MANAGING COCCIDIOSIS AND ITS EFFECTS IN ANTIBIOTIC FREE PRODUCTION

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OUTLINE

- **Coccidiosis**
  - Chickens
  - Turkeys
  - Solutions
- **Enteritis**
  - Chickens
  - Turkeys
  - Solutions
- **Questions**

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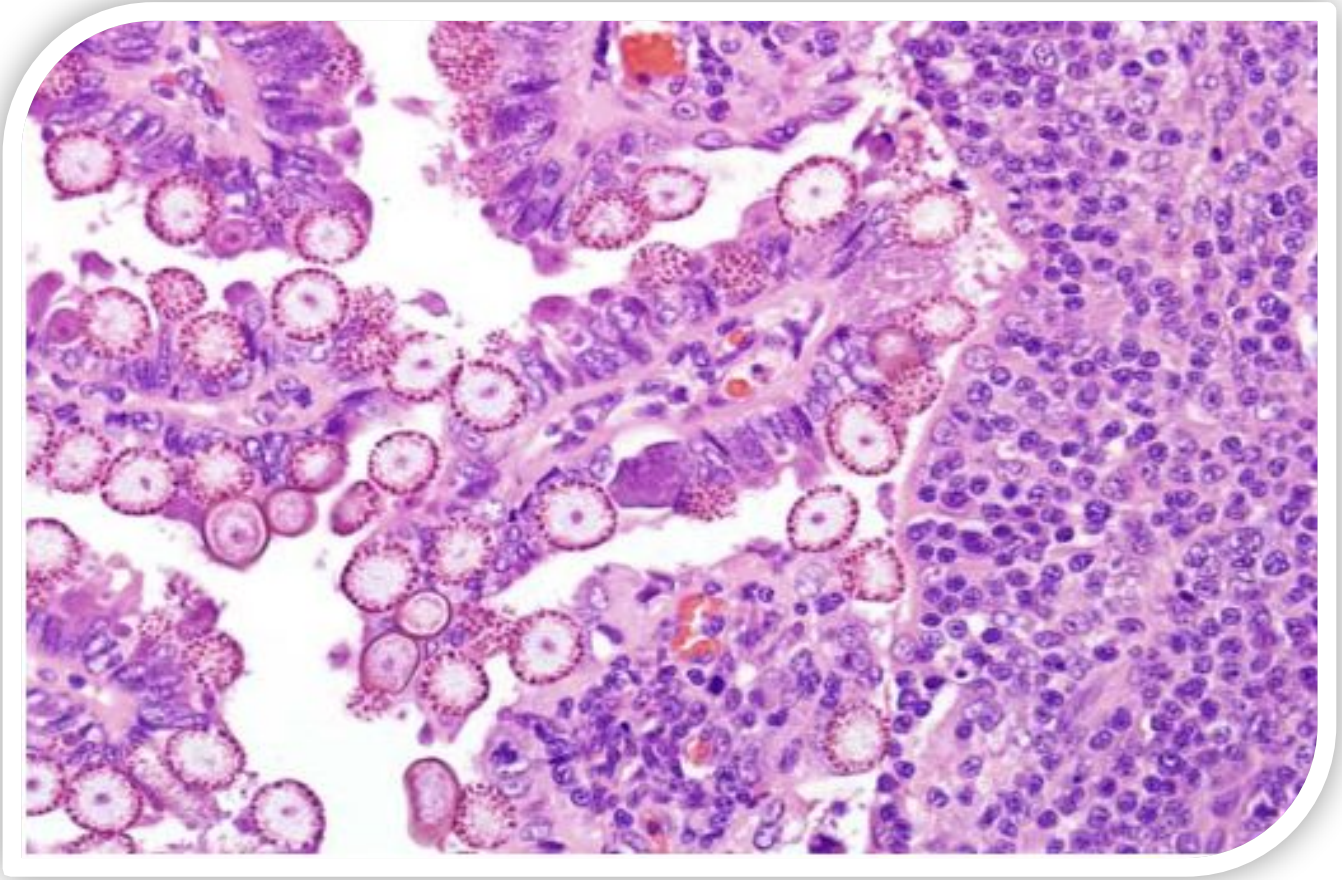
WHAT IS COCCIDIOSIS?



A disease caused by a protozoan from the genus *Eimeria*

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COCCIDIOSIS CAUSES PERFORMANCE LOSS BY DAMAGING NORMAL INTESTINAL VILLI

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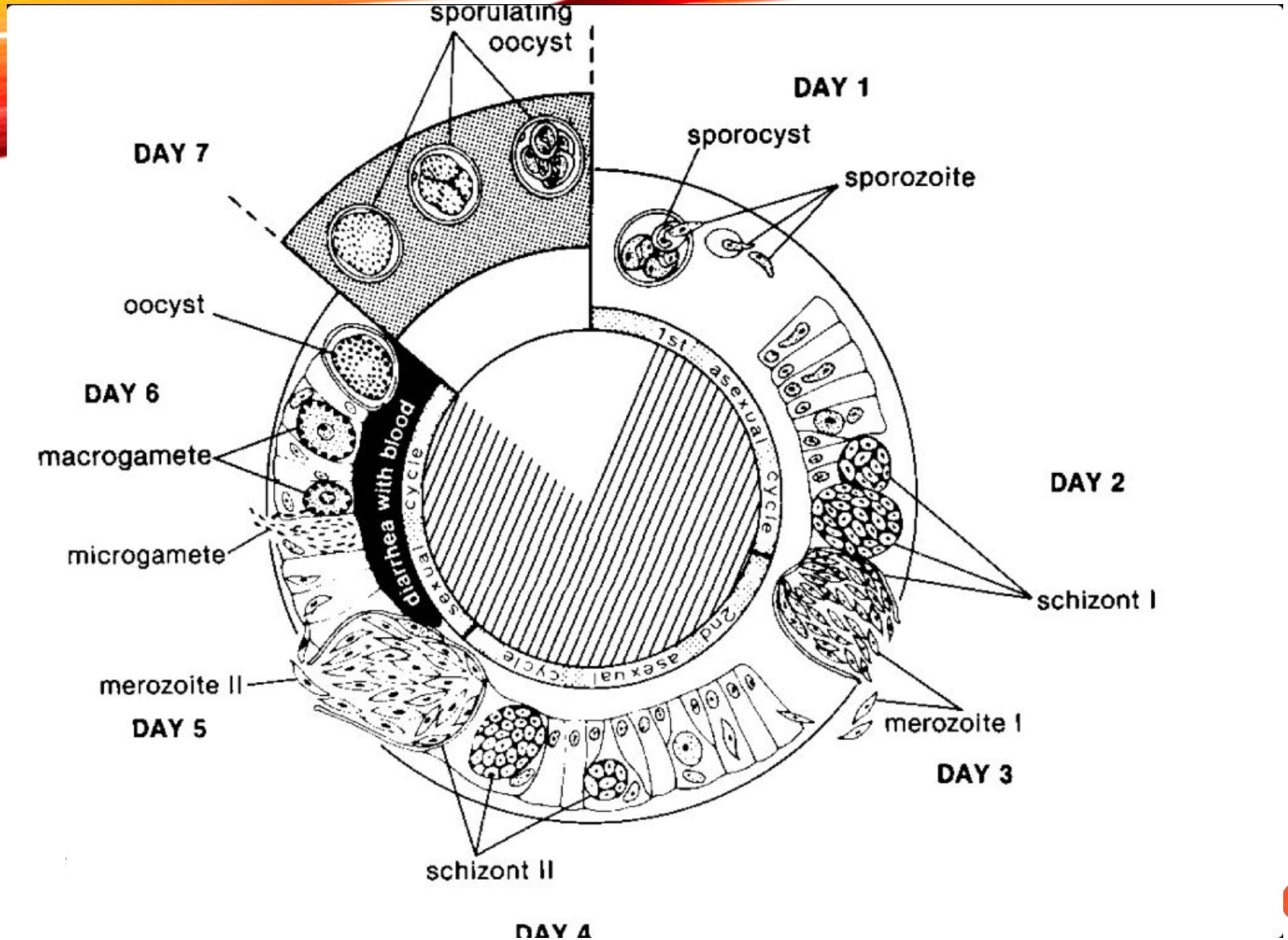

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OOCYSTS

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SPORULATED OOCYSTS

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CHICKEN COCCI

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THERE ARE 3 IMPORTANT SPECIES IN BROILER PRODUCTION

Broilers

Eimeria acervulina
Eimeria maxima
Eimeria tenella

Eimeria mitis

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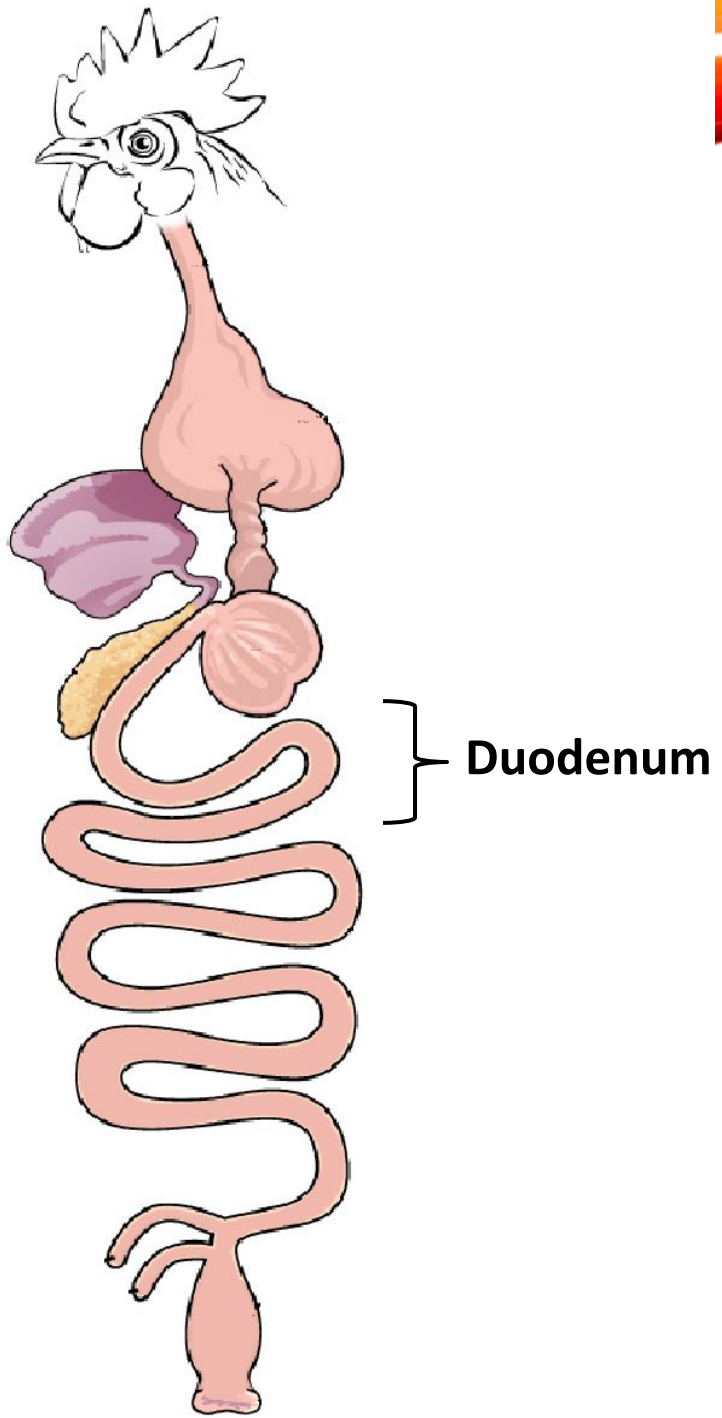
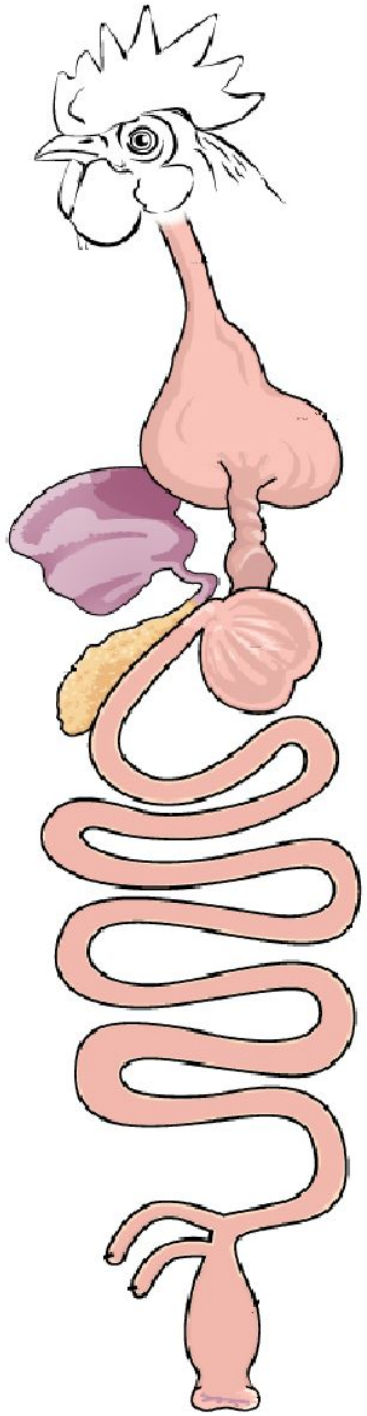


E. acervulina

- Superficial invader
- White spots/ stripes
- Most proliferative species



Midgut

E. maxima

- Deep invader
- Lesions can be nonspecific
- Oocysts monitored under the microscope
- “Performance robber”

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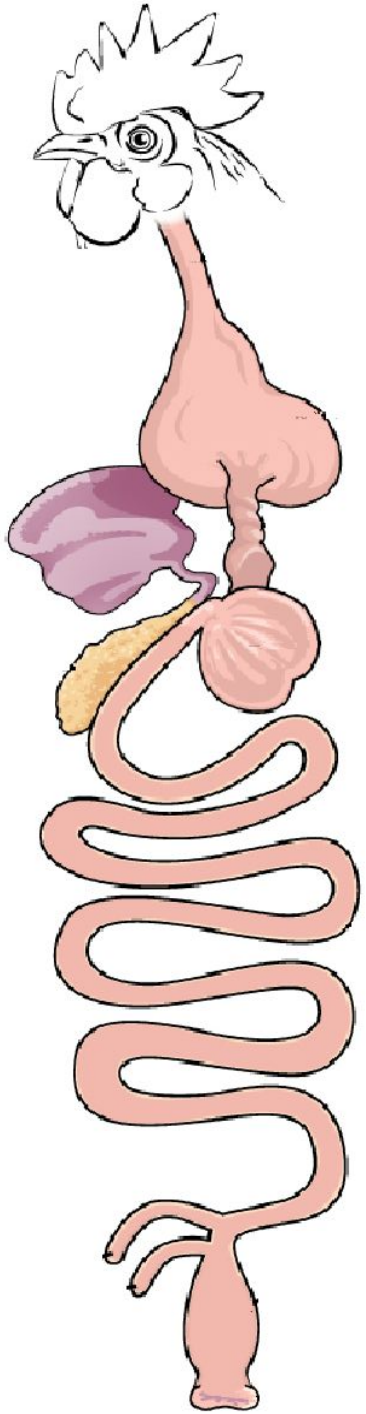
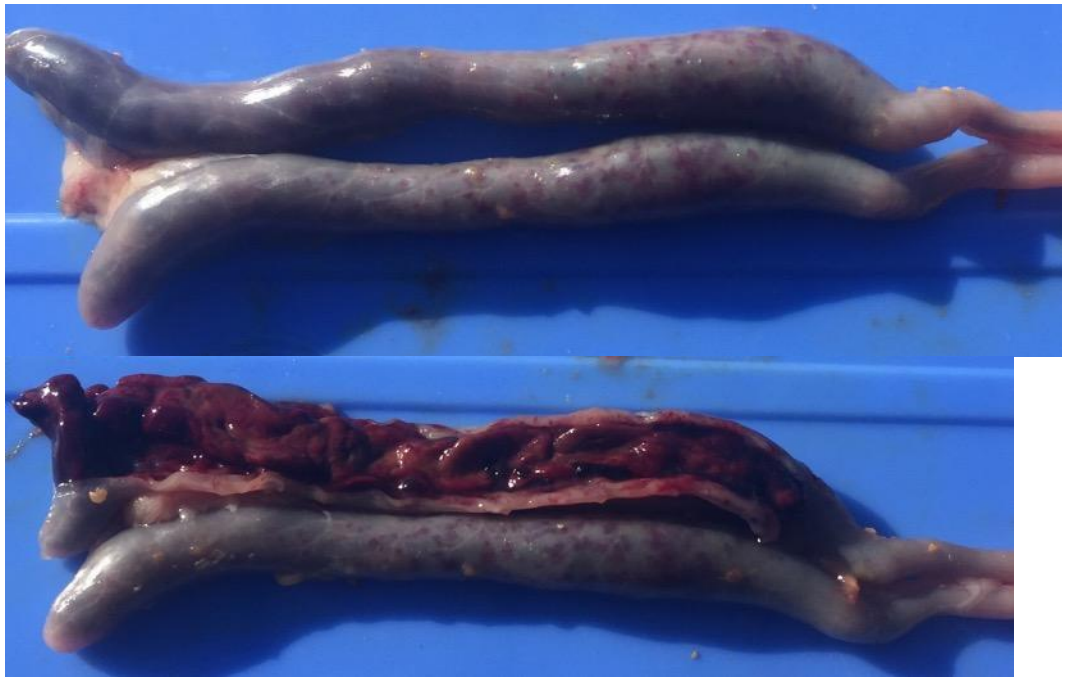


Ceca

E. tenella

- Bloody ceca/ droppings
- Cecal cores
- Causes mortality



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THERE ARE 2 EXTRA IMPORTANT SPECIES IN LONG-LIVED BIRDS

Broilers

Eimeria acervulina
Eimeria maxima
Eimeria tenella

Eimeria mitis

Layer type birds

Eimeria necatrix
Eimeria brunetti

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Midgut damage

Ceca replication

E. necatrix

- Causes mortality

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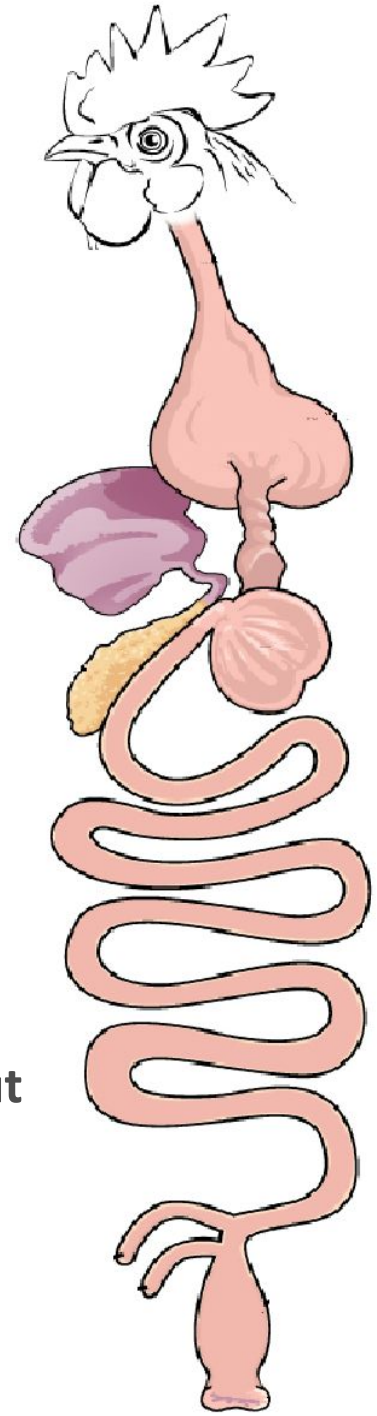


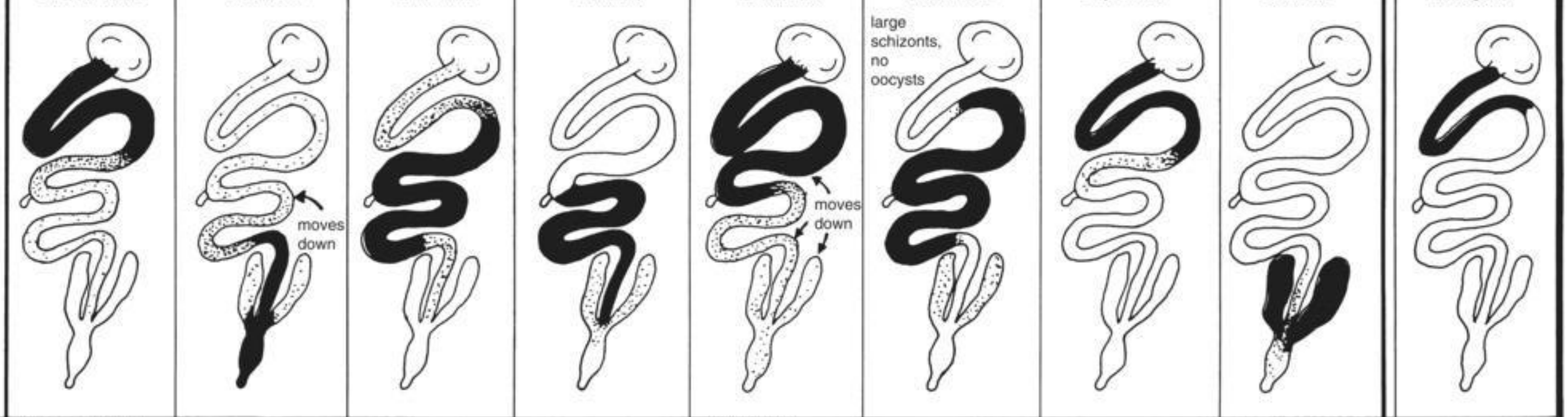
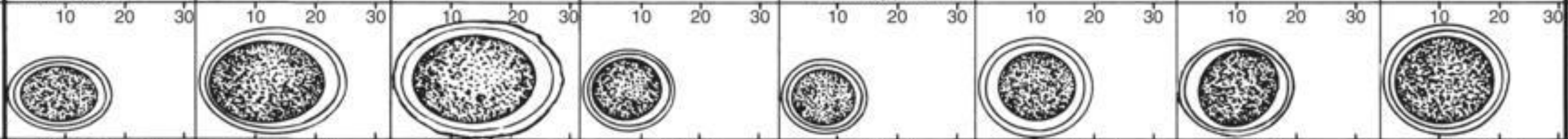
Lower gut

E. brunetti

- Causes mortality
- Similar appearance to *E. maxima*. Different location different age (usually)

E. maxima

Diseases of Poultry

									SPECIES OF DOUBTFUL VALIDITY
CHARACTERISTICS	E. acervulina	E. brunetti	E. maxima	E. mitis †	E. mivati ‡	E. necatrix	E. praecox	E. tenella	E. hagani
MACROSCOPIC LESIONS: ZONE PARASITIZED									
MACROSCOPIC LESIONS	light infection: whitish round lesions sometimes in ladder-like streaks heavy infection: plaques coalescing, thickened intestinal wall	coagulation necrosis mucoid, bloody enteritis in lower intestine	thickened walls, mucoid, blood - tinged exudate, petechiae	no discrete lesions in intestine, mucoid exudate	light infection: rounded plaques of oocysts heavy infection: thickened walls coalescing plaques	ballooning, white spots (schizonts), petechiae, mucoid blood - filled exudate	no lesions, mucoid exudate	onset: hemorrhage into lumen later: thickening, whitish mucosa, cores clotted blood	pinhead hemorrhages petechiae
MILLIMICRONS / OOCYSTS REDRAWN FROM ORIGINALS									non available
LENGTH×WIDTH μ LENGTH= WIDTH=	AV=18.3×14.6 17.7–20.2 13.7–16.3	24.6×18.8 20.7–30.3 18.1–24.2	30.5×20.7 21.5–42.5 16.5–29.8	15.6×14.2 11.7–18.7 11.0–18.0	15.6×13.4 11.1–19.9 10.5–16.2	20.4×17.2 13.2–22.7 11.3–18.3	21.3×17.1 19.8–24.7 15.7–19.8	22.0×19.0 19.5–26.0 16.5–22.8	19.1×17.6 15.8–20.9 14.3–19.5
OOCYST SHAPE AND INDEX-LENGTH/WIDTH	ovoid 1.25	ovoid 1.31	ovoid 1.47	subspherical 1.09	ellipsoid to broadly ovoid 1.16	oblong ovoid 1.19	ovoidal 1.24	ovoid 1.16	broadly ovoid 1.08
SCHIZONT, MAX IN MICRONS	10.3	30.0	9.4	15.1	17.3	65.9	20	54.0	
PARASITE LOCATION IN TISSUE SECTIONS	epithelial	2nd generation schizonts subepithelial	gametocytes subepithelial	epithelial	epithelial	2nd generation schizonts subepithelial	epithelial	2nd generation schizonts subepithelial	epithelial
MINIMUM PREPATENT PERIOD-HR	97	120	121	93	93	138	83	115	99
SPORULATION TIME MINIMUM (HR)	17	18	30	15	12	18	12	18	18

MACROSCOPIC LESIONS
MICROSCOPIC CHARACTERISTICS
LIFE HISTORY CHARACTERISTICS

† = From Norton and Joyner (1980)
‡ = As described by Edgar and Siebold (1964)
◉ = Complied from various sources (1982)

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TURKEY COCCI

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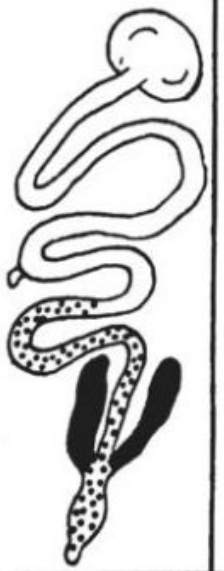
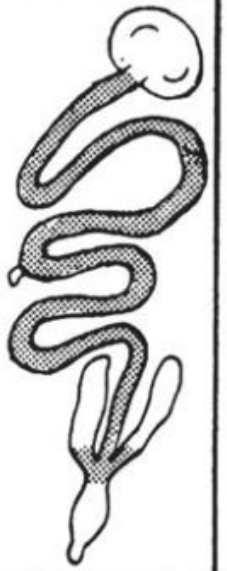
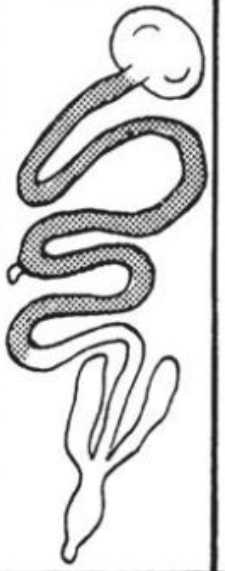
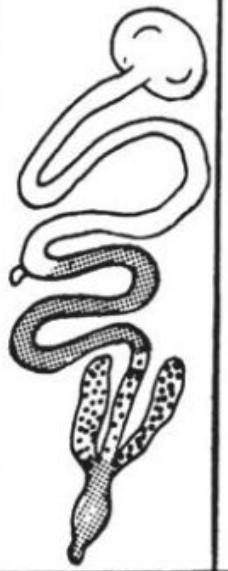
SPECIES → CHARACTERISTICS ↓	*E. adenoeides*	*E. dispersa*	*E. gallopavonis*	*E. innocua*	*E. meleagridis*	*E. meleagrimitis*	*E. subrotunda*
Lesions Occasional lesions Parasites no lesions Species distinctive							
Macroscopic lesions	*liquid feces with mucus and flecks of blood,* **loose whitish cecal cores**	*cream–colored serosal surface, dilation of intestine, yellowish mucoid feces*	*edema, ulceration of mucosal ileum, yellow exudate, flecks of blood in feces*	*none*	*cream–colored ceca, formation of caseous plug, a few petechial hemorrhages*	*spotty congestion and petechiae from duodenum to ileum, dilation of jejunum, casts*	*none*
Length × Width (in µm) *Length =* *Width =*	*AV = 25.6 × 16.6* *18.9–31.3* *12.6–20.9*	*AV = 26.1 × 21.0* *21.8–31.1* *17.7–23.9*	*AV = 27.1 × 17.2* *22.7–32.7* *15.2–19.4*	*AV = 22.4 × 20.9* *18.57–25.86* *17.34–24.54*	*AV = 24.4 × 18.1* *20.3–30.8* *15.4–20.6*	**AV = 19.2 × 16.3** **15.8–26.9** **13.1–21.9**	*AV = 21.8 × 19.8* *16.48–26.42* *14.21–24.44*
Oocyst shape and index length / width	*ellipsoidal* **1.54**	*broadly oval* **1.24**	*ellipsoidal* **1.52**	*subspherical* **1.07**	*ellipsoidal* **1.34**	*ovoid* **1.17**	*subspherical* **1.10**
Minimum sporulation	*24 hr*	*35 hr*	**15 hr**	**under 45 hr**	*24 hr*	**18 hr**	**48 hr**
Prepatent period (minumum)	*103 hr*	**120 hr**	**105 hr**	**114 hr**	*110 hr*	*103 hr*	**95 hr**
Refractile body	*yes*	*no*	*yes*	*no*	*yes*	*yes*	*no*
Pathogenicity	++++	+	++++	*none*	**none**	++++	*none*

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SOLUTIONS TO COCCIDIOSIS

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COCCIDIOSIS VACCINE MANAGEMENT

- Coccidiosis vaccines are comprised of live oocysts
  - The oocysts are selected for lower virulence or are attenuated.
- Attenuated vaccines only are created by selection for precocious strains
  - Often don't compete as well as wild types

- Uniform, carefully managed cycling is the key to success

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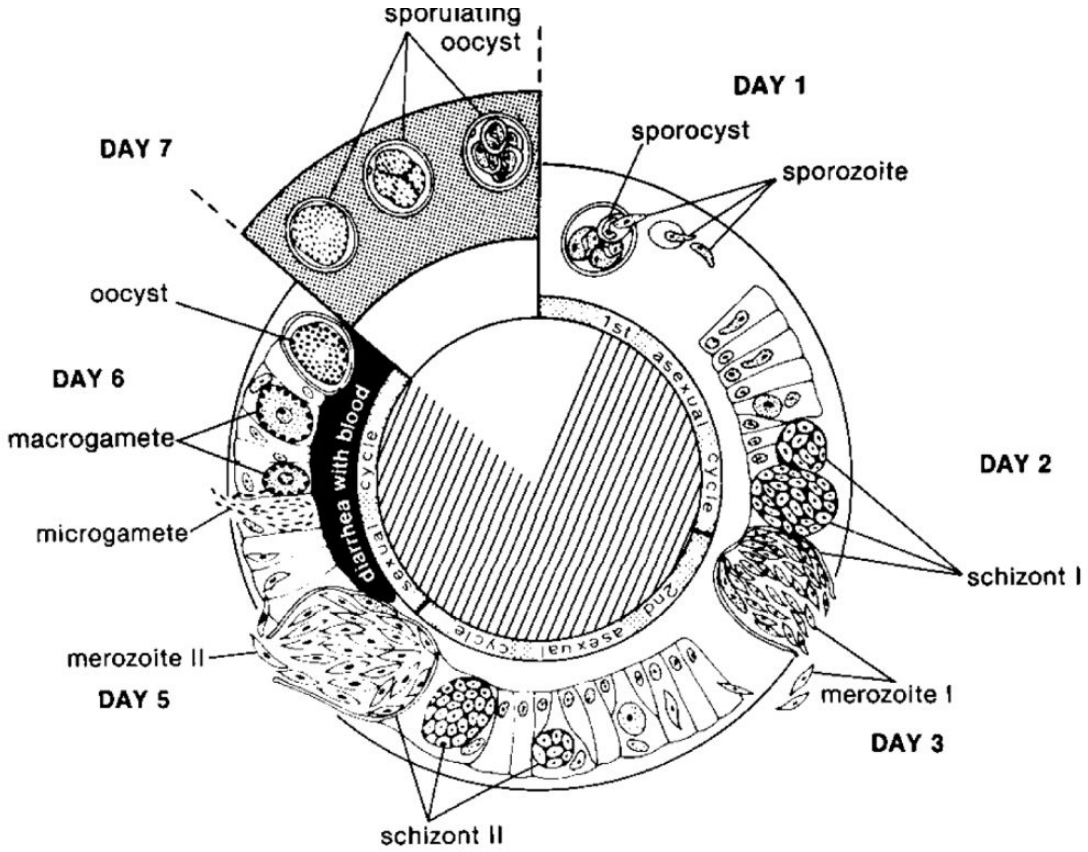
4 PARTS OF MANAGEMENT OF COCCIDIOSIS

3 parts in our control

- Hatchery
- Farm
- Feed

- 1 Part biology of *Eimeria*



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FARM MANAGEMENT

- Best management practices
  - Feed
  - Water
  - Lighting
  - Litter
  - Heat
  - Ventilation

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MANAGEMENT

- Brooding
  - Chick distribution
    - Comfortable temperature
      - Check set temperatures and chick comfort
    - Reduce drafts
      - Tight brood curtains and end doors
  - Feed availability
    - Extra feed pans

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MANAGING COCCI CYCLING

- Density of birds
- Litter moisture- 25% litter moisture
- Oocyst shedding pattern

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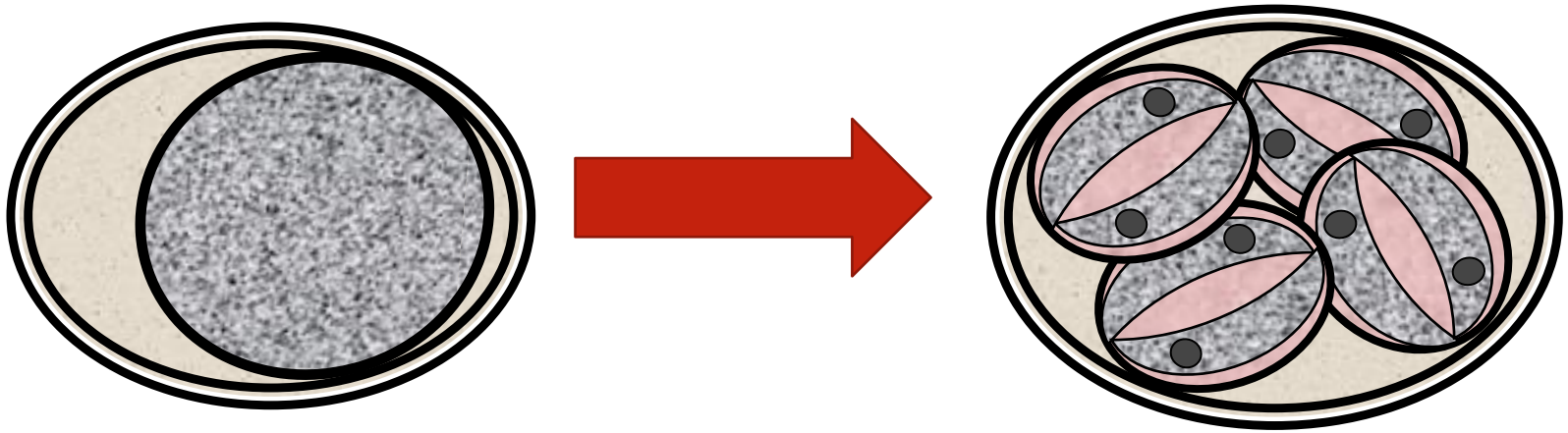
MANAGEMENT

- Good ventilation and litter management controls the number of sporulated oocysts thereby regulating the challenge



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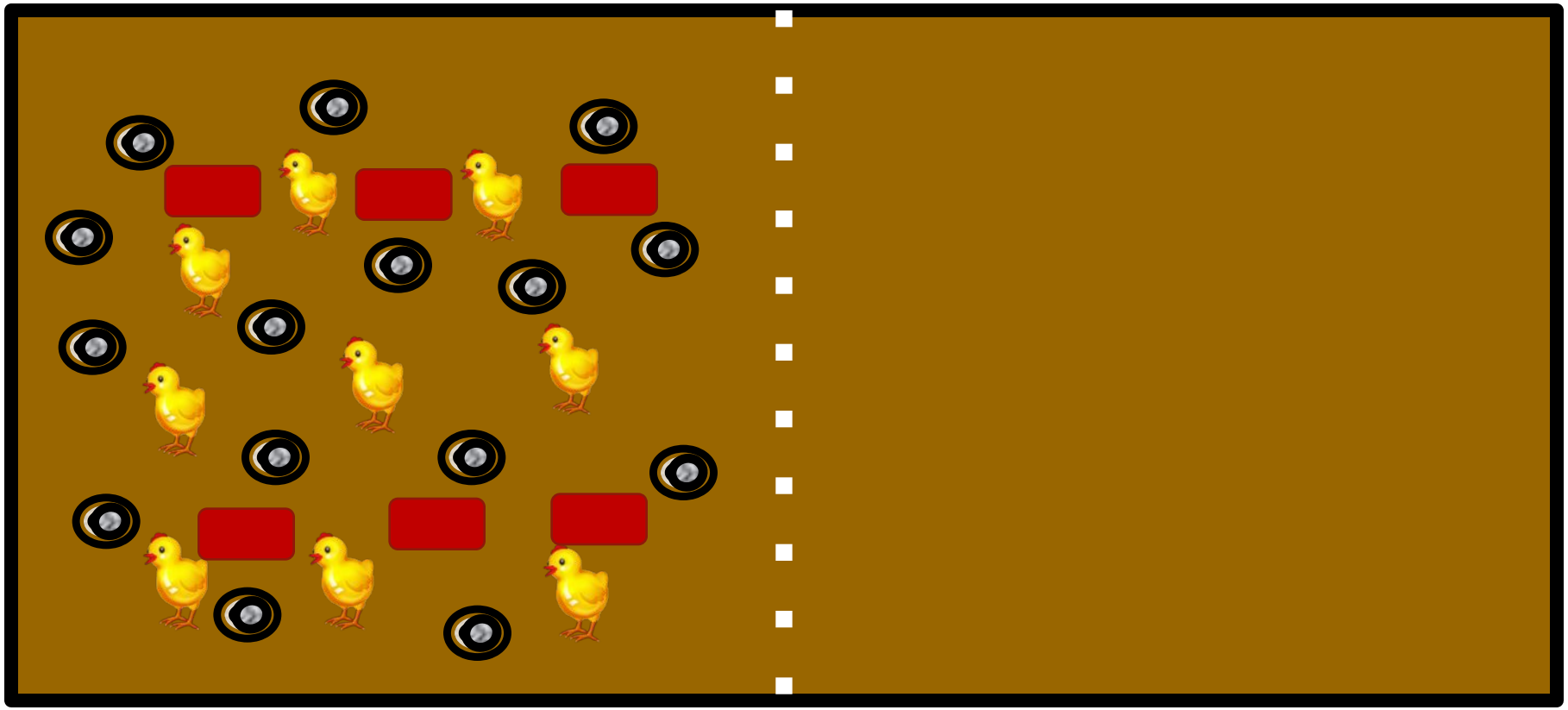
COCCIDIOSIS VACCINE MANAGEMENT



Oocysts at 7 days in half-house

The right amount of oocyst shedding at 8-10 days promotes good vaccine cycling

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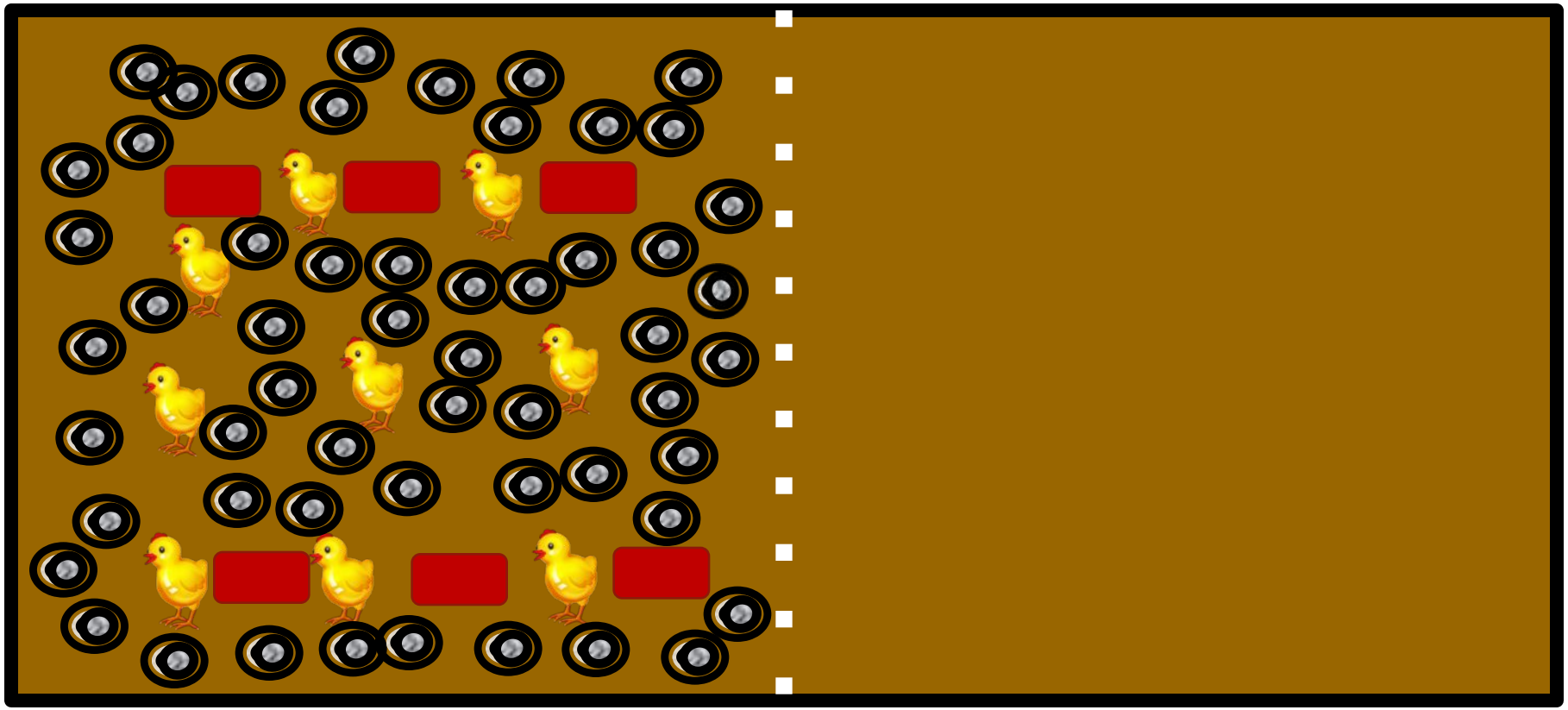
COCCIDIOSIS VACCINE MANAGEMENT



OOCYSTS AT 14 DAYS IN HALF-HOUSE

The 2nd shed of oocysts in half-house is overwhelming when ingested.
Wet floors promote sporulation of oocysts creating more challenge.

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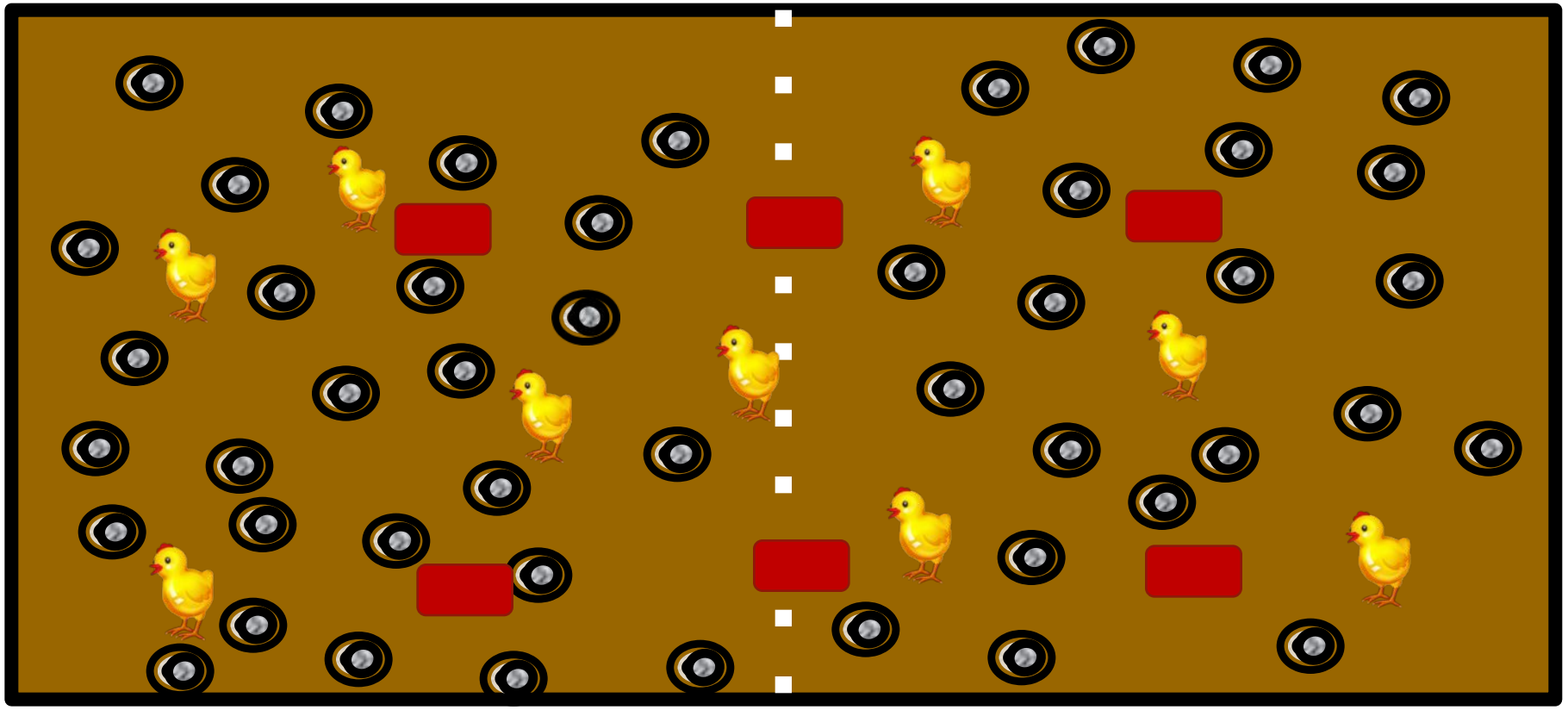
COCCIDIOSIS VACCINE MANAGEMENT



OOCYSTS AT 14 DAYS IN FULL-HOUSE

Moving birds to full house at 8-10 days insures that you “spred the shed” and prevent an overwhelming challenge for the birds. Moving some feed pans to the other side of the house can help with litter eating.

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PULLET VACCINE MANAGEMENT

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FEED MANAGEMENT

- Nutrition
  - High quality ingredients
- Feed mill
  - Pellet/ mash quality
  - Uniform product inclusion
  - Correct delivery
- Farm
  - Feed distribution and handling

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FDA APPROVED TREATMENTS

Table 28.2. Preventive anticoccidials approved by FDA for use in feed formulation. (Historical and scientific interest only. Not all products are available.) (9)

Trade or Empirical Name, Approval Label (Manufacturer)	Trade Name	First Approval by FDA	Drug Withdrawal (Days before Slaughter)
Sulfaquinoxaline, 0.015–0.025% (Merck)	SQ, Sulquin	1948	10
Nitrofurazone, 0.0055% (Hess & Clark; Smith-Kline)	nfz, Amifur	1948	5
Arsanilic acid or sodium arsanilate, 0.04% for 8 days (Abbott)	Pro-Gen	1949	5
Butynorate, 0.0375% for turkeys (Solvay)	Tinostat	1954	28
Nicarbazin, 0.0125% (Merck)	Nicarb	1955	4
Furazolidone, 0.0055–0.011% (Hess & Clark)	nf-180	1957	5
Nitromide, 0.025% + sulfanitran, 0.03% + roxarasone, 0.005% (Solvay)	Unistat-3	1958	5
Oxytetracycline, 0.022% (Pfizer)	Terramycin	1959	3
Amprolium, 0.0125–0.025% (MSD-AGVET)	Amprol	1960	0
Chlortetracycline, 0.022%	(American Aureomycin Cyanamid)	1960	(See feeding restrictions)
Zoalene, 0.004–0.0125% (Solvay)	Zoamix	1960	(higher levels, 5 days)
Amprolium, 0.0125% + ethopabate, 0.0004/0.004% (Merck)	Amprol Plus, Amprol Hi-E	1963	0
Buquinolate, 0.00825% (Norwich-Eaton)	Bonaid	1967	0
Clopidol or meticlorpindol, 0.0125–0.025% (A. L. Laboratories)	Coyden	1968	0 days at 0.0125%; 5 days at 0.025%
Decoquinate 0.003% (Rhone-Poulenc)	Deccox	1970	0
Sulfadimethoxine, 0.0125% + ormetoprim, 0.0075% (Hoffmann-La Roche)	Rofenaid	1970	5
Monensin, 0.01–0.0121 % (Elanco)	Coban	1971	0
Robenidine, 0.0033% (American Cyanamid)	Robenz, Cycostat	1972	5
Lasalocid, 0.0075–0.0125% (Hoffmann-La Roche)	Avatec	1976	3
Salinomycin, 0.004–0.0066% (Agri-Bio)	Bio-Cox	1983	0
Halofuginone, 3 ppm (Hoechst-Roussell Agri-Vet)	Stenorol	1987	5
Narasin, 54–72g/T (Elanco)	Monteban	1988	0
Madurimicin, 5–6 ppm (American Cyanamid)	Cygro	1989	5
Narasin + nicarbazin,54–90 g/T (Elanco)	Maxiban	1989	5
Semduramycin, 25ppm (Pfizer)	Aviax	1995	0
Diclazuril, 1 ppm (Schering-Plough)	Clinicox	1999	0

THE MARKET IS FULL OF FEED AND WATER ADDITIVES

- Probiotics
- Prebiotics
- Fermented products
- Plant extracts
- Enzymes
- Organic minerals
- Organic acids
- Others

Blends

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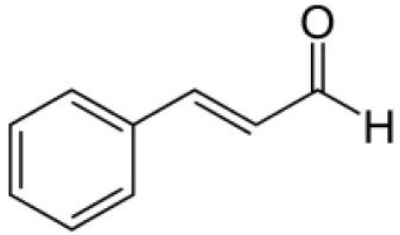
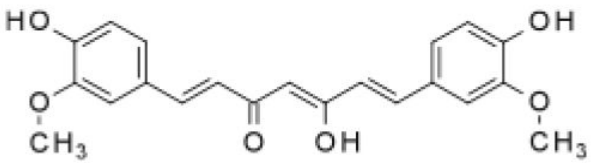
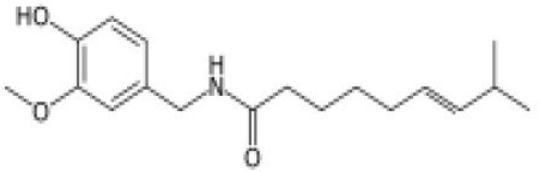
Phytogenic feed additives are just chemicals



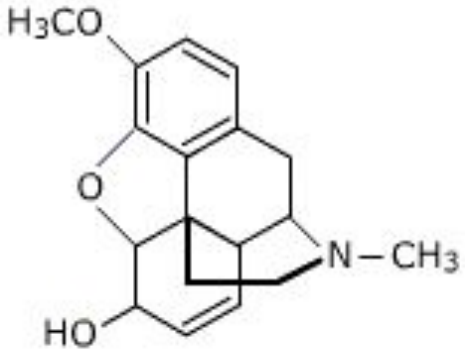
Cinnamaldehyde
(from cinnamon)



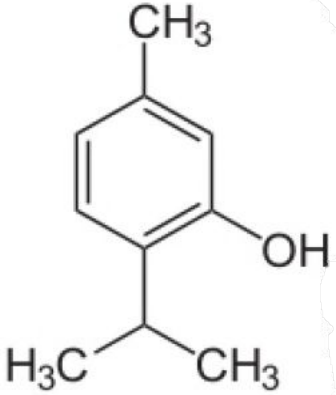
Curcumin
(from Turmeric)



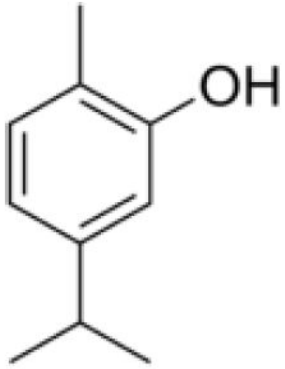
Capsaicin
(from chile pepper)



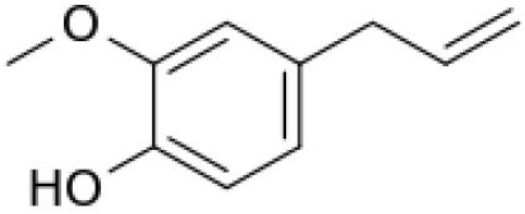
Codeine
(from poppies)



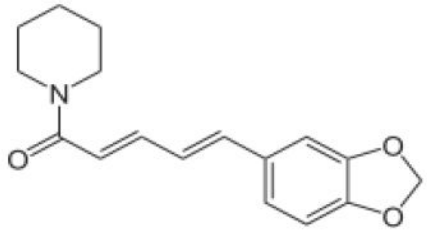
Thymol



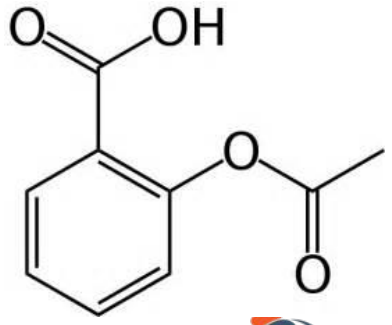
Carvacrol
(from oregano)



Eugenol
(from clove)

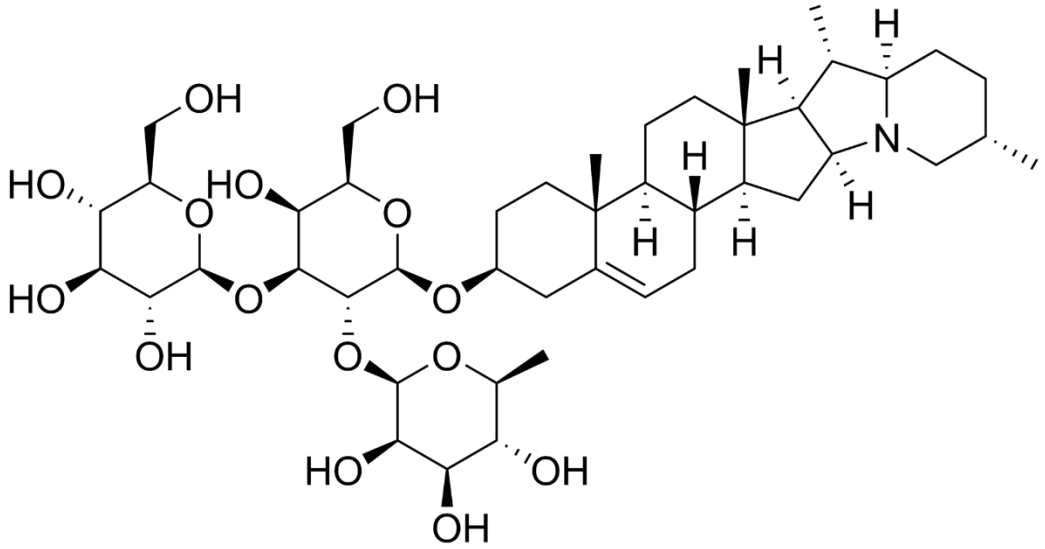


Piperine
(from black pepper)



Aspirin
(from willow)

SAPONINS HAVE SOAP-LIKE FOAMING PROPERTIES



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ENTERITIS

- Bacterial
  - Necrotic
  - Dysbacteriosis
- Viral
  - REO/ Runting and Stunting/ undefined viral enteritis
  - Hemorrhagic enteritis

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NECROTIC ENTERITIS

VIRAL ENTERITIS

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HEMORRHAGIC ENTERITIS

- Adenovirus
- Controlled by vaccination
- Immunosuppressive

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THE MARKET IS FULL OF FEED AND WATER ADDITIVES

- Probiotics
- Prebiotics
- Fermented products
- Plant extracts
- Enzymes
- Organic minerals
- Organic acids
- Others

Blends

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WHAT IS THE CORRECT ADDITIVE?

- Consistently produced
- Evidence based
- Specific for the problem
- Risk vs ROI

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NOTHING WILL REPLACE GOOD MANAGEMENT AND CHICK/ POULT QUALITY

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