




**Trouw Talks**

**Get Future Ready...**



# A New Lens on Sustainable Animal Nutrition

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Phytogenics, Trouw Nutrition Global





# Definition of Sustainability

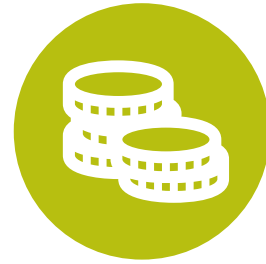
The concept of sustainability encompasses:



Environmental



Social



Economic

Sustainable policies **emphasize the future effect** of any given policy or business practice on humans, ecosystems, and the wider economy.



# Sustainability in Animal Agriculture



**Environmental Impact:** Feed constitutes over 60% of the environmental footprint in poultry production, followed by manure management.



**Social Responsibility:** Ethical concerns, animal welfare, and health are rising priorities for consumers.



**Economic Considerations:** Balancing profitability with responsible practices.



It takes **72%** fewer resources to produce the same amount of chicken than it did in 1965



**72%**  
less

farmland



**58%**  
less

water



**39%**  
less

fossil fuels



# How can chicken farmers further improve on sustainability?



nutrient  
cycling



biodiversity



improve feed  
to meat or eggs





Over **95%** of **poultry litter** is reused and recycled to fertilize crops



Plants feed the chickens and chickens fertilize the plants – **it's a sustainable nutrient loop!**







# Biodiversity enhancement



Diversify  
species and  
breeds



Plant trees  
and shrubs



Natural pest  
control



Local feed  
resources



Free range  
system

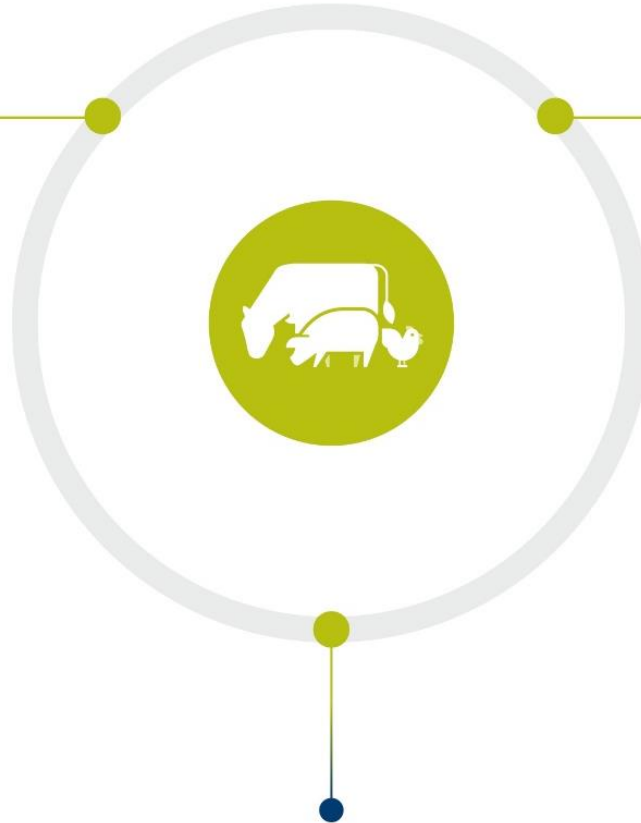




# Improve feed conversion to meat or eggs

## FEED MANAGEMENT

- Raw material choice
- Raw material quality
- Feed safety, hygiene and preservation
- Diet specification
- Feed form and presentation
- Digitalisation – modelling
- Digitalisation – ingredient evaluation



## FARM MANAGEMENT

- Biosecurity
- Animal management
- Cleaning & disinfection
- Housing and climate
- People management
  - Training
- Digitalisation

## HEALTH MANAGEMENT

- Infection chain & prevention chain
- Transition periods & Intestinal health
  - Diagnosis & monitoring
  - Medication & vaccination
    - Digitalisation





# Improve feed conversion to meat or eggs



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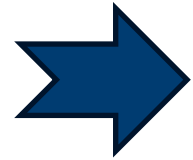
## Feed Additives



# Improve feed conversion to meat or eggs



Feed Additives



- Organic Acids**
- Prebiotics**
- Probiotics**
- Postbiotics**
- Mycotoxin management**



**PHYTOGENICS**





# Improve feed conversion to meat or eggs

## PHYTOGENICS

natural substances derived from plants

### Types:

Herbs  
Spices  
Oleoresins  
Essential Oils  
Other Extracts

### Active ingredients:

Flavonoids	Phenols
Tannins	Aldehydes
Saponins	Ketones
Terpenes	Alkaloids

Feed additives for livestock and poultry to improve animal health, performance, and welfare.

Various effects: digestive system, immune system, and metabolic processes of animals, depending on their composition and dosage.





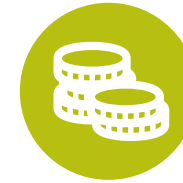
## Social

Community development  
Antimicrobial reduction  
Animal welfare



## Environmental

Phytogenics align with nature-positive approaches.  
Enhance nutrient digestibility and absorption  
Gut health  
Disease resistance  
Immune modulation  
Reduced need for antibiotics



## Economic

FCR Improvement  
Carcass Quality  
Eggshell Quality





# Social – Community Development



## PHYTO-GENETIC SELECTION & PRECISION FARMING. 01

1. Medicinal plants database for Nutreco's screening
2. Own hybrid development - No GMO breeds
3. Decades of expertise improving breeds' chemotypes



## DEDICATED AND SKILLED GROWERS 02

1. Growing the right plants at the right place
2. Buy-back agreement with focus on quality first
3. Agronomists' advise on the ground (Agri-kit)



## A COMMUNITY OF PARTNERS 03

1. Long term partnerships with growers & families
2. Social accompaniment (school, healthcare, agro training...)
3. Sustainable practices to respect biodiversity



## SUSTAINABLE PLANT PRODUCTION 04

1. Continuous improvement of the methods
2. Favors landscape management
3. Short-chain and integrated production system



## SMART HARVESTING 05

1. Actives migrate in plants over seasons
2. In-house identification of optimal harvesting window
3. Manual or mechanized processes



## PROCESSING & TRANSPORTATION 06

1. Stabilize raw material before processing
2. Manual cleaning
3. Active or passive drying
4. Concentration of actives in dry matter



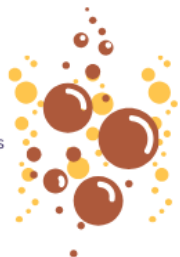
## PHYTO-COMPLEXES SELECTIVE EXTRACTION 07

1. Food grade extraction techniques
2. Essence unveiled
3. Combo. of methods to replicate full plant profile
4. Renewable energy sources and zero liquid discharge plants



## PHYTO-COMPLEXES RATIO ADJUSTMENTS AND GALENIC 08

1. Tailor-made Nutreco's formulations
2. Protection and Preservation of actives
3. Enclosing extracts in suitable matrix (fat or soluble)



## READY FOR MARKET 09

1. Careful packing in suitable boxes or bags
2. Specific labeling according regulatory requirements
3. Centralization of stock in Nutreco's warehouse



## FUNCTIONAL FEEDS, SMART MIXES AND ADDITIVES 10

1. Solving market issues and challenges
2. Accompanying our customers world wide
3. Providing all services around products



## FULL CIRCLE BENEFIT 11

1. Host-mediated answer to phyto-complexes
2. Reliable, consistent positive benefits
3. Animals, integrators and feed millers satisfied





# Social – Community Development

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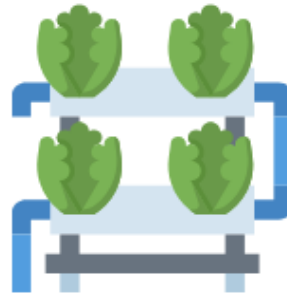
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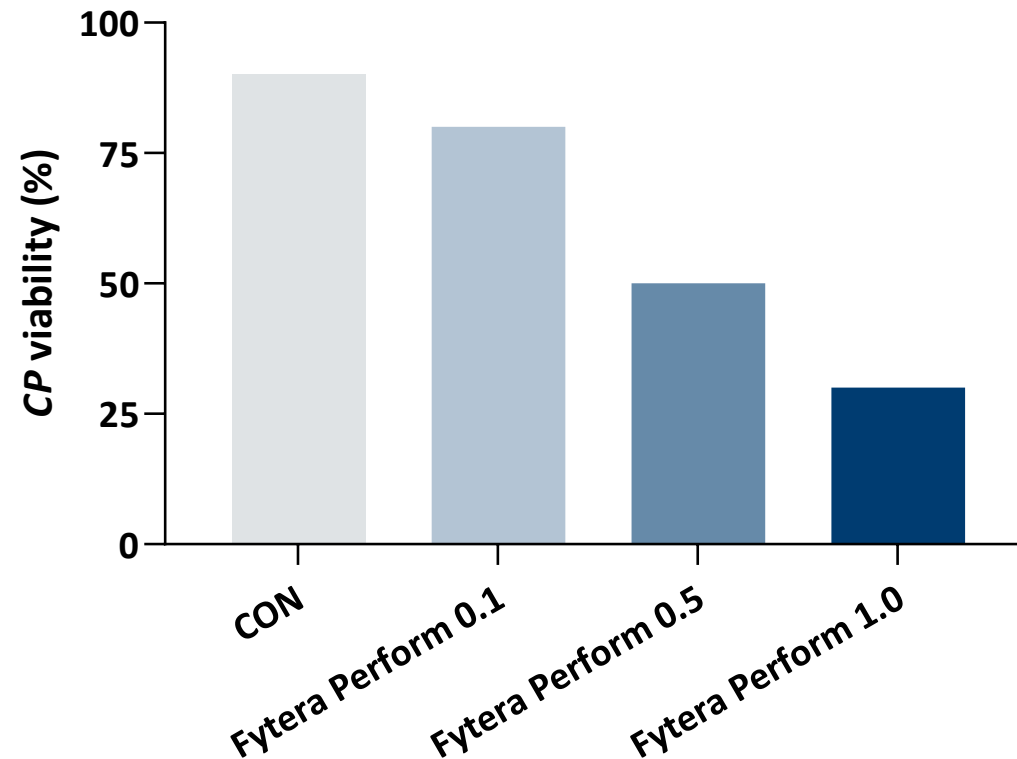
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# Social - Antimicrobial reduction

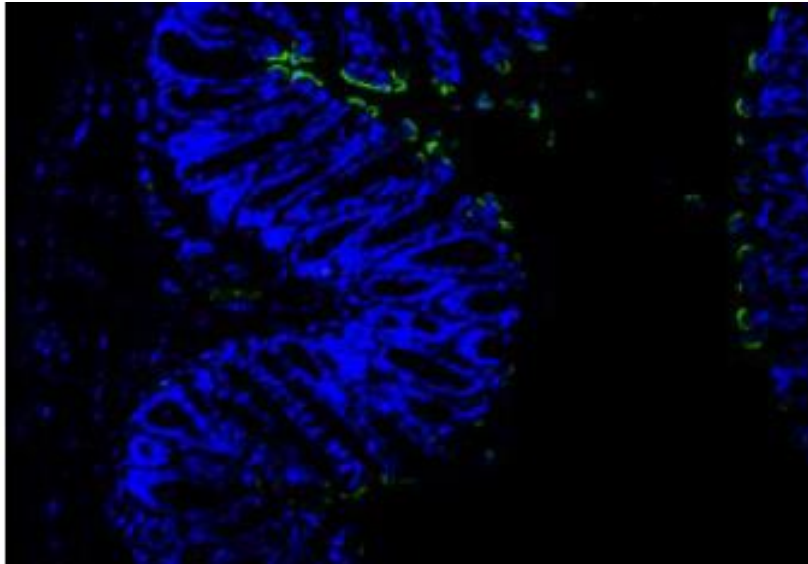


Doses used in vitro ranged from 400x to 4000x product dose

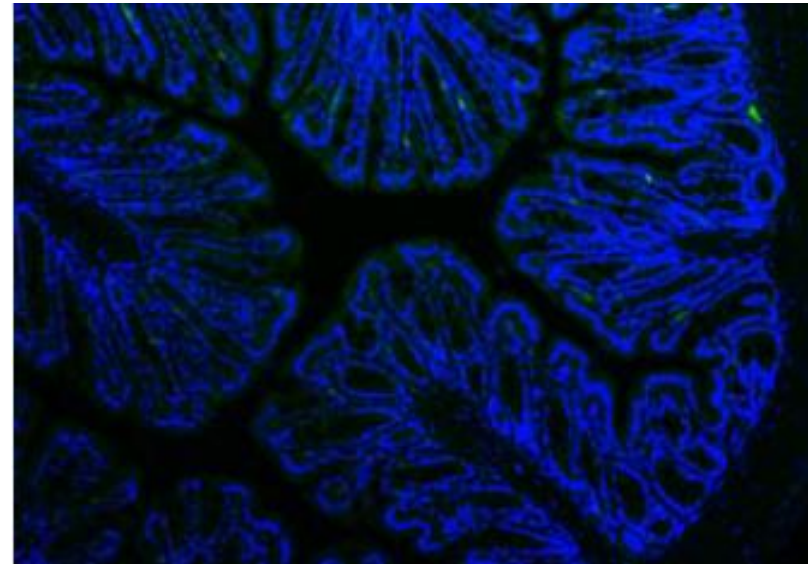


## What clove oil does (and doesn't do)

Negative control



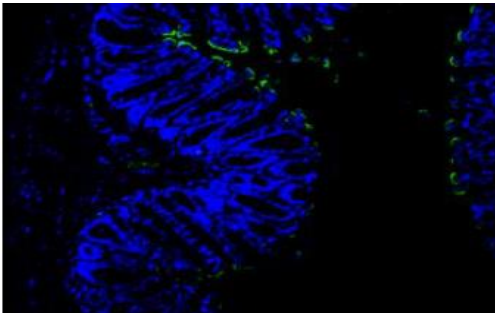
Clove Oil



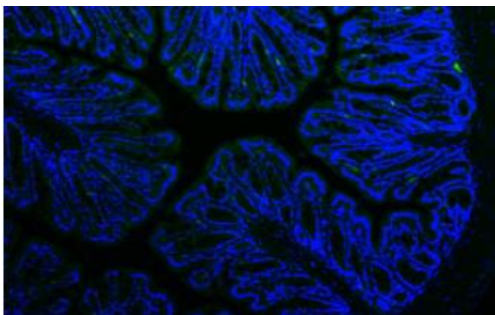


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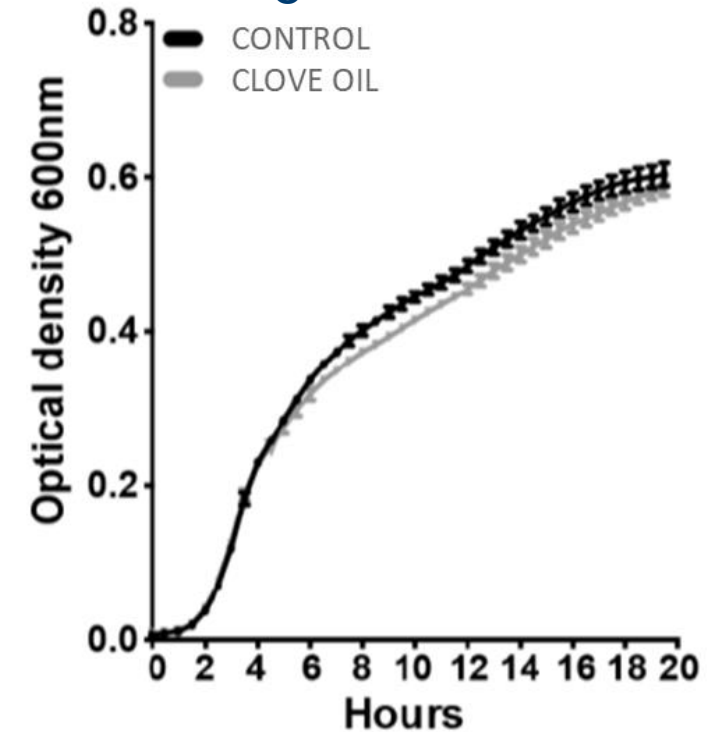
Negative control



Clove Oil



Bacterial growth over time



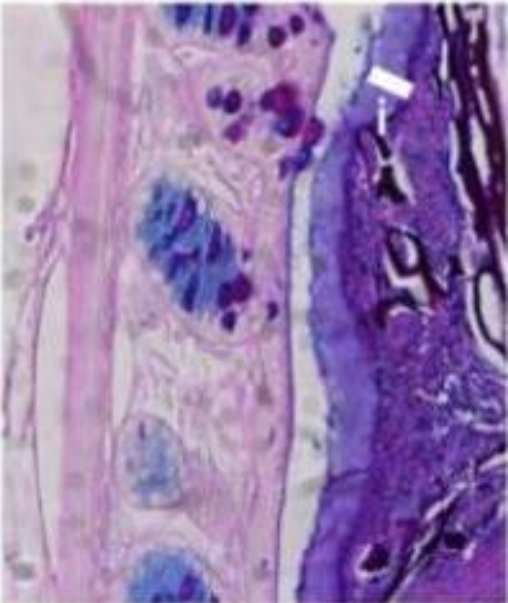
Clove oil prevents adhesion of bacteria in the colon...

...but does not kill the bacteria!

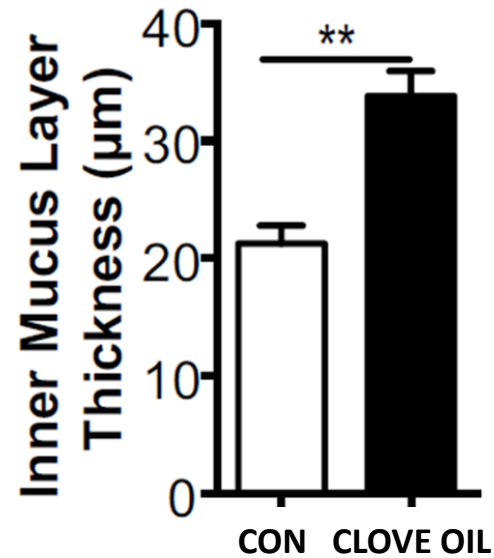
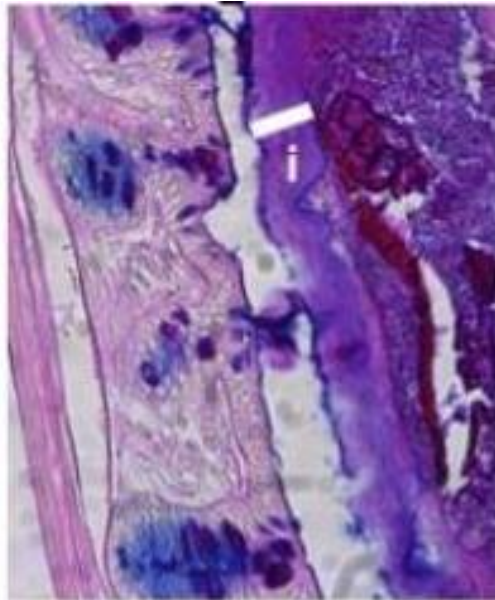


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Clove Oil



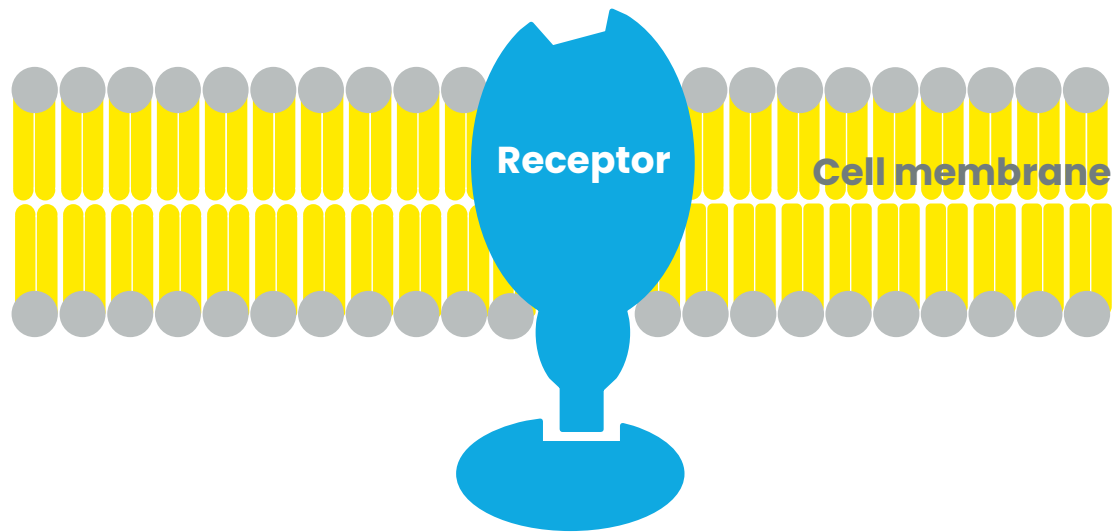
Clove oil strengthens the mucosal barrier by increasing the thickness of the inner mucus layer.



# Social - Antimicrobial reduction

It is about triggering, desensitizing or blocking signal transduction.

 Clove Oil (signalling molecule)



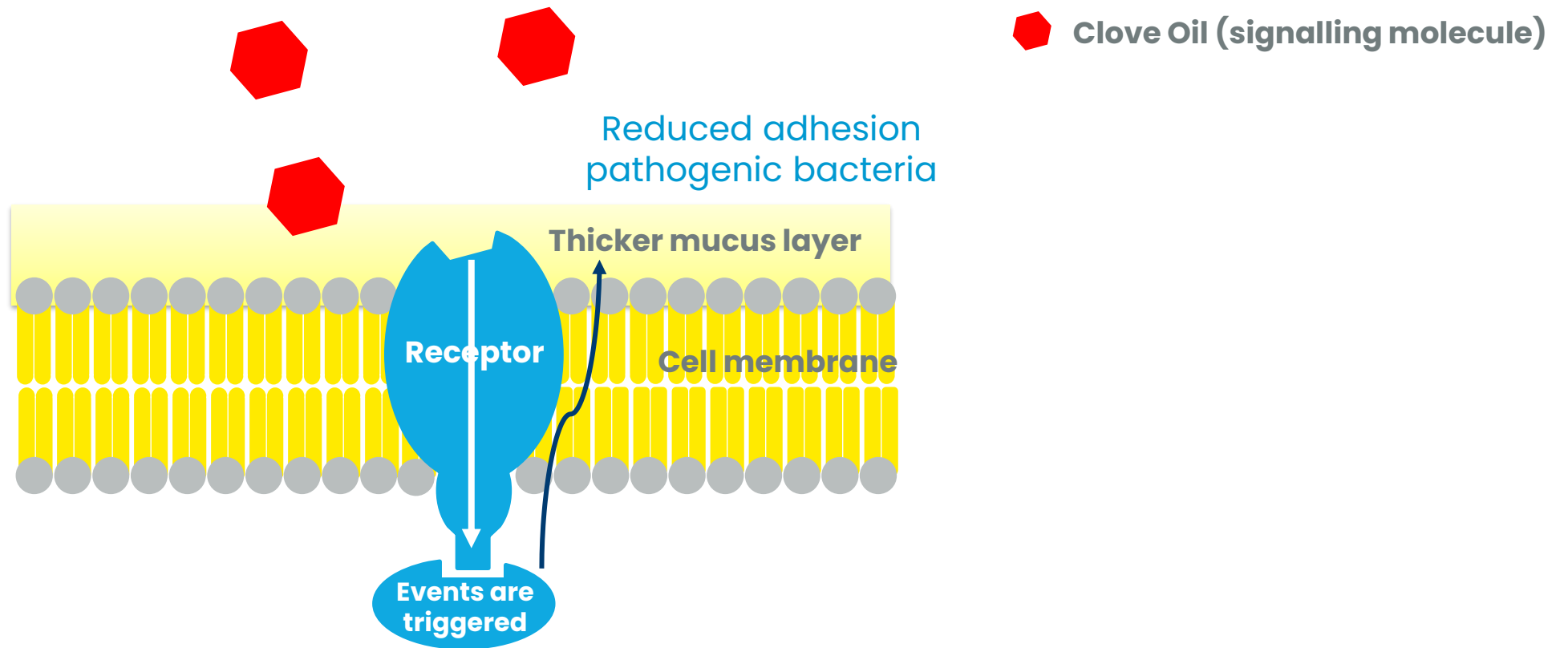
Events are triggered





# Social - Antimicrobial reduction

It is about triggering, desensitizing or blocking signal transduction.





# Social - Antimicrobial reduction

## Current market positioning of phytogenics

Replace antibiotics

**Pathogen in focus**



# Social - Antimicrobial reduction

Factors influencing health and performance	Current market positioning of phytogenics
Metabolic health	Replace antibiotics
Liver health	
Muscle health/ lean muscle mass	
Inflammation	
Bone health/calcium metabolism	
Immune modulation	
Intake regulation	
Respiratory health	
Dermatitis	

**Animal in focus**

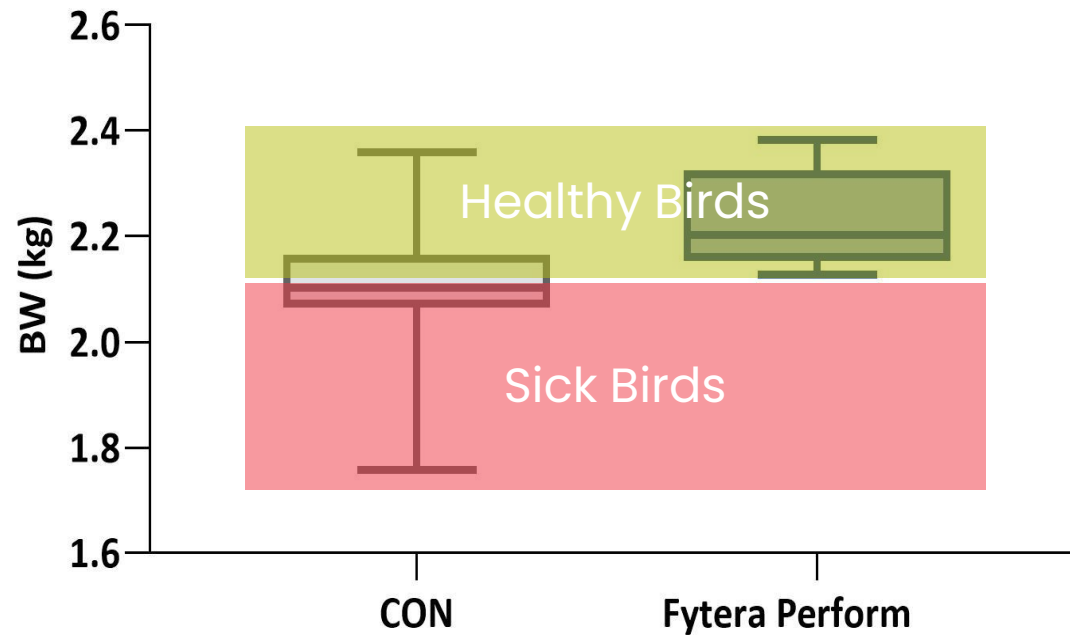
**Pathogen in focus**



Phytotechnology to **target the animal**  
(and not the pathogen)



# Social – Animal Welfare





## Social

Community development  
Antimicrobial reduction  
Animal welfare



## Environmental

Reduced need for antibiotics  
Phytogenics align with nature-  
positive approaches.  
Enhance nutrient digestibility  
and absorption  
Gut health  
Disease resistance  
Immune modulation



## Economic

FCR Improvement  
Carcass Quality  
Eggshell Quality

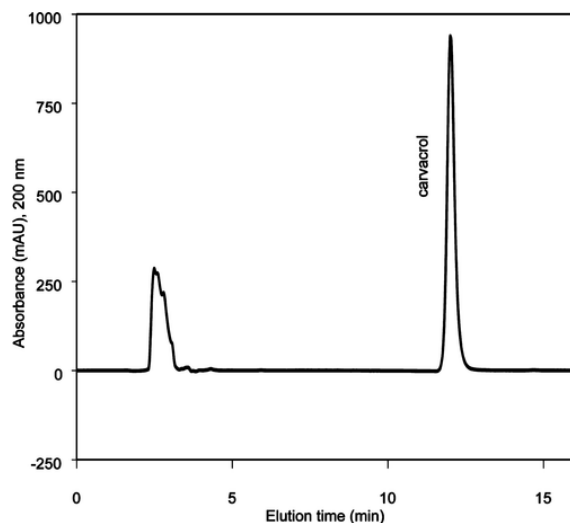




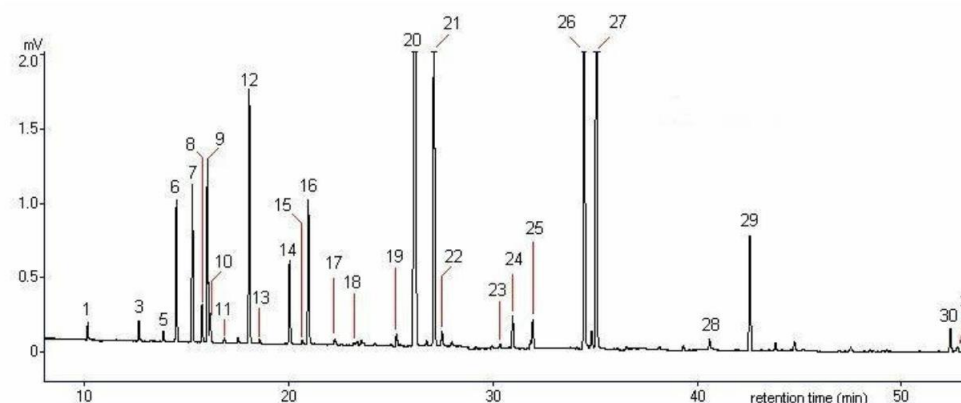
## Synthetic Active Ingredients vs. Natural Full Spectrum Essential Oils

Analysis of connections with GC-MS

Synthetic Carvacrol (N° CAS)



Natural Oregano Essential Oil (incl. Carvacrol)

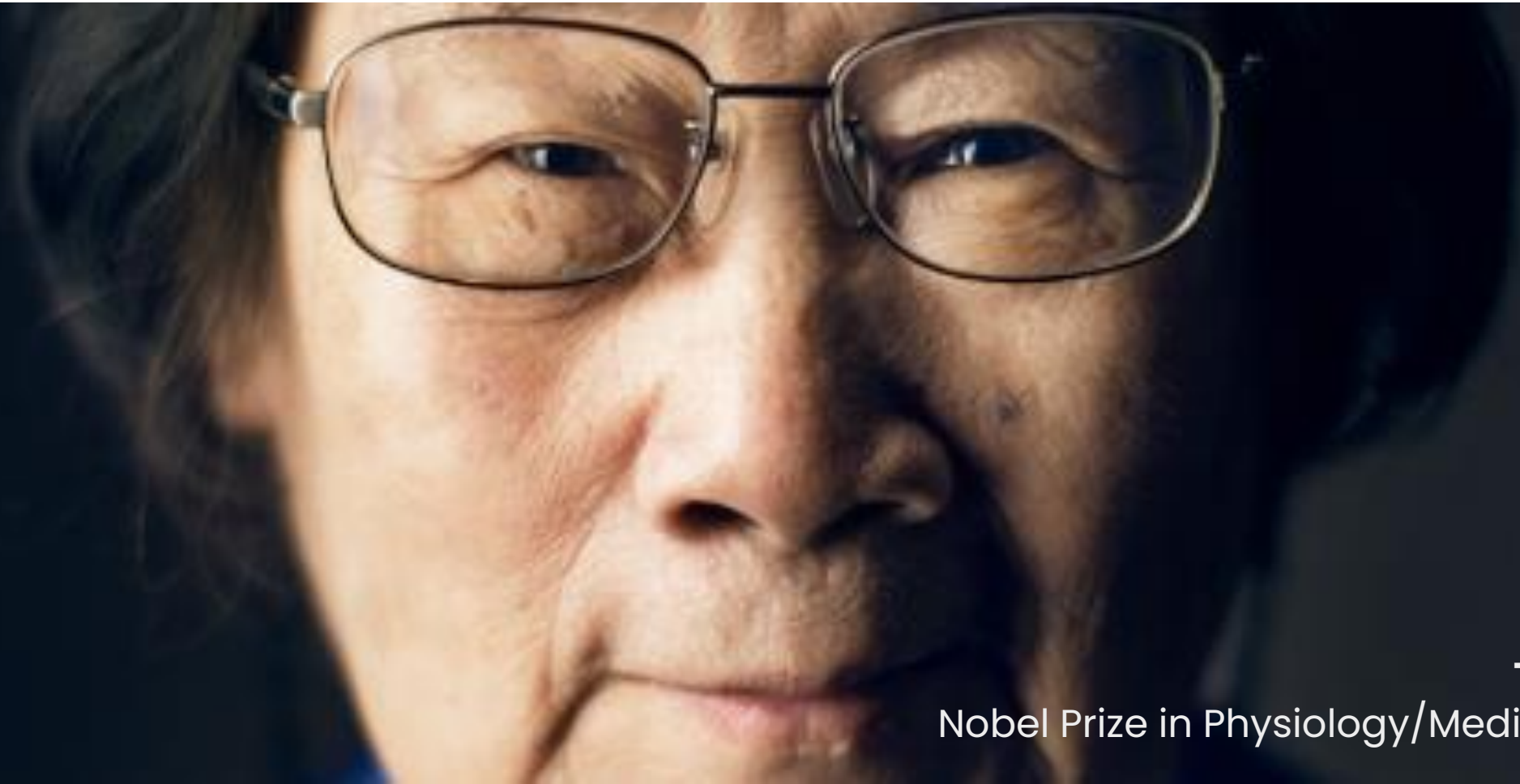


Chromatogram of oregano essential oil obtained by hydrodistillation. Terpineol (peak 20), carvacrol (peak 27), thymol (peak 26) and-terpineol (peak 21) are the main constituents. See table 2 for a description of the other peaks.

## Why is this important?

# Medicinal Plants in Human Medicine

Artemisinin (derived from the plant *Artemisia annua*) and its derivatives are one of the two treatment options available for malaria patients.



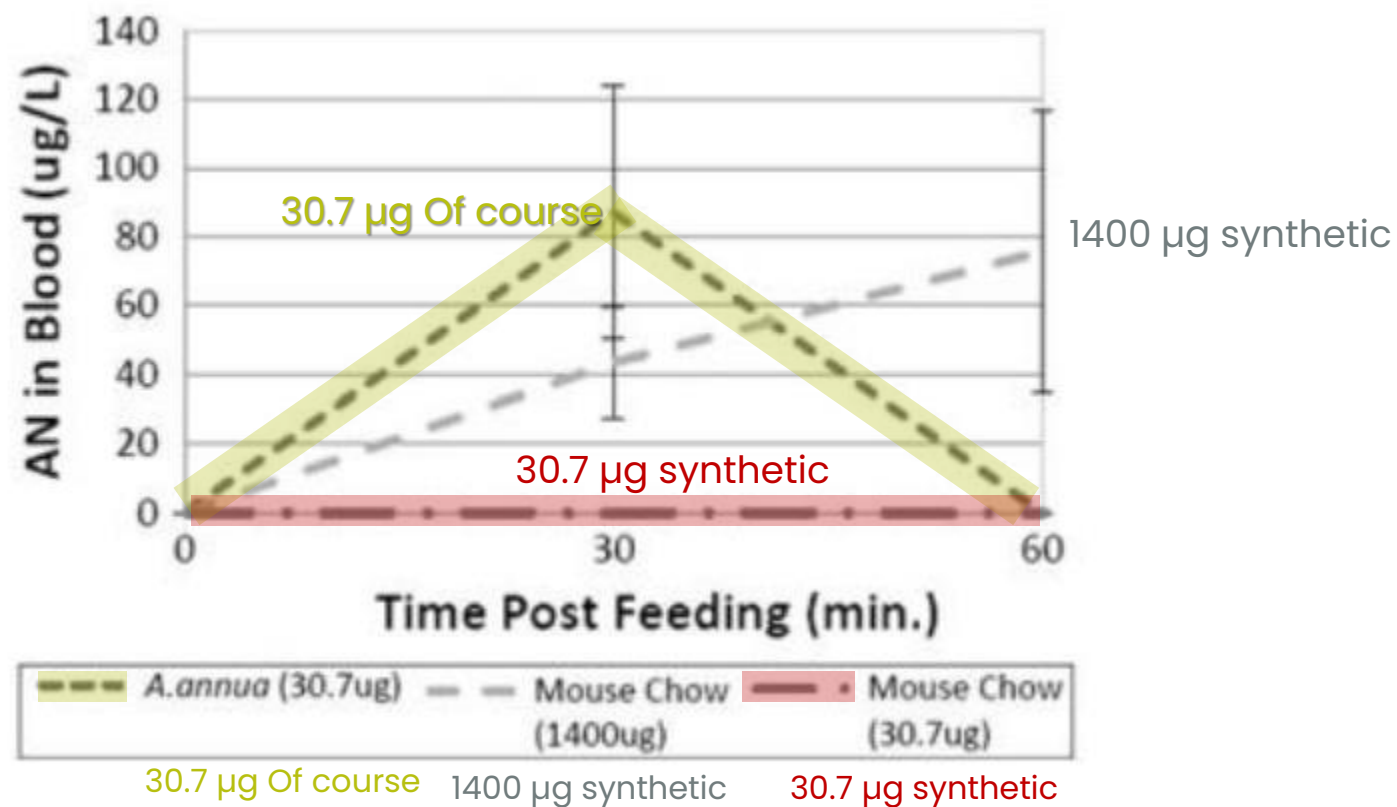
**TU YOUYOU**

Nobel Prize in Physiology/Medicine in 2015



## Synthetic Active Ingredients vs. Natural Full Spectrum Essential Oils

- High degree of transfer of artemisinin (antimalarial drug) into the bloodstream from the plant material compared to the synthetic drug.
- The mice were given 45 times more synthetic artemisinin than via the leaves of *A. annua*, yet almost the same amount appeared in the bloodstream

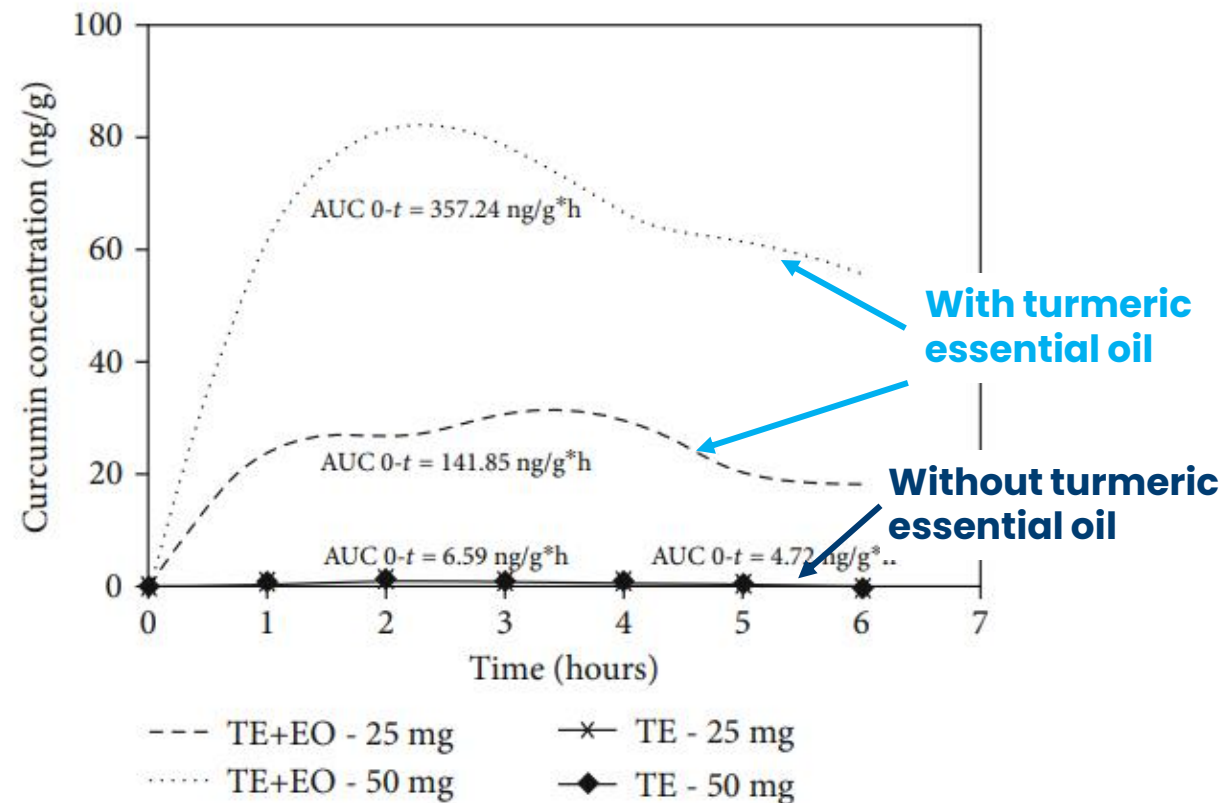






# Environmental – Full Natural

- A proprietary extraction process ensures that the natural ratio of the three most important phytoactive ingredients (curcumin, BDMC (bisdemethoxy-curcumin) and DMC (dimethoxy-curcumin)) is maintained.
- By combining turmeric oleoresin with turmeric essential oil, turmerone is restored.
- These active ingredients work synergistically and improve the famously low bioavailability of curcumin



Plasma concentration-time curve of curcumin after administration (25 or 50 mg/kg) of turmeric extract (TE), either with or without turmeric essential oil (EO).

# Phytogenics: A Sustainable Solution



## Social

Community development  
Antimicrobial reduction  
Animal welfare



## Environmental

Phytogenics align with nature-positive approaches.  
Enhance nutrient digestibility and absorption  
Gut health  
Disease resistance  
Immune modulation  
Reduced need for antibiotics



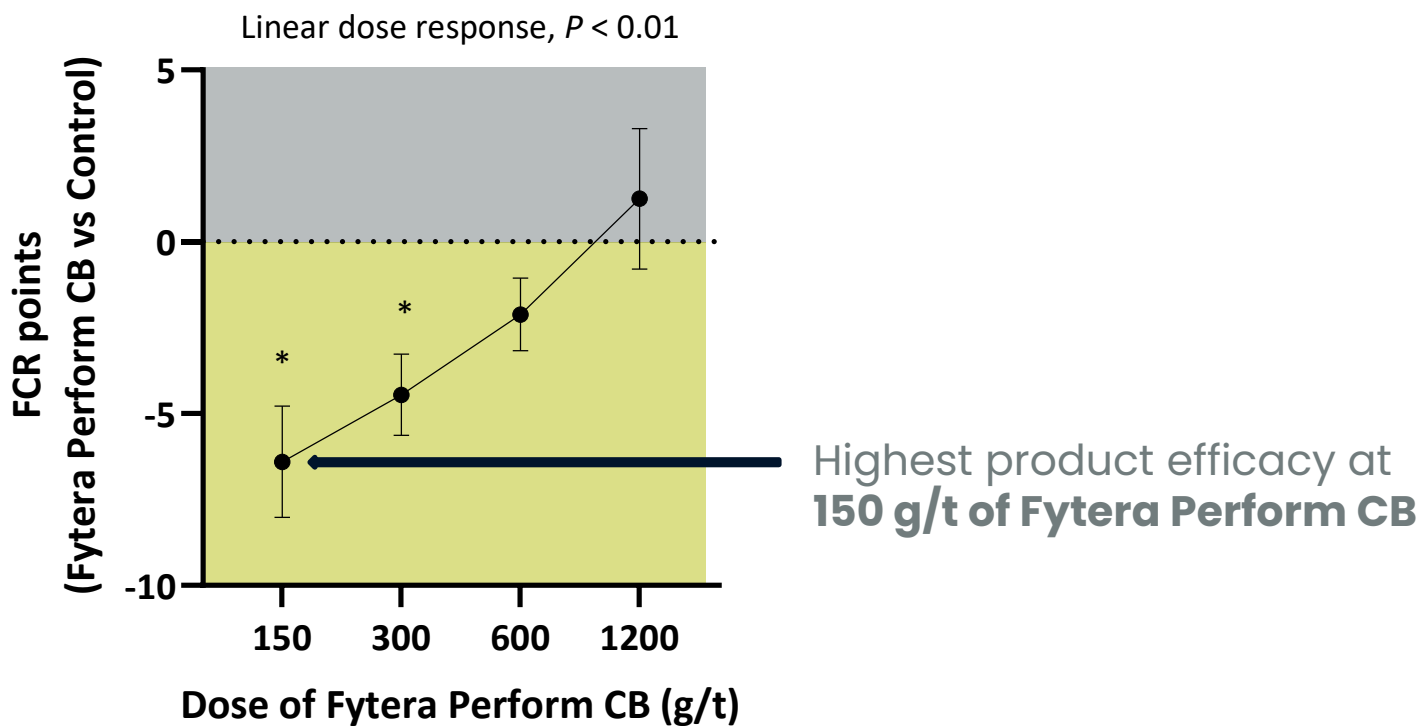
## Economic

FCR Improvement  
Carcass Quality  
Eggshell Quality



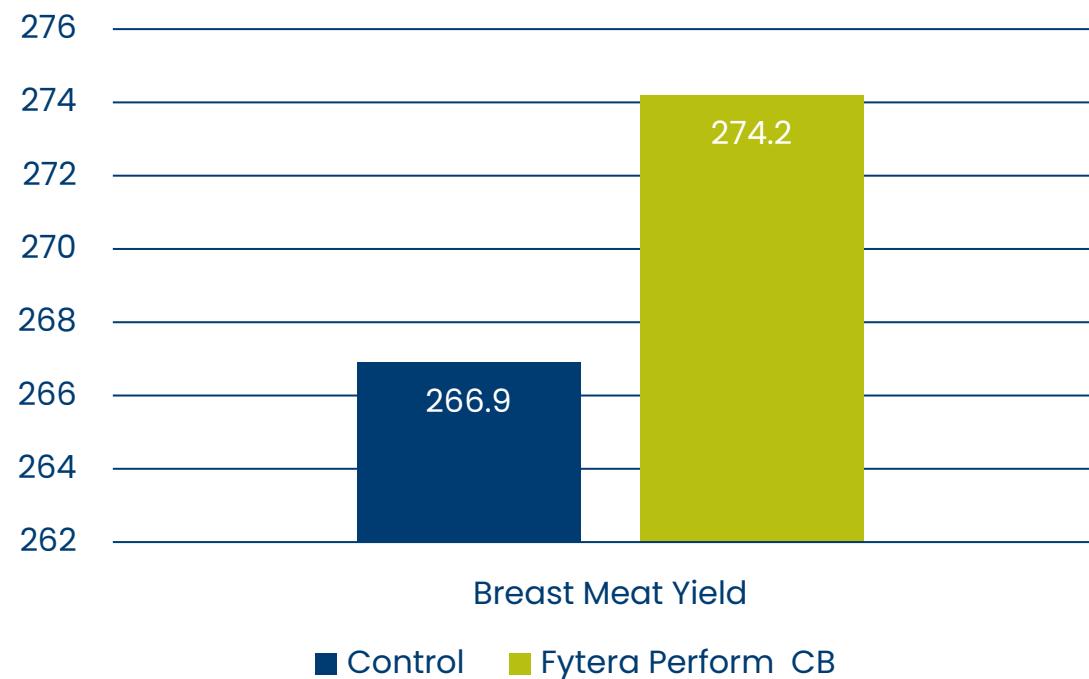
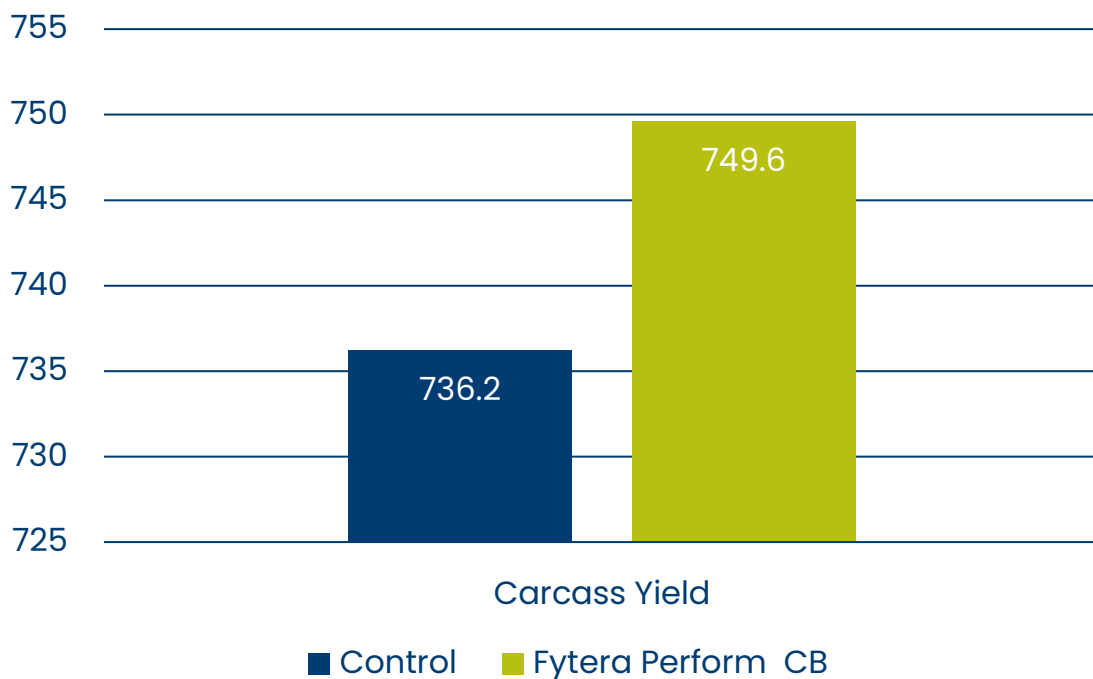
# Economics – FCR Improvement

It is about sending the correct signal, not maximizing the volume of the signal!





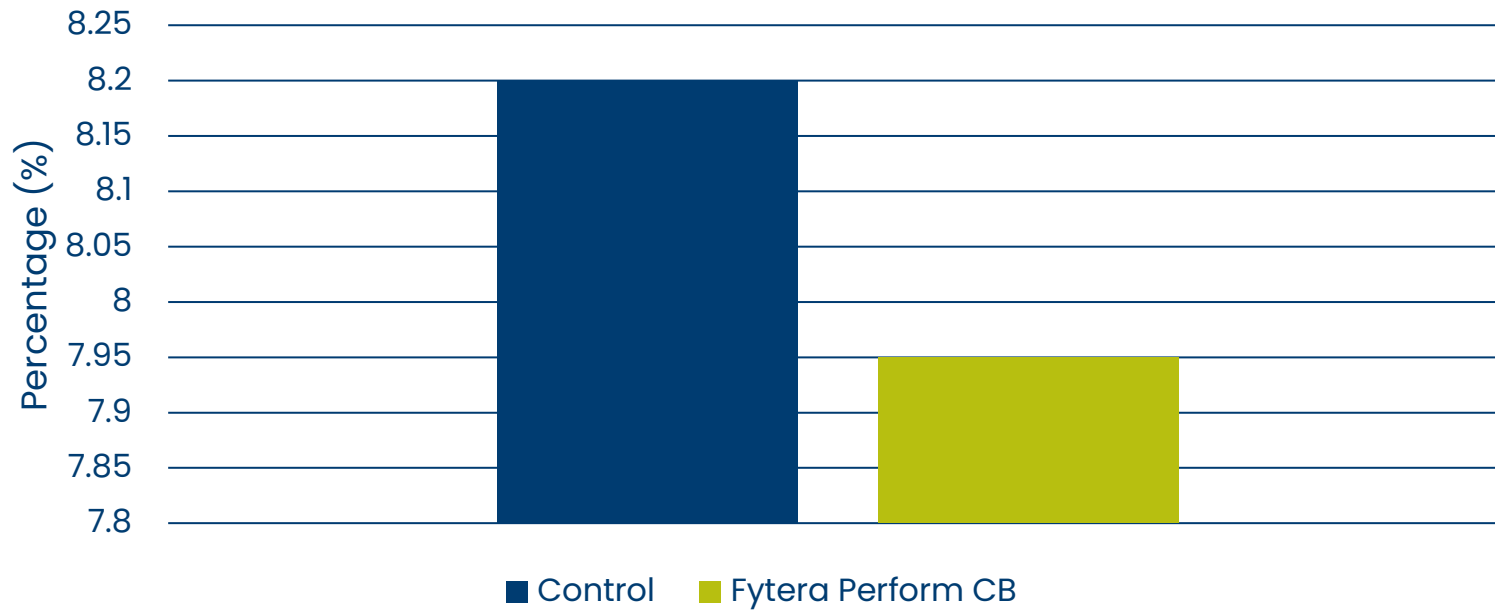
# Economics – Carcass Quality





# Economics – Carcass Quality

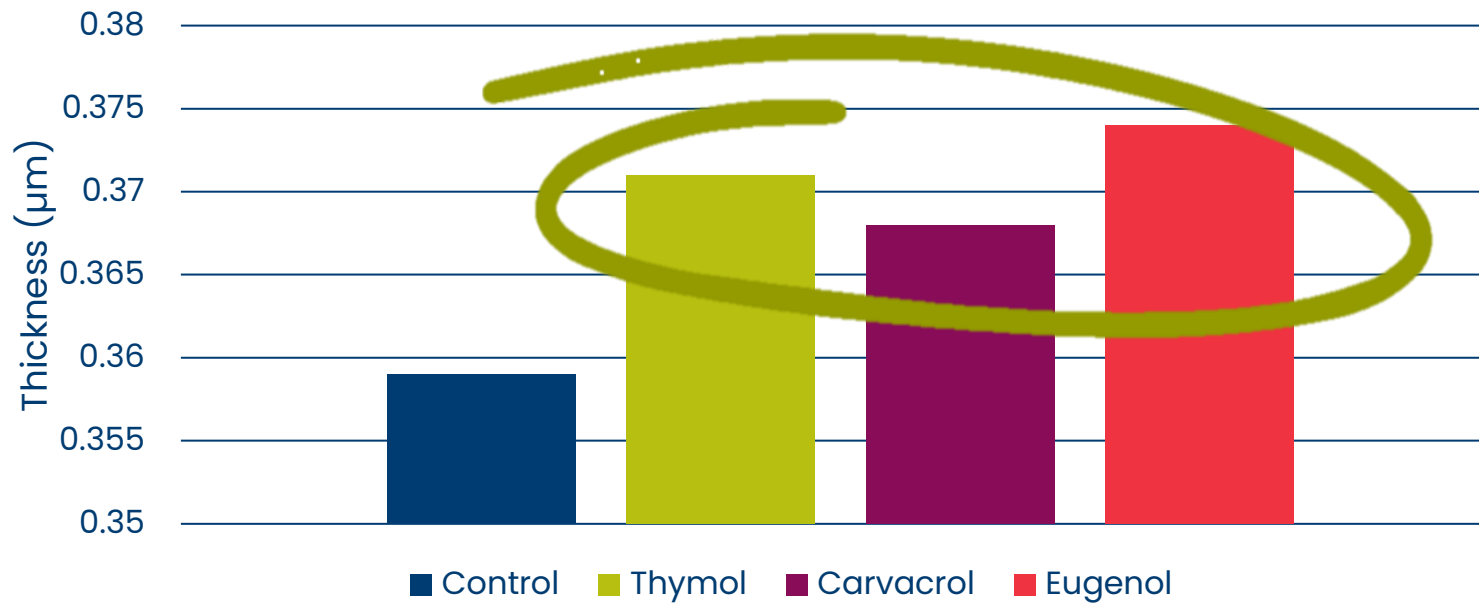
## Drip Loss





# Economics – Eggshell Quality

## Eggshell Thickness



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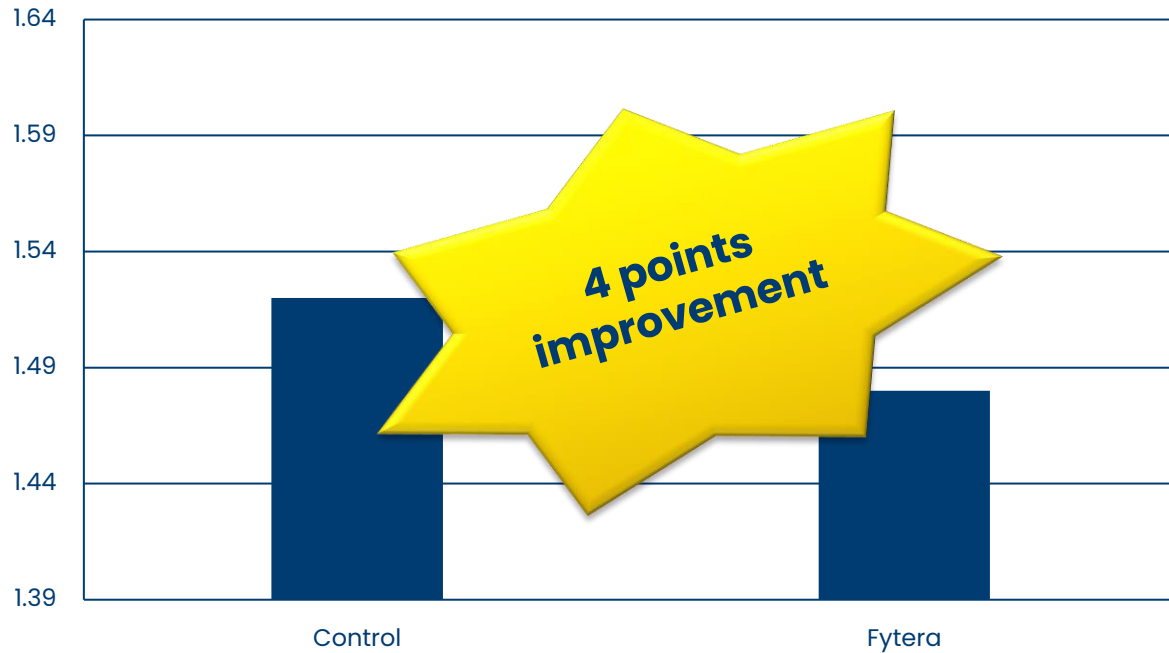


## Economic

Improved feed conversion ratio  
Reduced mortality  
Improved number of sellable eggs



Trial 1: Uttarakhand | Feed conversion ratio



Trial 2: Maharashtra | Feed conversion ratio







## Trial 1: Uttarakhand | Feed conversion ratio

**Feed Cost Saving** **INR 4.237,46**

**Return on Investment (ROI)** **4,9**

## Trial 2: Maharashtra | Feed conversion ratio

**Feed Cost Saving** **INR 5.465,17**

**Return on Investment (ROI)** **4,6**

Note: this does not include additional benefits such as increased flock uniformity and increased dressing yield



**Trouw Talks**

**Allow us to be your Reliable Partner  
in your journey to**

**Get Future Ready...**

# Thank you...



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