The Ever Changing World of Feed Additives in The Poultry Industry

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Outline

- Southern Poultry Research
- Impact of ethanol production of diet compositions
- Enzymes what are they and how they help nutritionist
- Products to aid in broiler health for a "natural" chicken

Southern Poultry Research

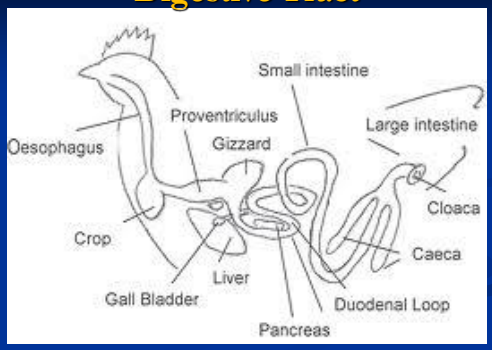
Feed Mixing

Pelleting

The Problem at Hand

- Nutritionists are constantly facing challenges when formulating diets
- Recent production of ethanol has created some of the biggest challenges
- In attempts to formulate least cost diets
  - Faced with lower quality ingredients due to rising prices of better quality ingredients such as corn and soybean meal
  - Fat sources also increasing in price due to biodiesel
- Do enzymes hold the answer in alleviating this stress?

Digestive Tract



A Common Enzyme in Poultry Diets

- Phytase is an enzyme that has been known to improve phosphorus utilization from grain and oilseeds (T.S. Nelson et al., 1969; M.I. Davies et al. 1970)
- Technical merits of phytase demonstrated, but commercialization was delayed until efficient fermentation technology was developed
- The current commercial phytase concentrations are effective at liberating phosphorus from the diet

Benefits of Phytase

- Phytase has also been recently credited with liberation of other nutrients including Ca, energy and amino acids
- 500 to 1000 FTU/kg of phytase in current formulations is based on costs associated with the current production technology

Phytase

Phytase

ABVista Feed Ingredients

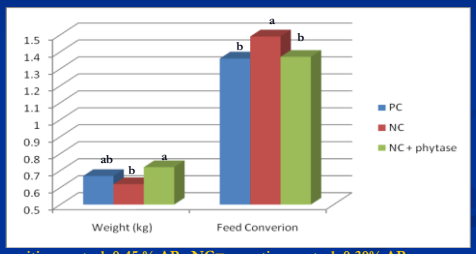
quantumblue
PERFORMANCE BEYOND PHYTASE

Added Benefits of Phytase

- **Feeding of phytase at higher concentrations may result in increased performance** (Putress *et al*., 2007; Persia *et al*., 2006; Shirley *et al*., 2002)

Improve nutrient availability of substances other than target

Day 21 Broiler performance comparison PC, NC, vs. NC + 5,000 FTU/kg Phytase
(Lumpkins, Humphrey, Mathis, and Persia, 2009)



PC= positive control, 0.45 % AP; NC= negative control, 0.30% AP
[a-b] Means columns with no common superscript differ significantly ($p < 0.05$)

Day 21 metabolizable energy, % protein digestibility, % phosphorus digestibility, and % calcium digestibility, PC, NC, vs. NC + 5,000 FTU/kg Phytase

Treatment	ME (kcal/Kg)	Protein, %	Phosphorus, %	Calcium, %
1. PC, 0.45% AP	3263 b	85.5 b	70.1 b	67.0 b
2. NC, 0.30% AP	3272 b	84.6 b	66.6 c	68.9 b
3. NC +5,000 FTU/kg phytase	3459 a	90.2 a	81.5 a	74.5 a

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Where can enzymes take us

- Today phytase has become a common additive in commercial poultry diets and has opened the door for other enzymes (i.e. non-starch polysaccharide enzymes)
- Distiller's dried grains with solubles (DDGS) has a higher level of NSP's than its parent product corn (Wang et al. 2007)
- Many common feed ingredients contain anti-nutritional factors
  - The trick is knowing how to deal with them

Common Ingredients

Alternative Feed Ingredients

Anti-nutritive effects of NSP

All cereals used in poultry feed contain various levels of NSP

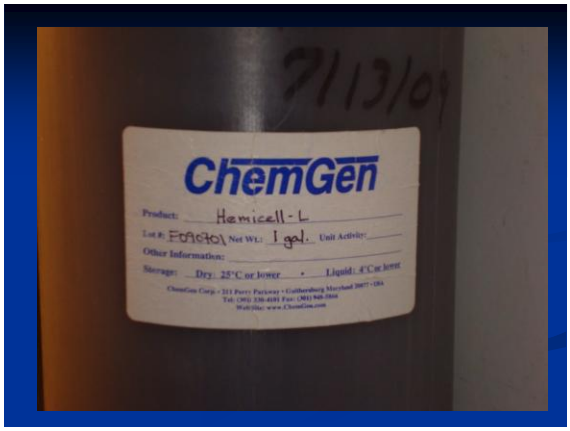
- Increase digesta viscosity
- Effect physiology and morphology of the intestinal tract
- Decease digesta passage rate and increase digesta retention time (increase bacterial colonization)
- Alter intestinal microbiota profile
- Depress feed conversion efficiency and growth

NSP's in Feed ingredients (Bach 1997)

	Corn	Wheat	Rye	Barley[2]	Oats[2]	Soybean meal
Starch	690	651	613	645	557	27
Beta-glucan	1	8	16	42	41	---
Arabinose	3	7	12	3	3	9
Xylose	2	9	20	4	2	2
Raffinose	2	4	4	---	---	10
Stachyose	1	2	3	---	---	47
Cellulose	22	20	16	10	14	62
Total NSP[3]	97	119	152	124	116	217
SNCP[4]	9	25	42	50	54	63
INCP[5]	66	74	94	64	49	92

Benefits of NSP Enzymes

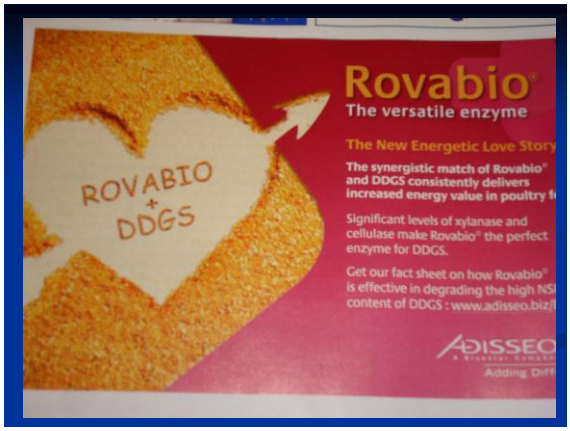
- Supplementing with exogenous enzymes degrade fiber and improve the availability from various grains i.e. DDGS (Min et al., 2009)



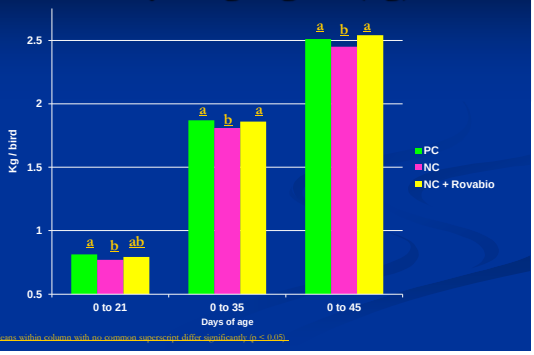
Enzymes decrease the anti-nutritive components of NSP

Guar meal: high levels of β-mannan

Corn/ soy meal + 10% Guar meal	Corn/ soy meal + 10% Guar meal + Hemicell (β- mannanase)
Day 42: FC 2.131	Day 42: FC 1.924
Wt. Gain 1.656 (kg)	Wt. Gain 1.958 (kg)

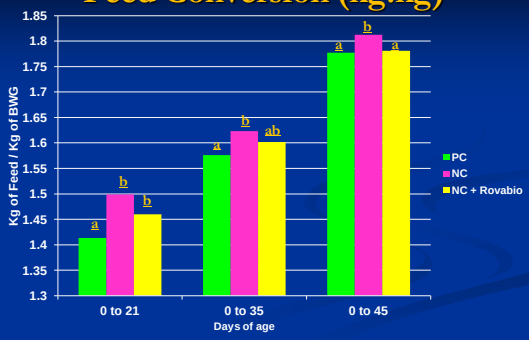


Body weight gain (kg)



a,b Means within column with no common superscript differ significantly ($p < 0.05$).

Feed Conversion (kg:kg)



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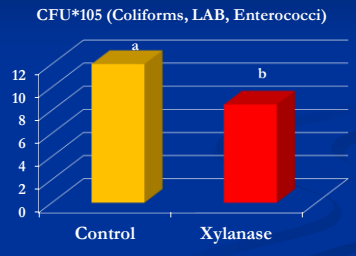
NSP Enzymes Cont.

Protease

NSP enzymes going beyond nutrient utilization

Enzymes influence bacterial populations and reduce microbial use of nutrients (Bedford and Apajalahti, 2001)



Alternatives for a "Natural" broiler

Other Factors at Hand

- Feed cost may be the main concern, but there are other issues currently arising
- The EU ban of antibiotics
- Push from consumers to produce "natural" chicken (antibiotic and drug free)
- Recently, the removal of 3-nitro
  - What's next to go?
- The need to search for alternatives

Growth Promoting Antibiotics

Antibiotics for many years have been an effective way of enhancing animal health, uniformity, and production efficacy (Bedford, 2000)

Probiotics: stabilize and balance host intestinal microbiota

Most important role of beneficial bacteria is inhibit colonization of pathogenic bacteria

- Compete for adhesion receptors and nutrients
- Produce antibacterial substances
- Modulate immune response
- Lower pH by production of lactic acid and short chain fatty-acids

Influencing Bacterial Populations

- Beneficial compete with Detrimental bacteria for nutrients
- Competitive Exclusion: Beneficial bacteria block adhesion sites (Hofacre, et. al. 2002)

Can a Probiotic replace Antibiotic Growth Promoters and Improve Performance of Broiler Chickens

Probiotics

Prebiotic

Thoughts to Consider

- Enzymes have the potential to help liberate the availability of nutrients in plant origin feedstuffs
- Feeding NSP enzymes from hatch to harvest provide maximal benefit.
- May provide other benefits in addition to improved performance

Thoughts to Consider

- Probiotics may provide a natural alternative to aid in the birds wellbeing
- Both probiotics and enzymes alter to community of the intestinal bacterial population to improve performance
- The combination of probiotics and exogenous enzymes in poultry diets can provide the answers to the main issues facing nutritionist today

Questions?