



# What are the alternatives to feed additives and medications?

Prepared and presented by Michael Sommerlad of "Poultry Works"  
PIX 2010



# Introduction

What are additives?

- “Feed ingredients other than the cereal grains and protein sources than constitute the bulk of a normal poultry ration”

What are medications?

- “Treatments applied to livestock for the prevention or treatment of disease”

# Introduction (continued)



## Why do we use them?

- Improve performance
- Reduce mortalities
- Optimise profitability
- Improve carcass quality
- Improve food safety
- Optimise animal welfare outcomes



# Introduction (continued)



## Why do we need alternatives?

- Save money
- Prevent the development of resistance in certain pathogenic organisms
- Meet the demands of the consumer
- Comply with certification standards (for certified free-range and organic producers)



# Feed additives



- Acidifiers
- Amino acids
- Antibiotics
- Anti-coccidials
- Anti-microbials
- Enzymes
- Mycotoxin binders
- Phytoogenics
- Pigments
- Prebiotics
- Probiotics
- Others



# Scope of this presentation

Due to the diverse range of broiler producers represented in this gathering, and the large number of feed additives and medications currently in use, this presentation will focus on those products most likely to cause concern with consumers, or non-compliance with certification requirements, namely:

- **Antibiotics**
- **Anti-coccidials**



# A closer look - Antibiotics

What are “antibiotics”?

- “Chemical substances used to inhibit the growth of, or destroy, certain organisms, normally micro-organisms such as bacteria”



Image demonstrating the inhibitory effect of antibiotic agents on a bacterial “lawn”



# Antibiotics (continued)

Why are they used?

- Two general uses for antibiotics:
- *Therapeutic* – that is to *treat* an existing condition (e.g. necrotic enteritis)
- *Prophylactic* – that is to *prevent* a condition occurring (antibiotics used in this way are known as “antibiotic growth promotants” or AGP’s)



# Antibiotics (continued)

## How do they work?

- When used as an AGP, antibiotics have four modes of action:
  1. The inhibition of sub-clinical infections
  2. Reduction of growth depressing microbial metabolites
  3. Reduction of microbial use of nutrients
  4. Enhanced uptake and use of nutrients through the thinner intestinal wall associated with antibiotic fed animals (Visek, 1978)

# Antibiotics (continued)

- Due to the lack of response to AGP's in germ-free chickens, antibiotics could be described as “growth permitters” rather than “growth promoters” (Anderson et al, 1999)



# Antibiotics (continued)



## Alternatives to antibiotics:

- Probiotics
- Prebiotics
- Phytogenics
- Organic acids



# Probiotics

## What are they?

- “One or more live micro-organisms that have a demonstrated positive effect on man and/or animals by improving conditions within the gut”



# Probiotics (continued)

## How do they work?

The mechanisms by which probiotics provide these benefits are quite complex, but can be summarised by the following:

“Beneficial micro-organism possess certain favourable characteristics that allow for the expression of several mechanisms that prevent pathogens from colonising the intestinal tract.” (Rolfe 1991)

# Probiotics (continued)

## How do they work? (continued)

These mechanisms are listed as follows:

1. Creation of a micro-ecology that is hostile to other bacteria species
2. Elimination of available receptor sites
3. Production and secretion of anti-microbial metabolites
4. Competition for essential nutrients

# Prebiotics

## What are they?

“Prebiotics provide a suitable substrate or medium (non-digestible food ingredients) for the growth of beneficial microbes in the gastrointestinal tract. Examples of these “non-digestible food ingredients” include non-starch polysaccharides (NSP), oligosaccharides, resistant starch, unabsorbed sugars and dietary proteins ”



# Prebiotics (continued)

## How are they used?

- Prebiotics are specific in the type of bacteria they stimulate
- Efficacy of probiotic treatment can be significantly improved by providing the appropriate prebiotic
- Some feed additive manufacturers combine the two into a single product

# Phytogenics

## What are they?

- “Phytogenic feed additives are plant-derived products used in animal feeding to improve the performance of livestock” (Windisch et al 2008).
- These include herbs, spices and essential oils



Oregano plant

# Phytogenics (continued)



## What do they do?

- Improve feed intake
- Stimulate the immune system
- Anti-microbial activity
- Anti-oxidant properties (Wenk, 2003)



# Phytogenics (continued)



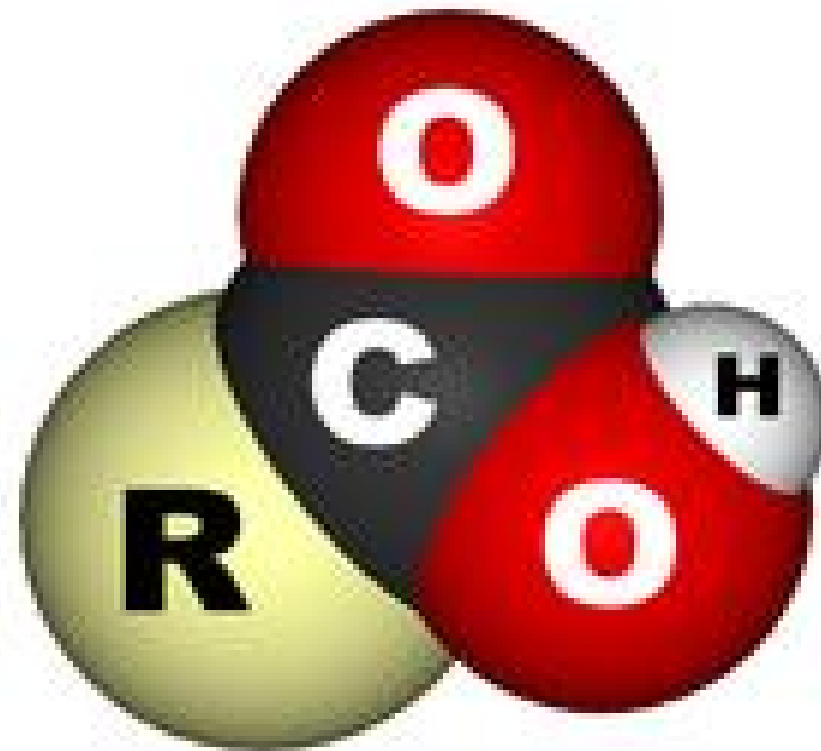
## Do they work – really?

- Plants and plant extracts have long been used to enhance health and nutrition
- There is an increasing body of evidence demonstrating the efficacy of certain phytogenic substances in improving broiler chick performance
- Personal experience includes essential oils and plant extracts

# Organic acids

## What are they?

- Any organic carboxylic acid, including fatty and amino acids, of the same general structure is considered to be an organic acid. These include formic, lactic, propionic sorbic, benzoic and acetic acids.



# Organic acids (continued)

## What do they do?

Organic acids are widely recognised as having two modes of action:

1. To preserve feed – mainly controlling fungus
2. Impact on microbial populations in the gastrointestinal tract – specifically those bacteria affected by acidic conditions

# Organic acids (continued)

## How do they do it?

- Penetrate the bacterial cell wall and disrupt the normal functioning of the organism (something inorganic acids like hydrochloric cannot achieve)
- To be effective they must reach the target areas of the gastrointestinal tract without dissociating. Some additive manufacturers have developed “protected” organic acids to ensure that they are delivered into the intestines in the appropriate form



# Organic acids (continued)



## Additional benefits

- Enhance protein digestion
- Improve nutrient retention
- Changing the physical structure of the intestinal cells
- Influencing electrolyte balance in the feed and the intestines (Gauthier, 2005)

# A closer look – anti-coccidials

Control of coccidiosis in broiler flocks has most recently been achieved by the use of ionophores, an antibiotic feed additive that controls oocyst output whilst at the same time allowing for some “leakage” of infective agent to assist in the development of natural immunity in the flock



Caecal coccidiosis (*Eimeria tenella*) in the caeca of a fowl

# Anti-coccidials (continued)

## Alternative coccidiosis control agents:

- Vaccination
- Phytogenics
- Litter management
- Gizzard health



# Anti-coccidials (continued)



## Vaccination

- Chicks or eggs are vaccinated with live, attenuated coccidial oocysts
- Full immunity is achieved after two or more complete life cycles through the flock



In ovo vaccination for coccidiosis is increasing in popularity worldwide

# Anti-coccidials (continued)



## Vaccination – continued

- Lifelong protection
- Provide protection against necrotic enteritis



# Anti-coccidials (continued)



## Litter management

- Only viable for small scale producers, or where labour costs are low
- Requires a sound understanding of the lifecycle of the *Eimeria* organism, and the development of immunity in the bird
- Prevents outbreaks of clinical coccidiosis by replacing, turning or covering infected litter to minimise the number of sporulated oocysts ingested by the birds
- Moving the chicks to a clean shed achieves the same effect



# Anti-coccidials (continued)

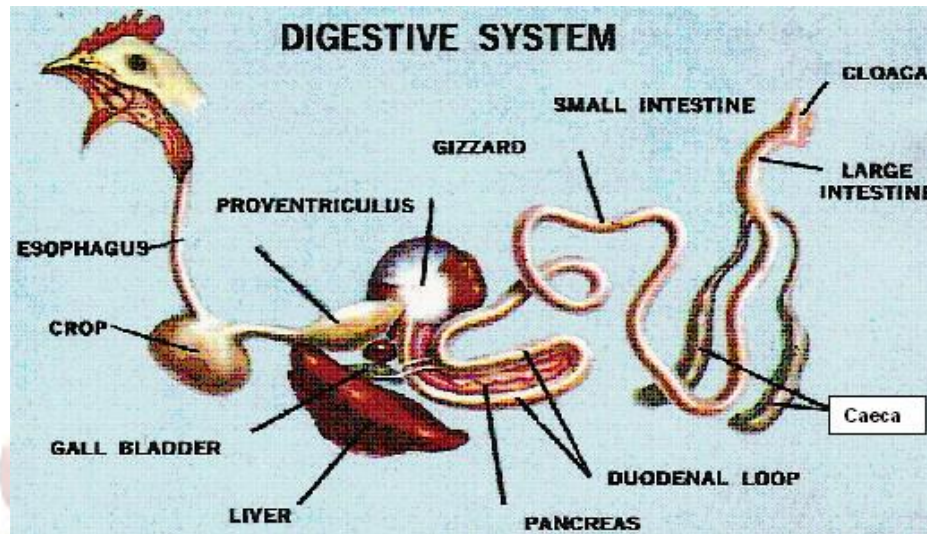


## Gizzard health

- This principle is based on the work conducted by the late Professor Robin Cumming and others
- Relies on the development of the gizzard to reduce the shedding of oocysts
- Exact means of control is still the subject of debate, but is likely to be related to the increased acidity created in a healthy, active gizzard coupled with the intense grinding action.



# Gizzard health - continued



- The gizzard and the proventriculus (the “true” or glandular stomach of a fowl) have a unique relationship, cycling digesta between the two organs, decreasing particle size and increasing acidity
- When poultry are fed a combination of whole grains and insoluble grit, the digestive efficiency of the gizzard is enhanced, because not only are the grinding muscles of the organ developed and strengthened, the sphincter muscles that control the flow of digesta in to and out of the gizzard are also strengthened

# Conclusion

- Feed additives are used to support or augment poultry rations
- Alternatives may be an option for some production systems, or compulsory for others, particularly those with clearly defined certification standards
- As consumer demands change, and major retailers and resellers of chicken products seek to satisfy these changing demands, chicken producers may well need to carefully consider those options with an application in their particular enterprise

# Acknowledgements



I would like to thank the following people –

- ☺ The organisers of this great event; for giving me the opportunity to address you today
- ☺ Ken Bruerton and Peter Scott for their input
- ☺ The late professor Rob Cumming; for his gentle and unselfish desire to share good science with all poultry keepers
- ☺ And finally you , my audience; for your attention and courtesy.

Michael Sommerlad  
[michael@poultryworks.com.au](mailto:michael@poultryworks.com.au)

*Note: All references are contained in the technical paper supporting this presentation*

"Alternatives to Feed Additives and Medications" PIX 2010

32

