



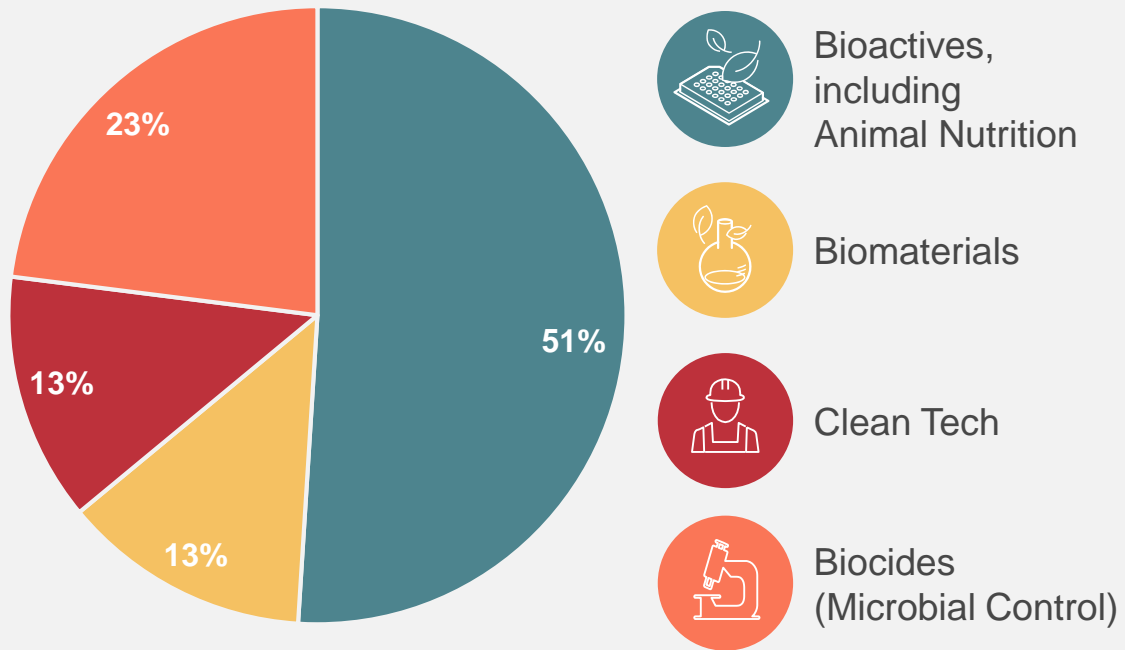
Nutribiosis to address pig production challenges

Mr. Aart Mateboer and Dr. Milan Hruby
World Pork Expo Press Conference, June 7th 2018

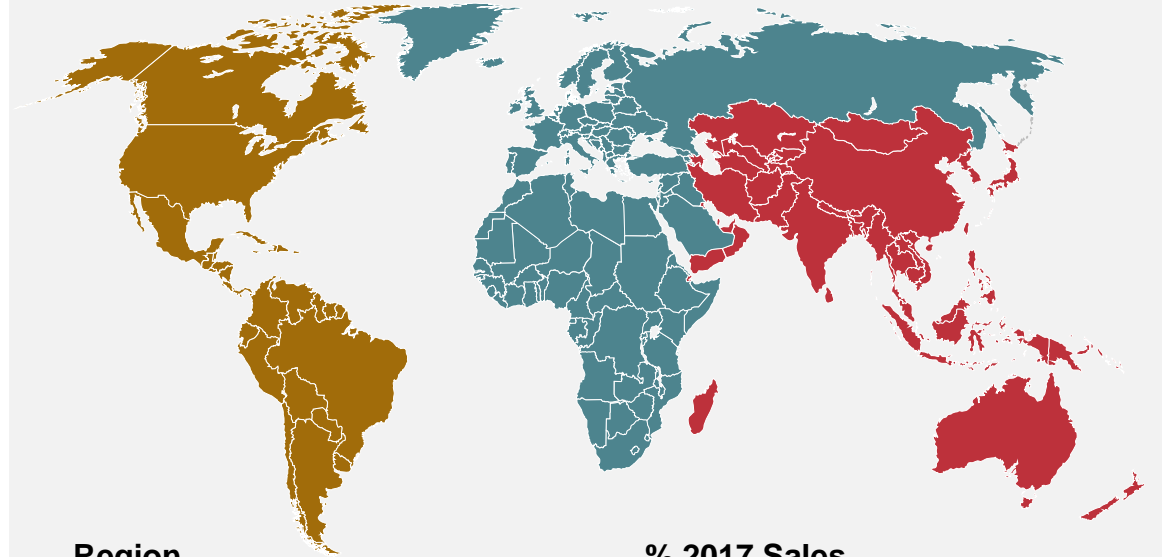
DUPONT INDUSTRIAL BIOSCIENCES AT A GLANCE: DIVERSE AND GLOBAL BUSINESS

Revenue by Major Product Group

2017: \$2.1B Sales

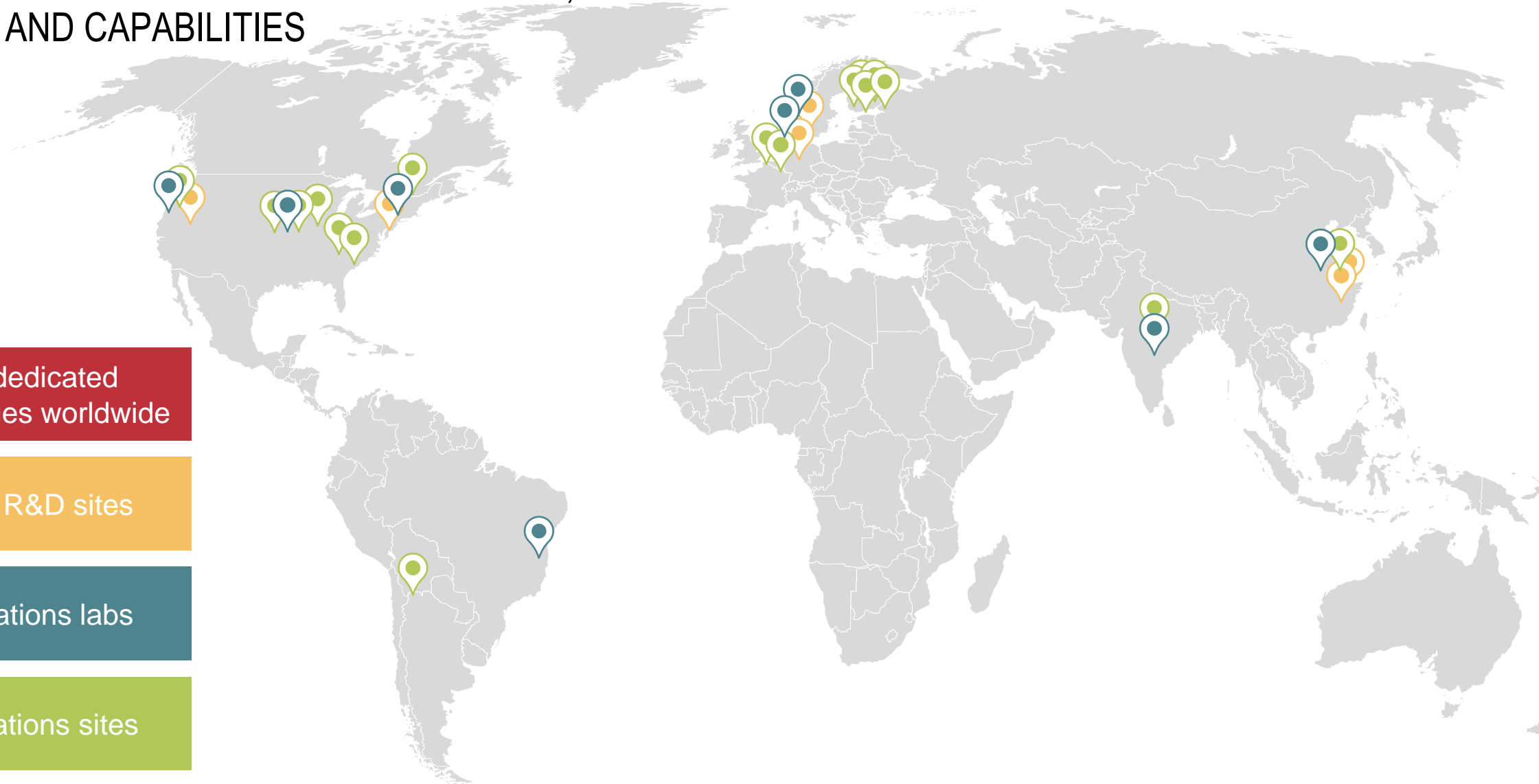


By Region



Region	% 2017 Sales
● Americas	49%
● Europe, Middle East and Africa	25%
● Asia Pacific	26%

WORLDWIDE AND WORLD CLASS PEOPLE, SCALE AND CAPABILITIES



~ 2700 dedicated colleagues worldwide



7 global R&D sites



6 applications labs



23 operations sites



**ANIMAL NUTRITION
FEED ADDITIVES FOR SUSTAINABLE ANIMAL PRODUCTION**

Enzymes Betaine Essential oils DFM's

- **Improve gut health**
- **Lower feed costs**
- **Reduce environmental footprint**
- **Improve farm productivity**
- **Promote animal welfare**

KEY ANIMAL PRODUCTION CHALLENGES



Volatility in feed cost prices



Feed efficiency



Disease control

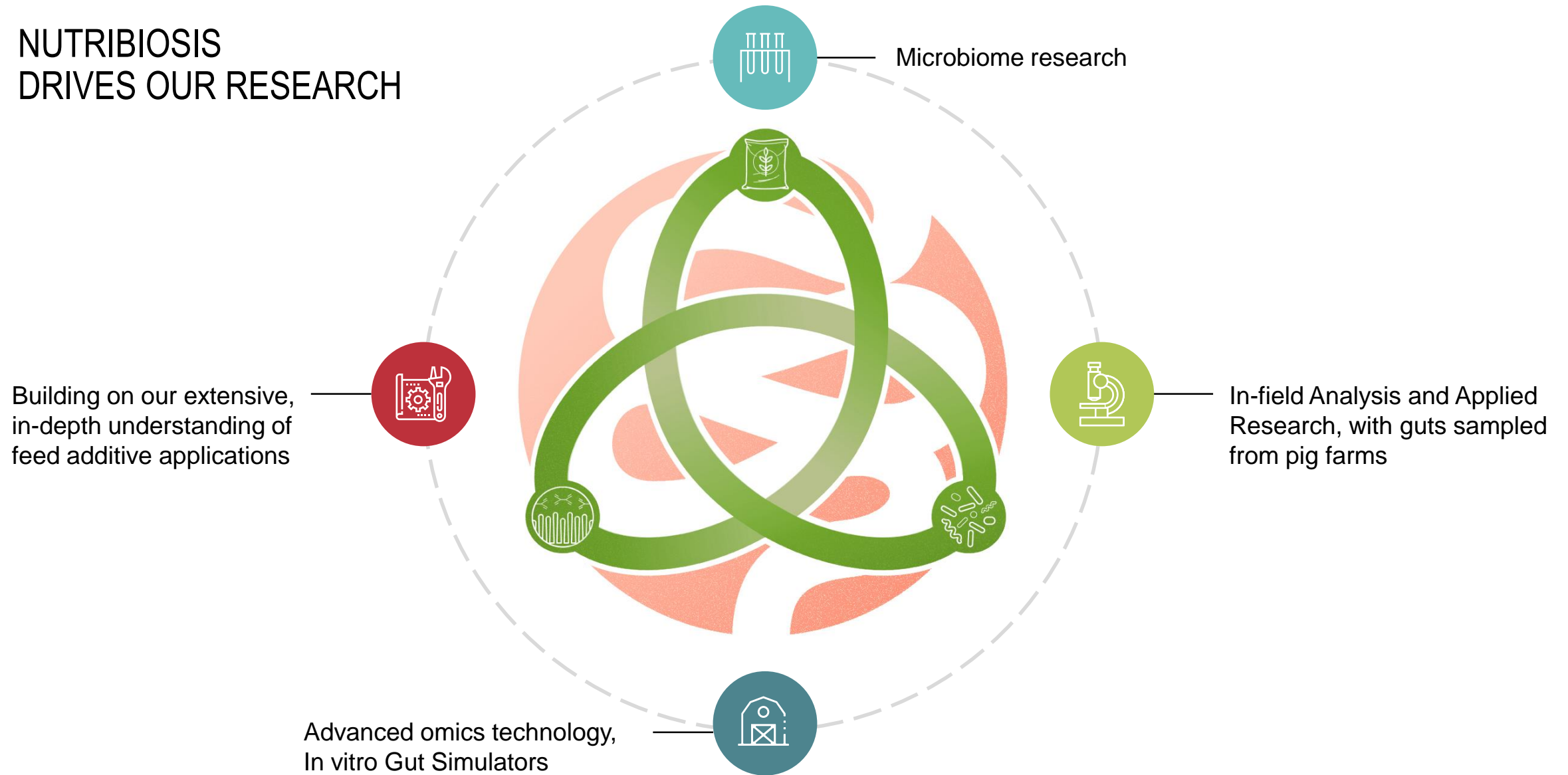


Growth performance & consistency

DUPONT INTRODUCES NUTRIBIOSIS: A STATE DESCRIBING INTERACTIONS

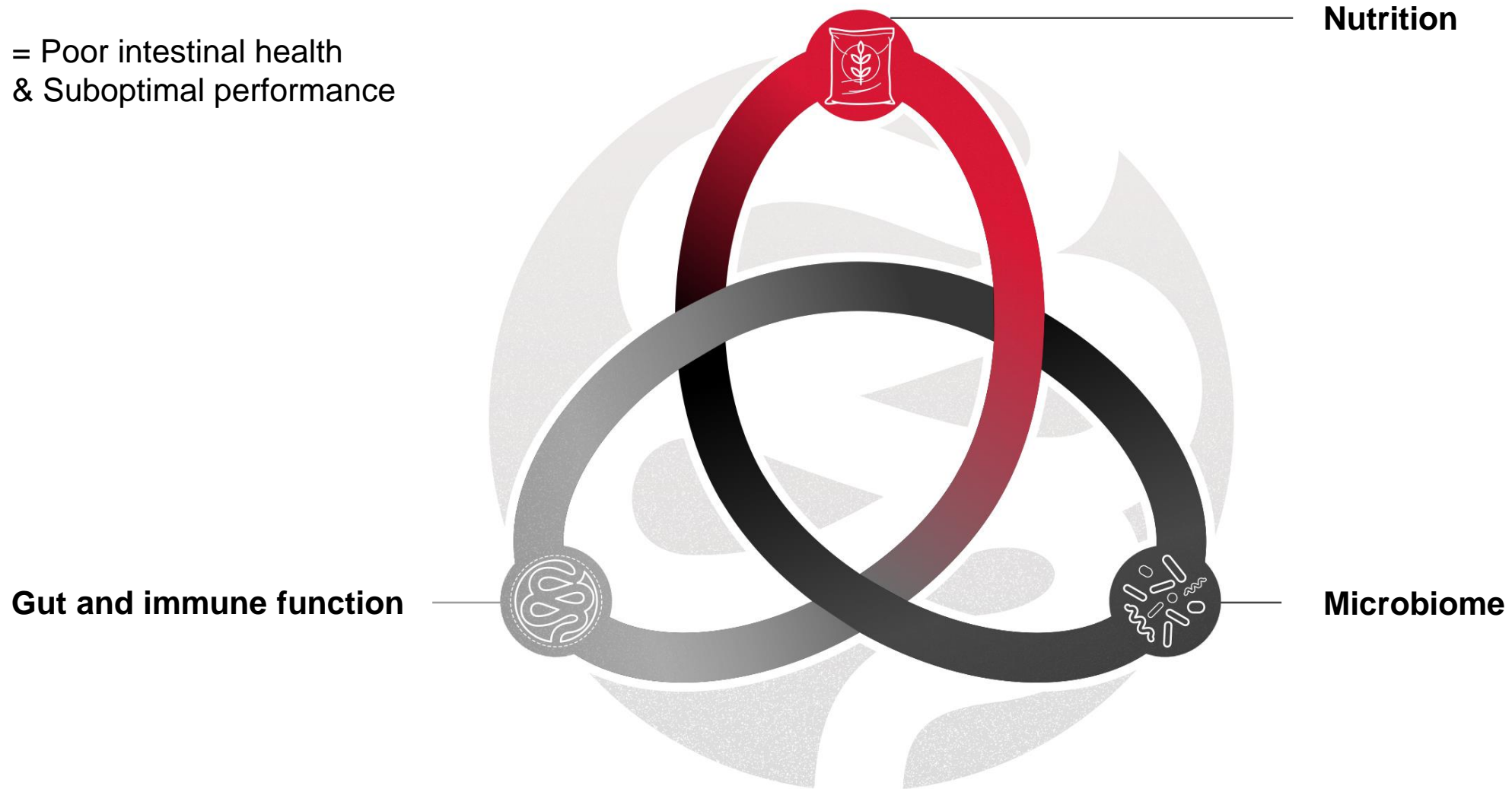


NUTRIBIOSIS DRIVES OUR RESEARCH



UNFAVORABLE NUTRIBIOTIC STATE

= Poor intestinal health
& Suboptimal performance



FAVORABLE NUTRIBIOTIC STATE

= Good intestinal health
& optimal performance

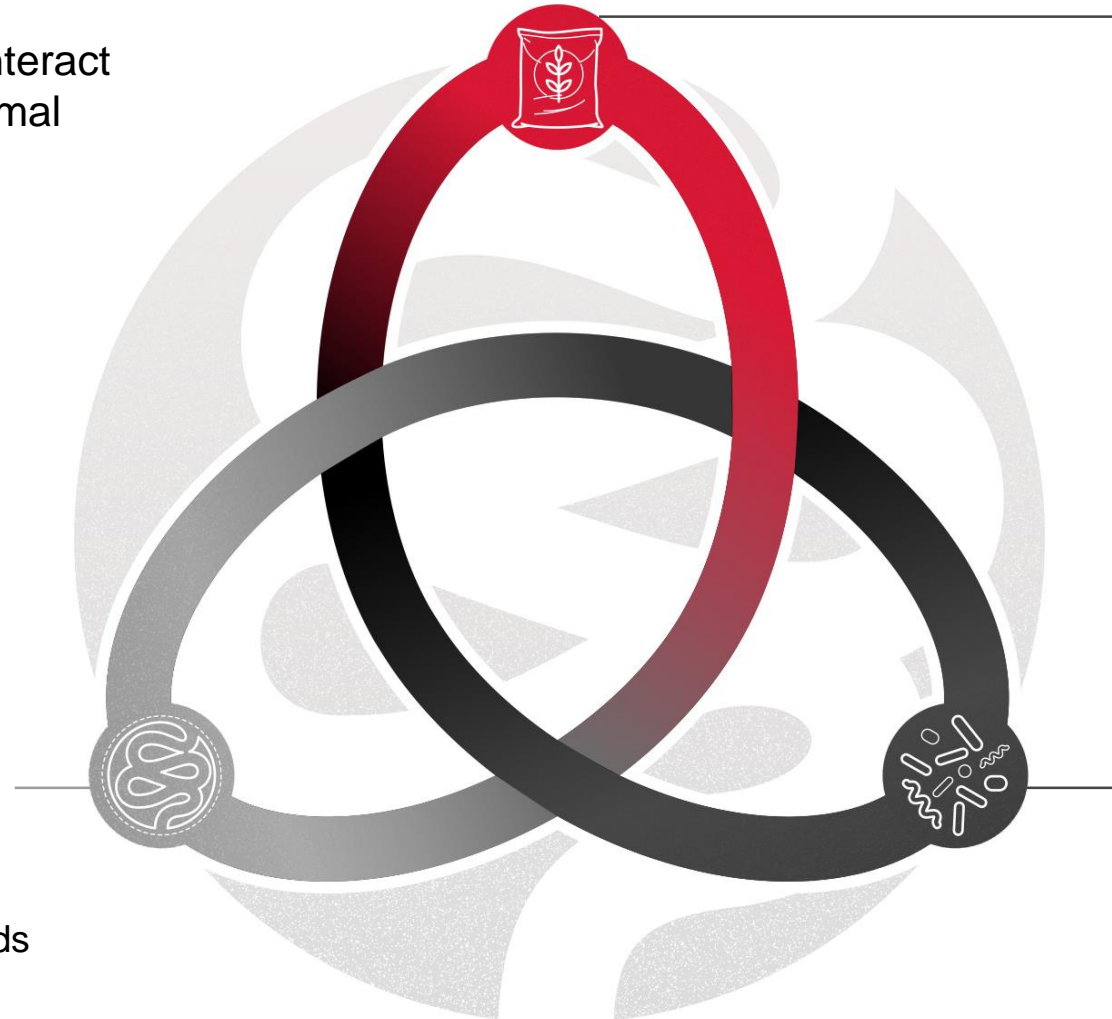


UNFAVORABLE NUTRIBIOTIC STATE PHYTATE

Ultimately these factors will interact with each other to reduce animal performance

Gut and immune function

- Increase acidity in the stomach can damage the gut absorptive surface and requires more buffering through release of sodium bicarbonate
- The increased demand for sodium negatively effects gut function by depleting sodium levels in cells, reducing the functionality of the sodium pumps required for key nutrient such as glucose and amino acids absorption



Nutrition

- Phytate binds protein in the upper GIT, making it unavailable to the animal

Microbiome

- Potential of high level of protein fermenters

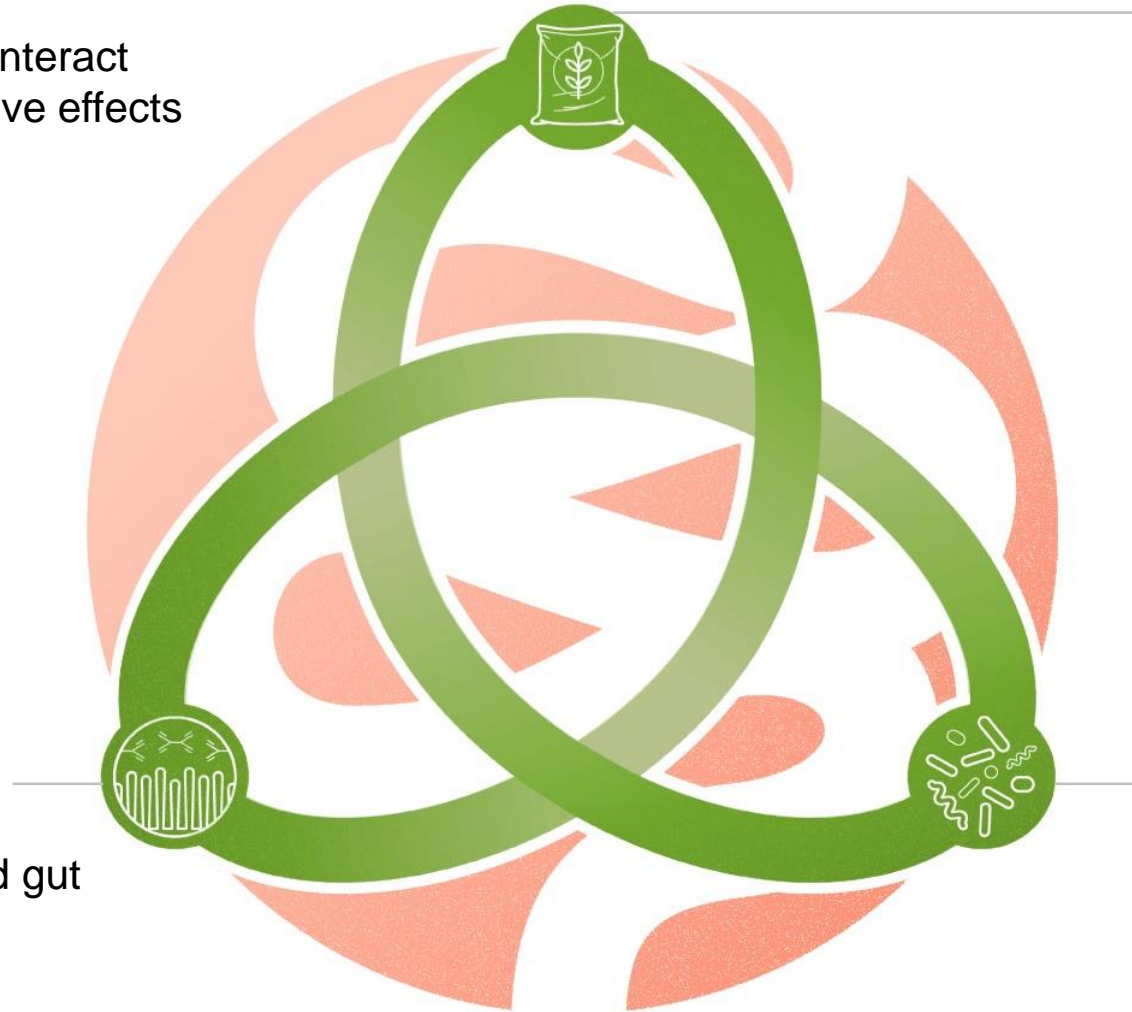
FAVORABLE NUTRIBIOTIC STATE

Axtra[®] PHY

Ultimately these factors will interact with each other to give positive effects

Gut and immune function

- Less undigested protein reaches the caeca or hind gut



Nutrition

- Breaks down phytate quickly before it binds the protein avoiding the anti-nutritive effect
- Improves nutrient uptake

Microbiome

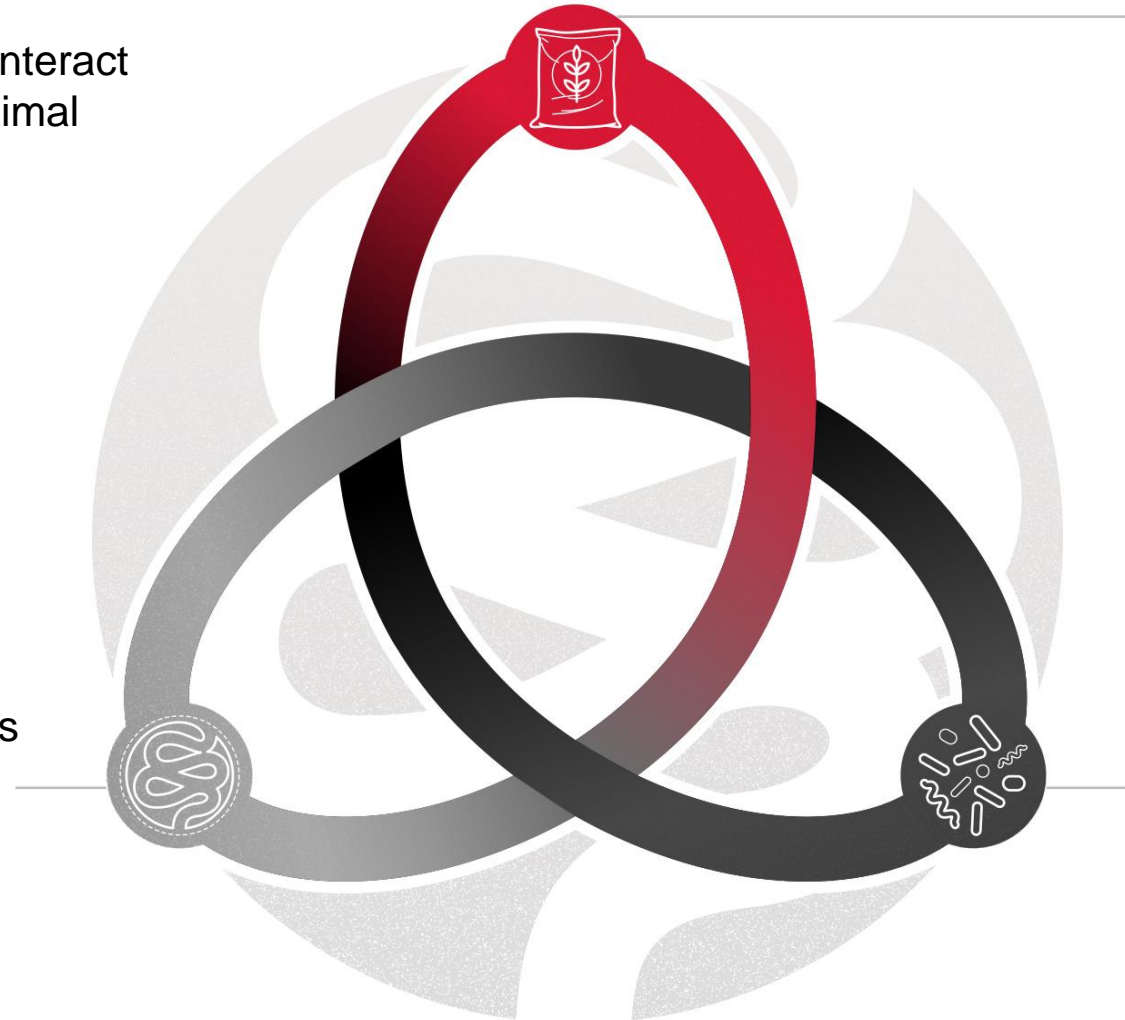
- Reduces protein fermentation
- Potentially reduces ammonia

UNFAVORABLE NUTRIBIOTIC STATE SWINE DYSENTERY

Ultimately these factors will interact with each other to reduce animal performance

Gut and immune function

- *B. hyodysenteriae* induces extensive inflammation
- Necrosis of the epithelial surface of the caecum and colon



Nutrition

- High energy high and/or protein diets
- Low nutrient digestibility
- Too much or too little carbohydrate fermentation in the hind gut

Microbiome

- Increased prevalence of *Brachyspira hyodysenteriae*

FAVORABLE NUTRIBIOTIC STATE

Syncra® SWI

Ultimately these factors will interact with each other to give positive effects

Gut and immune function

- Improved gut barrier strength through tighter junctions



Nutrition

- Release of fiber bound nutrients
- Increased protein digestion and amino acid utilization

Microbiome

- *Bacillus* adapt to the diet and produce fiber degrading enzymes to help nutrient digestion
- Reduction in undigested proteins so less substrate for non-beneficial bacteria
- Production of prebiotic AXOs
- Reduced protein fermentation so less ammonia produced
- Increase in *Lactobacillus* populations, indicating a beneficial shift in the microbiota
- Increase fiber fermentation resulting in higher SCFA (e.g. butyrate)

NUTRIBIOSIS SUPPORTS THE INDUSTRY



Clearer decision making on feed additives



Promote Animal Welfare



Improve Gut Health



Improve Animal Performance

QUESTIONS?

Nutribiosis

Nutrition

Gut and immune function

Microbiome





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Thank you!

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