Effects of feed additives beyond performance: vital pieces of the profitability jigsaw in an era of reduced antibiotic growth promoter usage

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Higher purpose!

1960 2010 2050

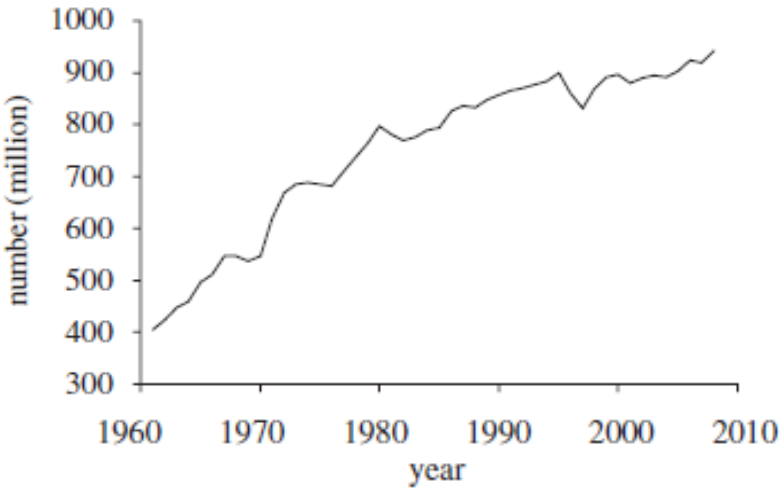
Achieved Dream

Food on plate for extra 4B people

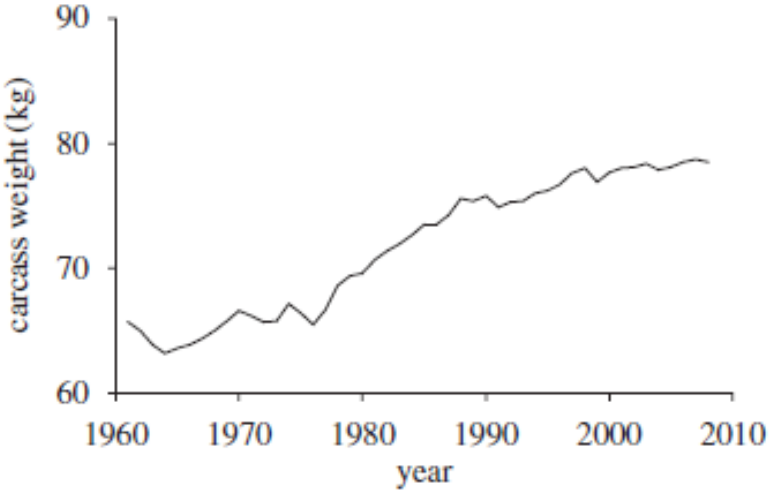
Extra 3B still to feed

Approximates Based on 2011 Hunger report, www.bread.org

Whether we were successful?



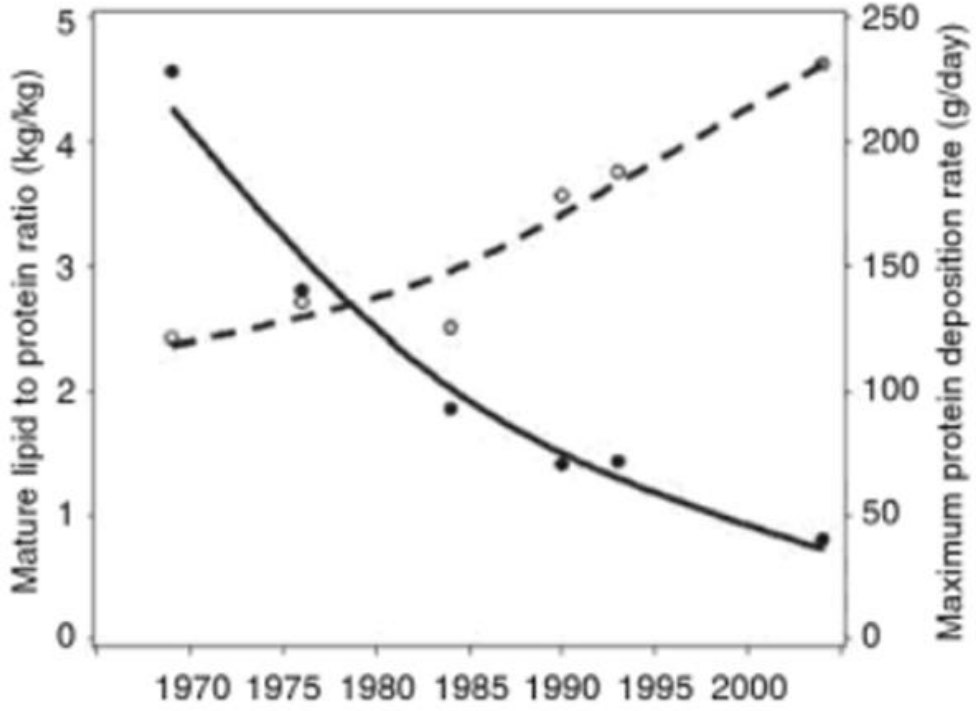
Number of pigs produced



Carcass weight of individual pig

Thornton 2010

Whether we were successful?



Knap and Rauw 2009

Animal production: before and after 2000AD

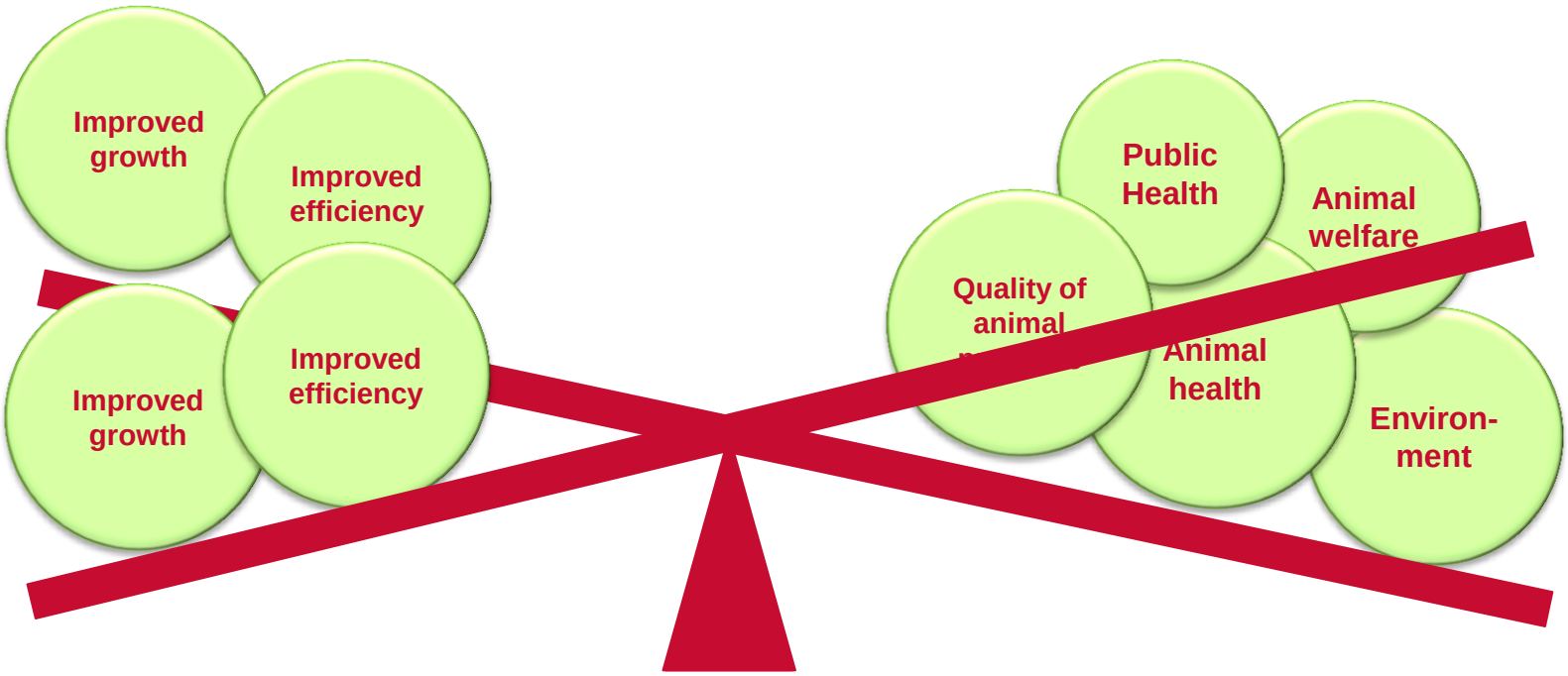
Changes in global human population, pig and poultry inventories, and production and international trade of pig and poultry meat between 1996 and 2005.

	1996	2005	Annual growth (%)
Human population	5,762	6,451	1.1
Inventory			
Pigs (million)	859	963	1.1
Poultry (million)	14,949	18,428	2.1
Production			
Pig meat (thousand tons)	79,375	103,226	2.6
Poultry meat (thousand tons)	56,408	81,856	3.7
International trade			
Pig meat (thousand tons)	6,398	9,557	4.0
Poultry meat (thousand tons)	5,359	9,234	5.3

Source: FAOSTAT

Otte *et al*., 2007

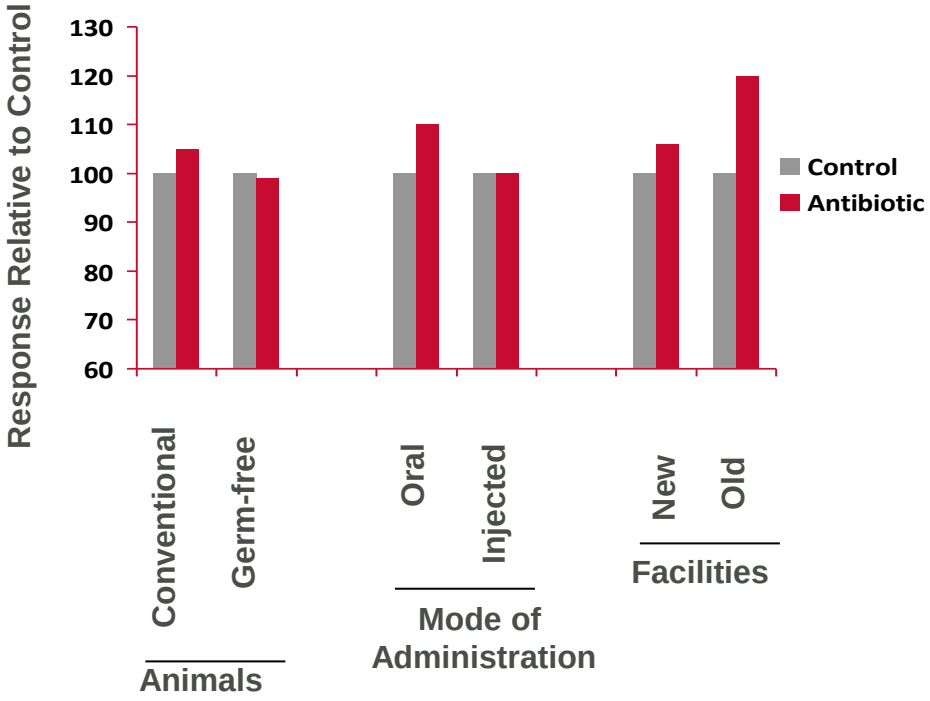
Then why ‘dream’ is still distant?



Most of these if not all are gut health and microbiota related

Bad news is AMGPs are going away

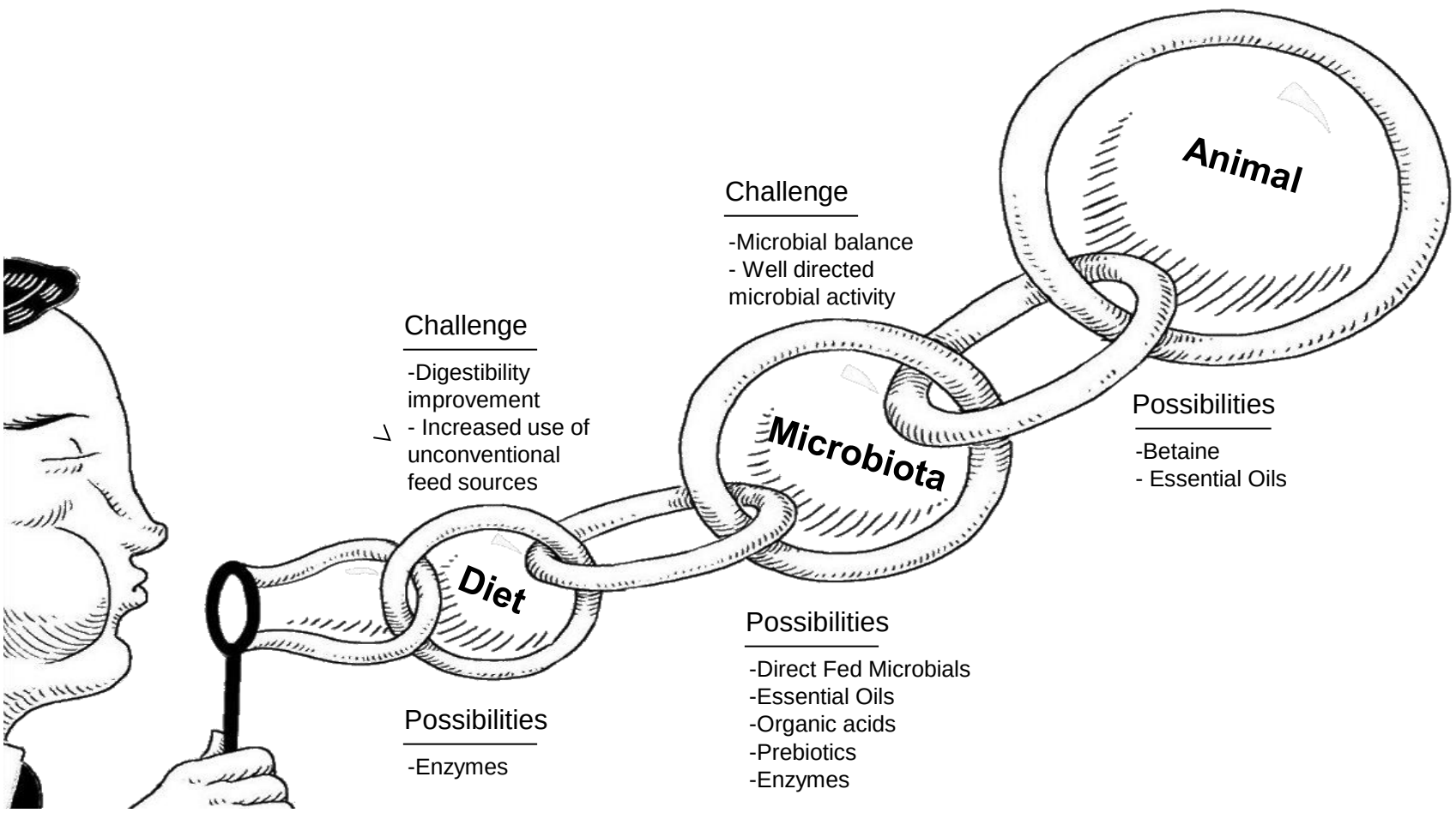
When, how and why AMGPs work?



- AMGPs work more effectively in **gut**
- AMGPs work more effectively under **stress**

Anderson, 1999

What can we do about it?

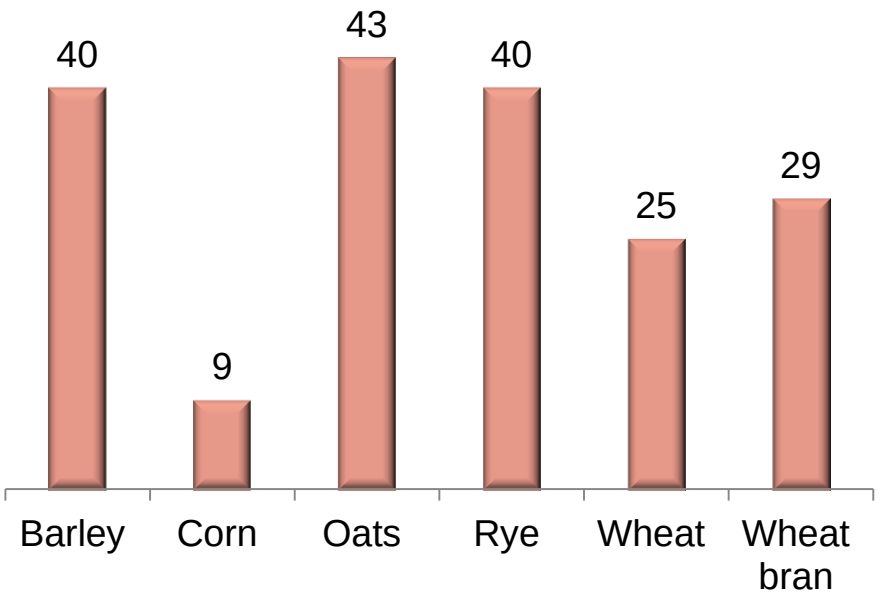


Diet

NSP contents in diet contribute to the problem

Animal diets contain Cereals

unconventional cheap ingredients with high NSP contents

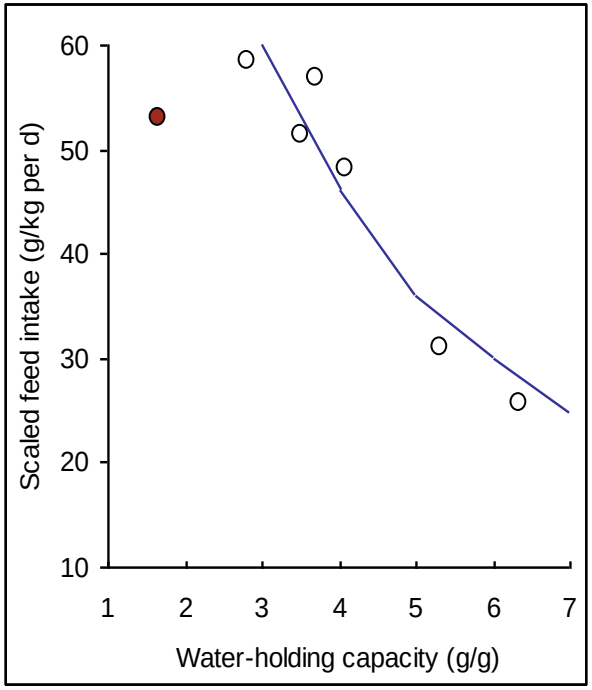


Concentration of soluble NSPs g/Kg DM

Soluble NSP levels are high

Bach Knudsen, Anim. Feed Sci. Technol. 67:319-338

Water Holding Capacity Of The Feed And Its Effects On Feed Intake



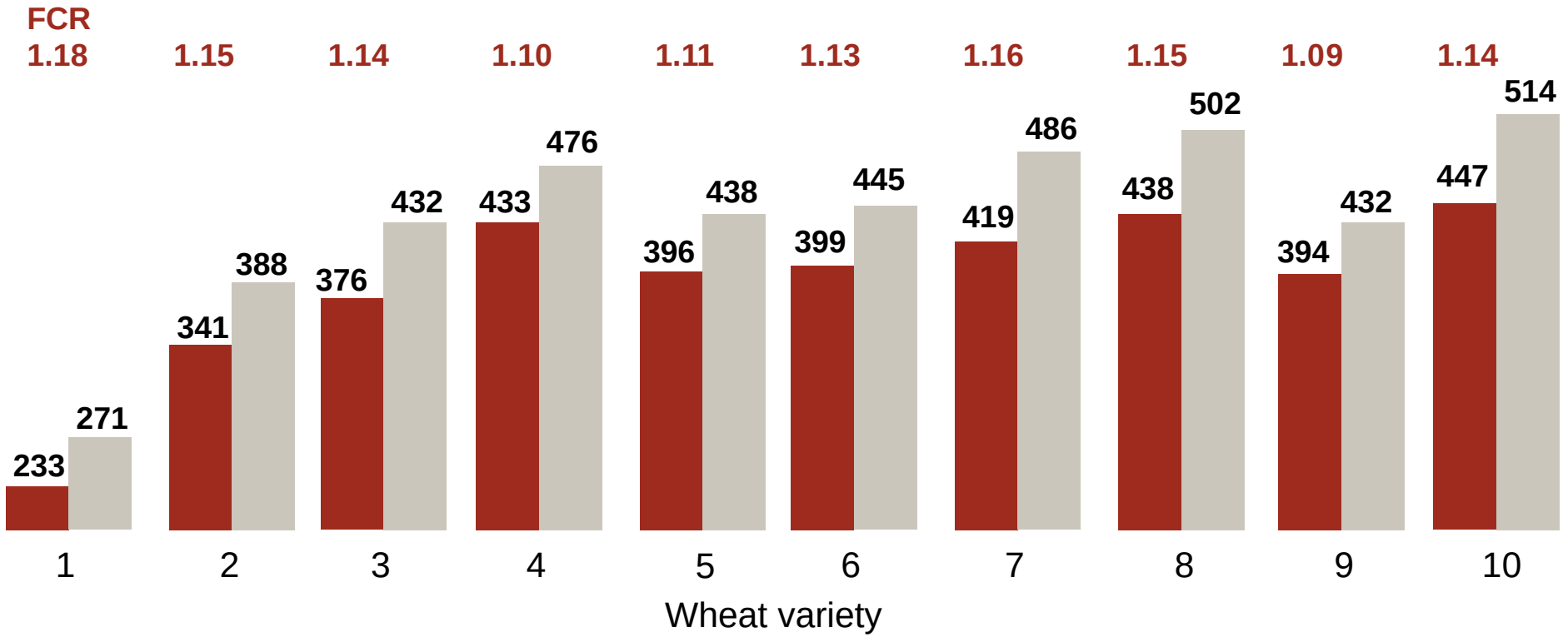
Basal diet

Test diets

Kyriazakis and Emmans (1995), 12-36kg pigs

Wheat Variety Can Influence Pig Growth And Feed Intake - Australia

31% variation in daily gain between the best and next-to-worst Australian wheat samples



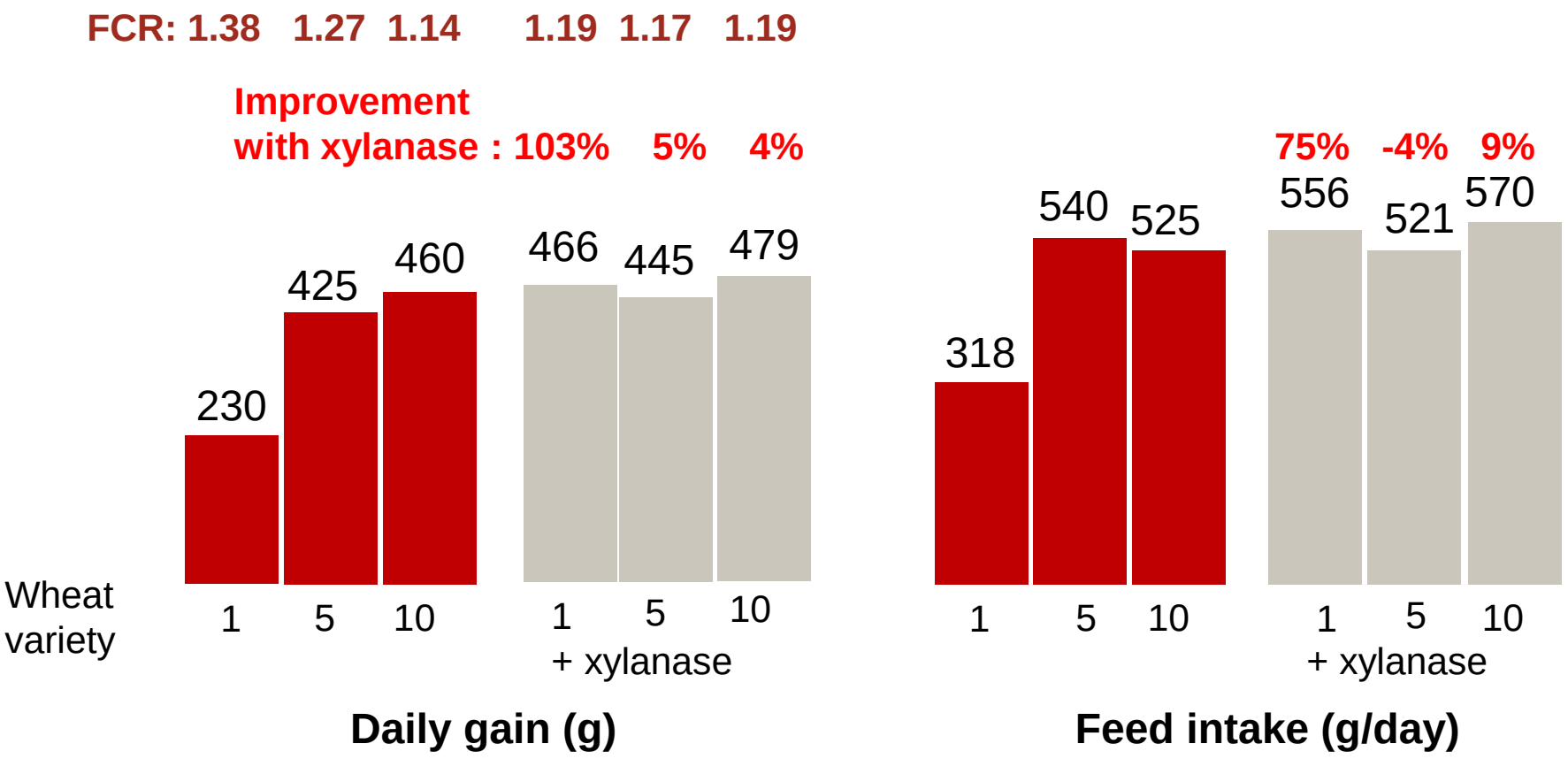
Growth: P<0.001 Feed intake: P <0.001 Feed:gain: NS

Daily gain (g)
Feed intake (g/day)

65% wheat in diets
Weight 7-16 kg

Source : Cadogan et al (1999)

Xylanase Reduces Variation In Performance Between Different Varieties Of Wheat



Xylanase effects:
Daily gain P<0.001 Feed intake P<0.001 FCR NS
Wheat x Xylanase P <0.001

Source : Choct et al (1999)

Enzymes can be part of the solution

Small Intestine

-De-polymerisation of soluble NSPs
-Reduction in viscosity
-Increased nutrient digestibility
-Digesta transit time is better regulated
-Lesser microbial overgrowth
-Better nutrient absorption

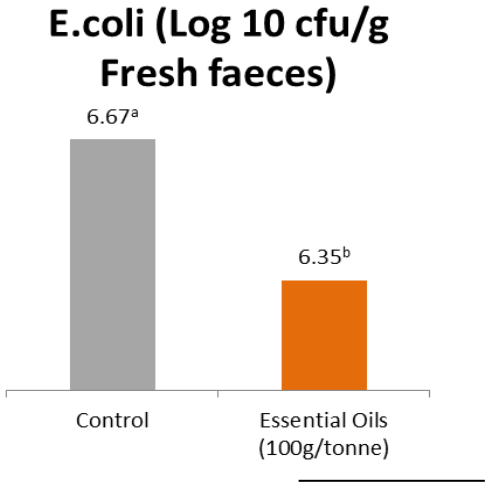
Large Intestine

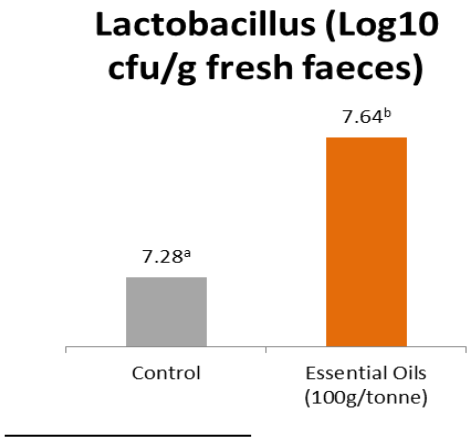
-De-polymerisation of soluble NSPs produce smaller oligomers which utilized by healthy microflora
-Increased energy availability by higher VFA production
-Lower pathogen pressure

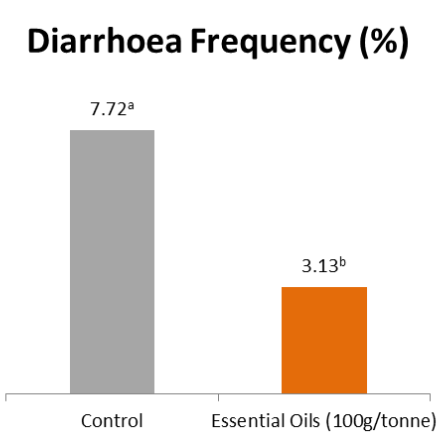
Choct 1997

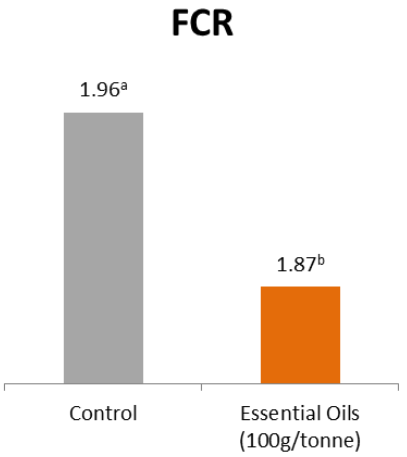
Microbiota

Essential Oils and effects on gut environment



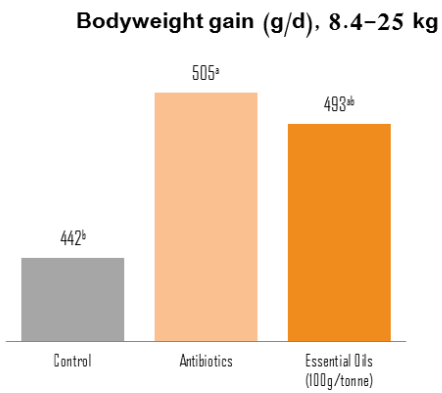


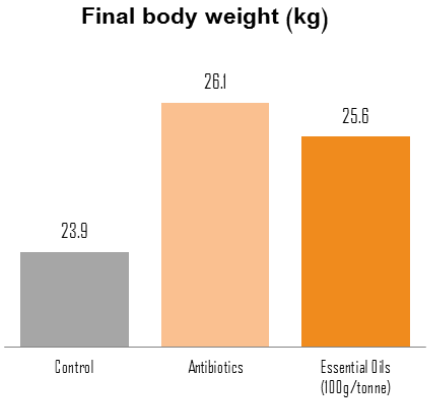


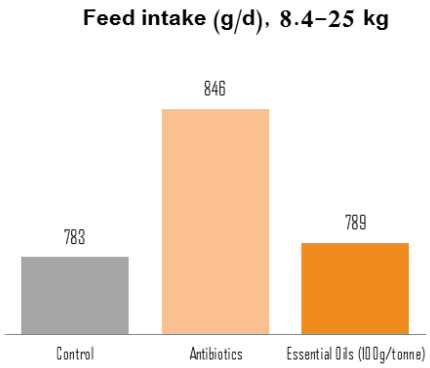


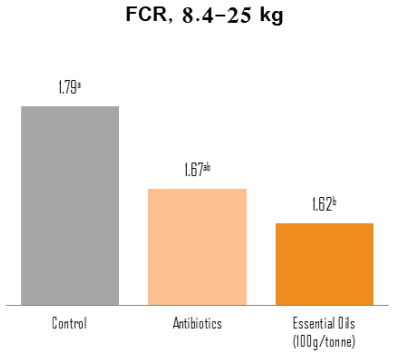
Essential oils levels of 4.5 g of cinnamaldehyde and 13.5 of thymol/tonne of feed respectively.

Essential oils can be part of solution





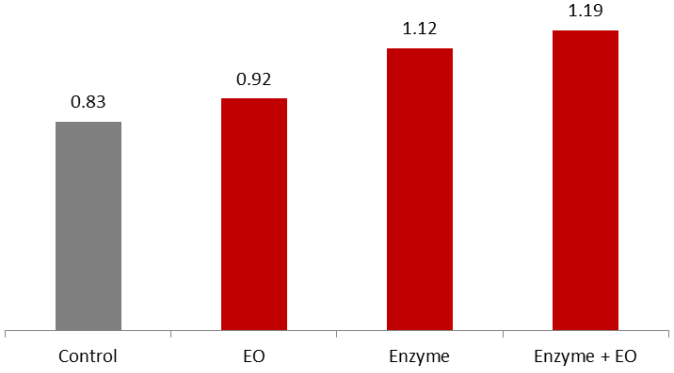




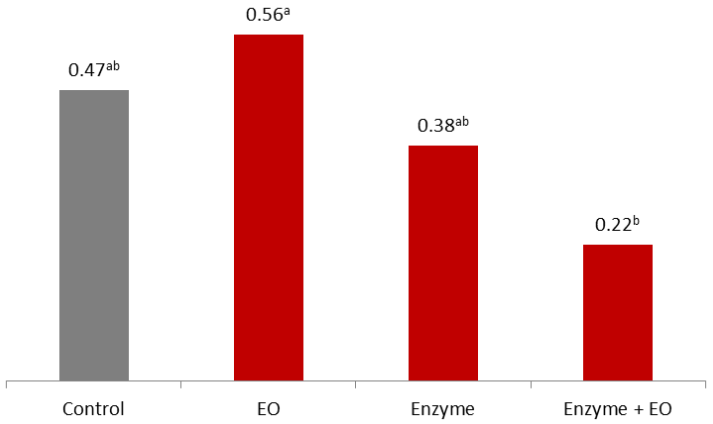
[1]150 mg/kg Chlortetracycline, 80 mg/kg Colistin sulfate, 50 mg/kg Kitasamycin.
[2] To supply guaranteed minimum levels of 4.5 g of cinnamaldehyde and 13.5 g of thymol/tonne of feed.

Animal Response

Dietary and gut health solutions improve animal response



IL-10



IL-1α

[1] Enzyme is the combination of Xylanase and Beta- glucanase
[2] EO is a essential oils mixture to supply levels of 4.5 g of cinnamaldehyde and 13.5 g of thymol/tonne of feed respectively.

Jiang *et al* 2014

Conclusions:

Performance = improvement in diet utilization + improvement in gut environment

In post- AMGP era, effective feed additive strategy should address

- **reduce anti-nutritional factors** (Enzymes can be of importance)
- **improve microbial balance in the GIT** (Essential oils can be of importance)

In post- AMGP era, effective feed additive strategy should take into account **appropriate combinations** of feed additives which have an additive response to help mitigate challenges beyond growth performance

Thank you for your attention

Image courtesy: Google Images

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