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## RABBITS

## Coccidiosis

## BASIC INFORMATION



## DEFINITION

Coccidiosis is a hepatic or enteric disease caused by protozoan parasites of the subclass Coccidia, genus *Eimeria*. It is important to distinguish between infection by coccidia, which is common, and coccidiosis or overt disease, which is infrequent. Many rabbits are infected with coccidian parasites at least once during their life, and wild rabbits may be infected their entire lives with several species of coccidia that continually cycle through them, yet do not develop disease. Enhanced transmission of coccidia occurs when rabbits are brought together in large groups because of the rapid and direct life cycle of *Eimeria* species. Under these circumstances, coccidia cause disease. Consequently, coccidiosis is considered a major health problem in rabbits raised under intensive husbandry conditions.

## SYNONYMS

- *Eimeria stiedai*: The spelling “stiedai” is used even though the original description used “stiedae.” It was named for Ludwig Stieda, and according to the International Rules of Zoological Nomenclature, the genitive ending must be used. “-ae” would indicate that the species was named for a woman and “-ai” for a man.
- *Rabbit dysentery* is often used by rabbit breeders to describe intestinal coccidiosis.

- Intestinal coccidian:
  - *E. coecicola* (syn *E. oryctolagi*)
  - *E. irresidua* (syn *E. elongata*)
  - *E. media* (syn *E. flavescens*)
  - *E. intestinalis* (syn *E. piriformis*, *E. agnosta*)
  - *E. perforans* (syn *E. nana*, *E. lugdunumensis*)

## SPECIAL SPECIES CONSIDERATIONS

- More than 12 *Eimeria* species are found in the rabbit:
  - *E. coecicola*, *E. exiqua*, *E. intestinalis*, *E. irresidua*, *E. magna*, *E. matsubayashii*, *E. media*, *E. nagpurensis*, *E. perforans*, *E. piriformis*, and *E. steidai* occur in domestic and wild rabbits.
  - *E. neoleporis* and *E. roobroucki* have been reported only in wild rabbits.

## EPIDEMIOLOGY

## SPECIES, AGE, SEX

- Intestinal coccidiosis
  - Suckling rabbits up to 16 days old are not susceptible to infection.
  - Young, recently weaned (e.g., 5- to 6-week-old) rabbits are most susceptible.
  - With increasing age, fecal oocyst output decreases progressively. It reaches a low level in animals older than 4 months but does not disappear completely without treatment.
  - Adults rarely develop clinical disease.

**GENETICS AND BREED PREDISPOSITION** No breed or gender susceptibility has been detected.

## RISK FACTORS

- Most common in breeding colonies
- Poor hygiene results in large infective oocyst dose challenge.
- 1 to 4 months old: the overwhelming determinant of oocyst count is host age, with six species being most abundant in rabbits up to 4 months of age
- Immune suppressed rabbits of any age

## CONTAGION AND ZOOONOSIS

- Spores are infective 1 to 4 days after being passed in the feces and remain infective on soil or vegetation for several years.
- *Eimeria* species found in rabbits have not been shown to infect humans.

## GEOGRAPHY AND SEASONALITY

- Geography
  - *E. irresidua*, *E. media*, and *E. perforans* occur throughout the world and are common.
  - *E. magna* occurs throughout the world but is uncommon.
  - *E. piriformis* is common in Australia.
- Seasonal differences are often detected in fecal oocyst counts of adults and young animals:
  - Peak intensity appears to occur from late spring to summer.

## ASSOCIATED CONDITIONS AND DISORDERS

- Mixed infections of different *Eimeria* spp. are common.

- Eggs of the parasitic nematodes (see Endoparasites) (e.g., *Passalurus ambiguus*) are often seen in fecal samples of rabbits with heavy coccidial infections.

## CLINICAL PRESENTATION

### DISEASE FORMS/SUBTYPES

- Hepatic
  - Subclinical disease is common.
  - Acute mortality is associated with large infective oocyst dose.
  - When clinical disease is present, the signs are variable.
- Intestinal
  - Subclinical disease is common in adult rabbits. Pathogenicity varies with:
  - Species of *Eimeria*
    - All intestinal species of *Eimeria* appear to be pathogenic in young rabbits.
    - In adult rabbits, *E. coecicola*, *E. irresidua*, and *E. magna* are highly pathogenic; *E. piriformis* and *E. media* are moderately pathogenic; and *E. perforans* is mildly pathogenic.
  - Target organ
    - *E. perforans*, *E. irresidua*, and *E. intestinalis* may develop in the small intestine.
    - *E. magna* and *E. media* may develop in the small and the large intestine.
    - *E. coecicola* and *E. piriformis* may develop in the cecum.
  - Immune status of the rabbit
  - Infective oocyst dose

### HISTORY, CHIEF COMPLAINT

- Hepatic
  - Weight loss
  - Stunting
  - Abdominal enlargement
  - Lethargy
  - Anorexia (see Anorexia)
  - Death
- Intestinal
  - Diarrhea sometimes with mucus and/or blood
  - Weight loss
  - Stunting
  - Lethargy
  - Anorexia (see Anorexia)
  - Death

### PHYSICAL EXAM FINDINGS

- Hepatic
  - Ascites
  - Jaundice
  - Hepatomegaly
- Intestinal
  - Dehydration
  - Diarrhea
  - Occasionally intussusception and/or rectal prolapse

### ETIOLOGY AND PATHOPHYSIOLOGY

- Hepatic coccidiosis

- The liver is enlarged owing to papillary hyperplasia of the bile duct epithelium (and gallbladder occasionally) with different developmental stages of coccidia within bile ducts.
- Acute cases may show numerous miliary hepatic abscesses.
- Chronic cases develop a fibrotic response around affected ducts.
- Other organs are not infected.
- Intestinal coccidiosis
  - In most cases, little or no reaction occurs.
  - When clinical disease occurs, a mixed inflammatory cell response is seen in the intestinal mucosa, with multifocal areas of intestinal necrosis, ulceration, edema, and hemorrhage.
  - Depending on the species of *Eimeria*, sporozoites may be found in the mesenteric lymph nodes and spleen (e.g., *E. coecicola* sporozoites present; *E. intestinalis* sporozoites absent).

## DIAGNOSIS

### DIFFERENTIAL DIAGNOSIS

- Hepatic
  - Adult rabbits
    - Toxin-induced hepatitis (e.g., drug, plant)
    - Chronic bacterial hepatitis (e.g., *Salmonella* spp.)
    - Chronic helminthic hepatitis (e.g., *Cysticercus pisiformis*)
  - Juvenile rabbits
    - Toxin-induced hepatitis (e.g., drug, plant)
    - Acute bacterial hepatitis (e.g., *Clostridium piliforme*)
- Intestinal
  - Mucoïd enteropathy; however, it generally occurs in rabbits older than 10 weeks
  - Bacterial enteritis (e.g., clostridial enterotoxemia, colibacillosis, Tyzzer's disease, *C. piliforme*)
  - Viral enteritis (e.g., rotavirus, adenovirus, coronavirus and parvovirus have been isolated from young rabbits with diarrhea)

### INITIAL DATABASE

- Detection of oocysts on examination of fecal smears or flotations. It is essential to distinguish between the different species of *Eimeria* because the oocysts look similar but their pathogenicity varies.
- Examination of sporulated oocysts is necessary to distinguish between certain intestinal *Eimeria* spp. Sporulation may take around three days.
- The prepatent period for intestinal *Eimeria* spp. is 14 to 18 days. In

acute infection, oocysts may not be present.

- Blood biochemistry may demonstrate raised hepatic enzymes in hepatic coccidiosis.

### ADVANCED OR CONFIRMATORY TESTING

- Demonstration of typical hepatic lesions (bile duct hyperplasia) on histopathologic examination is diagnostic for hepatic coccidiosis.
- Enzyme-linked immunosorbent assays (ELISAs) for detecting serum antibody in rabbits with coccidiosis have been developed experimentally but are not routinely available in diagnostic laboratories.

## TREATMENT



### THERAPEUTIC GOALS

- Eliminate the protozoa or slow their multiplication until immunity develops.
- Limit contamination of the environment with infective oocysts.
- Provide supportive care to optimize survival.

### ACUTE GENERAL TREATMENT

- Anticoccidial drugs work best in the early stages of the disease:
  - Sulfonamides have the advantage that they are often also effective against secondary bacterial pathogens. Trimethoprim/sulfamethoxazole 30 mg/kg q 24 h PO; sulfadimethoxine 50 mg/kg first dose, then 25 mg/kg q 24 h PO
  - Toltrazuril (25 mg/kg daily for 2 days PO, then repeat after 5 days) is a highly effective anticoccidial treatment.
- Provide supportive care for dehydration:
  - Correct dehydration over 12 to 24 hours. Fluids (see Fluid Therapy in Rabbits and Rodents, Sec. II) can be given subcutaneously, intravenously, or intraosseously (see Intraosseous Catheters, Sec. II), depending on the patient. Crystalloids or colloid combinations are given depending on the condition of the patient.
  - In collapsed rabbits, track the response by monitoring blood pressure.
- Provide nutritional support by syringe feeding or via a nasogastric tube. Commercial products are available that provide effective nutritional support with a fiber content that helps promote normal gut function.
- Prokinetic drugs help normalize gut motility (e.g., metoclopramide 0.5-1 mg/kg q 6-8 h PO, SC; cisapride 0.5-1 mg/kg q 6-8 h PO)

- H<sub>2</sub> histamine-receptor antagonists (e.g., ranitidine 2-5 mg/kg q 12 h PO) may stimulate gut motility but may also reduce the risk of gastric ulceration.

### CHRONIC TREATMENT

- Vaccination of entire litters of rabbits by spraying a vaccine strain of oocysts into the nesting box has been shown effective in clinical trials of intensive production farm-reared rabbits.
- The vaccine strain is a precocious line (shortened life cycle) of oocysts derived from field isolates that display immunogenicity but are not pathogenic when administered at the correct oral dose.
- Immunization is quick and efficient because it does not require handling of rabbits.

### POSSIBLE COMPLICATIONS

- Resistance to coccidiostats is seen increasingly in intensive production farm-reared rabbits.
- Intussusception subsequent to hyperperistalsis induced by coccidial infection of the intestines is reported in young rabbits.

### RECOMMENDED MONITORING

- For breeding colonies with recurrent coccidiosis, investigate all cases of enteritis in young rabbits to ensure that preventive measures are working.
- Because the prepatent period for *E. stiedai* is 21 to 37 days, monitoring feces for oocysts is unlikely to be effective.

### PROGNOSIS AND OUTCOME



Severe clinical signs carry a grave prognosis, especially for hepatic coccidiosis. Less severe clinical signs have a better prognosis. Subclinical infections will result in natural immunity.

### PEARLS & CONSIDERATIONS



#### COMMENTS

- Parasitism with coccidia (and nematodes) does not appear to be an important cause of mortality in adult rabbit populations.
- Jaundice and abdominal effusion in a 4- to 16-week-old rabbit are virtually pathognomonic for hepatic coccidiosis.
- Intestinal coccidiosis is often difficult to confirm in a single patient because clinical disease is often aggravated by the proliferation of opportunistic pathogens (e.g., bacteria, viruses).

- Examination of sporulated oocysts is necessary to distinguish between some intestinal *Eimeria* spp.

### PREVENTION

- Control is achieved by prevention of exposure to infective oocysts:
  - Frequent cleaning of rabbit accommodation, feeding, and water containers
  - Exposure to 140°F (60°C) for 60 minutes or to 176°F (80°C) for 15 minutes renders ≈80% of *Eimeria* species oocysts incapable of sporulation. *E. irresidua* oocysts tolerate exposure to 176°F (80°C) for 60 minutes.
  - Efficient removal of feces daily (before oocysts become infective)
    - Change bedding litter frequently, and keep it dry.
  - Control vermin and flies that could serve as mechanical vectors.
  - Avoid fecal contamination of food.
  - Keep rabbits younger than 4 months old out of contaminated areas.
  - Where there is a problem in spite of good husbandry, prophylactic anticoccidials may be needed.
  - Because coccidiosis primarily affects young rabbits just after weaning (5- to 6-week-old animals), disease prevention must be initiated before weaning.

### CLIENT EDUCATION

- Warn clients of risks of mechanical transfer.
- Emphasize reason for good hygiene practices.
- Remove young rabbits from infected does as early as possible.
- Stop breeding with known infected does.

### SUGGESTED READINGS

Barriga OO, et al: Pathophysiology of hepatic coccidiosis in rabbits, *Vet Parasitol* 8:201-210, 1981.

Levine ND, et al: Coccidia of the Leporidae, *J Eukaryot Microbiol* 19:572-581, 1972.

Pakandl M: Coccidia of rabbit: a review, *Folia Parasitol (Praha)* 56:153-166, 2009.

### CROSS-REFERENCES TO OTHER SECTIONS

Anorexia  
Endoparasites  
Hepatic Disorders  
Intestinal Disorders  
Intraosseous Catheters (Section II)  
Fluid Therapy in Rabbits and Rodents (Section II)

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**Coccidiosis** Photomicrograph of a fecal floatation from a rabbit. 1, Oocyst of intestinal *Eimeria* spp. Parasitologists identify Eimerian species by distinguishing morphologic features of the oocysts such as dimensions (length × width in  $\mu$ ), shape (e.g., ellipsoid, ovoid), wall (e.g., light yellow, colorless, light pink), micropyle (none, present, prominent), and residual body (none, variable, large). 2, Egg of a parasitic nematode. 3, The yeast *Cyniclomyces guttulatus* (previously *Saccharomycopsis guttulata*), which is a common and normal nonpathogenic inhabitant of the rabbit stomach and intestine. (Photo courtesy Jörg Mayer, The University of Georgia, Athens.)