

superzyme[®]

*The Original
Multi-Carbohydriase*

What are Enzymes?

- » Enzymes are biologically active proteins and when faced with the proper target substrate, significantly speed up their breakdown.
- » Their end goal is to break-down molecules into smaller pieces that are more easily absorbed within the gastrointestinal tract.
- » Enzyme supplements in commercial livestock feed are typically one single bacterial or fungal strain fermented to create a single enzyme fermentation product.

What is Multi-Carbohyrase Technology?

Multi-Carbohyrase technology is more effective in the breakdown of complex target substrates. Superior efficacy is derived from multiple activities from multiple strains expressing a broad range of activities.

- » Multiple bacterial or fungal strains expressing multi-profiled fermentation products.
- » These fermentation products will have a primary activity in addition to multiple side activities.
- » Multi-Carbohyrase technology essentially broadens the available tools when looking to destroy target substrates.

Competitors

 **superzyme®**

Enzyme Development Platform

EDP5 Process

Enzyme Development Platform is CBS' proprietary evaluation process to identify the most effective activity combination to break down both common feedstuffs and complex by-products.

EDP⁵

Enzyme Development
Platform **FIVE**

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Identify Target Substrates

- » Full chemical composition analysis of sample ingredients
- » Full nutritive profile reports generated and analyzed

1



Ingredient Evaluation

- » Common feedstuffs & by-products are collected from the field
- » CBS performs ongoing ingredient surveys which keep our database up-to-date

3



In Vitro Evaluation

- » Lab scale hydrolysis of ingredient samples
- » pH and temperature carefully controlled to mimic the environment of the digestive system
- » Hydrolysis done using library of Multi-Carbohydrase and other available activities

4



In Vivo Evaluation

- » Research farms and small scale animal production facilities are used to evaluate the enzyme activities identified in our *In Vitro* work
- » What works *In Vitro* doesn't necessarily work *In Vivo* making this step crucial

5



Final Product Development

- Final product formulation is complete and the product is market ready.



Swine Trial Data

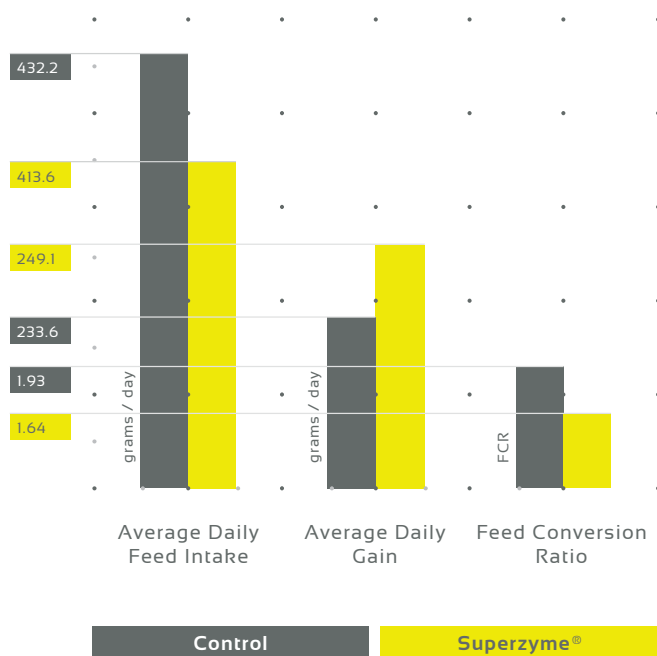
Improving Starter Pig Performance



Newly weaned pigs have limited digestive capacity which impedes early growth performance and overall health. Applying Multi-Carbohydrase technology to young pig diets has been shown to improve digestive function leading to increased body weight gain and feed efficiency and superior intestinal health.



Nursery Pigs fed CBS Enzymes



Source: Omogbenigun et al.; IAS

Growth Performance

of nursery pigs supplemented with Superzyme®

Item	Control	Superzyme®	% Improvement
ADFI, g/d	432.20	413.60	- 4.5%
ADG, g/d	223.6 ^a	249.1 ^b	+ 11%
FCR	1.93 ^a	1.64 ^b	+ 15%

Nutrient Digestibilities

of nursery pigs supplemented with Superzyme®

Item	Control	Superzyme®	% Improvement
Dry Matter	60.1 ^a	66.7 ^b	+ 11.0%
Starch	86.7 ^a	95.7 ^b	+ 10.3%
Gross Energy	62.8 ^a	71.4 ^b	+ 13.6%
Crude Protein	62.1 ^a	73.2 ^b	+ 17.8%
Phytate	59.2 ^a	69.7 ^b	+ 17.7%
NSP	10.1 ^a	21.4 ^b	+ 112%

Poultry Trial Data

Broiler Chickens fed Corn-Soy Diets

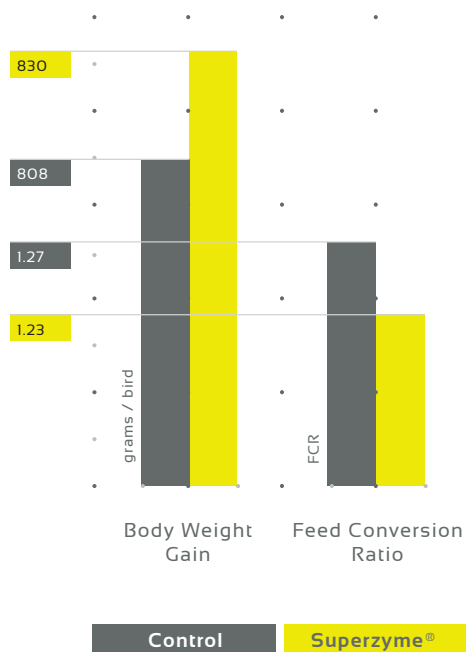




Corn-Soy diets are the most popular feed ration globally. Due to the highly digestible nature of Corn-Soy diets, the successful application of exogenous enzymes has been challenging and published results have been inconsistent. This study shows how growth performance and nutrient digestibility can be improved through the use of Multi-Carbohydase technology present in Superzyme® when broiler chickens are fed Corn-Soy diets.

Growth Performance

Day 1-21



Nutrient Digestibility

Day 1-21

Item	Control	Superzyme®	SEM	P-Value
Ileal Starch, %	92.4	95.2	0.33	0.028
Total Tract NSP, %	10.1	29.3	1.41	<0.001
AMEn, kcal/kg	2,972	3,070	12.72	<0.001

Source: Kaczmarek et al.; PS

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**Western Canada
Head Office**

4389 112 Ave SE
Calgary, AB T2C 0J7

Eastern Canada

1345 Thornton Road South
Oshawa, ON L1J 8C4

www.canadianbio.com

f /canadianbio @canadianbio



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