

**Comparative Efficacy of
synbiotic and diclazuril
on the performance of
broilers
infected with *Eimeria
acervulina***

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INTRODUCTION



✓ **When chicks start to ingest feed**

Indigenous acid production is low

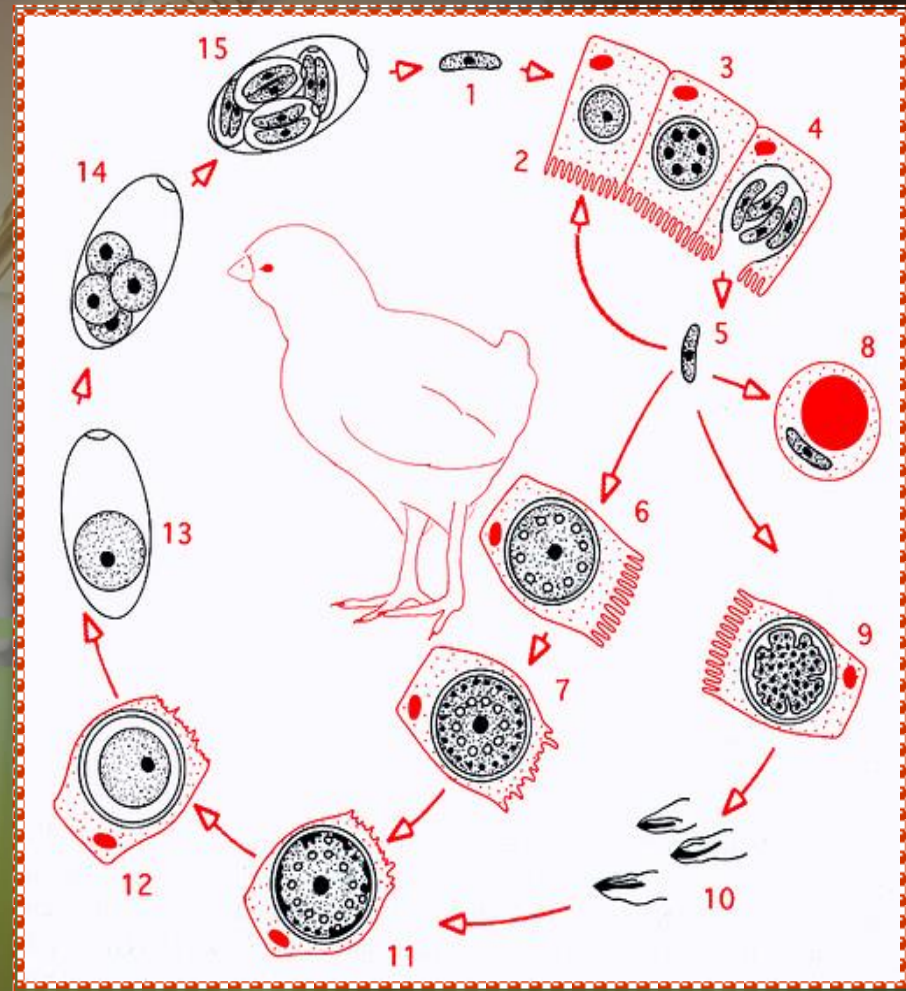
>>>> **very susceptible to pathogenic microorganisms**

✓ **A worldwide disease.**

AVIAN COCCIDIOSIS

AVIAN COCCIDIOSIS

- ✓ Cause: *Eimeria* spp.
- ✓ The most economically important disease of domestic poultry.
- ✓ Global economic losses: **over \$3 billion annually**
(Shivaramaiah et al., 2014).



AVIAN COCCIDIOSIS



Eimeria spp.

Survive environmental challenges ➤

Emergence of drug resistance ➤



A serious threat to
production of poultry.

ANTIMICROBIAL FEED ADDITIVES

IN MODERN POULTRY PRODUCTION

Antibiotics are often used as feed additives

ADVANTAGES :

- 1- Suppress or eliminate harmful organisms in the intestine.**
- 2- To improve growth and feed efficiency.**



ANTIMICROBIAL FEED ADDITIVES

DISADVANTAGE :

Formation of resistance against pathogenic bacteria to humans.

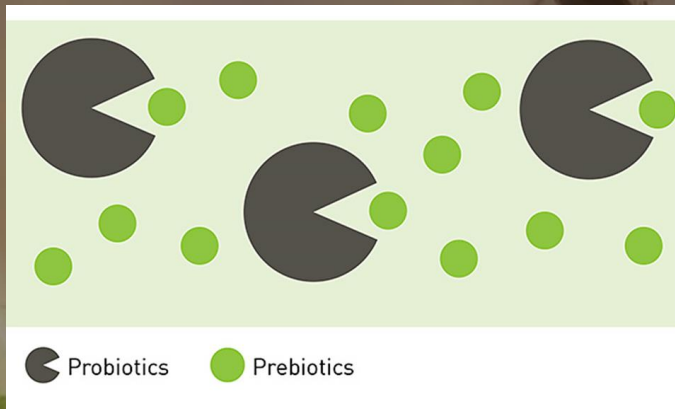
- ✓ in 2006; a ban on the use of antibiotics as growth promoters in animal nutrition by the European Union (EU).
- ✓ Researchers and nutritionists searching other alternatives for improvement of the performance of broiler chicken, e.g. Synbiotic.



Probiotics



Probiotics and Prebiotics -
essential for good digestion



Prebiotics vs Probiotics

Prebiotics	Probiotics
Prebiotics are defined as nonliving non-digestible special form of fiber or carbohydrates.	Probiotics are referred to as live active microorganisms that when administered in adequate amount will have beneficial effects to its host.
The powder form of prebiotics can survive heat, cold, acid.	<ul style="list-style-type: none"> more fragile. vulnerable to heat. may be killed over time.
Prebiotics perform their role by nourishing the bacteria that live in the intestines.	Probiotics fight the harmful bacterial species present in the gut.



Probiotics:

Live microorganisms that confer a health benefit on the host when administered in adequate amount (FAO/WHO, 2002)

Prebiotics:

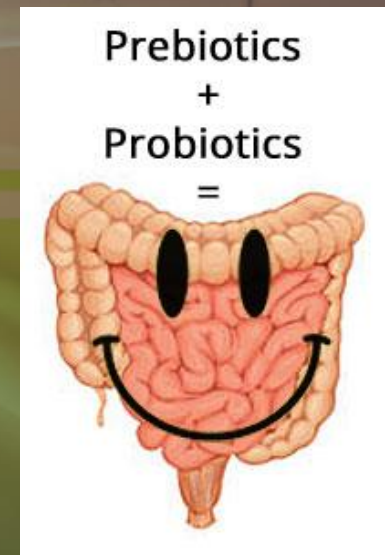
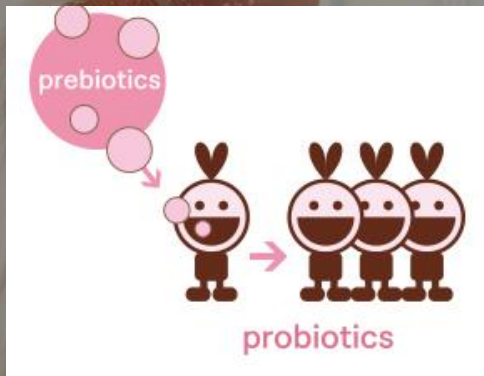
food ingredients that stimulate the growth of probiotic bacteria.

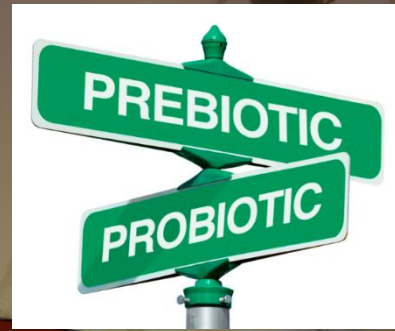
Non-digestible food ingredients that beneficially affect the host by selectively stimulating growth of probiotic bacteria

Synbiotics

- **Pairing a probiotic with its preferred nutrient (prebiotic)**
- **Allow probiotics to stay present in the body for a longer time**

Efficient way to maintain all the health benefits they confer.





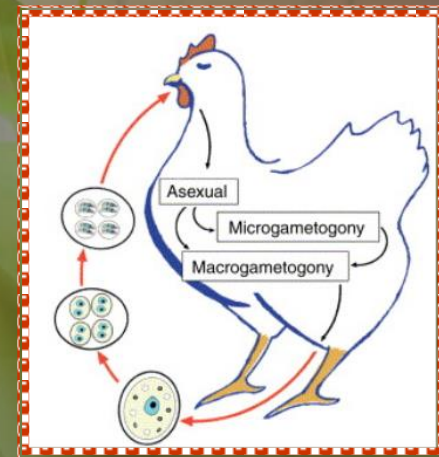
AIM OF THE WORK




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Using synbiotic to control experimental infection with *E. acervulina* in broilers.

Effect of Synbiotic on *growth* performance and some *biochemical* parameters of treated broilers with or without Diclazuril.





**MATERIAL
AND METHODS**



MATERIALS



Chemical VS natural

Diclazuril

(Clinacox® 0.5%; Janssen Pharmaceutica N.V., Belgium)

1 g per ton of feed (1 ppm)

Synbiotic

(Clostat HC SP Dry®, Kemin, Belgium)

Probiotic : *Bacillus subtilis* 2×10^8 CFU/gm
prebiotic: Lactose 99.8%
1 kg/ton feed

EXPERIMENTAL INFECTION

Time of infection

On the 8th day of age

Infective dose/chick

1×10^5 sporulated oocysts of *E. acervulina*

Route of infection

Direct inoculation intra-crop by a stomach tube

EXPERIMENTAL INFECTION

150, one day old chicks

Time of infection



On the 8th day of age

Route of infection

Direct inoculation intra-crop by a stomach tube

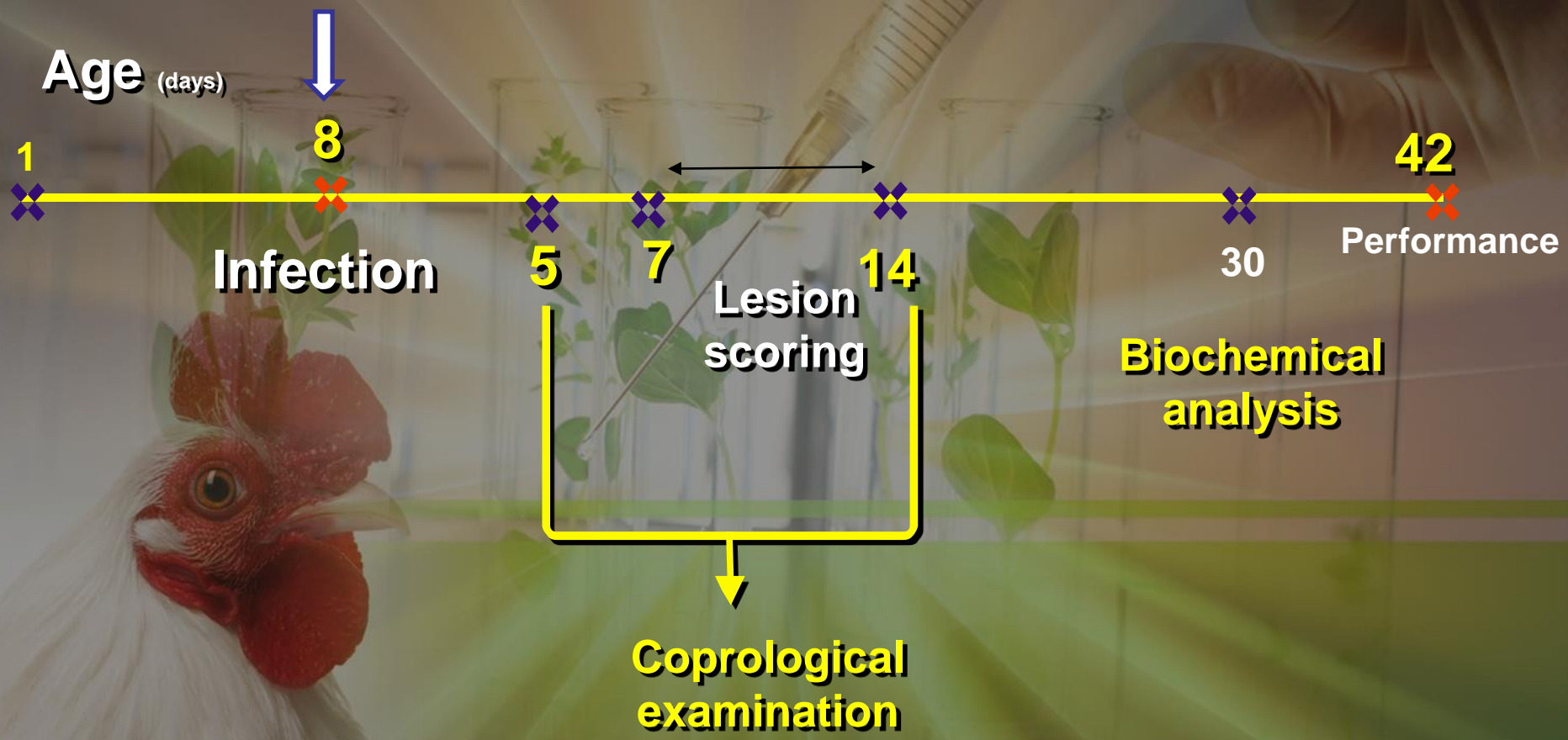
Infective dose/chick

1×10^5 sporulated oocysts of *E. acervulina*

EXPERIMENTAL GROUPS

Group	No. of chicks/group	Infected with <i>E. acervulina</i>	Treatments		
			Diclazuril (1ppm)	Synbiotic (1 Kg/ ton)	Diclazuril + Synbiotic
1	30	-	-	-	-
2	30	+	-	-	-
3	30	+	+	-	-
4	30	+	-	+	-
5	30	+	-	-	+

EXPERIMENTAL DESIGN





RESULTS

OOCYST OUTPUTS

**Effect of treatments on oocysts output
of broilers experimentally infected with *Eimeria acervulina***

Parameter	Oocysts output (x 10 ⁵ ocysts/gram dropping ± SEM)				
	Groups				
	-Ve control	+Ve control	Diclazuril	Synbiotic	Diclazuril + Synbiotic
Overall mean	0.00 ± 0.00 ^b	106.44 ±19.96 ^a	26.87 ±7.44 ^b	31.92 ±8.35 ^b	11.84 ±3.66 ^c
Reduction %	0.00	75.00	70.00	89.00

LESION SCORING

Effect of Diclazuril and/ or Synbiotic on lesion score of broilers experimentally infected with *Eimeria acervulina*

Time (days)	Groups				
	-Ve control	+Ve control	Diclazuril	Synbiotic	Diclazuril + Synbiotic
7	0.00 ± 0.00 ^d	4.21 ± 0.13 ^a	2.42 ± 0.46 ^b	2.67 ± 0.13 ^b	1.60 ± 0.14 ^c
14	0.00 ± 0.00 ^d	4.32 ± 0.26 ^a	0.58 ± 0.04 ^b	0.64 ± 0.02 ^b	0.43 ± 0.03 ^c

GROWTH PERFORMANCE

Parameter (Age: 42 days)	-Ve control	+Ve control	Diclazuril	Synbiotic	Diclazuril + Synbiotic
Final Body weight (gm)	1811.70 ±55.72 ^b	1418.27 ±67.34 ^c	1795.68 ±28.46 ^b	1897.64 ↑ ±72.62 ^a	1890.48 ↑ ±73.62 ^a
Total Feed intake (gm)	3775.25 ±74.24 ^a	3346.25 ±73.73 ^c	3771.37 ±56.12 ^a	3540.88 ±76.14 ^b	3537.38 ±85.44 ^b
Cumulative Body gain (gm)	1766.09 ±23.55 ^b	1369.80 ±33.47 ^c	1762.41 ±33.45 ^b	1850.54 ↑ ±32.42 ^a	1848.71 ↑ ±62.37 ^a
FCR	2.13 ±0.08 ^b	2.44 ±0.04 ^a	2.14 ±0.03 ^b	1.91 ↓ ±0.04 ^c	1.91 ↓ ±0.06 ^c

BIOCHEMICAL PARAMETERS-1

Parameters	Groups				
	1	-Ve control	+Ve control	Diclazuril	Synbiotic
Total Protein (gm/dl)	3.84 ±0.04 ^b	2.64 ±0.05 ^c	3.66 ±1.06 ^b	6.11 ±0.18 ^a	6.66 ±0.08 ^a
Serum albumin (gm/dl)	2.17 ±0.02 ^b	1.52 ±0.02 ^c	2.12 ±0.08 ^b	3.68 ±0.04 ^a	3.88 ±0.03 ^a
Serum globulin (gm/dl)	1.67 ±0.04 ^b	1.12 ±0.04 ^c	1.54 ±0.06 ^b	2.43 ±0.01 ^a	2.78 ±0.04 ^a

BIOCHEMICAL PARAMETERS-1



Parameters	-Ve control	+Ve control	Diclazuril	Synbiotic	Diclazuril + Synbiotic
Total cholesterol (gm/dl)	110.72 ±4.34 ^a	73.57 ±5.18 ^b	118.72 ±7.83 ^a	71.57 ±5.15 ^b	70.22 ±3.25 ^b
Triglycerides (mg/dl)	41.23 ±2.46 ^a	31.17 ±2.55 ^b	42.33 ±3.64 ^a	30.56 ±1.64 ^b	30.88 ±2.84 ^b
HDL-C (mg/dl)	33.12 ±1.38 ^b	30.33 ±2.84 ^b	32.87 ±2.79 ^b	41.2 ±1.72 ^a	42.12 ±2.76 ^a
LDL-C (mg/dl)	69.35 ±4.46 ^a	37.01 ±1.45 ^b	77.38 ±4.95 ^a	24.26 ±1.47 ^c	21.92 ±1.37 ^c
VLDL-C (mg/dl)	8.25 ±0.68 ^a	6.23 ± 0.42 ^b	8.47 ± 0.11 ^a	6.11 ±0.24 ^b	6.18 ±0.41 ^b

BIOCHEMICAL PARAMETERS-2

<i>Parameter</i>	<i>Groups</i>				
	<i>-Ve control</i>	<i>+Ve control</i>	<i>Diclazuril</i>	<i>Synbiotic</i>	<i>Diclazuril + Synbiotic</i>
<i>ALT (U/L)</i>	24.46 ±1.16 ^b	38.52 ±2.15 ^a	25.26 ±1.13 ^b	26.23 ±1.03 ^b	25.17 ±1.08 ^b
<i>AST (U/L)</i>	53.24 ±1.25 ^b	76.28 ±2.37 ^a	51.17 ±2.31 ^b	55.47 ±1.17 ^b	56.11 ±1.05 ^b
<i>Uric acid (mg/dl)</i>	7.33 ±0.27 ^a	7.25 ±0.17 ^a	7.46 ±0.14 ^a	6.54 ±0.39 ^a	6.19 ±0.18 ^a
<i>Creatinine (mg/dl)</i>	1.16 ±0.02 ^a	1.06 ±0.02 ^a	1.13 ±0.08 ^a	1.12 ±0.04 ^a	1.33 ±0.06 ^a

MODE OF ACTION

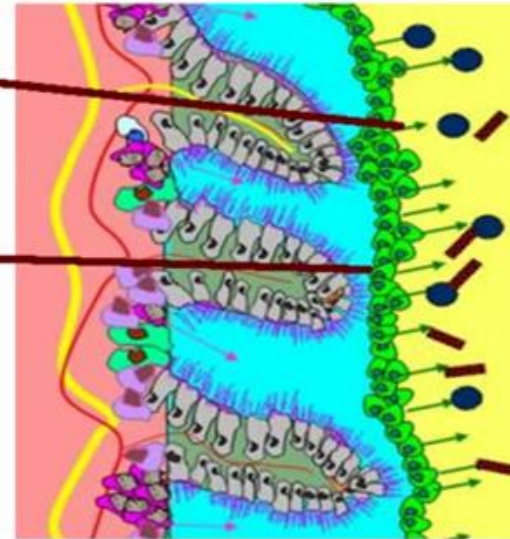
Probiotics

Secrete antiviral,
Antibacterial & antifungal chemicals

Form a physical barrier >>
hinder invasion of pathogenic MO

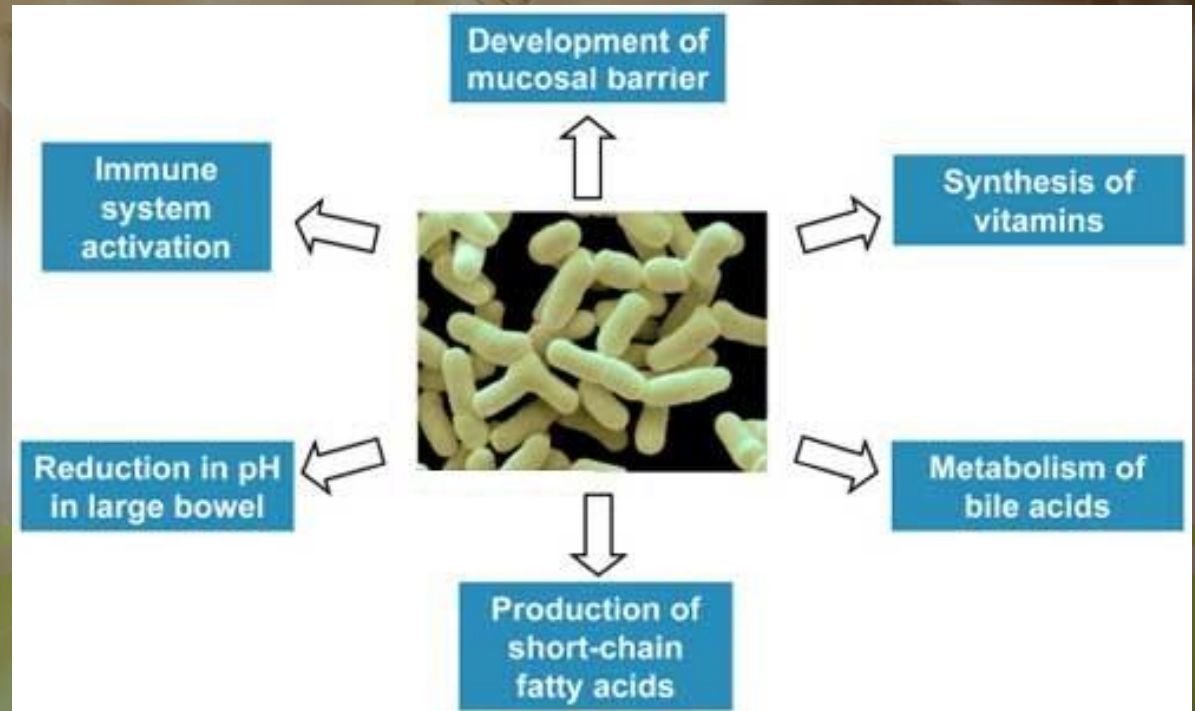
Create acidic microenvironment >>
Promote absorption of iron and the other minerals

Probiotic Benefits

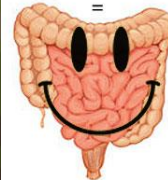


MODE OF ACTION

Probiotics

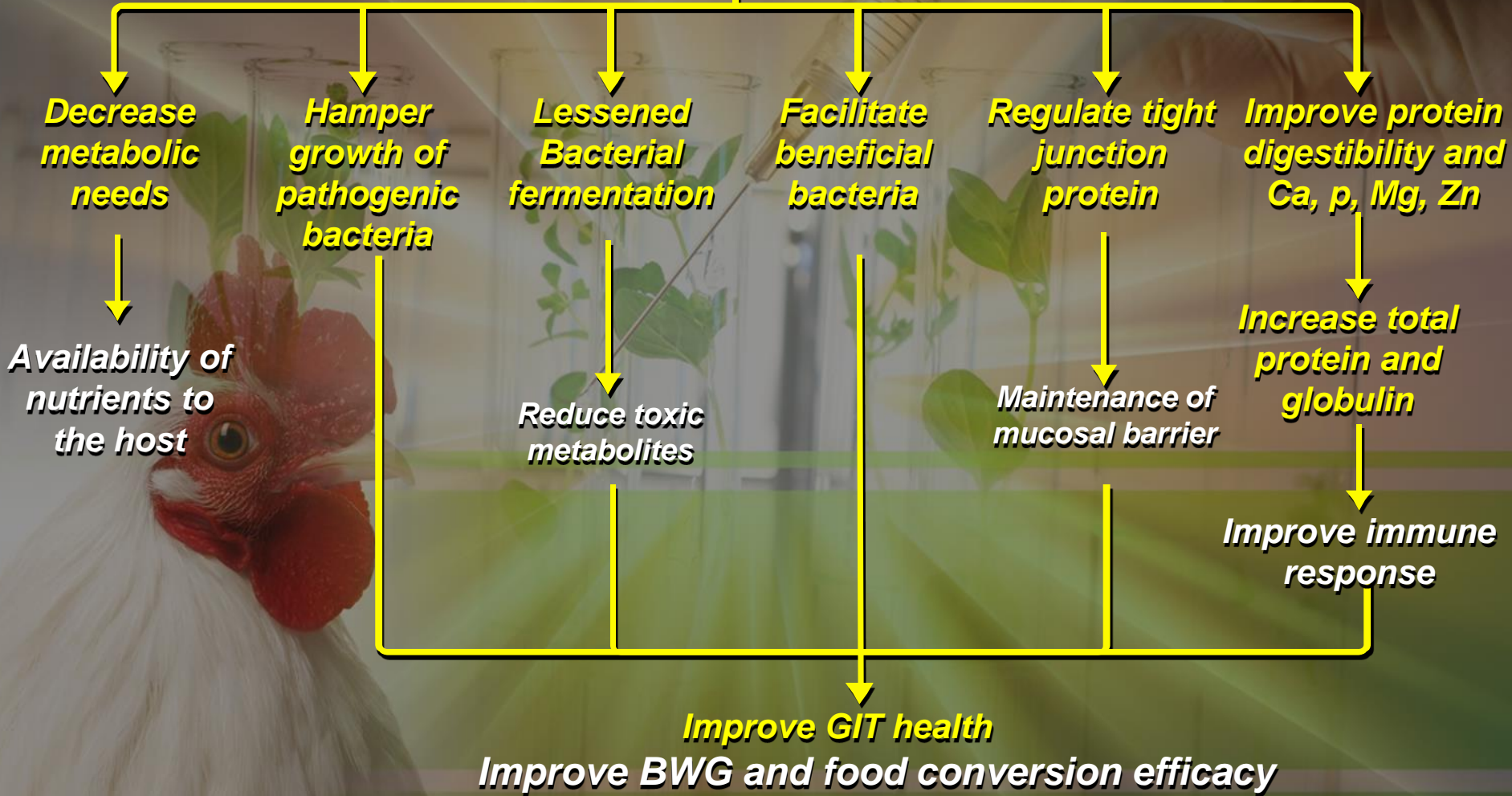


Prebiotics
+
Probiotics
=



MODE OF ACTION

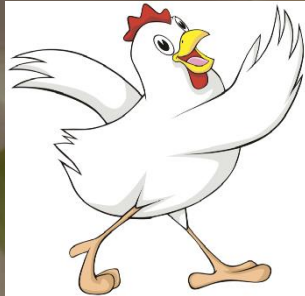
Short Chain Fatty Acids



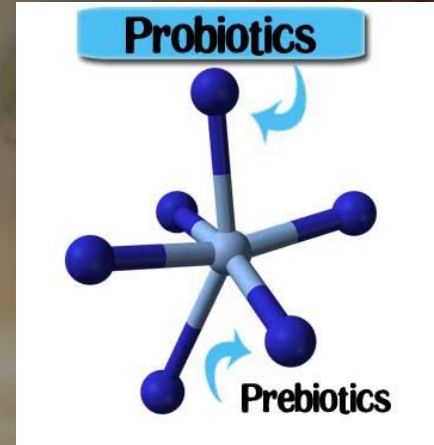
CONCLUSION



CONCLUSION



Synbiotic



- ✓ **Controlled Coccidial infection**
- ✓ **Improved growth performance of broiler chickens**
- ✓ **Increased total protein, albumin, and globulin**
- ✓ **Decreased total cholesterol**

Cholesterol concentration in thigh and breast muscle of the broilers was positively correlated with the lower serum cholesterol content (Salma et al., 2007)

Other benefits of Synbiotics



- ✓ Provide people with healthy and nutritious poultry products.
- ✓ Friendly to the environment, producers, and consumers.

CONCLUSION

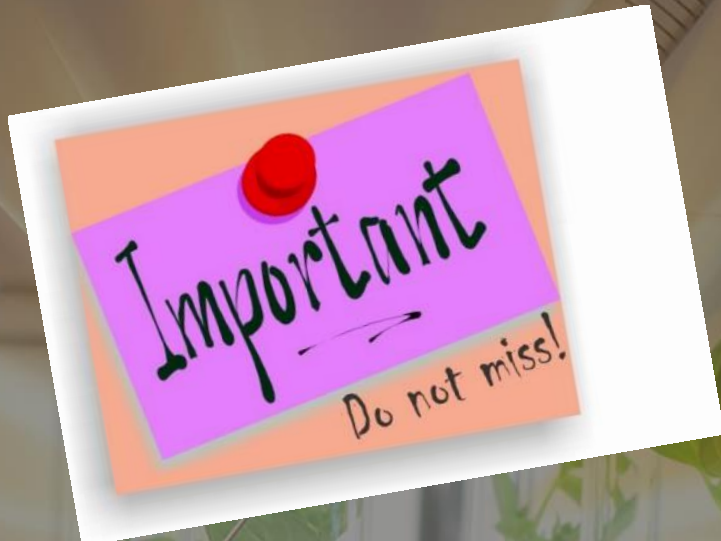
Synbiotic

**Improve morphology and physiology
of the intestinal epithelium**

A useful supplement in broiler diets

An alternative to growth promoters and antimicrobial drugs





We should be ahead of it





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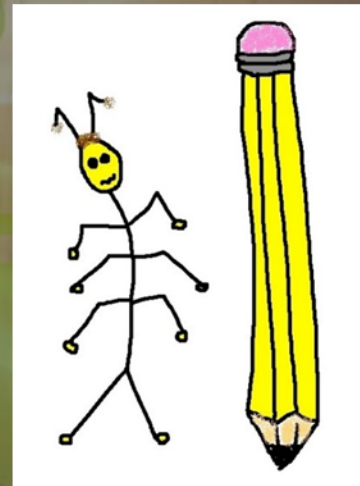
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In Egypt: +20 106 072 8777

*Thank
You*

We should be ahead of it

Vector resistance
to pesticides:



Dr. Hanem Khater

Professor of Parasitology, Benha University, Egypt.

oocyst outputs

Birds fed on a combination of diclazuril and synbiotic (Gp 5) showed a significant reduction in oocyst output compared to those of Gps 3 and 4.

Direct effect of diclazuril on asexual stages of *E. acervulina* especially late schizont generation.

The indirect effect of synbiotic through increasing the intestinal microflora that occupying the specific receptors responsible for adherence and attachment of sporozoites and merozoites.

Lesion scoring

Improved in all treated groups especially in Gp 5 and there is no statistical difference between oocyst output and lesion scoring in Gp 3 and 4.

These findings may be attributed to the beneficial effects of synbiotic on intestinal epithelial morphology.

Lesion scoring (Johnson and Reid, 1970)

Score 0: no gross lesions.

Score 1: small red petechiae may appear on the serosal side of the midintestine. There is no ballooning or thickening of the intestine, though small amounts of orange mucus may be present.

Score 2: serosal surface may be speckled with numerous red petechiae, intestine may be filled with orange mucus, little or no ballooning of the intestine and thickening of the wall.

Score 3: intestinal wall is ballooned and thickened. The mucosal surface is roughened and intestinal contents are filled with pinpoint blood clots and mucus.

Score 4: the intestinal wall may be ballooned for most of its length, contains numerous blood clots and digested red blood cells, giving a characteristic colour and putrid odour; the wall is greatly thickened.

performance parameters

The beneficial effects of synbiotic on all performance parameters, including cumulative body weight, cumulative body weight gain and FCR.

The synergistic effect of probiotic and prebiotic could reduce the count of pathogenic bacteria and increase the population of useful microflora in the gut. Therefore, the immune system may be less stimulated

A favorable medium is provided for the use of nutrients and energy by birds. synbiotic increases the length of the intestinal mucosa, which increases the absorption areas and improves the bird's energy and protein efficiency ratio.

Accordingly, each of the above-mentioned reasons may lead to the observed enhancement of broiler's growth.

Protien

The positive control group, Gp 2, showed significant decreases in the levels of the total protein, albumen and globulin.

hypoproteinemia in coccidial infections:

Acute stress >> ↑ cortisol secretion >> ↑ catabolism of protein.

Acute haemorrhage >> loss of plasma protein followed by rapid movement of interstitial fluid, without protein, into plasma compartment resulting in acute hypoproteinemia.

In Synbiotic-treated birds >>

Increase of serum total protein, albumin, globulin and HDL-C.

good the intestinal environment >>> improvement of the digestion and absorption of the nutrients. .1

*synbiotic limits the damage caused by the pathogenic bacteria and parasites (*Eimeria* spp.) >> increases the bioavailability of essential nutrients >>> improves utilization of proteins (amino acids), particularly from food that does not contain them in optimum quantities.*



Lipids in +ve control

A decrease of all parameters of lipid profile.

Anorexia and malabsorption of nutrients by broilers.

Anorexia >> declined triglyceride level in coccidia affected birds.

Disturbance in vitamin B synthesis in coccidiosis >> hinder lipogenesis from carbohydrate.

Lipid in Synbiotic-treated birds:

A significant decrease of serum total cholesterol, triglycerides, LDL-C and VLDL-C and increase in the HDL-C.

↓↓ Total cholesterol absorption

Prebiotic >> bind to bile salts >> ↓ Cholesterol

Symbiotic >> ↑ the population of *Lactobacillus* spp. in GIT << which has a high bile salt hydrolytic activity, >> de-conjugation of bile salts >> De-conjugated bile acid are less soluble at low pH and less absorbed in the intestine >>> ↑ excreted in feces.

↓ Total cholesterol synthesis

Probiotic inhibits hydroxymethyl- glutaryl-coenzyme A, an enzyme involved in the cholesterol synthesis.

prebiotic eliminates cholesterol would likely be through reducing lipid absorption in intestine by binding bile acids, which results in increased cholesterol elimination and hepatic synthesis of new bile acid.

Diclazuril treated group, Gp 4, did not show any significant difference regarding biochemical parameters when compared those of Gp1.