



Rovabio®

# Rovabio® *excel*

## THE BEST SOLUTION

to manage all swine rearing periods



Improve Nutrient and Energy availability



Most versatile enzyme in the market



Reduce Environmental footprint



## Fiber content in feed affects digestibility in swine

Non-starch polysaccharides (NSPs) are the main constituents of the plant cell wall and account for most of the indigestible fraction of feed. These fibers encapsulate nutrients, preventing the action of endogenous enzymes.

The NSPs present in the diet can vary a lot depending on the ingredient composition. A multi-complex enzyme is the most suitable solution to address the variability which exists between different raw materials.

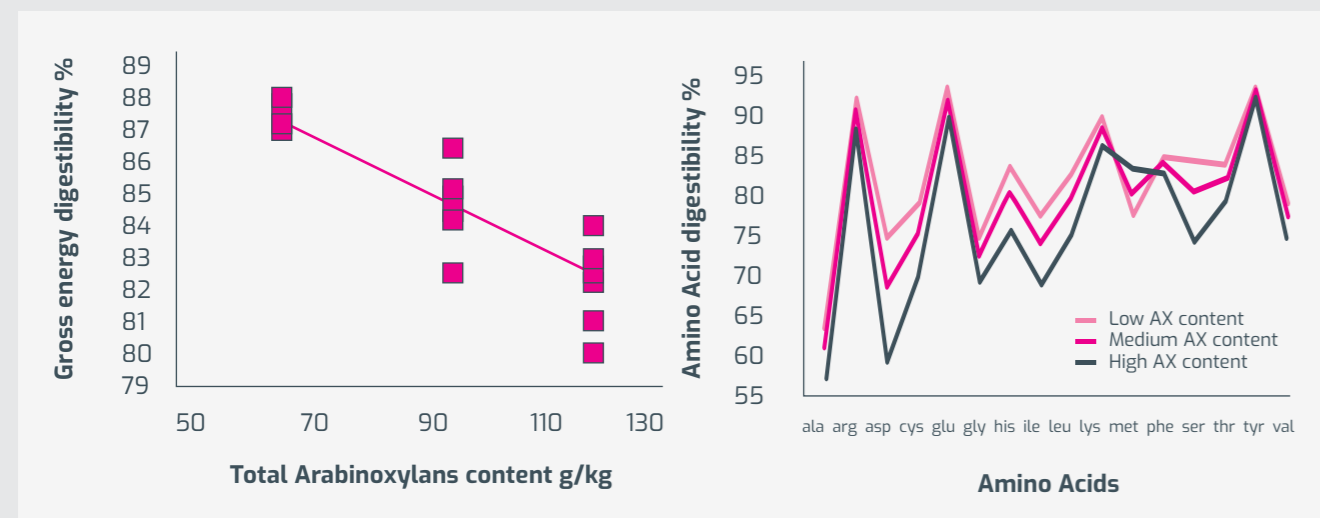
Composition % DM	Carbohydrates	Corn	Barley	Wheat	Soybean meal
<b>Total NSPs</b>		9.9	18.7	11.9	21.9
<b>Cellulose</b>	Glucose	2.2	4.3	2.0	6.2
<b>Arabinoxylans</b>	Arabinose	2.2	2.8	2.9	2.6
	Xylose	3.0	5.6	4.7	1.9
<b>β-glucans</b>		0.1	4.2	0.8	-
	Mannose	0.3	0.4	0.3	1.3
<b>Pectins</b>	Rhamnose	-	-	-	0.3
	Galactose	0.5	0.3	0.4	4.1
	Uronic acids	0.7	-	0.4	4.8

Ref. Bach-Knudsen, 1997



### Arabinoxylans (AX) are the most represented NSPs in the main cereals used in swine feed.

The metabolizable energy and amino acid digestibility are highly correlated with the level of arabinoxylans present in feed: higher the level of arabinoxylans, lower the energy and amino acid digestibility.



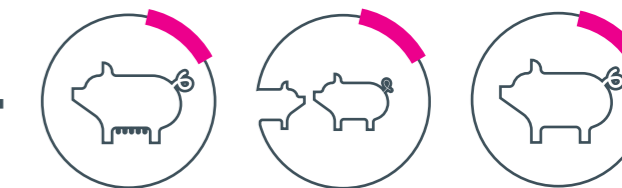
Ref. Adisseo data, Cozannet, 2019, Journées de la Recherche Porcine

FIBERS, IN PARTICULAR ARABINOXYLANS, HAVE A NEGATIVE IMPACT ON ENERGY AND AMINO ACID DIGESTIBILITY. **ROVABIO® EXCEL** HAS THE SET OF ENZYMES TO TARGET FIBERS AND DECREASE THEIR ANTINUTRITIONAL EFFECTS.

## Rovabio® Excel increases feed digestibility in all swine production cycle

By acting on NSPs, Rovabio® Excel limits their antinutritional effects thus increases the digestibility of swine diets.

Adisseo performed several *in vivo* trials, under different conditions, to understand the contribution of **Rovabio® Excel** in digestibility improvement for piglets, pigs and lactating sows.

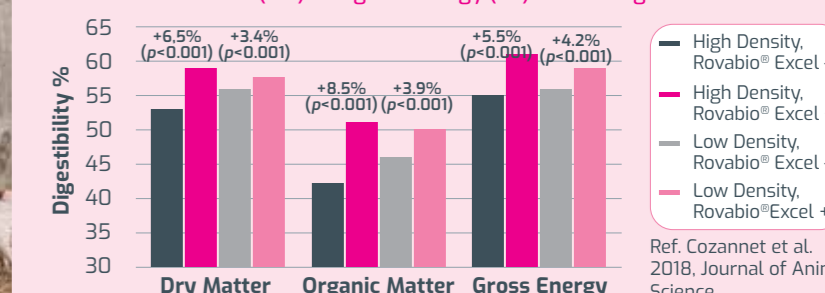


### Sows

Sow performance is a key parameter for pig producers to rear healthy and fast-growing piglets. Moreover, sows have to do that without losing too much body protein reserves. Adding **Rovabio® Excel** to diets for lactating sows has several benefits: nutrient digestibility, sow condition and piglet performance. In a meta-analysis published in 2018, **Rovabio® Excel** has demonstrated to be efficient in improving digestibility in sows in both low- and high-density diets. The study also shows that Rovabio® Excel has a more significant effect on multiparous sows than primiparous sows.



Determination of total tract feed digestibility of dry matter (DM), organic matter (OM) and gross energy (GE) in lactating sows



Ref. Cozannet et al. 2018, Journal of Animal Science

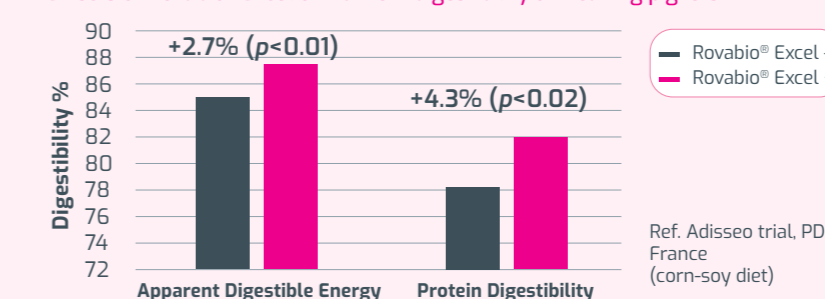
### Piglets

Post-weaning is a delicate period for piglets. The nutritional strategy applied during this period is thus crucial to insure pig long term performance.

**Rovabio® Excel** has demonstrated to have a positive impact on piglet feed digestibility, increasing apparent digestibility of energy as well as protein digestibility.

**Rovabio® Excel** can be part of different nutritional strategies: on-top usage so that piglets can benefit the extra-nutrients released to secure performance or matrix usage with feed specification reductions, following the recommendations provided by Adisseo.

Effects of Rovabio® Excel on nutrient digestibility of weaning piglets



Ref. Adisseo trial, PD 02-13, France (corn-soy diet)

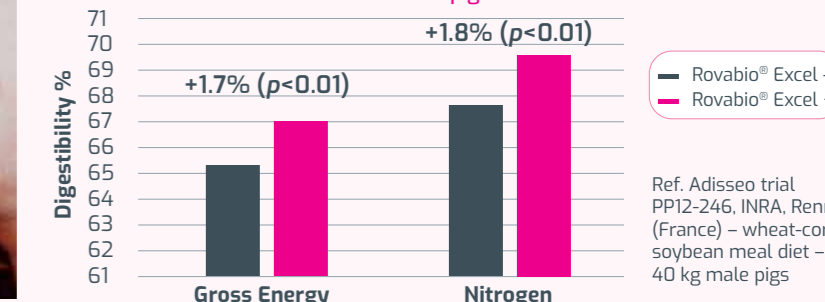


### Grower-Finisher Pigs

In Grower-Finisher pigs, the main challenge of producers remains the management of feed costs. As enzymes can increase the value of major feedstuffs, they are normally used with matrix values, which Adisseo can provide. **Rovabio® Excel** has shown to positively affect the nitrogen and energy digestibility in pigs. A better digestibility can also translate into a better performance, allowing producers to have shorter rearing time.



Effects of Rovabio® Excel on nitrogen and energy digestibility in Grower-Finisher pigs at ileal level



Ref. Adisseo trial PP12-246, INRA, Rennes (France) - wheat-corn-soybean meal diet - 40 kg male pigs

## Thanks to its prebiotic-like effect, Rovabio® Excel improves gut microbiota and ileal morphology of pigs

Carbohydrases can play a role in pig gut health through two major mechanisms:

1. they reduce the indigestible fraction in the feed.
2. they generate short-chain oligosaccharides from cell wall constituents.

When these oligosaccharides are fermented, short chain fatty acids (SCFA) are produced. **Rovabio® Excel**, by its action on oligosaccharide release, has shown to increase the proliferation of beneficial bacteria - such as *Ruminococcus* like bacteria - which produce SCFA, having a positive impact on gut health.

**ROVABIO® EXCEL**, BY ITS PREBIOTIC EFFECT, REDUCES INTESTINAL INFLAMMATION MAKING MORE ENERGY AND AMINO ACIDS AVAILABLE FOR GROWTH AND PRODUCTIVE PERFORMANCE.

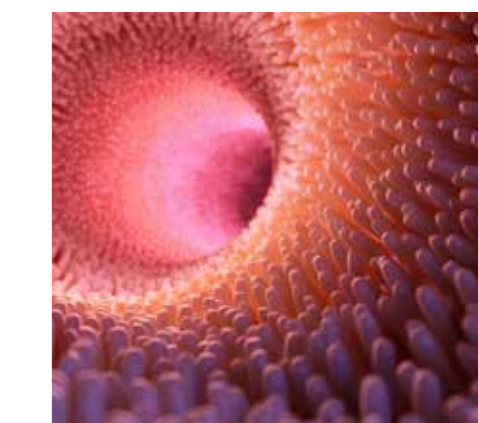


BY TARGETING FIBERS, **ROVABIO® EXCEL** RELEASES EXTRA NUTRIENTS AND ENERGY AVAILABLE FOR GROWTH. IT CAN EITHER BE USED ON-TOP OR WITH MATRIX VALUES DEPENDING ON THE PRODUCTION AIMS AND NUTRITIONAL STRATEGY.

### Ileal and caecal fermentations

	Corn	Corn + Rovabio® Excel
<b>Ileal fermentations (μmol/g FM)</b>		
Lactate	8.4 <sup>a</sup>	29.1 <sup>b</sup>
Acetate	15.5 <sup>c</sup>	20.5 <sup>d</sup>
<b>Caecal fermentations (μmol/g FM)</b>		
Propionate	24.6 <sup>a</sup>	37.6 <sup>b</sup>
Butyrate	7.4 <sup>c</sup>	12.2 <sup>c</sup>
<b>Caecal content (mg/100 mL FM)</b>		
Ammonia	84.5 <sup>a</sup>	27.5 <sup>b</sup>
<b>Gut immune response (number of cells/100μm)</b>		
Intraepithelia lymphocytes	4.8 <sup>a</sup>	3.2 <sup>b</sup>

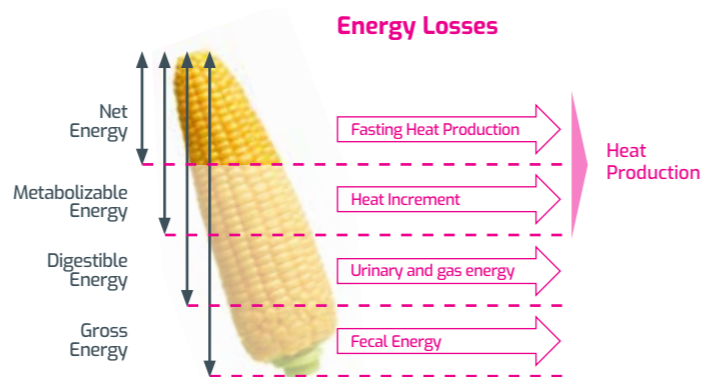
Ref. Willamiel, 2017, PhD Thesis, Universitat Autònoma de Barcelona



# 4 Net Energy is the most accurate system to evaluate enzyme potential

Not all the energy supplied in a diet is available to the animals. Indeed, part of energy could be contained in non-digestible fraction of feed or could even be lost during metabolic processes of digestion. The net energy system allows considering the energy deposited as proteins and lipids. In swine nutrition, the NE system has long been promoted for its effectiveness and good correlation with performance results.

Furthermore, recent research showed that the effect of exogenous enzymes is larger when evaluating it in the NE than metabolizable energy (ME) system. This can be attributed to the extra benefits of enzymes beyond digestibility through gut functioning.



## Comparison of DE, ME and NE values for pigs (MJ/kg)

	DE	ME	NE <sub>inra</sub>	NE/ME,%
Diet*	13.7	13.2	9.9**	75
Fat	33.4	33.2	29.8	90
Corn	14.2	13.8	11.1	80
Pea	13.9	13.2	9.7	73
Wheat bran	9.3	8.8	6.3	71
Soybean meal	14.7	13.4	8.1	60

INRA & AFZ feeding tables

## Effect of NSP enzymes on energy values in pig feeds

NE/ME,%	Control	+NSP enzymes	
DE, MJ/kg DM	16.01	ns	16.16 <b>+0.9%</b>
ME, MJ/kg DM	15.40	ns	15.51 <b>+0.7%</b>
NE, MJ/kg DM	11.91	*	12.10 <b>+1.6%</b>

2 diets (x2); 5 pigs per diet; 65 kg BW; respiration chambers

INRA data

\* Diet: wheat (67%), soybean meal (16%), fat (2.5%), wheat bran (5%), peas (5%), etc.

\*\* NE = 0.703 DE + 0.0066 EE + 0.0020 Starch - 0.0041 CP - 0.0041 CF.

**ROVABIO® EXCEL EFFECT IS CLEARLY DEMONSTRATED IN THE NE SYSTEM, WHICH IS THE SYSTEM THAT BETTER RECOGNIZES THE REAL ENERGY VALUE OF THE FEED. WE STRONGLY RECOMMEND TO USE NE TO PREDICT PERFORMANCE WHEN ENZYMES ARE USED.**

# 5 Rovabio® Excel improves performance and profitability in swine production

Improving the digestibility and the gut health have a direct impact on swine performance.

Lactating Sows*		
Body Weight losses during lactation	-3 kg/sows	(p=0.003)
Litter weight at weaning	+4.1%	(p=0.001)

Piglets**		
FCR improvement	3.6%	(p<0.01)
BWG	5.0%	(p<0.01)

Growing pigs***		
FCR improvement	3.1%	(p<0.01)
BWG	4.2%	(p<0.01)

\* Ref. Cozannet et al. 2018, Journal of Animal Science

\*\* Ref. Adisseo internal data, meta-analysis of 19 trials

\*\*\* Ref. Adisseo internal data meta-analysis of 21 trials

**ROVABIO® EXCEL POSITIVELY INFLUENCES GROWTH AND PRODUCTIVE PERFORMANCE. IT SUITS ALL SWINE PRODUCTION CYCLES AND ALL TYPES OF DIET.**

# 6 Product range and how to use them

## TARGETING THE UNDIGESTIBLE FRACTION OF FEED IN YOUR SWINE DIET WITH ROVABIO® EXCEL

### An Adisseo technology...

- 19 enzyme activities produced by a unique micro-organism in the same fermentation batch and naturally compatible: xylanase (5), β-glucanase (5), pectinases (4), mannanases (2), β-galactosidase, aspartic protease, metalloprotease.
- This enzyme complex degrades non-starch polysaccharides to catch the entire potential of feed.

### ... tailored for your needs:

- **Rovabio® Excel** increases nutrient and energy availability even in complex diets;
- **Rovabio® Excel** improves nitrogen efficiency decreasing your environmental footprint;
- **Rovabio® Excel** is a key to enhance intestinal health.

**Rovabio® Excel** includes powder and liquid products which can be used in all swine rearing period feeds: piglet, grower-finisher pig as well as lactating sow\*.

**Rovabio® Excel** allows producers increasing their profitability by either acting on feed formulation levers or optimizing performance criteria.

\* Rovabio® Excel is authorized as a feed additive in the EU for piglets, pigs and lactating sow.

Product Name	Rovabio® Excel AP	Rovabio® Excel AP 10	Rovabio® Excel AP T-Flex	Rovabio® Excel AP 10 T-Flex	Rovabio® Excel LC 2
<b>Endo -1, 4-β-xylanase</b>	22,000 visco units/g (equivalent 1400 AXC units/g)	2,200 visco units/g (equivalent 140 AXC units/g)	22,000 visco units/g (equivalent 1,400 AXC units/g)	2,200 visco units/g (equivalent 140 AXC units/g)	11,000 visco units/mL (equivalent 700 AXC units/mL)
<b>Endo-1, 3-(4)-β-glucanase</b>	2,000 AGL units/g	200 AGL units/g	2,000 AGL units/g	200 AGL units/g	1,000 AGL units/mL
<b>Form</b>	Powder	Powder	Coated Powder	Coated Powder	Liquid
<b>Inclusion Rate</b>	50 g/ton of feed	500 g/ton of feed	50 g/ton of feed	500 g/ton of feed	100 mL/ton of feed
<b>Recommendations for Use</b>	Mash or pelleted feeds up to 85°C	Mash or pelleted feeds up to 85°C	Pelleted feeds up to 90°C	Pelleted feeds up to 90°C	Post pelleting
<b>Shelf-life</b>	12 months	12 months	18 months	12 months	12 months
<b>Packaging</b>	25 kg carton (500 kg/pallet)	25 kg carton (1,000 kg/pallet)	25 kg carton (500 kg/pallet)	25 kg carton (1,000kg/pallet)	1,000 litre IBC 2,000 litre IBC

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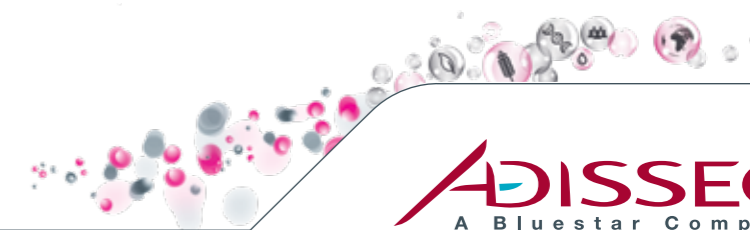
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