

## Synthetic Anticoccidials for Poultry: Understanding modes of action and options for effective coccidiosis control

Following our recent focus on ionophore anticoccidials, this edition of Poultry News explores synthetic anticoccidials, an important class of drugs used widely in poultry production to combat coccidiosis. While ionophores remain foundational, synthetics play a critical complementary role, especially in shuttle, rotation, and “clean-out” programs designed to manage resistance and enhance control.

### What Are Synthetic Anticoccidials?

Synthetic anticoccidials are chemically manufactured compounds that target different stages of the *Eimeria* parasite lifecycle, primarily working by inhibiting parasite metabolism or replication. Unlike ionophores, which disrupt ion transport, synthetic drugs interfere with specific biochemical pathways essential to parasite survival.

These compounds are usually administered via feed or water and are approved strictly for prevention and treatment of coccidiosis in broilers and other poultry species.

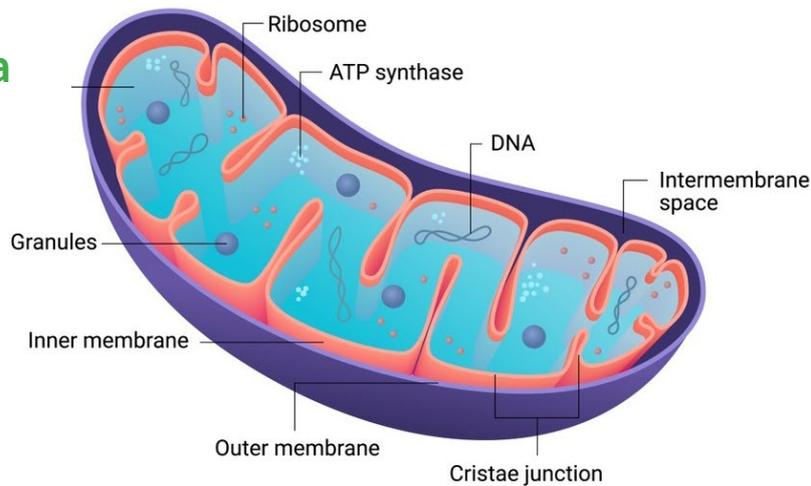


### How Do Synthetic Anticoccidials Work?

Synthetic anticoccidials target vital biochemical or physiological processes in *Eimeria* parasites, such as:

- **Inhibition of mitochondrial respiration** (blocking energy production)
- **Interference with nucleic acid synthesis** (stopping DNA/RNA replication)
- **Disruption of folic acid metabolism** (essential for parasite growth)
- **Inhibition of microtubule formation** (preventing cell division)

## Mitochondria



By attacking these vital functions, synthetic drugs effectively reduce parasite replication and oocyst shedding, helping maintain flock health and performance.

## Types of synthetic anticoccidials in poultry

Synthetic anticoccidials are diverse, classified by their chemical structure and mode of action. Below are common examples, including the requested additions:

### 1. Nicarbazin

- **Mode of Action:** Interferes with mitochondrial function and disrupts energy metabolism in *Eimeria*.
- **Use:** Starter and grower feed anticoccidial; broad-spectrum efficacy.
- **Notes:** Common in shuttle programs with an ionophore; requires careful dosing to avoid egg production issues in layers. Creates metabolic heat so judicious use is required in summer and in older birds.

### 2. Diclazuril

- **Mode of Action:** Inhibits nuclear division and development of coccidial schizonts and gametes.
- **Use:** Shuttle programmes. No meat withhold.

### 3. Toltrazuril

- **Mode of Action:** Affects multiple life stages by disrupting mitochondrial respiration and nuclear division.
- **Use :** Mostly therapeutic (in water); long residual effect helps break parasite cycles.

### 4. Amprolium

- **Mode of Action:** A thiamine analog inhibiting parasite carbohydrate metabolism.
- **Use:** Primarily therapeutic treatment (in water) for active coccidiosis outbreaks, excellent for “dampening” an outbreak.

### 5. Clopidol

- **Mode of Action:** Disrupts mitochondrial respiration and electron transport.
- **Use:** Feed additive, often part of shuttle programs.

## 6. Robenidine

- **Mode of Action:** Acts on mitochondrial energy metabolism, disrupting parasite energy production.
- **Use:** Effective synthetic anticoccidial commonly used in rotation or shuttle programs.
- **Note:** Long withdrawal time due to its impact on the taste of meat.

## 7. Halofuginone

- **Mode of Action:** Interferes with parasite protein synthesis and development of schizonts.
- **Use:** Typically used in prevention programs; known for rapid action and potency against early *Eimeria* stages. Shuttle in starter feeds.

## Synthetic Anticoccidials as “Clean-Out” Programs: A Single-Cycle Approach

When talking about synthetic anticoccidials, a clean-out is the deliberate use of a highly effective synthetic anticoccidial (often in a shuttle or rotation program) to drastically reduce the *Eimeria* population in the poultry house environment.



## Why it's done

### 1. Reduce environmental oocyst load

- Synthetic drugs (chemicals like nicarbazin, clopidol, diclazuril, etc.) are generally stronger than ionophores.
- They suppress oocyst cycling more aggressively, lowering contamination in litter.

### 2. Reset coccidial pressure

- After multiple cycles with ionophores, *Eimeria* numbers in the house can build up.
- A clean-out cycle reduces this background pressure, improving bird performance.

### 3. Improve subsequent program effectiveness

- By reducing “challenge pressure,” the following cycles (ionophores or vaccines) work more predictably.

## How it fits into programs

- **Rotation strategy :** After several ionophore cycles, one flock may go on a **synthetic clean-out** to drop oocyst levels.
- **Shuttle program:** Synthetic may be used in starter or grower phases specifically to reduce early cycling. This is strongly advised to prevent resistance.
- **Timing:** Synthetic anticoccidials are usually used during lower humidity (summer) period.

## Key points of the “clean-out” strategy:

- Use a synthetic anticoccidial **only in one production cycle** to avoid resistance build-up.
- Consider in a shuttle only, with an ionophore or another chemical to avoid rapid resistance occurring.
- Ionophores or vaccination programs are then used for ongoing control during the production cycle.
- Clean-out programs can significantly reduce environmental contamination and improve subsequent flock performance.

## Synthetic vs. Ionophore anticoccidials: complementary tools

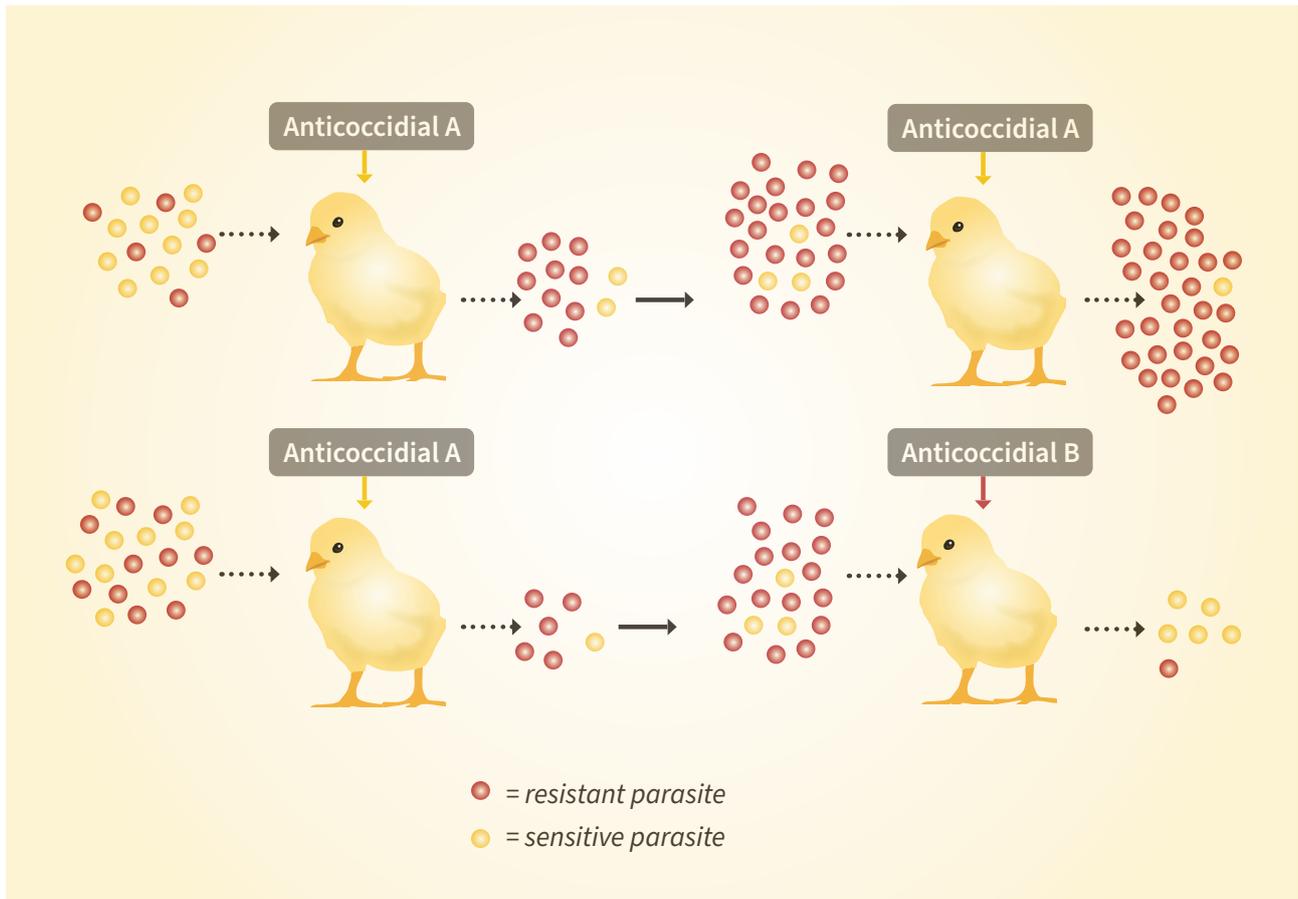
- **Synthetic anticoccidials** tend to provide *sterilising* effects killing parasites thoroughly without allowing partial cycling. This prevents immunity development but is useful for heavy coccidial challenges or environmental “clean-out.”



- **Ionophores** allow limited cycling (“leakage”), supporting natural immunity and generally exert a milder selective pressure.
- Combined thoughtfully, synthetic and ionophore anticoccidials form the backbone of modern **shuttle, rotation, and clean-out programs** that optimize coccidiosis control while mitigating resistance risks.
- **Ionophores differ from synthetic anticoccidials in that they also possess antibacterial activity.** Ionophores disrupt cell membrane ion balance not only in *Eimeria* parasites but also in certain Gram-positive bacteria, which can influence gut flora and indirectly improve growth performance. In contrast, synthetic anticoccidials act through specific biochemical pathways in *Eimeria* only, with no antibacterial effect. This distinction is important, as ionophores can impact both coccidial control and the intestinal microbiome, while synthetics provide a more targeted, parasite-specific action.

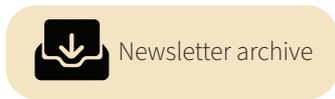
## Best practices for using synthetic anticoccidials

- **Limit synthetic anticoccidial use to one production cycle:** Avoid continuous or repeated use to reduce resistance pressure.
- **Rotate chemical classes regularly:** Alternate synthetic and ionophore anticoccidials between flocks.
- **Follow precise dosing:** Ensure feed and water inclusion rates adhere to label recommendations.
- **Microbial pathogen control:** Additional antimicrobial control, such as probiotic support, required.
- **Combine with strong management:** Maintain litter quality, ventilation, and biosecurity.
- **Monitor flock health:** Detect and respond to breakthrough infections early.



## Conclusion: Strategic use preserves anticoccidial efficacy

Synthetic anticoccidials provide potent tools for coccidiosis control, especially when used strategically in **clean-out programs** or as part of shuttle and rotation strategies with ionophores. Understanding their modes of action, timing, and limitations is key to sustaining flock health, managing resistance, and maintaining productive poultry operations.



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