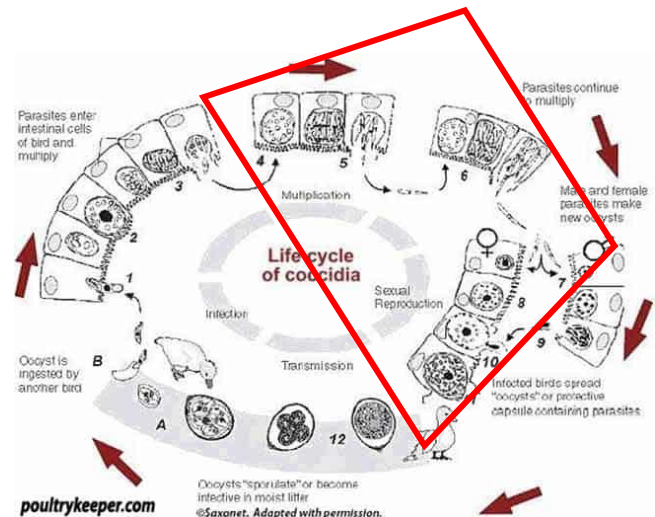


ADVANTAGE Products Promote Gut Health during Coccidiosis Exposure

Coccidiosis is a major disease affecting performance of poultry – broilers, pullets, turkeys, game birds and cage-free layers. Each class of poultry is impacted by different *Eimeria* species. Coccidia are almost universally present in poultry raising operations, but clinical disease occurs only after ingestion of relatively large numbers of sporulated oocysts by susceptible birds. The gut of birds become inoculated with these protozoans when the birds consume oocysts that have contaminated the litter, feed, water and/or soil. Once consumed the oocysts multiply rapidly within the sections of the intestine/ceca with a reproductive life cycle of 7 days. Infected birds excrete more oocysts into their environment to provide a source of reinfection for other birds.

When the parasites enter and multiply within the epithelial cells lining the intestinal villi and ceca, they cause **extensive tissue damage** and hemorrhage. These are the “lesions” observed upon necropsy. The damage to the intestinal lining results in fluid loss and malabsorption of nutrients. Additionally, there is inflammation of the intestinal wall with bleeding and sloughing of damaged epithelial cells. Complete destruction of villi can occur resulting in extensive hemorrhage and death.



Birds develop immunity to coccidiosis during the exposure. Generally, it requires 3 life cycles to maximize; however, it never appears to be complete. Coccidia species continue to exist in the bird’s environment throughout its growth period. Even after the acute stages of the disease during the early weeks of a bird’s life, the constant environmental contamination/re-inoculation/shedding results in sub-clinical disease that negatively impacts weight gain and feed conversion.

The objective of feeding coccidiostats is to provide control during both acute and sub-clinical stages. A Canadian study (*Poultry Science* 100:110-118; 2021) monitored the cocci oocyst cycling pattern in 53 broiler flocks where a coccidiostat was fed. Most of the flocks had maximal fecal OPG (oocysts per gram) counts at week 4 (45.3% of flocks) or week 5 (37.7% of flocks). Despite continuous in-feed medication, most medicated flocks (92.4%) showed increased oocyst shedding from week 3 onward (Figure 1).

A technical service bulletin by Schering-Plough Animal Health (2004) illustrated typical litter cocci oocyst counts for turkeys fed an ionophore coccidiostat. They noted an increase in counts after being transferred to the grow-out house (Figure 2).

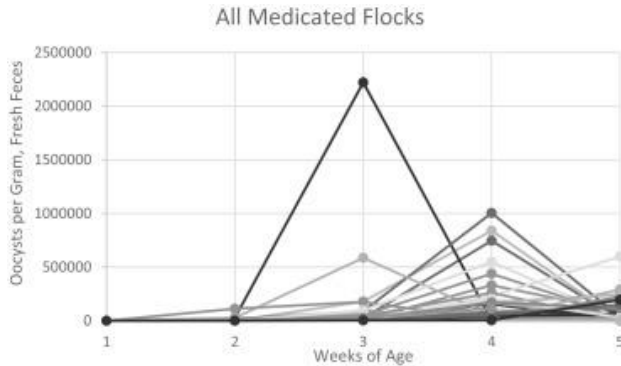


Figure 1. Cocci OPG shedding pattern in broilers over a 5-week grow-out period.

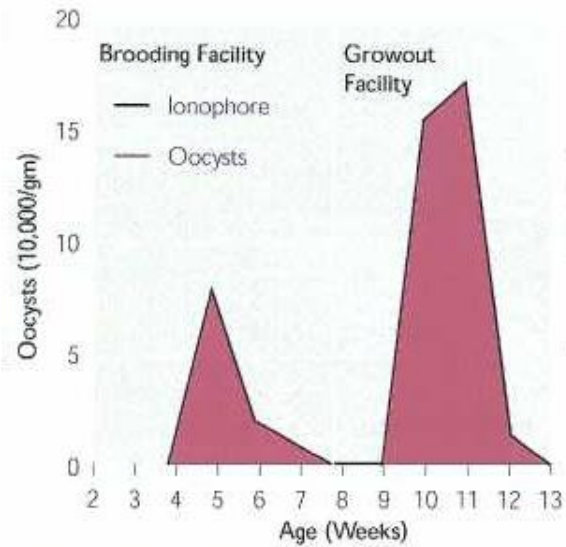


Figure 2. Litter cocci oocyst counts in turkeys fed ionophore coccidiostats.

Vaccinations for coccidiosis have been popular. The oocyst shedding (OPG) peak typically occurs between 18 to 21 days post vaccination. However, OPG counts continue afterward throughout the grow-out period (Figure 3; Source: Schering-Plough).

Problems associated with a cocci-vac program are achieving complete vaccination of all birds and reduction in feed/gain due to significant gut damage.

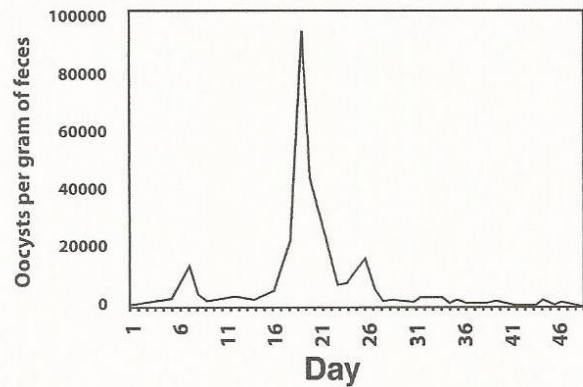


Figure 3. Cocci-vac Oocyst Shedding Pattern

Coccidiostats do not completely stop an outbreak. While there is little cross-resistance to anticoccidials with different modes of action, there is widespread resistance to most drugs. Consequently, “shuttle” programs are employed where use of 2 or more products are fed during the grow-out of a flock.

Various phytogetic products are being used either in conjunction with traditional anti-coccidials or as an alternative (particularly in NAE programs). Modes of action vary based on the specific phytogetic components. Polyphenols have emerged as key phytogenics to reduce the effects of coccidiosis.

Proanthocyanidins are a naturally occurring polyphenolic antioxidant widely distributed in grape seed. The antioxidant power of proanthocyanidins is 20 times greater than vitamin E and 50 times greater than vitamin C (*J. Med. Food; 2003*). An extensive number of research studies have reported that grape seed proanthocyanidins provide health benefits by providing protection against oxidative stress (*Biomedicine and Pharmacotherapy 116; 2019*).

As the *Eimeria* species invade the gut epithelial tissues, they cause damage via oxidative stress and lipid peroxidation resulting in diarrheal hemorrhage, poor growth, increased susceptibility to other disease agents and also death. Inflammation is a protective response in tissues against cell injury, irritation, pathogen invasions and serves as a mechanism for eliminating damaged and necrotic cells. However, when the inflammatory process lasts too long, then healthy tissues become damaged.

The grape seed extract polyphenols reduce oxidative stress by decreasing chronic inflammation. The antioxidant actions neutralize free radicals to both protect healthy tissues and heal damaged tissues (*Poultry Science; 2021*).

Evidence of the protective action of grape seed proanthocyanidins was derived from coccidiosis challenge studies with broilers by Southern Poultry Research. Trials with both feed additive and water soluble forms were conducted. These products (**Advantage** and **Advantage WS**) contain grape seed proanthocyanidins collected by water extraction followed by spray drying.

Intestinal and cecal lesion scores were taken 6 days following an oral challenge of a mixture of *E. acervulina*, *E. maxima* and *E. tenella*. **Advantage** (1 lb./ton) was fed throughout the 20 day study and compared to Salinomycin (60 g/ton). Lesion scores higher than 1.5 are considered to be indicative of acute clinical disease.

The reduction in severity of lesion scores by feeding **Advantage** compared to “Non-medicated, infected” demonstrated the antioxidant benefits of the polyphenols. Reduced lesion scores indicate a healthier gut that is able to better absorb nutrients and impact feed/gain.

Diet Regimen	Lesion Score			Feed/Gain
	Upper <i>E. acervulina</i>	Middle <i>E. maxima</i>	Cecal <i>E. tenella</i>	
Non-medicated, Uninfected	0	0	0	1.461
Non-medicated, Infected	2.6	2.4	3.0	2.142
Salinomycin, Infected	1.5	1.3	2.6	1.826
Advantage , Infected	1.7	1.6	2.2	1.753

Similar results were reported when grape seed extract proanthocyanidins (**Advantage WS**) were administered via the drinking water throughout the study. Gut lesion scores were recorded 6 days after a mixture of *Eimeria* (*acervulina*, *maxima* and *tenella*) was given orally on day 20. The antioxidant and anti-inflammatory effects of the **Advantage WS** proanthocyanidins promoted a healthier gut lining resulting in improved nutrient utilization.

Water Regimen	Lesion Score			Feed/Gain
	Upper <i>E. acervulina</i>	Middle <i>E. maxima</i>	Cecal <i>E. tenella</i>	
Non-medicated, Uninfected	0	0	0	1.378
Non-medicated, Infected	3.0	2.0	2.0	2.704
Advantage WS , Infected	2.2	1.5	1.1	2.221

Summary

Coccidiosis causes major damage to intestinal and cecal epithelial tissue resulting in hemorrhage and reduced ability to digest feed and absorb nutrients. Anti-coccidials provide protection but development of resistance has diminished their effectiveness. Consequently, additional intervention strategies including use of phytogetic products are being implemented to provide additional support.

Grape seed extract polyphenols (proanthocyanidins) present in **Advantage** and **Advantage WS** demonstrate reduced oxidative stress caused by coccidiosis. The protective and healing actions of the proanthocyanidins reduce the severity of gut lesions thus promoting a healthier gut that supports a higher level of bird performance.

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