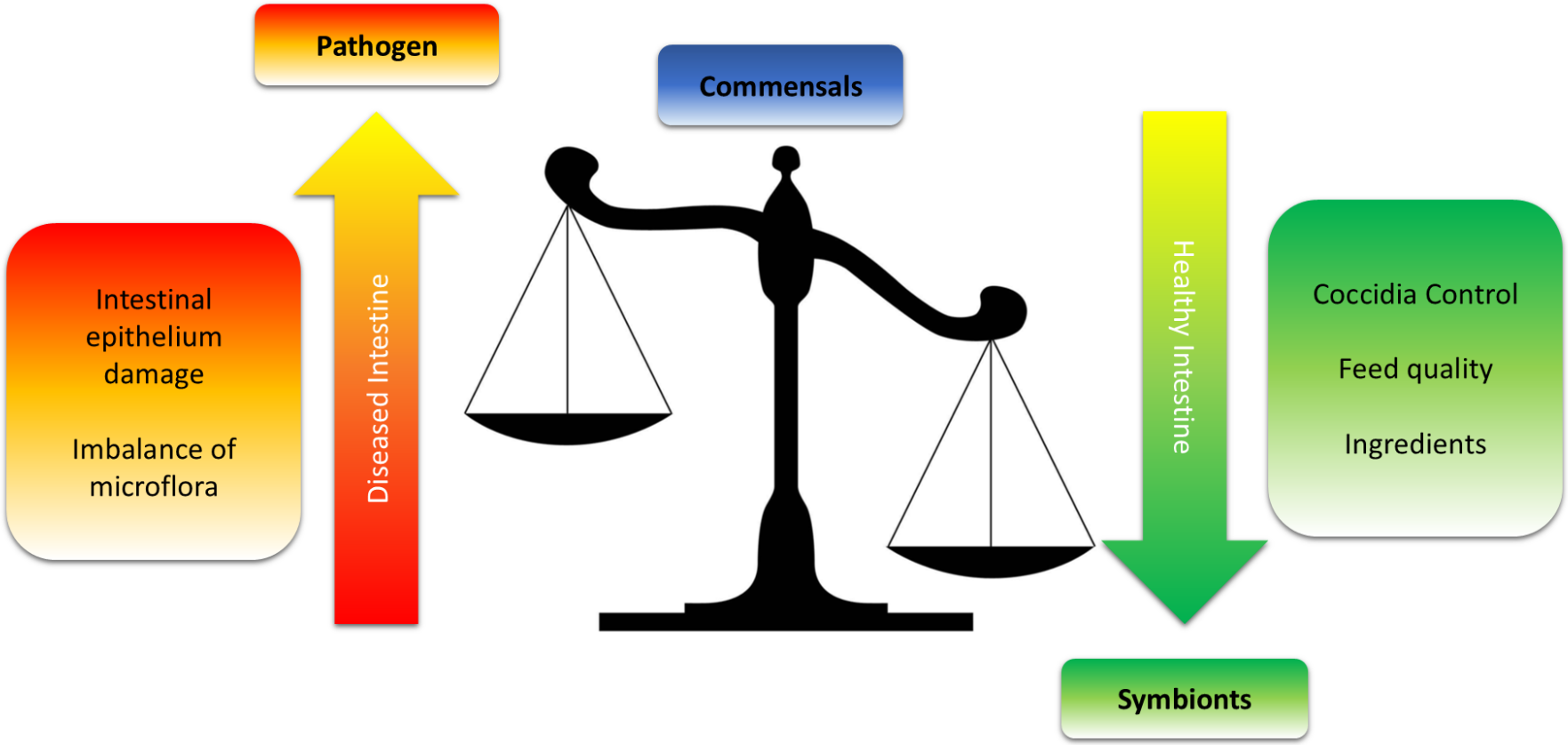
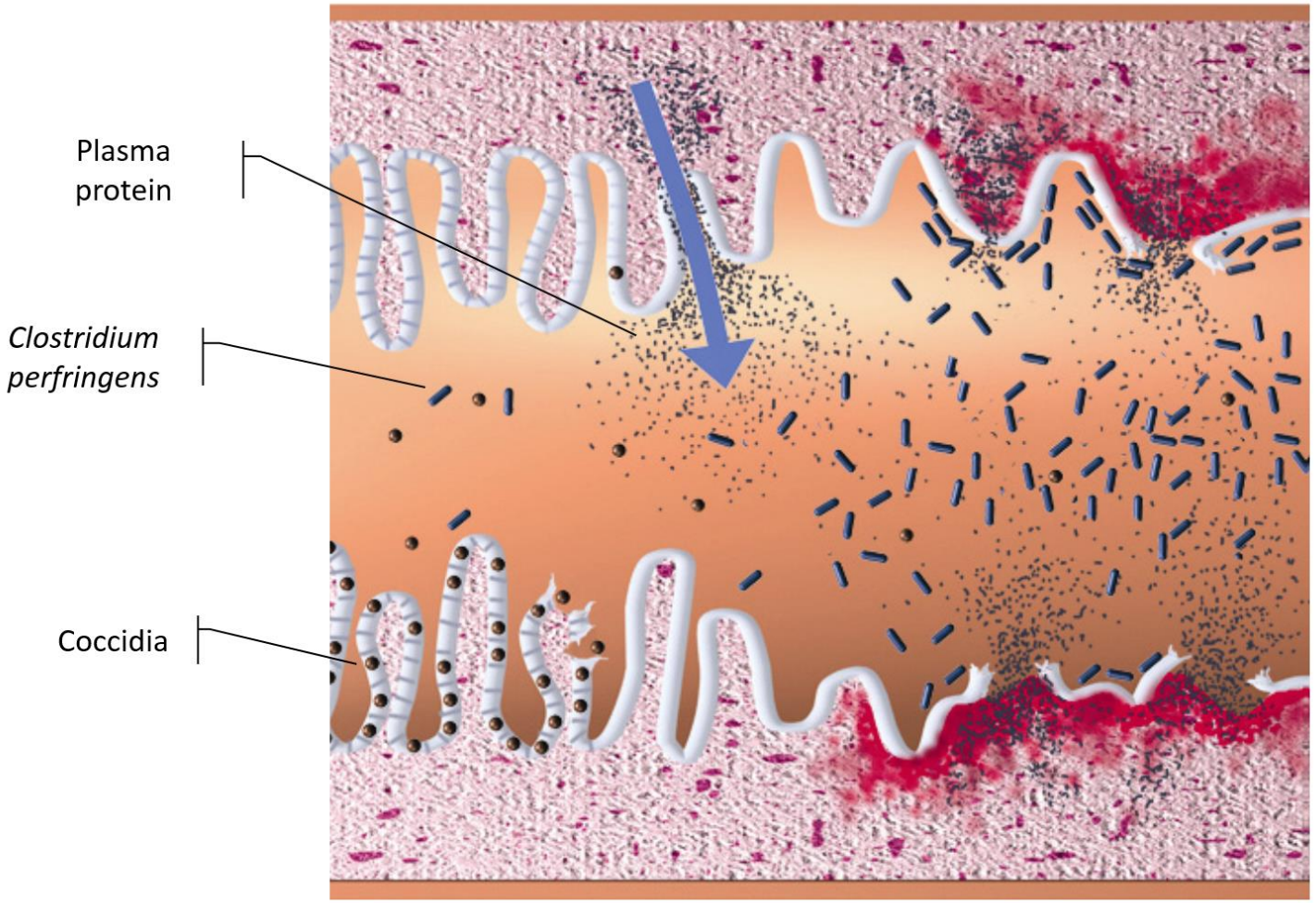
Risk factor	Reference
Infectious	
Coccidiosis (*Eimeria* infection)	Long, 1973; Alsheikhly & Alsaieg, 1980; Baba *et al.*, 1992; Baba *et al.*, 1997; Hofacre *et al.*, 1998a
Immunosuppression	McReynolds *et al.*, 2004b
Non-infectious	
Fish meal	Wijewant & Senevira, 1971b
Barley	Riddell & Kong, 1992; Kaldhusdal & Skjerve, 1996; Annett *et al.*, 2002
Wheat	Branton *et al.*, 1987; Riddell & Kong, 1992; Kaldhusdal & Skjerve, 1996 Annett *et al.*, 2002
Increased digesta viscosity (NSPs)	Kosher, 2003
Lipids	Dahiya *et al.*, 2006
Dietary protein	Truscott & Alsheikhly, 1977; Kaldhusdal & Skjerve, 1996; Drew *et al.*, 2004; Dahiya *et al.*, 2005a; Wilkie *et al.*, 2005;
Managment	
Litter	Cowen *et al.*, 1987; Droual *et al.*, 1994; Williams, 2005; Hermans & Morgan, 2007; Mikkelsen *et al.*, 2009; Palliyeguru *et al.*, 2010

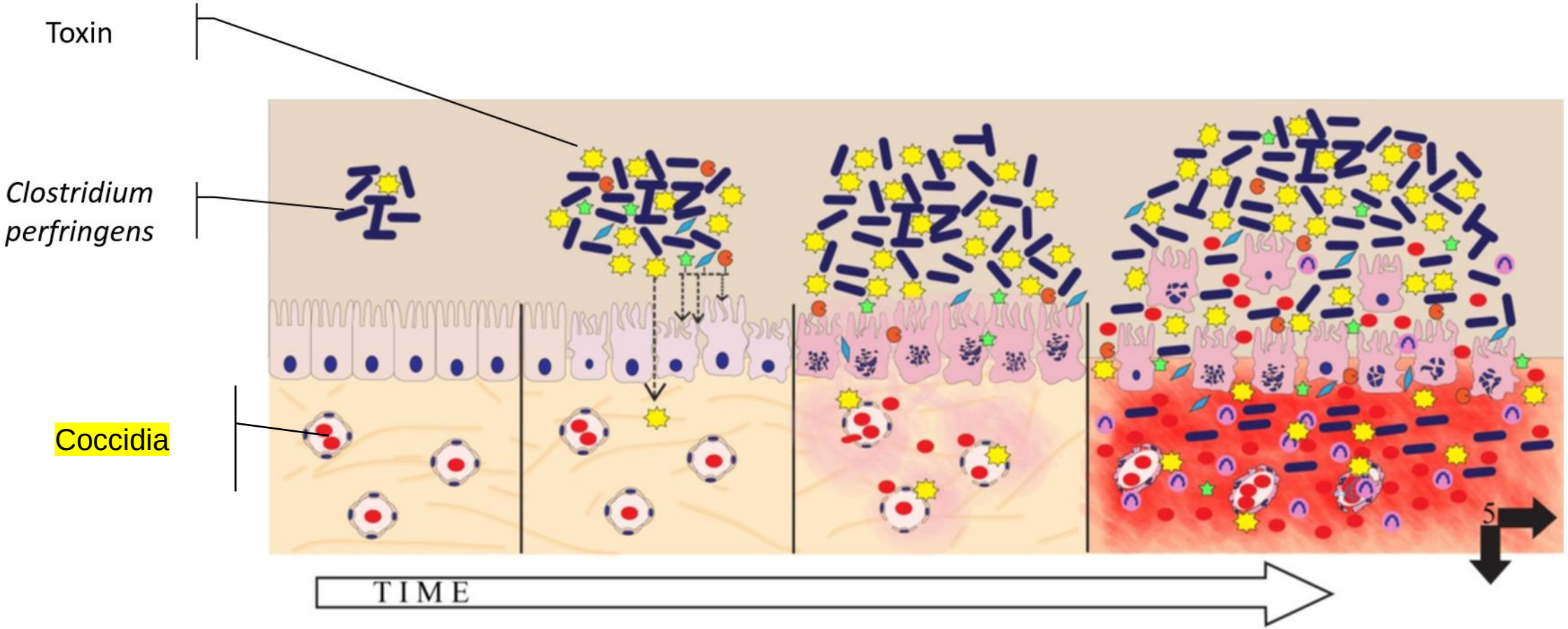
Immunological Equilibrium - Clostridial Enteropathies



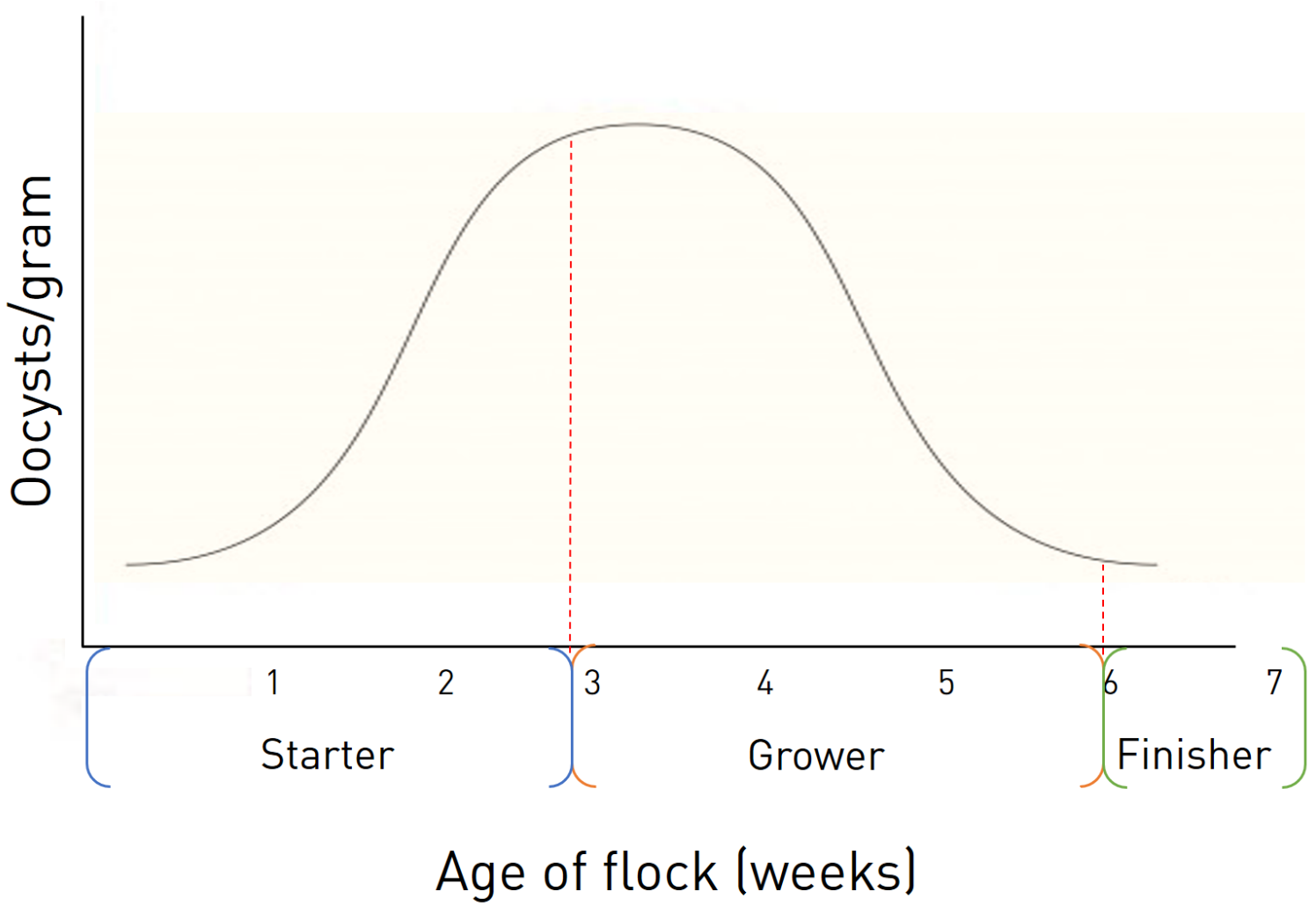
Necrotic enteritis :
Disease Induction & Predisposing Factors



Clostridial Proliferation and Intestinal Instability

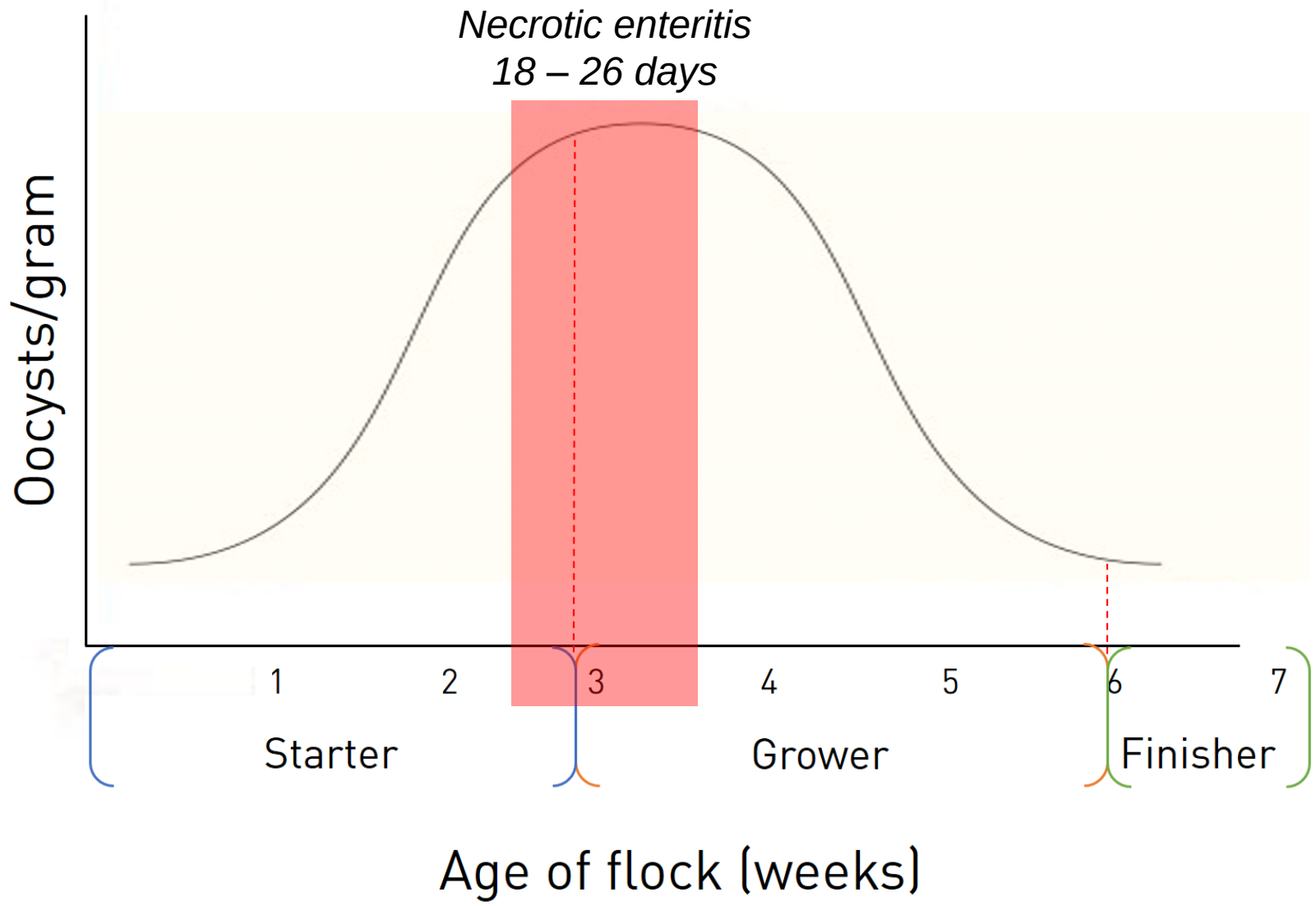


Oocysts per gram of litter by flock age



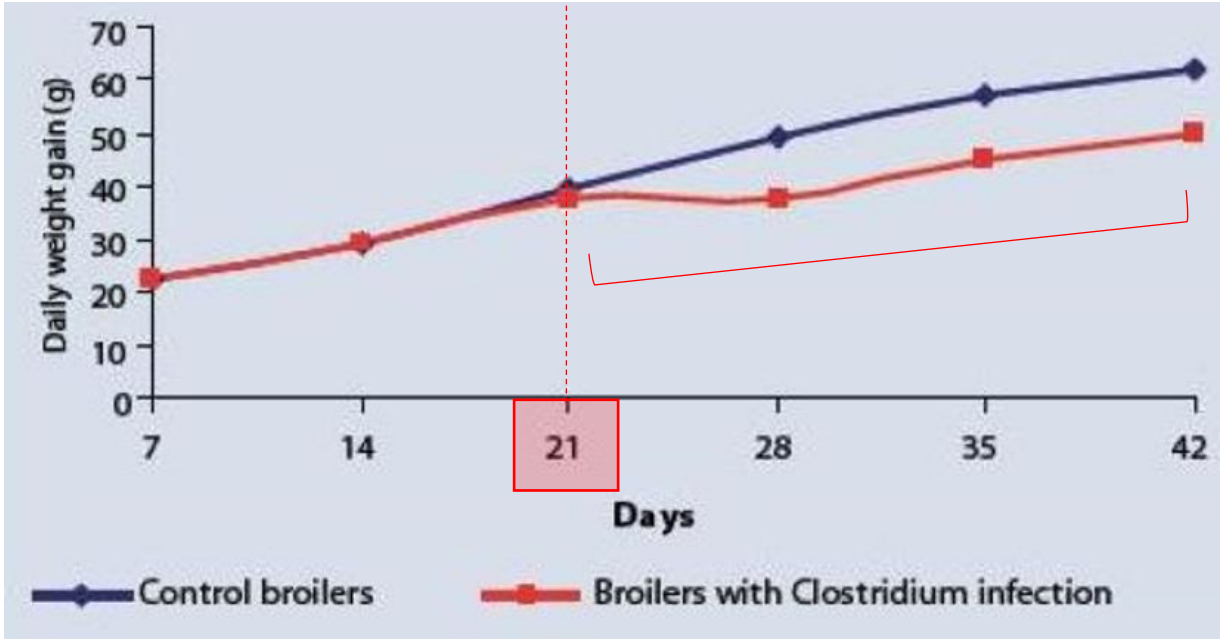
McDougald 1982 as cited by Kling, Hanssens, and Grant (1989)

Oocysts per gram of litter by flock age



McDougald 1982 as cited by Kling, Hanssens, and Grant (1989)

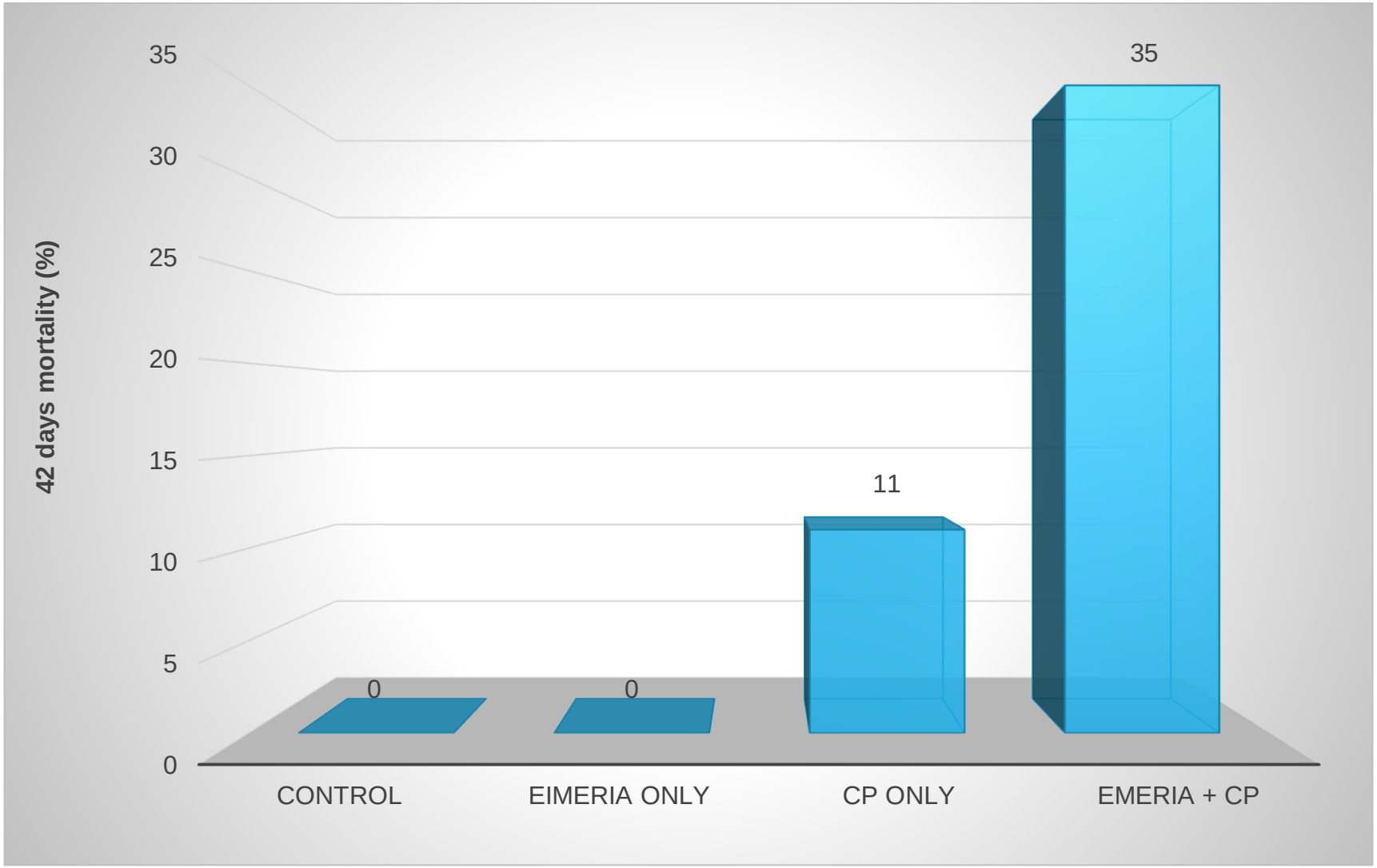
Impact of Clostridial enteritis on the daily gain & performance of broilers



	Mortality	Body weight gain	FCR units
Clinical	Up to 30% of flock		
	3 to 7% of flock		+> 0,7
	+1% versus control	-5%	+0,05 – 0,1
Subclinical	+0,8% versus control	-4%	+0,04 – 0,08

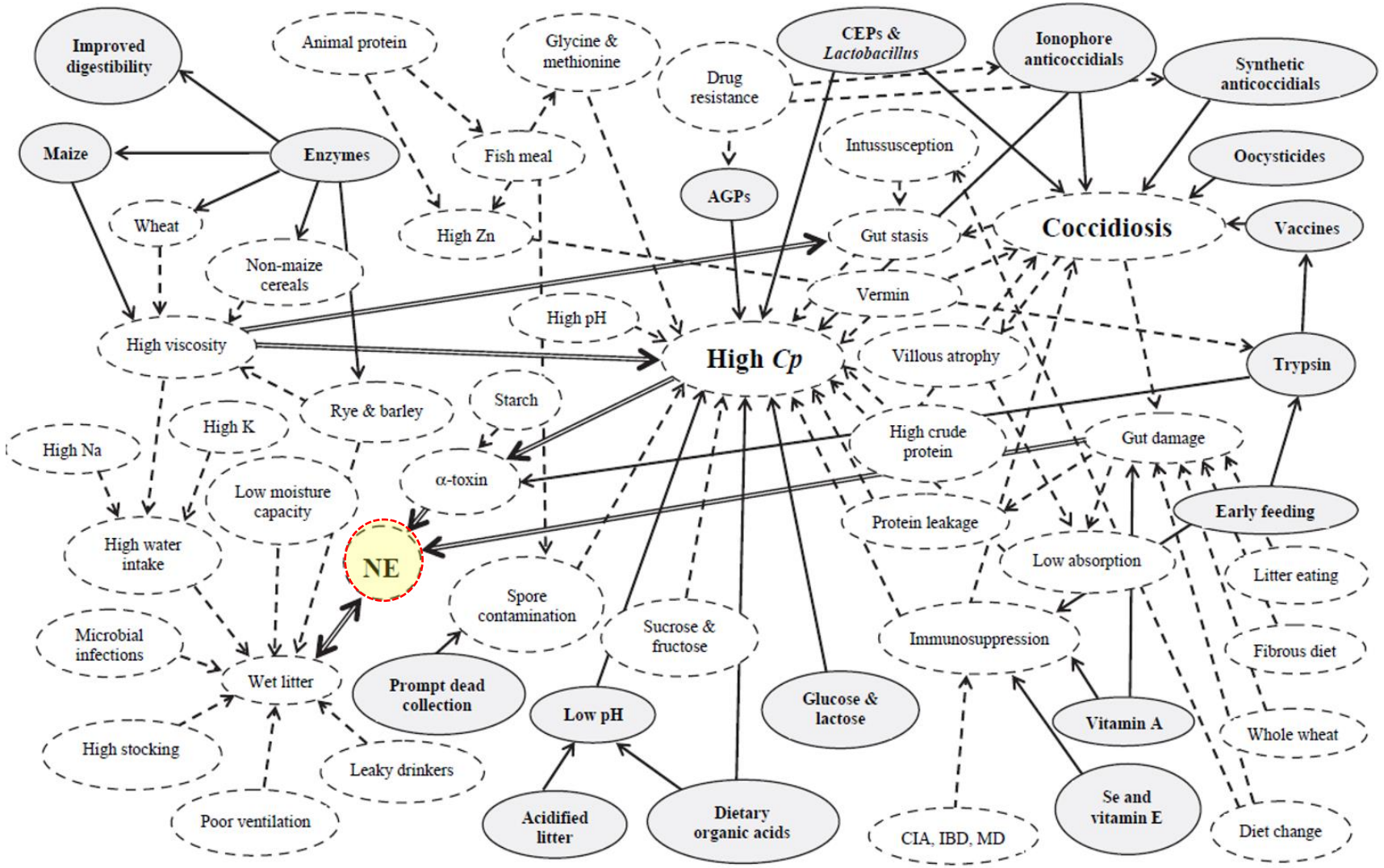
De Smet & Verleyen, International Poultry Production (2010)

Role of coccidiosis in Necrotic Enteritis



Shane et al. (1985)

Predisposing Factors for Necrotic Enteritis



R.B Williams (2005)

2015 Top 10 Broiler Health Issues Surveyed

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Ranking	Philippines	Thailand	Japan	China	Korea	Vietnam	India	Indonesia	Asia
1	CRD	ND	Colibacillosis	AI(LP,HP)	Chick quality	HPAI	CAstV	ND	**CRD**
2	Chick quality	IB	RVR	IB	IB	ND	CRD	AI	**IB**
3	RVR	CRD	BMM	CRD	Lameness (Infectious)	IBD	AI	CRD	**AI**
4	RSS	MG	Metabolic issues	RVR	Cocci	IB	RSS	Gut health	**ND**
5	Gut health	MS	Chick quality	MG	DOA	CRD	IB	RVR	**Chick quality**
6	DOA	IBD	Cocci	MS	Metabolic issues	MG	FAdV	Chick quality	**RVR**
7	IB	Cocci	NE/GD	FAdV	IBD	MS	IBD	Metabolic issues	**Cocci**
8	ND	Lameness (Infectious)	HPAI	Cocci	FAdV	Cocci	Mycotoxin	SMS	**IBD**
9	Lameness (Structural)	FAdV	Lameness (Infectious)	Gut health	NE/GD	Gut health	Cocci	Cocci	**MG**
10	CAV	RVR	IBD	Chick quality	Salmonellosis	Mycotoxin	NE/GD	IBD	**Gut health**

CRD is including colibacillosis, RVR: Respiratory Vaccine Reaction, RSS: Runting and Stunting Syndrome, DOA: Dead On Arrival in slaughter house, BMM: Breast Muscle Myopathy, Metabolic issues include Ascites and SDS

Youngho Hong, Aviagen Inc (2015)

2015 Top 10 Broiler Breeder Health Issues Surveyed

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Ranking	Philippines	Thailand	Japan	China	Korea	Vietnam	India	Indonesia	Asia
1	FC	ND	RT	AI(LP,HP)	RT	HPAI	MD	Metabolic disorder	**IB**
2	SMS	IB	NE/GD	IB	EYP	ND	IB	Gut health	**AI**
3	Cocci	MG	Cocci	Lameness (Infectious)	IB	IB	CAV	EYP	**EYP**
4	Chick quality	MS	Lameness (Infectious)	EYP	HPAI	MG	NE/GD	Lameness (Infectious)	**Cocci**
5	ILT	Gut health	Red mite	Cocci	APV	MS	MG	NE/GD	**Gut health**
6	IC	EYP	EYP	MG/MS	Gut health	FAdV	IBD	Trauma	**MG**
7	Gut health	Cocci	Chick quality	Gut health	MS	APV	ND	Cocci	**NE/GD**
8	NE/GD	Chick quality	Metabolic disorder	APV	REO	CAV	FAdV	FC	**ND**
9	Lameness (Nutrition)	Aspergilllosis	HPAI	MD	Metabolic disorder	Salpingitis	ILT	Parasite	**MS**
10	Parasite	FAdV	FAdV	Salmonellosis	Chick quality	Salmonellosis	Metabolic disorder	IBV	**Lameness (Infectious)**

FC: Fowl Cholera, SMS: Spiking mortality syndrome, IC: Infectious Coryza, NE: Necrotic Enteritis, GD: Gangrenous Dermatitis, EYP: Egg Yolk Peritonitis, FAdV: Fowl Adenovirus, RT: Ruptured Tendon

Youngho Hong, Aviagen Inc (2015)

Disease Control
Swine

Evolution of Piglet Intestinal Flora

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Before Birth

Digestive system is sterile

During Lactation

Small Intestine
- Lactobacillus
- Streptococcus

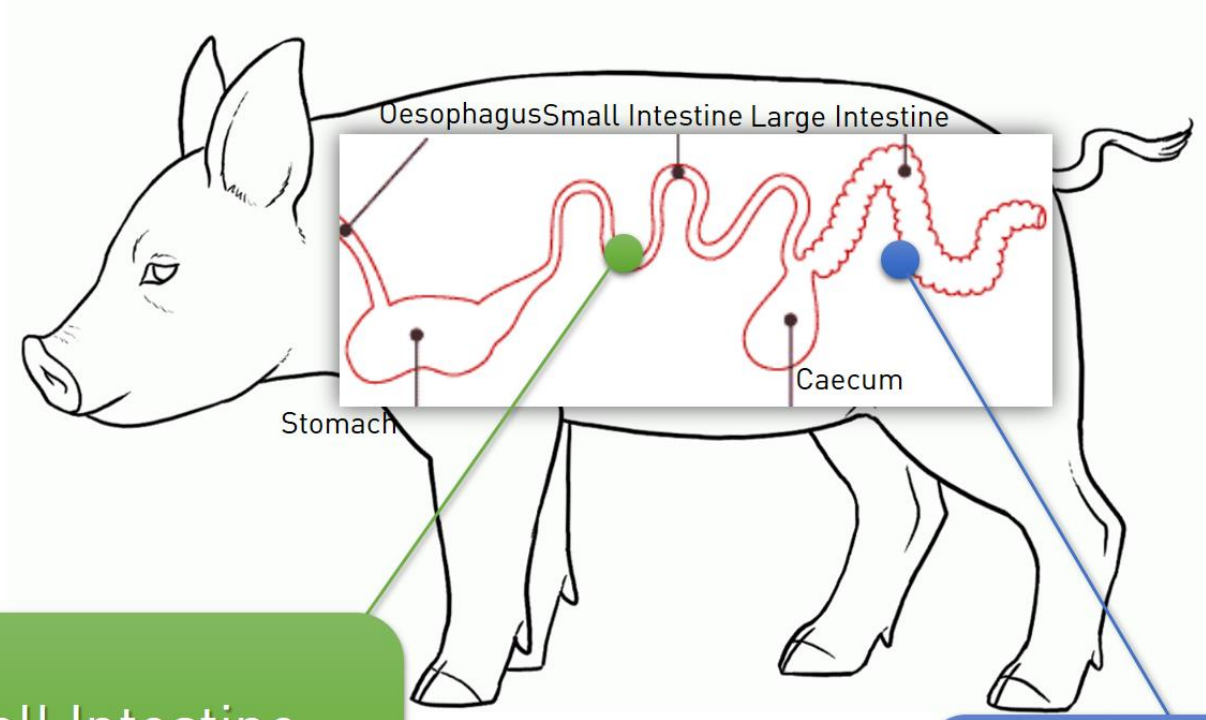
Large Intestine
- Anaerobic Gram positives

After Weaning

Small intestine
- Higher proportion of coliforms

Large Intestine
- Gram negative

Intestinal normal flora takes some time to be 100% balanced and functional



Small Intestine
7 days after weaning

Large Intestine
20 days after weaning

Population of enteric bacterial in the intestine is affected by

1. Nutritional factors
   - Feed and litter contaminated with large numbers of pathogenic enteric bacteria have been convincingly implicated as a source of infection

2. Environmental factors

3. Health status of the gut of the pig

Various Predisposing Factors for Swine Enteric Bacterial Infection

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Non - Infectious

Feed
- Structure and pellet quality
- Palatability
- Formulation and content
- Mycotoxins

Management
- Available feed space
- Available water space
- Distribution of waterers
- Water quality
- Air quality
- Temperature
- Stocking density

Infectious

Viral Agent
- Rotavirus
- Coronavirus
- Circovirus

Bacterial Agent
- Clostridium
- *Brachyspira*
- E.coli

Parasites
- *Cryptosporidium* sp
- *Isospora suis*
- *Trichuris suis*

Non-infectious Diarrhea

- Inflammation without pathogen detection

- Disruption in the intestinal
  - Diet change
  - Diets ingredient change
  - Water quality
  - Mineral levels or mycotoxins

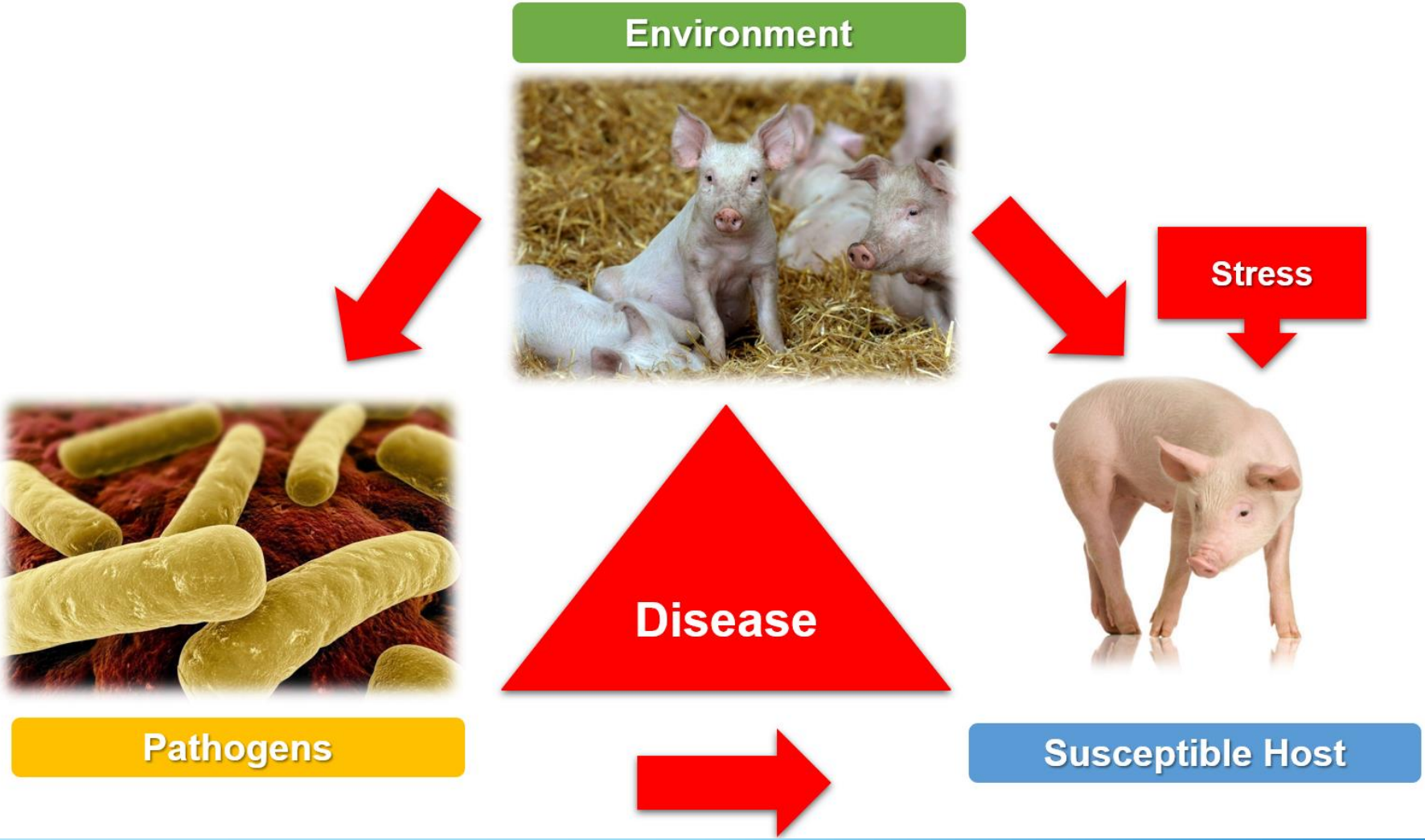
Epidemiology of Enteric Bacterial Infection

Transmission of infection between pigs and the environment

Transmission of enteric bacteria from sows to their progeny

External vectors in transmission of enteric bacteria

Pathogenesis of Disease: Interactions Between Pathogens, Host, and Environment



The Main Causes Of Piglet Diarrhoea

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	Early Period Days		Late Period Days		Mortality Level
	0-3	3-7	7-14	15-21	
Agalactia	●	●	●	●	Moderate
Clostridia	●	●	●		High
Coccidiosis		●	●	●	Low
Colibacillosis	●	●	●		Moderate
PED	●	●	●	●	Low
PRRS	●	●	●	●	Variable
Rotavirus			●	●	Low
TGE	●	●	●	●	High

Muirhead et al (1997)

Age Distribution of Diarrheal Diseases in Pigs
Enteric Bacterial Disease

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	Age Group		
	Nursing	Weaning	Growing Finishing Breeding
Clostridium difficile enteritis	⇧⇧⇧	⇧	⇧
Clostridium perfringens type A enteritis	⇧⇧	⇧	-
Clostridium perfringens type C enteritis	⇧⇧	-	-
Enteric colibacillosis	⇧⇧⇧	⇧⇧⇧	-
Intestinal spirochetosis	-	⇧⇧	⇧⇧⇧
Porcine proliferative enteritis	-	⇧⇧	⇧⇧⇧
Salmonella enteritis	⇧	⇧⇧	⇧⇧⇧
Swine dysentery	⇧	⇧⇧	⇧⇧⇧

D.L.H. Harris (2013)

[-] Rare or does not occur [⇧] Uncommon [⇧⇧] Common [⇧⇧⇧] Very common

Impact on Animal Performance

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- Reduced in feed & water intakes
- Underweight
  Poor growth
  Take longer to wean
- Loss of appetite and condition
  Dehydration

- Dull & depressed
  Abdominal discomfort
- Poor feed conversions
  Uneven growth rates
- Diarrhoea

Clinical Findings

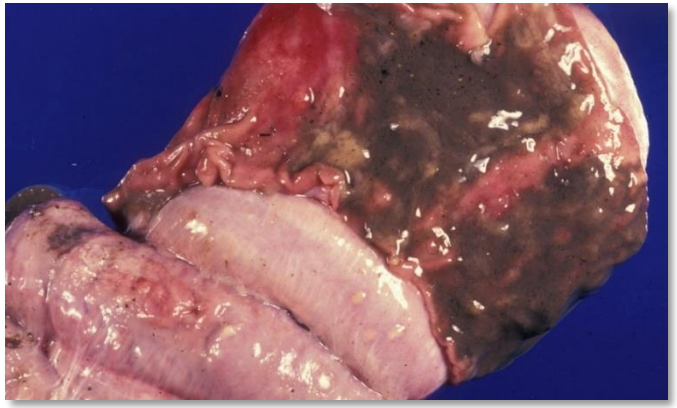




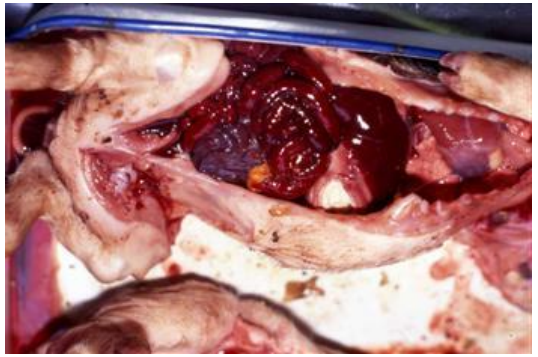

Clinical Findings

Porcine proliferative enteritis

Catarrhal Colitis



Swine Dysentery



Clostridium perfringens type C enteritis

Clostridium perfringens type A enteritis

Porcine proliferative enteritis

Important Pig Diseases in SEA

Table 6. Important pig diseases currently endemic in Southeast Asia.

Diseases and pathogen	Transmissible	Diseases and pathogen	Transmissible
Enzootic Pneumonia	Zoonose	Epidemic Diarrhea	
Pasteurellosis		Transmissible gastroenteritis	
Porcine Pleuropneumonia		Round Worm	
Bordetella		Oesophagostomiasis	
Atrophic Rhinitis		Leptospirosis	Zoonose
Porcine Respiratory Coronavirus		Brucellosis	Zoonose
Swine influenza	Zoonose	Parvovirus	
Glassers Disease		Porcine Reproductive and Respiratory Syndrome	
Streptococcus meningitis	Zoonose	Erysipelas	
Lungworm		Tuberculosis	Zoonose
Colibacillosis	Zoonose	Exudative Epidermitis	
Oedema Disease		Mange	
Salmonellosis	Zoonose	Encephalomyocarditis	Zoonose
Rotavirus		Nipah Encephalitis	Zoonose
Coccidiosis		Foot and Mouth Disease	
Swine Dysentery		Swine Versicular Disease	Zoonose
Spirochaetal diarrhoea	Zoonose	Pseudorabies	
Proliferative Enteropathy		Classical Swine Fever	
		Japanese Encephalitis	Zoonose

Source: Cameron (2000).

Performance Improvements

Performance Improvements

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Poultry

- Prevents necrotic enteritis in poultry.
- Has been shown to treat necrotic enteritis in broilers.
- Significantly reduces environmental loading of excreta and nitrogen.
- Increased rate of bodyweight gain.
- Lower feed requirements for each unit of gain.

Environmental Benefits

Environmental Benefits

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Reduced nitrogen excretion (all species)

Increase the efficiency of nutrient utilisation, improving retention of N and P and decreasing excretion when nutrient intake matches requirements.

1. Decrease microbial degradation of essential amino acid
2. Improve absorption, enabling amino acid utilisation
3. Reductions in nitrogen excretion.
4. Ammonia gas emission from the manure was markedly decreased by feeding these lower-protein diets

Other Benefits

Other Benefits

- Protein sparing
- Energy sparing
- Improved mineral absorption
- Improved immune status
- Drier litter and reduced foot problems

Production and Economic Impacts

The Real Silent Performance Killer

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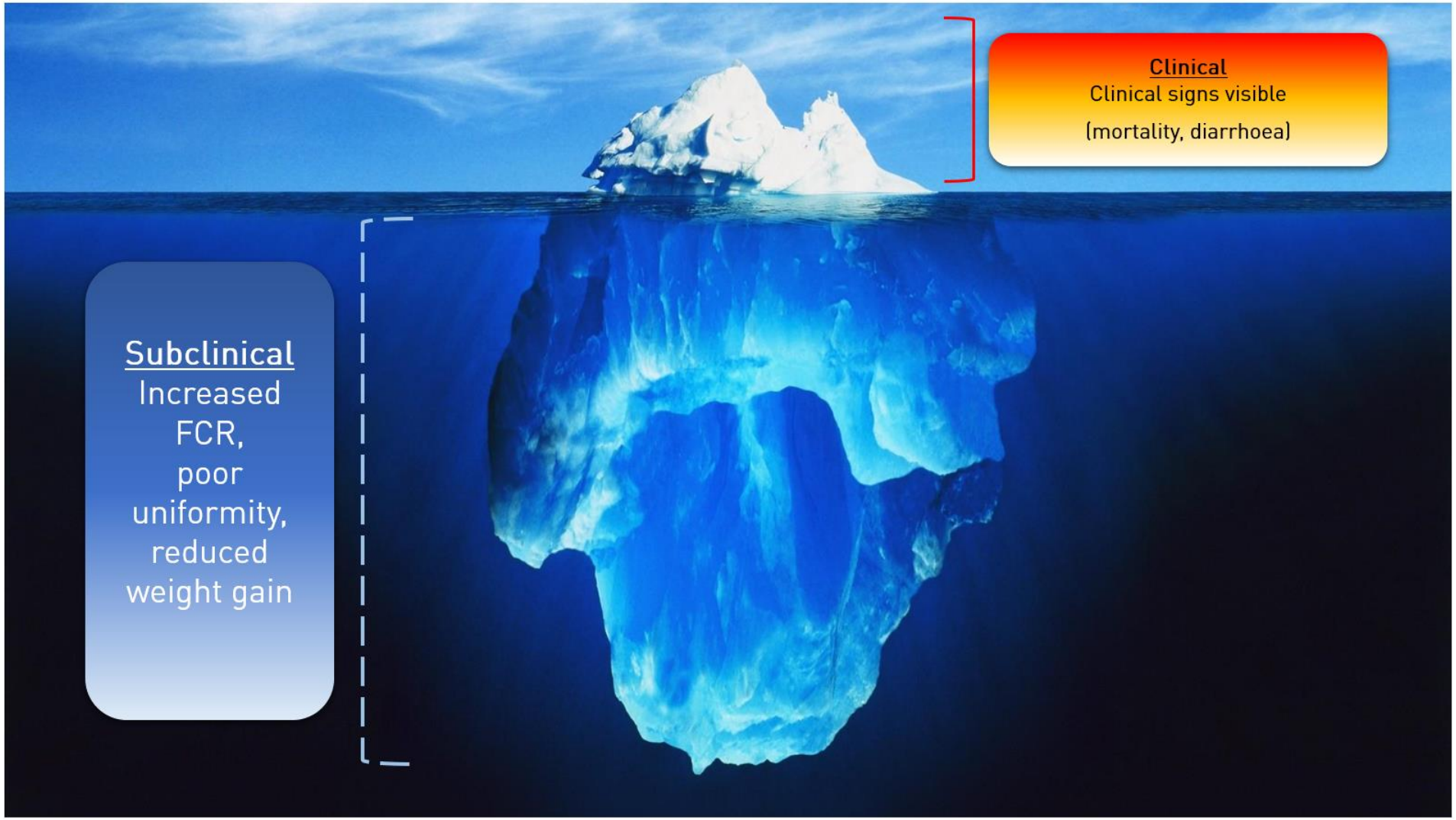

Impact on Poultry Performance

- High mortality rate : up to 30% of the flock.

- Subclinical level:
  - FCR to increase with 6-9 points & final bodyweight to reduce between 3-5%

- Annual losses to producers due to subclinical NE:
  - Est. US$0.015 cent to US$0.05 cent per birds (2000)

Verleyen, World Poultry (2010)

Economical Importance in Poultry Industry

- NE occurs worldwide and causes considerable financial losses to poultry producers due to mortality and treatment cost.

- Producer often adopt the figure of USD 0.05 per chick derived from a USD 2 billion loss on a worldwide scale estimated in 2000.

- Since then, parameter have changed, as have the true costs of NE, would come closed to US$6 billion in 2015.

- A later study found that the cost was closer to US$0.625 per bird.

Due to:

1. Increased mortality.
2. Increased feed conversion ratio.
3. Decreased weight gain.

Wade & Keyburn, World Poultry (2015)

Production and Economic Impacts of Swine Enteric Bacterial Infection

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Subclinical infections

- Diarrhoea is rarely observed in pigs sub-clinically affected with bacterial infections
- Decreased feed intake
- Reduce pig weights or weight gains
- Variation in pig weights (increased in infected pigs relative to non-infected pigs)
- Reductions in ADG and increased FCR
- The economic impact of sub-clinical infection is difficult to estimate because many producers are unaware that sub-clinical infection is present in their herd.

Production and Economic Impacts of Swine Enteric Bacterial Infection

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Enteric bacterial infections occur worldwide and causes considerable financial losses to swine producers due to morbidity, mortality and treatment cost.

Due to:

1. Increased mortality.
2. Increased feed conversion ratio.
3. Decreased weight gain.

	Sow infected	Nursing/Grower/Finisher	
		Morbidity	**Mortality**
Swine dysentery	Up to 25%	75 - 90%	25 - 30%
Clostridium difficile enteritis		7 - 10%	Up to 50%
Clostridium perfringens type A enteritis		> 90%	< 1%
Porcine proliferative enteritis		10 - 15%	50%
Intestinal Spirochetosis		5 - 15%	1 - 2%

Summary

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Benefits in poultry

- Improves liveweight gain and feed conversion efficiency of broilers.
- Prevents necrotic enteritis in broilers and caged birds.
- Has been shown to treat necrotic enteritis in broilers.
- Significantly reduces environmental loading of excreta and nitrogen.

Summary

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Benefits in pigs

- Improves the growth rate and feed conversion efficiency of treated pigs.
- Treatment of pregnant sows decreased the incidence and severity of clostridial enteritis in their piglets.
- Treated sows lose less weight and wean greater numbers of heavier piglets.
- Controls swine dysentery (SD) in growing-finishing pigs.

What is a veterinary feed directive (VFD)?

FDA – Veterinary Feed Directive (VFD)

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What is a veterinary feed directive?

In United States agricultural policy, a Veterinary Feed Directive (VFD) is

- a written statement that authorizes the owner or caretaker of animals to obtain and use animal feed containing VFD drugs to treat their animals
- in accordance with the FDA-approved directions for use.

FDA – Veterinary Feed Directive (VFD)

What is a VFD drug?

A VFD drug is

- intended for use in animal feeds
- VFD drug is permitted only under the professional supervision of a licensed veterinarian.

FDA – Veterinary Feed Directive (VFD)

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Over-the-counter medicine

- Is also known as OTC or non-prescription medicine

- Refer to medicine that you can buy without a prescription
- They are safe and effective when you follow the directions on the label and as directed by your health care professional

FDA – Veterinary Feed Directive (VFD)

National Grain and Feed Association

FDA's Antimicrobial Resistance Policies and the Veterinary Feed Directive

Impacts on Medicated Feed

July 2016

FDA – Veterinary Feed Directive (VFD)

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Unaffected by FDA proposals

Animal use only

Drugs used exclusively in animals:

- Ionophores
- Polypeptides
- Carbadox
- Bambermycin
- Pleuromutilin

Human use only

Drugs used exclusively in humans:

- Daptomycin
- Glycylcyclines
- Mupirocin
- Mycobacterium anti-infectives

Affected by FDA proposals

Shared use

Drugs deemed "important for human medicine" and used by both animals and humans, such as:

- Penicillins
- Cephalosporins
- Quinolones
- Fluoroquinolones
- Tetracyclines
- Macrolides
- Sulfas
- Glycopeptides
- Others

Therapeutic uses
(still allowed under veterinary supervision)

Treat animals diagnosed with an illness

Control the spread of illness in a herd

Prevent illness in healthy animals when exposure is likely

Production uses
(No longer allowed)

Enhance growth or improve feed efficiency

OIE List of Antimicrobial Agents of Veterinary Importance

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ANTIMICROBIAL AGENTS (CLASS, SUB-CLASS, SUBSTANCE)	SPECIES	Specific comments	VCIA	VHIA	VIA
POLYPEPTIDES					
Enramycin	Avian, Swine, Bovine, Rabbit, Ovine	Bacitracin is used in the treatment of necrotic enteritis in poultry. This class is used in the treatment of septicaemias, colibacillosis, salmonellosis, and urinary infections.		X	

VCIA: Veterinary Critically Important Antimicrobial Agents
VHIA: Veterinary Highly Important Antimicrobial Agents
VIA: Veterinary Important Antimicrobial Agents

Maximum Residue Limits (MRLs) and Risk Management Recommendations (RMRs) for Residues of Veterinary Drugs in Foods

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CODEX ALIMENTARIUS
INTERNATIONAL FOOD STANDARDS

Food and Agriculture Organization of the United Nations
World Health Organization

E-mail: codex@fao.org - www.codexalimentarius.org

Maximum Residue Limits (MRL)

Abamectin
Albendazole
Amoxicillin
Ampicillin
Avylamycin
Azaperone
Benzylpenicillin/Procaine benzylpenicillin
Carazolol
Ceftiofur
Chlortetracycline/Oxytetracycline/Tetracycline
Clenbuterol
Closantel
Colistin
Cyfluthrin
Cyhalothrin
Cypermethrin and alpha-cypermethrin
Danofloxacin
Deltamethrin
Derquantel
Dexamethasone
Diclazuril
Dicyclanil
Dihydrostreptomycin/Streptomycin
Diminazene
Doramectin
Emamectin benzoate
Eprinomectin
Erythromycin
Estradiol-17beta
Febantel/Fenbendazole/Oxfendazole
Fluazuron
Flubendazole
Flumequine
Gentamicin
Imidocarb
Isometamidium
Ivermectin
Lasalocid sodium
Levamisole
Lincomycin
Lufenuron
Melengestrol acetate
Monensin
Monepantel
Moxidectin
Narasin
Neomycin
Nicarbazin
Phoxim
Pirlimycin
Porcine somatotropin
Progesterone
Ractopamine
Sarafloxacin
Spectinomycin
Spiramycin
Sulfadimidine
Teflubenzuron
Testosterone
Thiabendazole
Tilmicosin
Trenbolone acetate
Trichlorfon (Metrifonate)
Triclabendazole
Tylosin
Zeranol

E →

Enramycin Residue Studies

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Animal	Poultry			Swine		
ppm	0	20	100	0	20	100
Withdrawal period	0	0	0	0	0	0
Tissues	-	-	-	-	-	-
Blood	-	-	-	-	-	-
Muscle	-	-	-	-	-	-
Liver	-	-	-	-	-	-
Kidney	-	-	-	-	-	-
Spleen	-	-	-	-	-	-
Fat	-	-	-	-	-	-

Fujitani (1976)

ZAMIVET 80

80g/1kg enramycin

What is ZAMIVET80?

Is highly effective in controlling Necrotic Enteritis caused by *Clostridium perfringens*.

ZAMIVET 80 consistently and reliably increases rate of weight gain and improves the efficiency of feed utilization.

Active Constituent : 80g/1kg enramycin

Why Use ZAMIVET80?

ZAMIRA® AUSTRALIA

- Highly effective for use in pigs and poultry as prevention and control of a range of enteric diseases
- Acts in very low inclusion level
- Not absorbed in the gut
- Promotes a healthy gastrointestinal tract, resulting in improved performance
- Reducing ammonia levels in the intestinal contents and blood
- No history of resistance
- High safety margin
- No antibiotic residue issues in meat
- Synergist effects when used with other antimicrobials & anticoccidials
- Stable during the pelleting process and in feeds
- Not used in human therapy

Increase profits with ZAMIVET80

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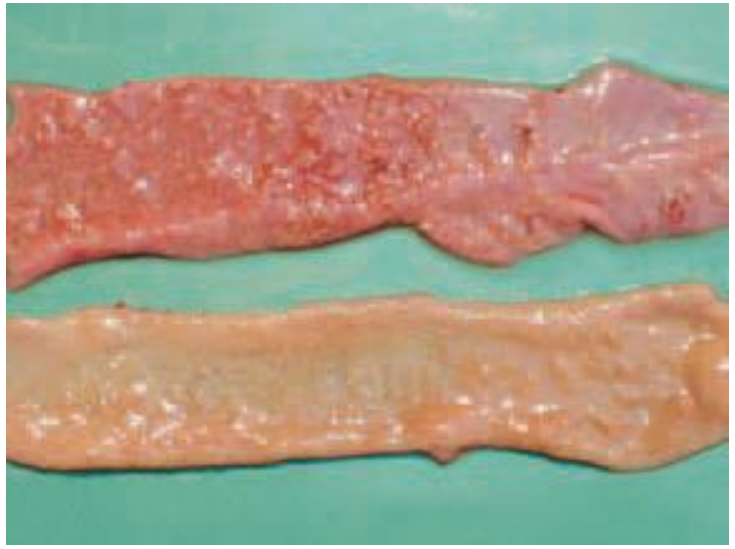
Swine

- Increase piglet weaning weight
- Increase piglets weaned per sow
- Reduce sow weight loss during lactation
- Increase growth in grower/finisher pigs
- Improve feed conversion efficiency

Poultry

- Increase egg production from layers
- Increase growth from broilers
- Reduced mortality
- Improve feed conversion efficiency

Indications - Poultry







For prevention and control of Necrotic Enteritis in poultry caused by *C. perfringens* (Types A and C).

Indications - Swine





For prevention and control of *Brachyspira hyodysenteriae* and *Clostridium perfringens* in pigs

Usage

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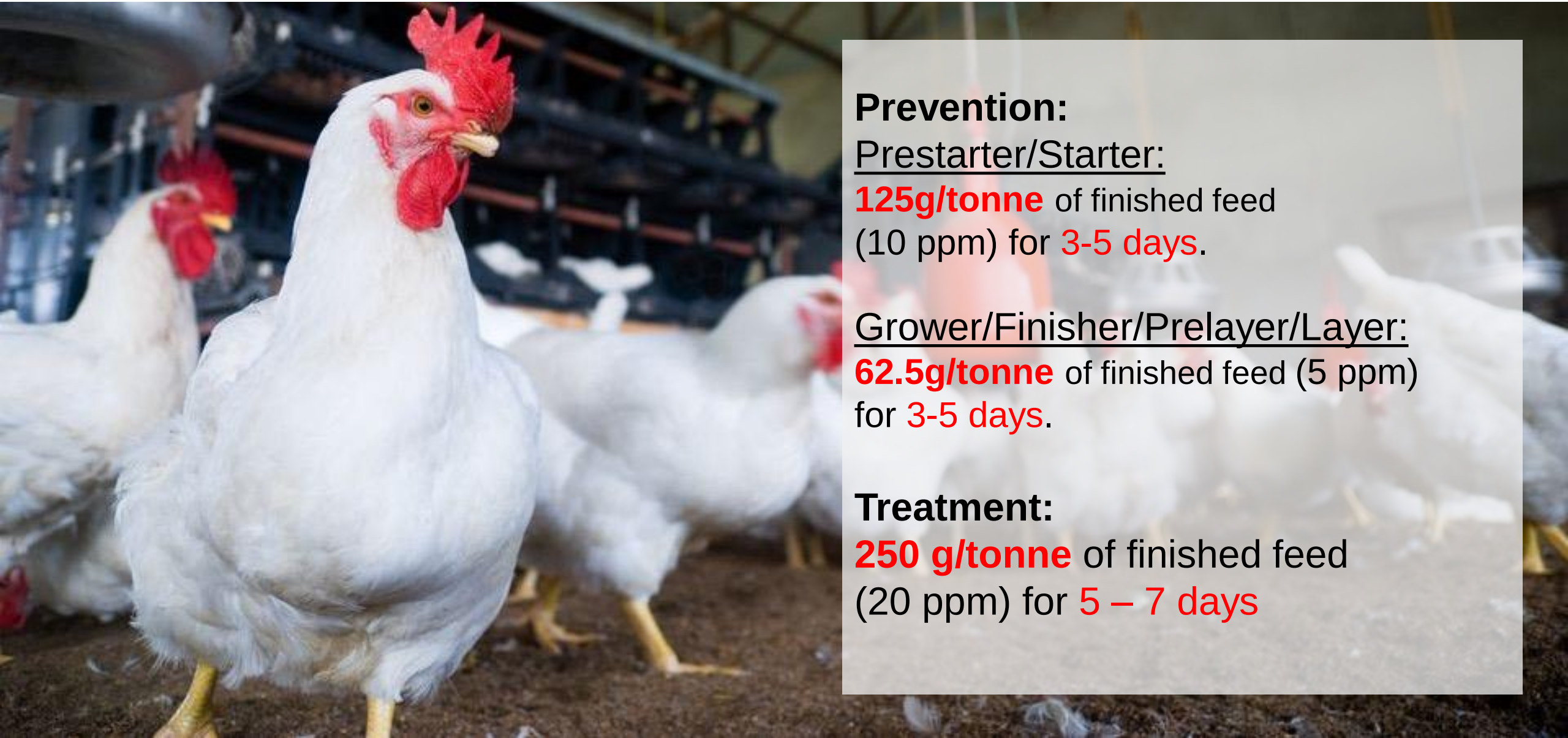

Prevention:

Prestarter/Starter:

125g/tonne of finished feed (10 ppm) for 3-5 days.

Grower/Finisher/Prelayer/Layer:

62.5g/tonne of finished feed (5 ppm) for 3-5 days.

Treatment:

250 g/tonne of finished feed (20 ppm) for 5 – 7 days

Usage – Poultry Program

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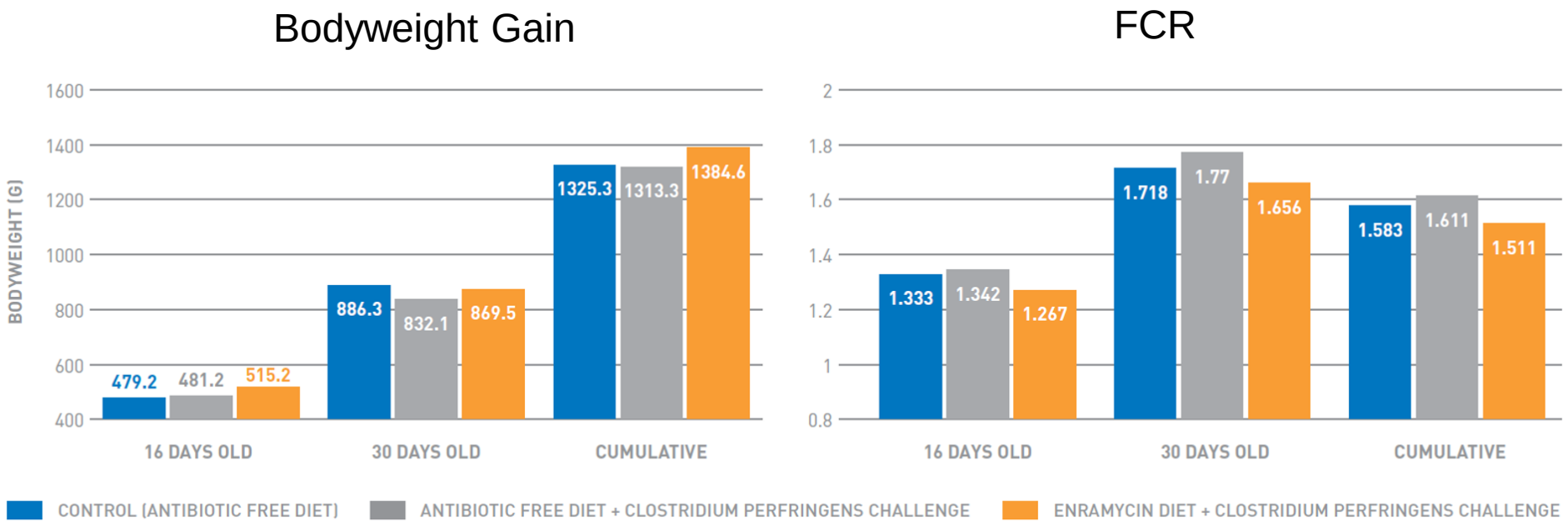
	Phase	Inclusion rate (ppm)
Broiler	Starter	6 – 8
	Grower	4 – 6
	Finisher	3 – 4
Breeders	DOC to 4 weeks	10
	5 to 18 weeks	8
	19 to 24 weeks	6
	Production	4
Layer	Laying	5

Broilers Performance



King Saud University (2012)

Usage - Swine

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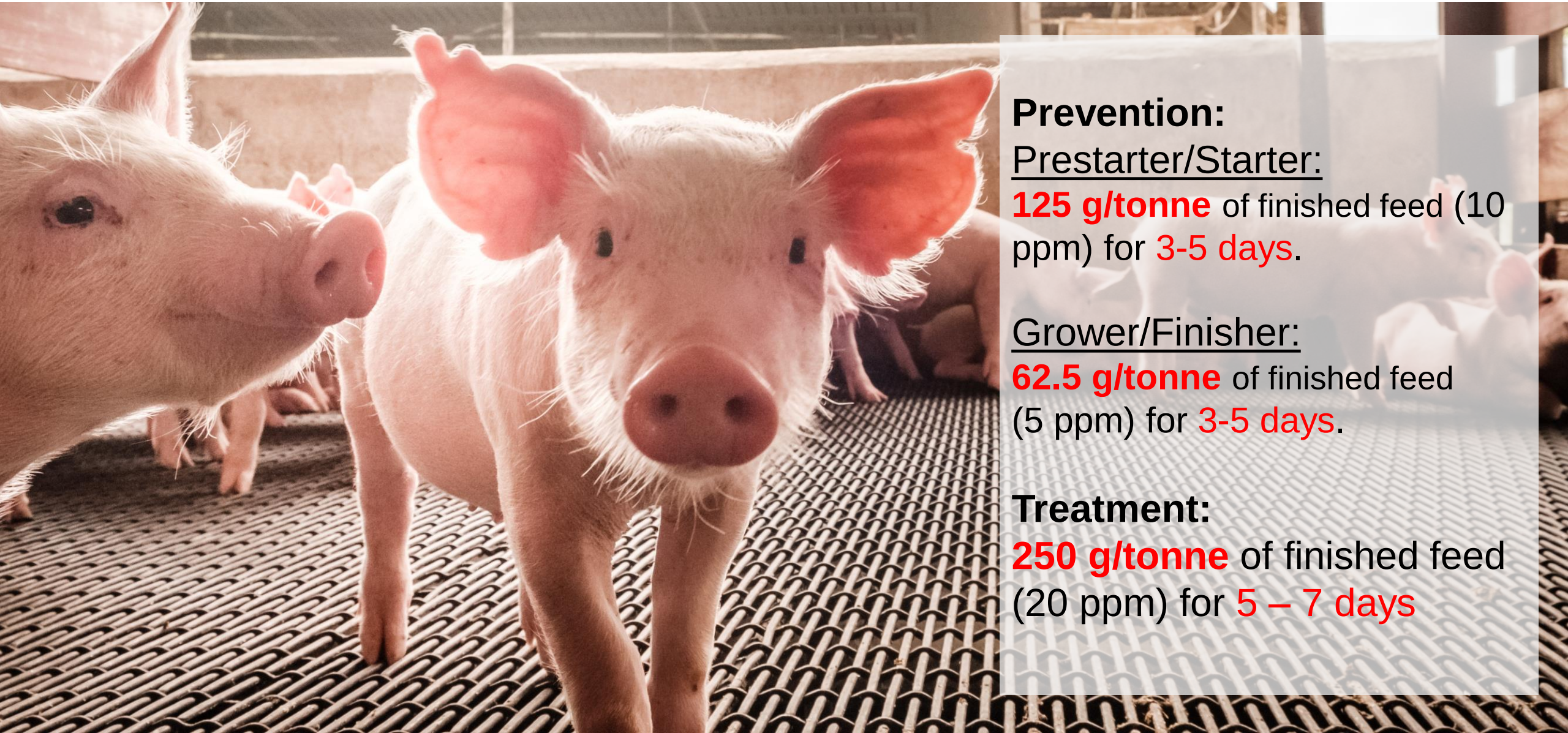

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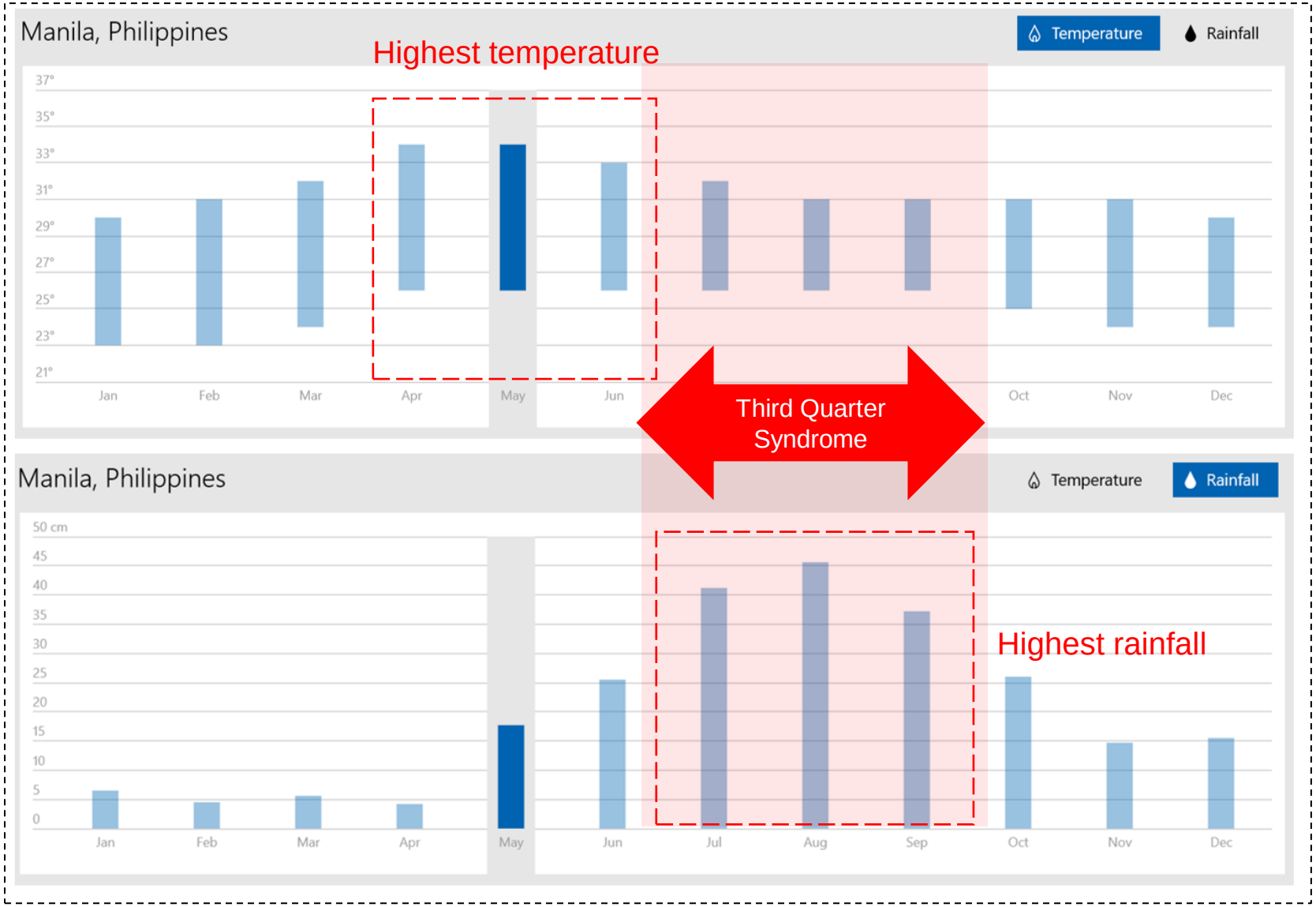
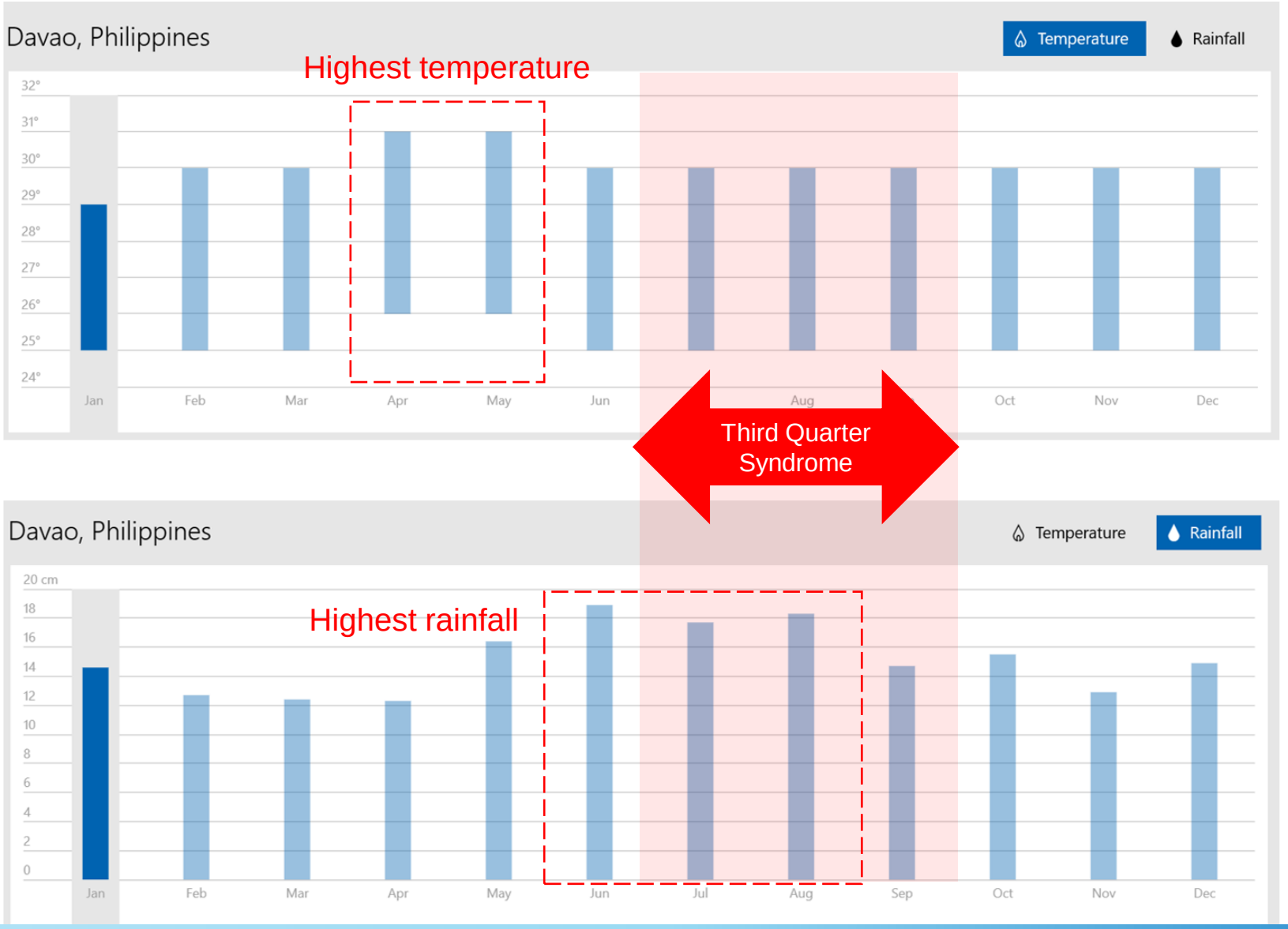
Historical Weather - Manila



Historical Weather - Davao



Temperature & Humidity Index - Poultry

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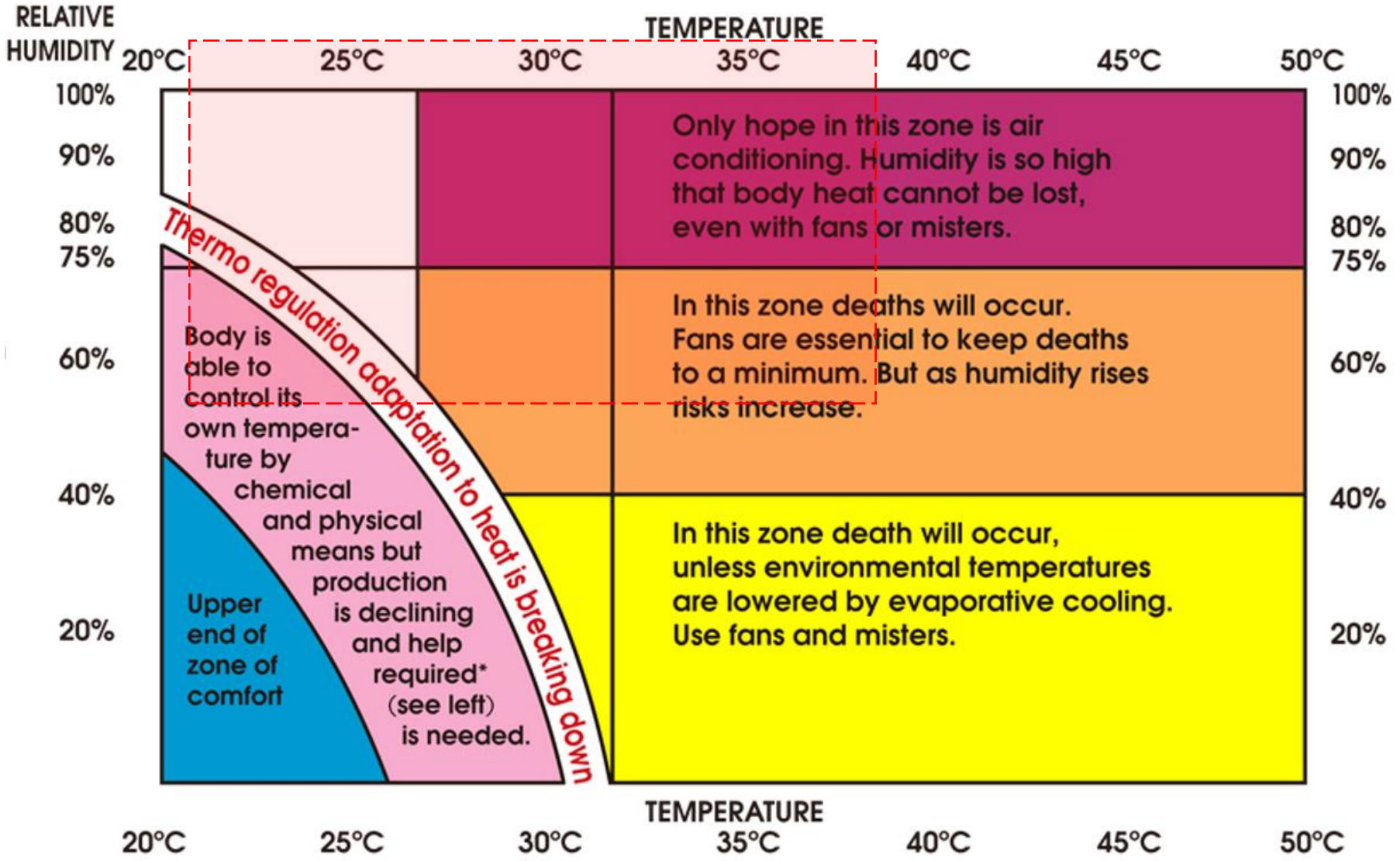


Applications - Swine

[-] Rare or does not occur [⇧] Uncommon [⇧⇧] Common [⇧⇧⇧] Very common

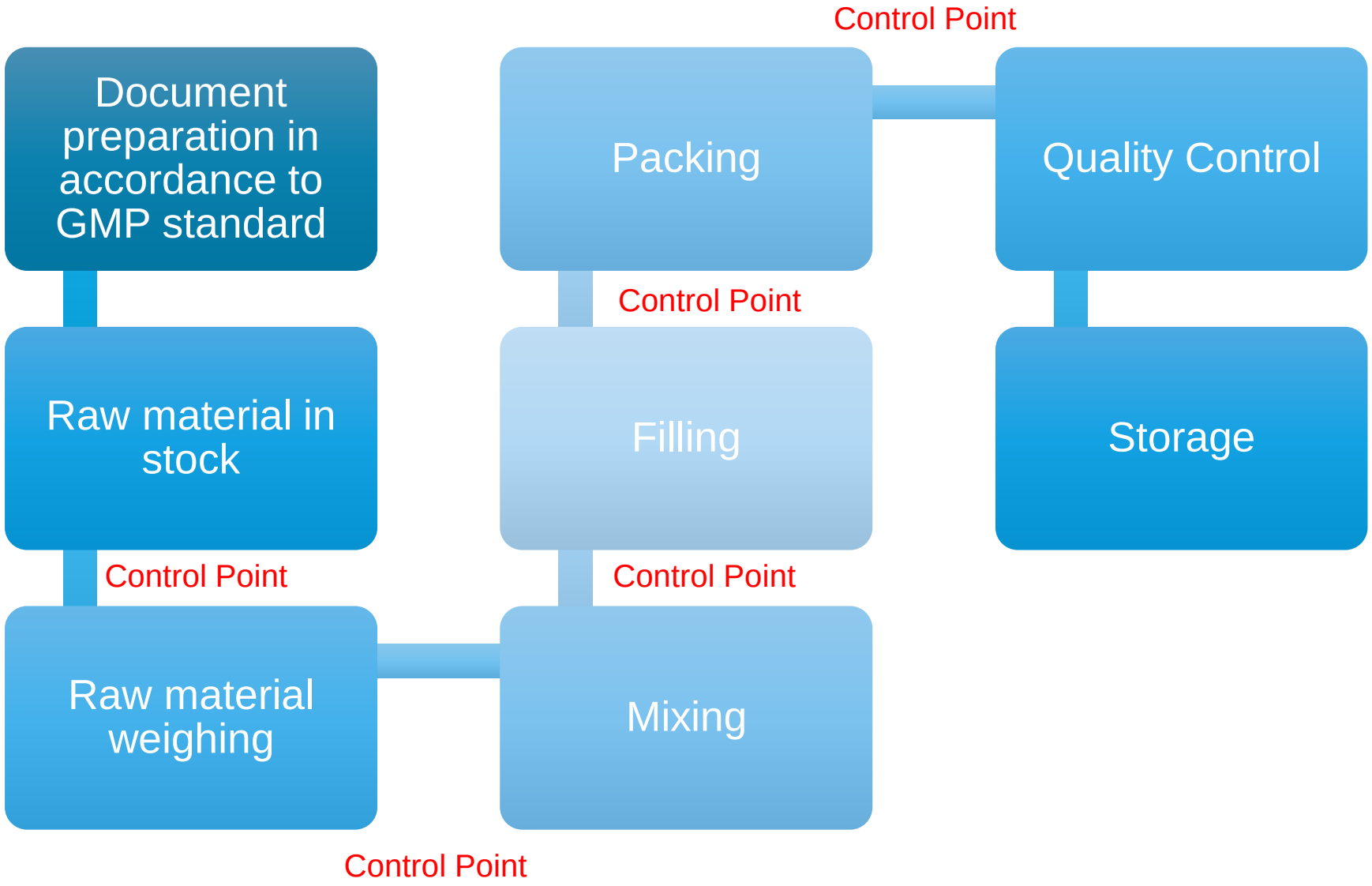
Withdrawal Period

Swine & Poultry

Seven (7) days

Quality Indicators

Manufacturing Process Flow



MIC of fecal *Clostridium perfringens*

ZAMIRA® AUSTRALIA

	MIC_{50}	MIC_{90}
Enramycin	**0.2**	**0.4**
Avilamycin	0.25	0.5
Virginiamycin	0.8	2
Oxytetracycline	4	16
Lincomycin	64	8
Colistin	≥100	≥100

Minimum inhibitory concentrations (MICs) are defined as the lowest concentration of an antimicrobial that will inhibit the visible growth of a microorganism

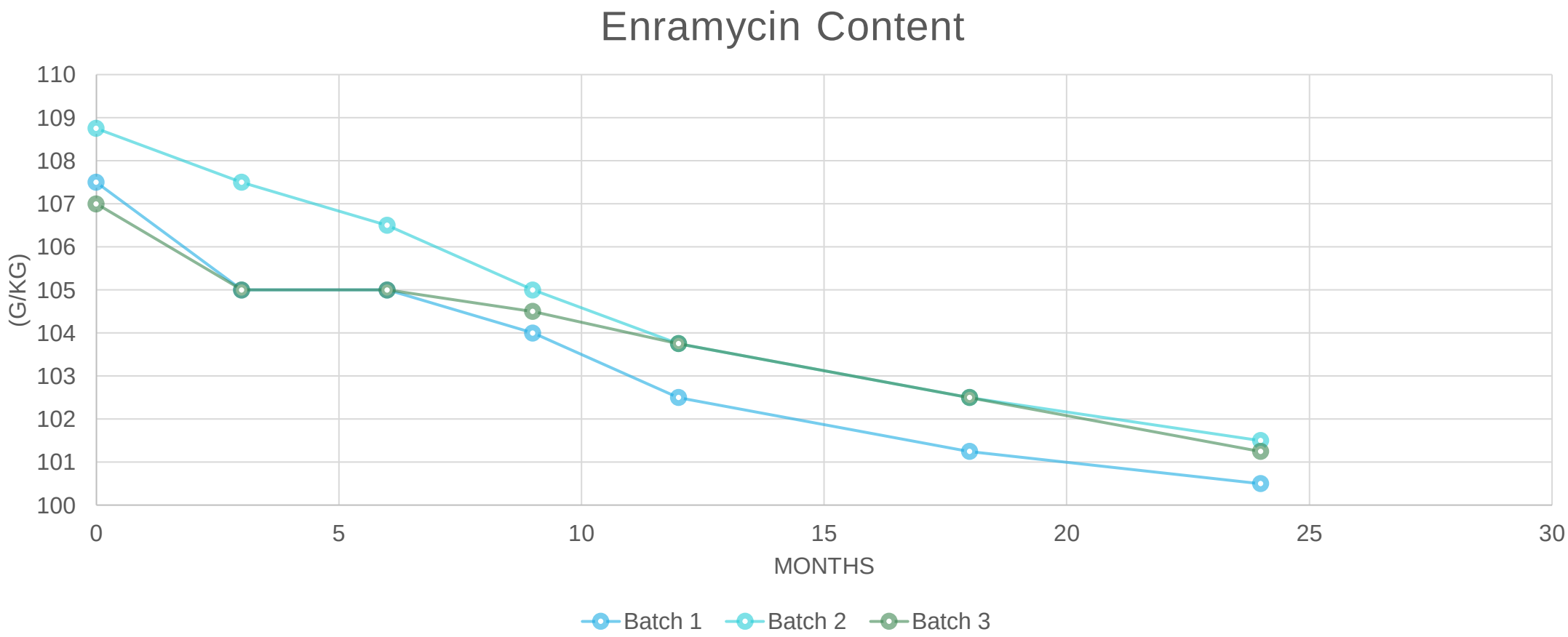
Quality Indicators

- Zamira certifies every batch of **ZAMIVET80**
- All **ZAMIVET80** batches are tested for potency
- Guaranteed level of bacterial killing potency
- Giving end-users confidence in the product every time

Product – Physical Appearance

Grey to grey-brown powder

Product Stability – Assay



Specification: 90 – 110%

Packaging

25kg bags.

Multilayered polyethylene bag to ensure product stability in humid climates.

Shelf Life of 24 months.


ZAMIRA®
AUSTRALIA
Better animal health
ZAMAX
ZAMBACZN150
ZAMBACMD100
ZAMSTAT120
ZAMDINE100
ZAMPRO-SL
ZAMURIL5
ZAMIVET40
ZAMIDAN10
CLEAN WATER
B
A
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