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A European Public-Private Platform

Emerging Technologies to Support Livestock

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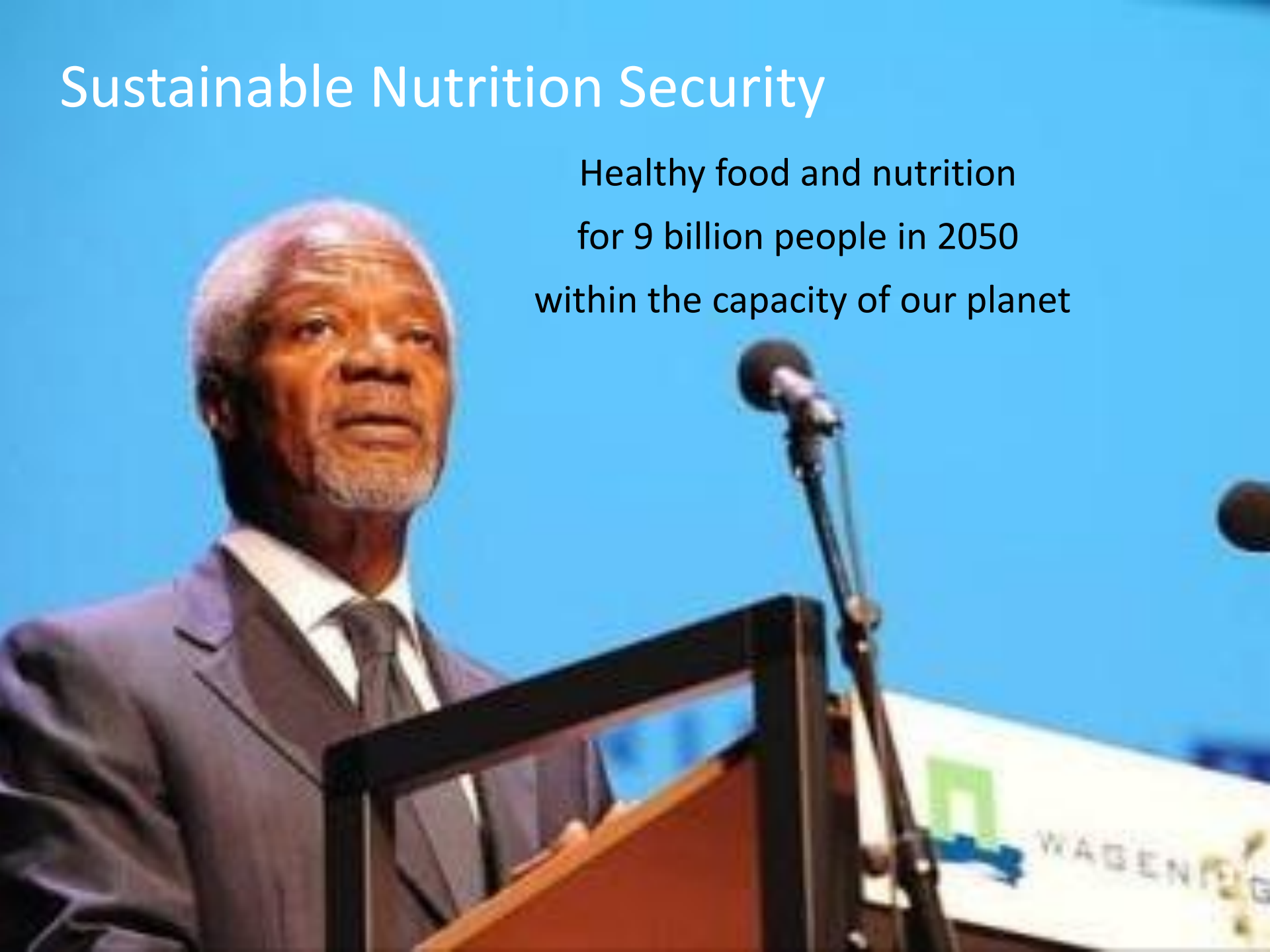
Animal Task Force

(Wageningen University)

WAGENINGEN UR

For quality of life

Sustainable Nutrition Security

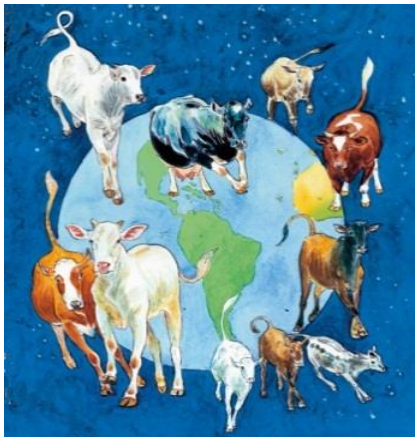


Healthy food and nutrition

for 9 billion people in 2050

within the capacity of our planet

Why Livestock?



- Converts raw biomass in nutritious food
- Contributes to biomass cycling
- Serves the agro-ecosystem functioning
- Matches demand for animal proteins and fatty acids with high nutritional value

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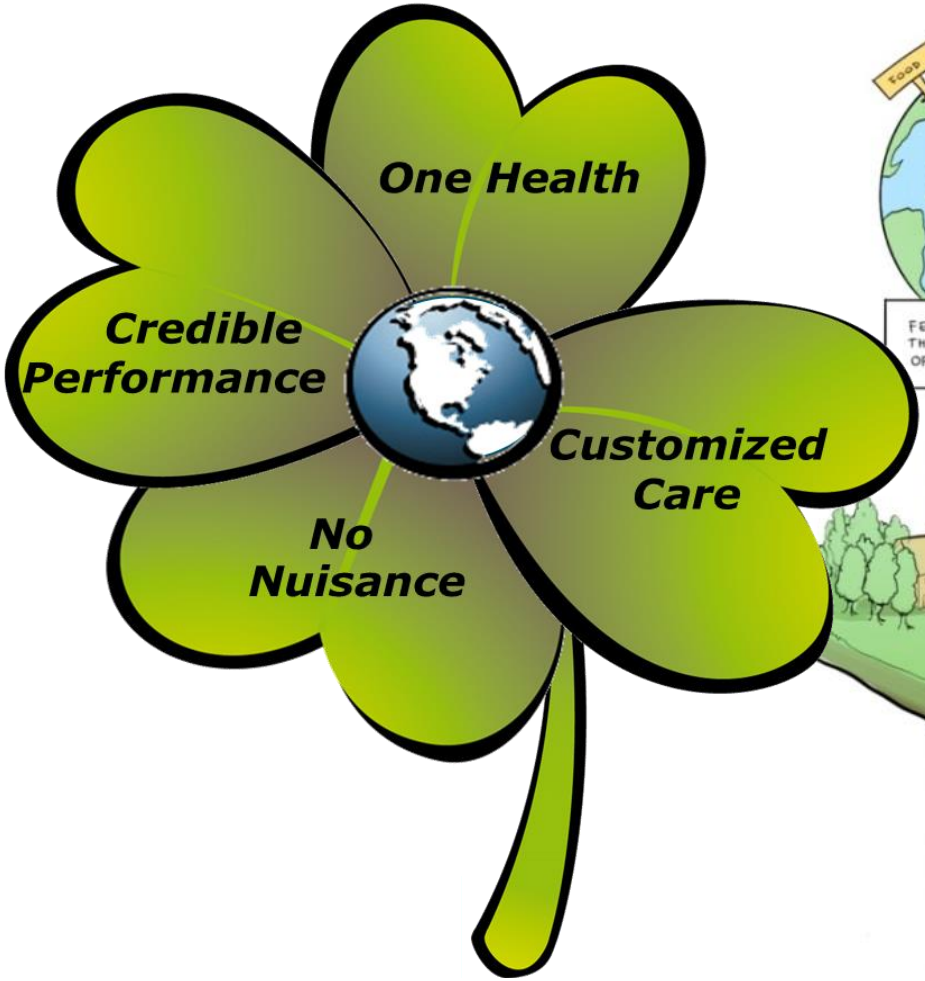
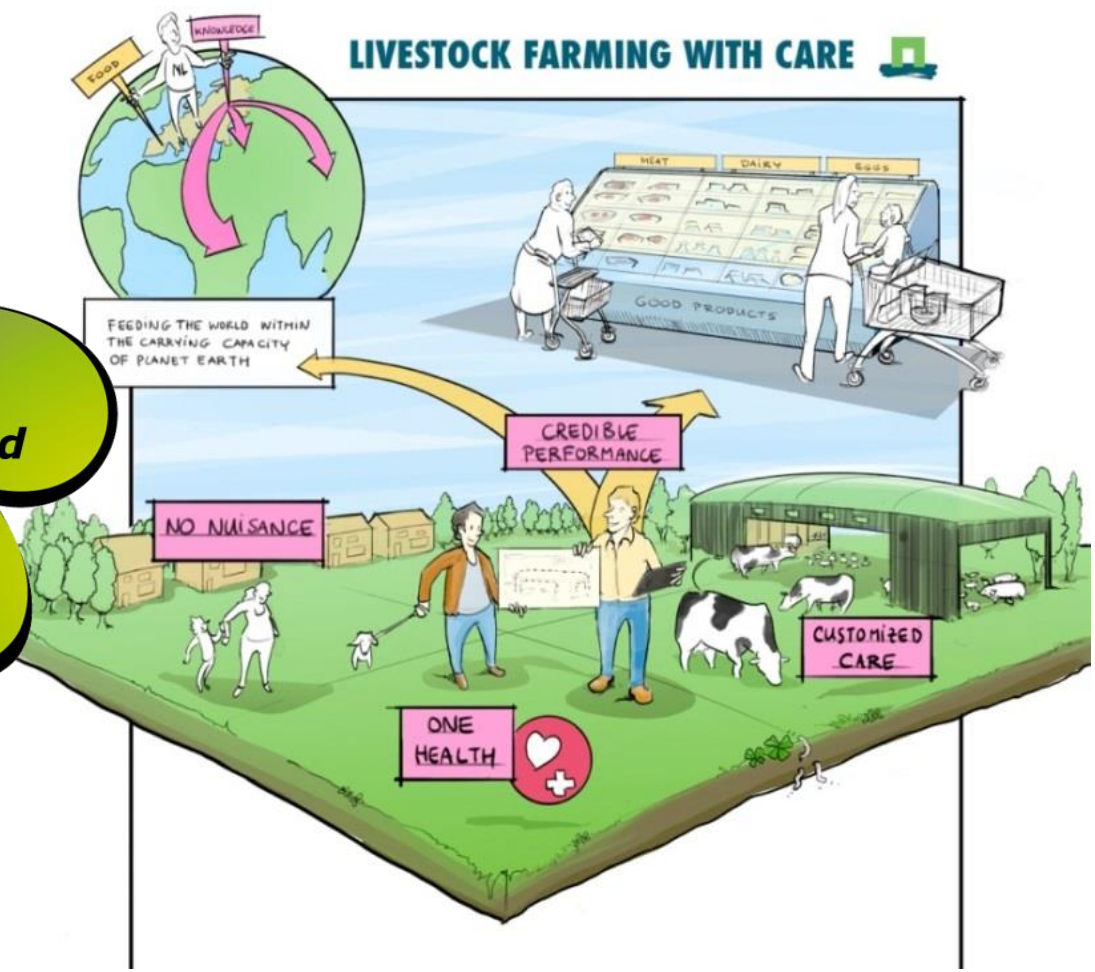
Livestock Farming with Care





M.C.Th. Scholten, I.J.M. de Boer, B. Gremmen, C. Lokhorst; Livestock Farming with Care: towards sustainable production of animal-source food
NJAS - Wageningen Journal of Life Sciences, Volume 66, November 2013, Pages 3–5

Livestock Challenges

- Sustainable Intensification
- Smart Breeding
- Customized Feeding & Resource Efficiency
- Healthy Livestock
- Animal Welfare
- Precision Livestock Farming
- Climate Smart Agriculture
- Grassland Management
- Manure Management
- One Health Management
- Antibiotics Resistance
- Resilience & Robustness

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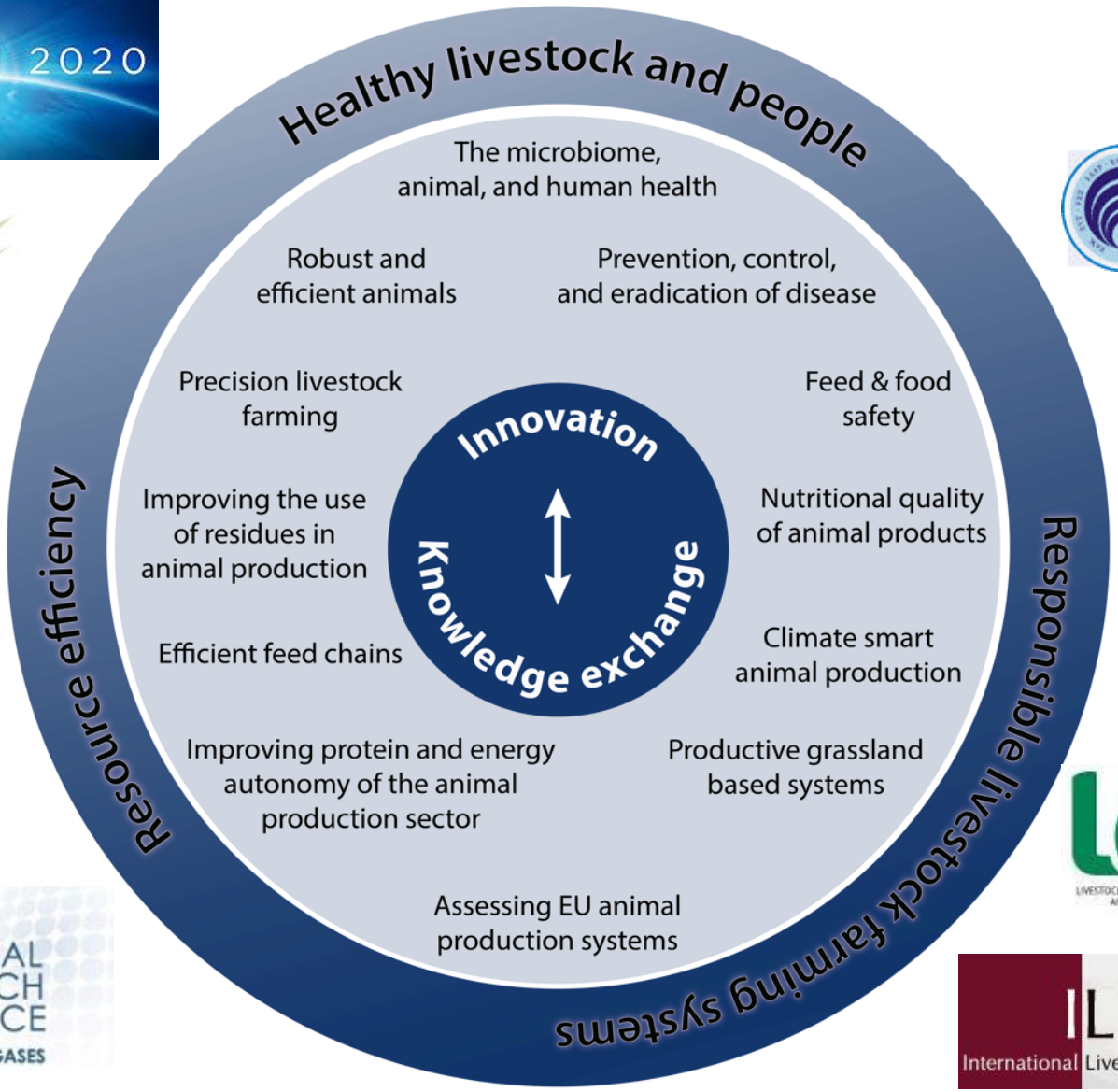
Wheel of Innovation



SCAR
Standing Committee on Agricultural Research

GLOBAL AGENDA FOR SUSTAINABLE LIVESTOCK

FACCEJPI

GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

European Federation
EAAP
Animal Science

SAI PLATFORM

leap
LIVESTOCK ENVIRONMENTAL ASSESSMENT AND PERFORMANCE PARTNERSHIP

ILRI
International Livestock Research Institute

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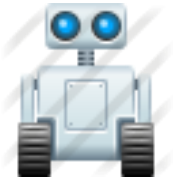
Technology Supports

Genomics

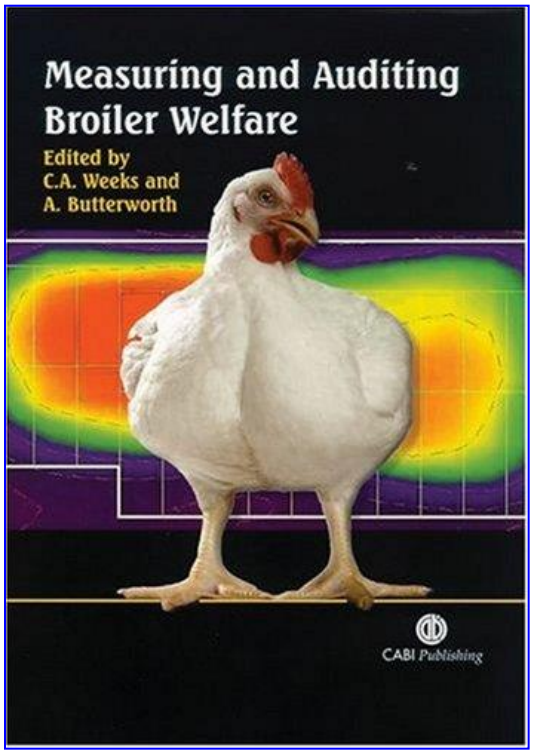


Robotics

Biologics

Informatics

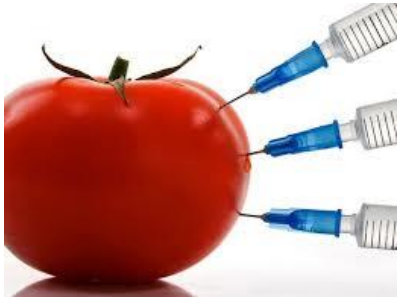
Monitoring Welfare

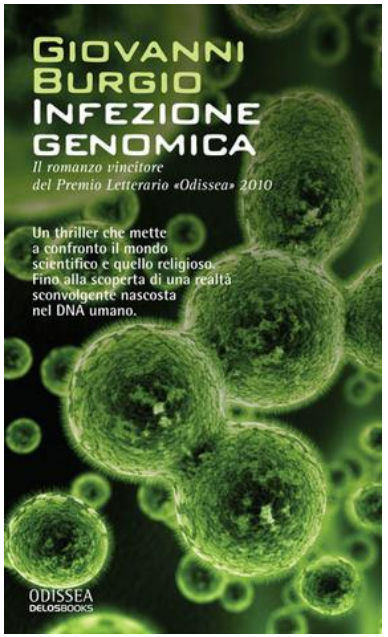


Telemetrics

Welfare Quality®
Science and society improving animal welfare

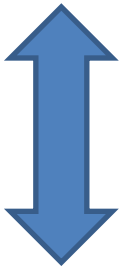
Technology in Food Production?





Ethical Considerations

Social Morality: intuition, principles, facts



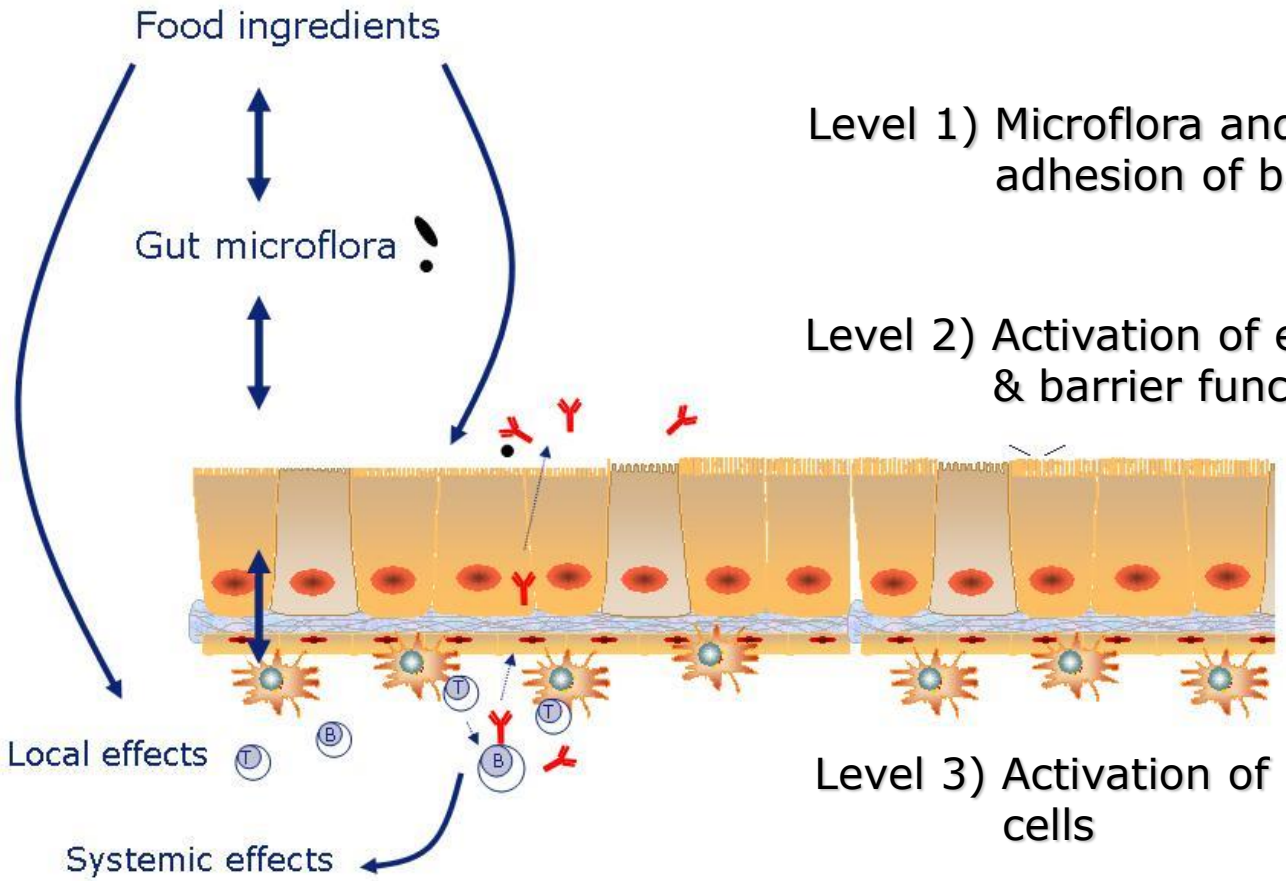
Scientific Knowledge: actuals, facts, insights

Key: Resilience and Robustness

- Genomic Selection
- Neonatal Interventions
- Immuno Modulation
- Animal Welfare
- Animal Health

1HEALTH 4FOOD

IMmunological Correlate Of Protection (IMCOP): Immunity can be targeted at 4 levels in the gut



Level 1) Microflora and adhesion of bacteria

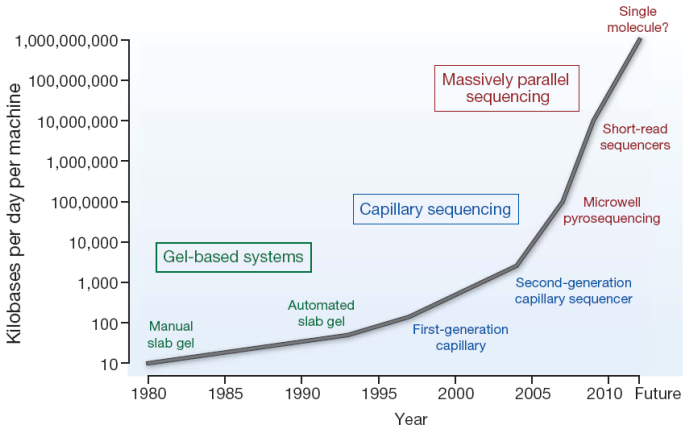
Level 2) Activation of epithelia & barrier function

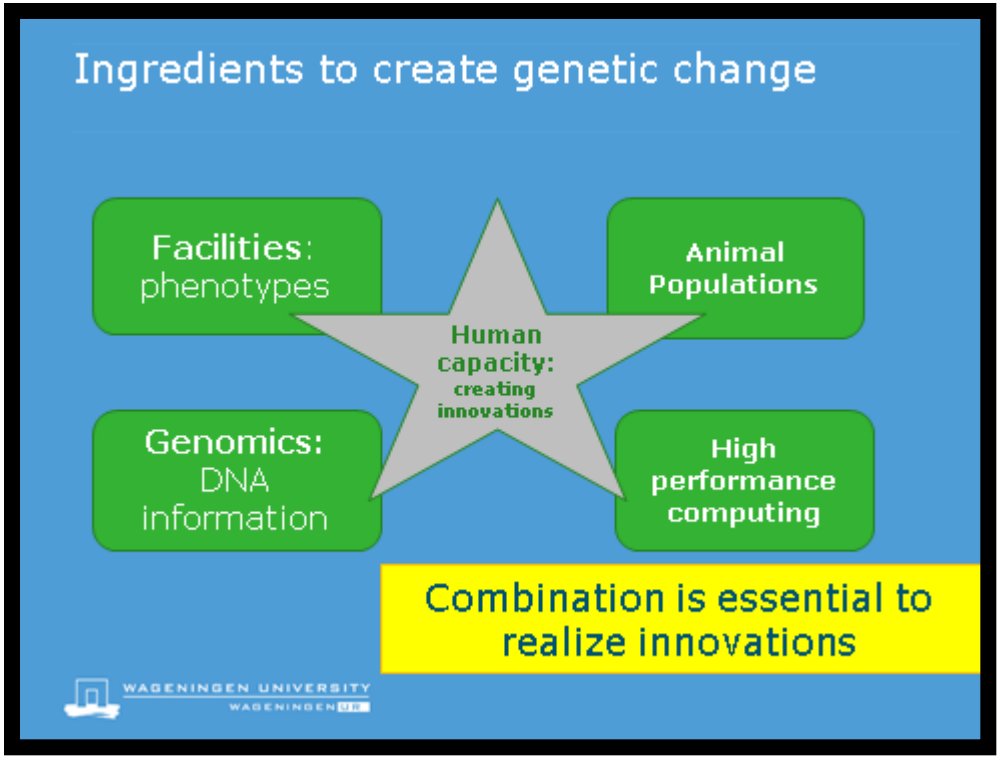
Level 3) Activation of immune cells

Level 4) Uptake in blood: Systemic effects

Development Quantitative Genetics

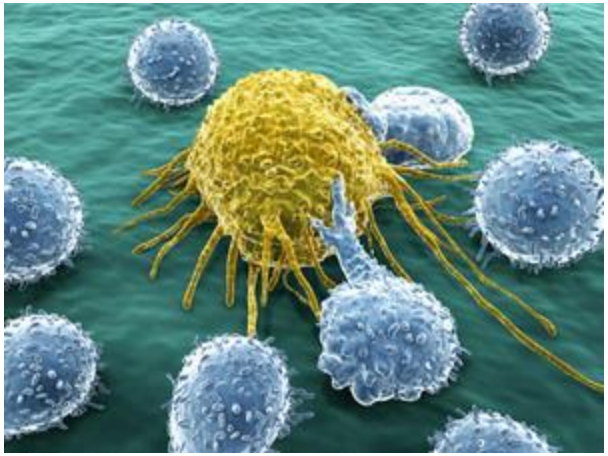
- Gene Editing
- Reporter Genes
- Infectivity Genes
- Trans-genese
- Cis-genese



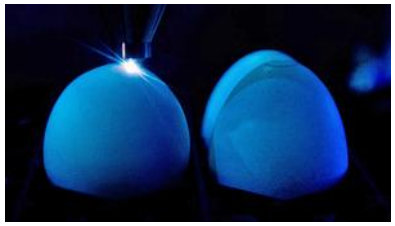


Spectrum of Biologicals

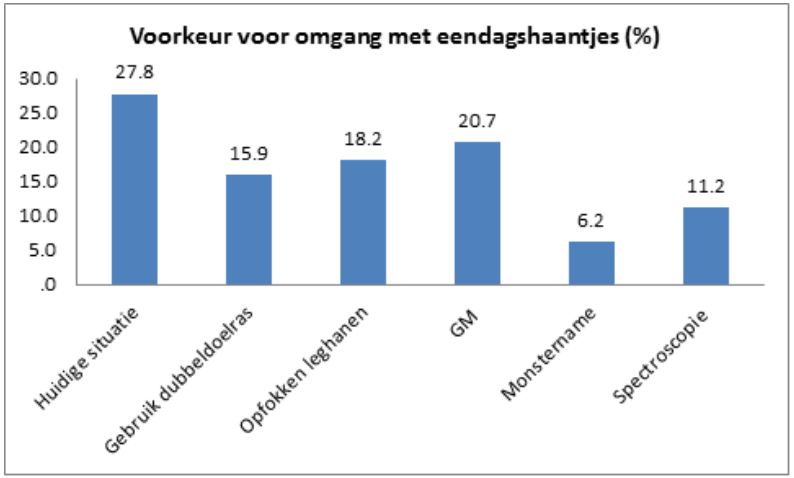
- Gene technologies
- Immuno-modulations (beta glucans)
- Vaccin adjuvants (T cell activation)
- DNA vaccination
- Mucosal vaccins
- Bacteriophages
- Probiotics
- Diagnostics



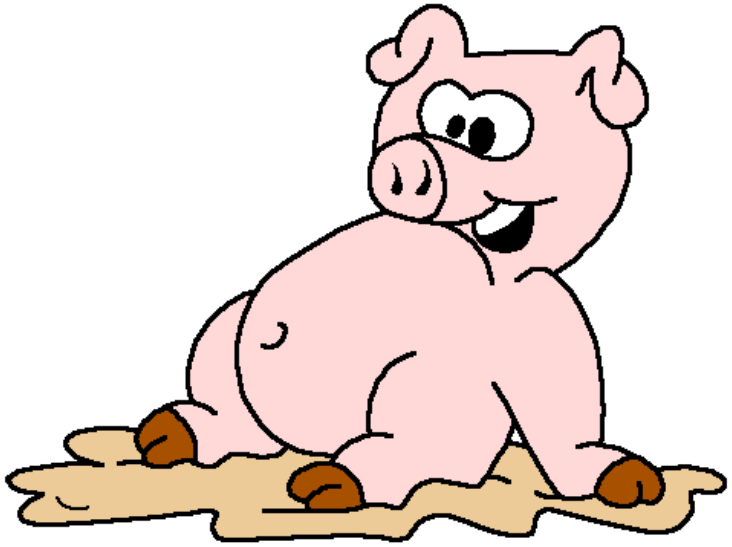
Example 1: Sexing Chicken Embryos

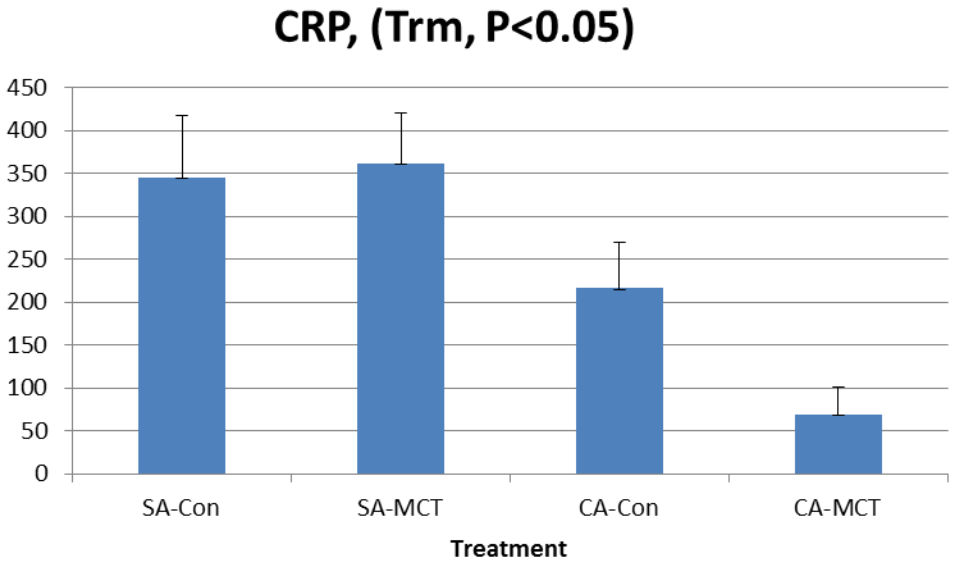


- GM marker gene to screen male chromosomes
- No incubation male eggs ->
  No killing male chicks
- No male chicks ->
  No marker genes in laying hens
- Parliament banned
- But, Public opinion:



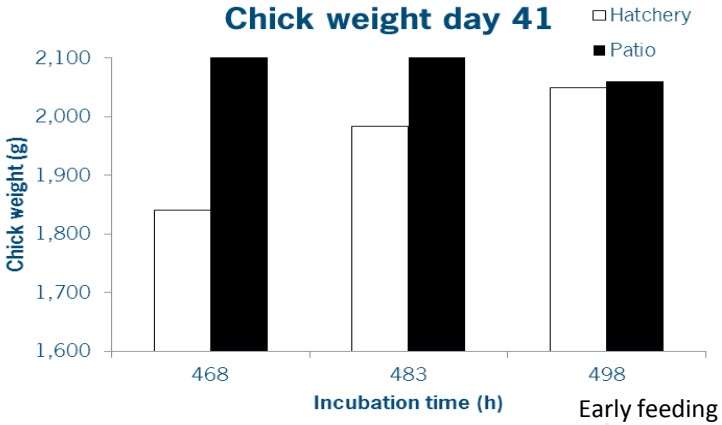
Example 2: Neonatal Fatty Acids Supplements & Intestine Immunology

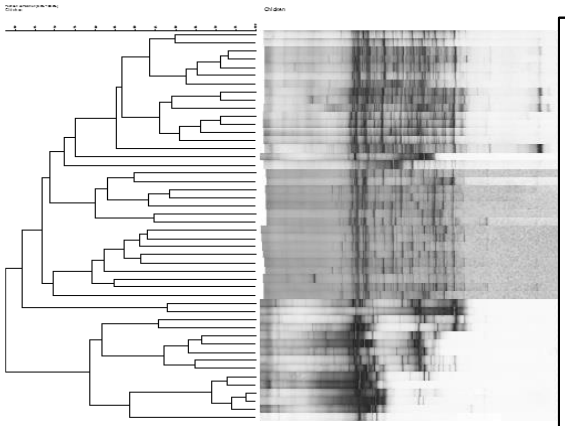


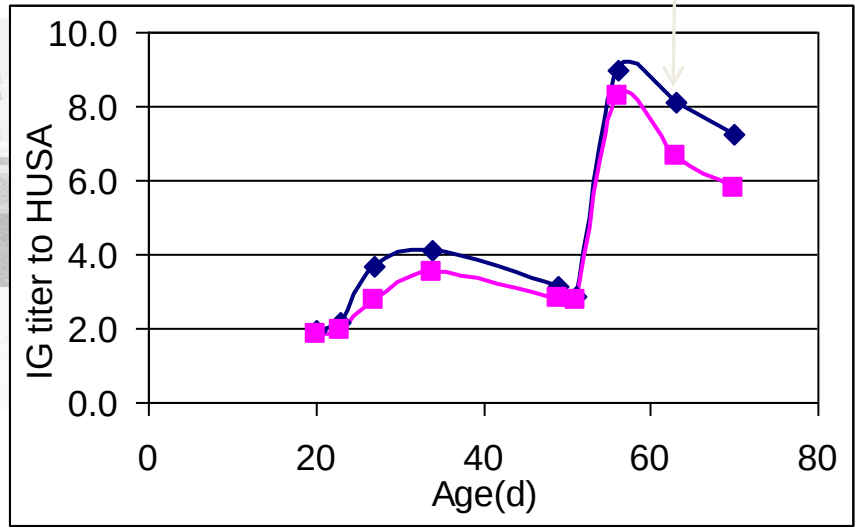


Example 3: Early Feeding after Hatch

- Growth performance ⬆
- Immune response later life ⬆
- Long term effects microbiota composition ⬆





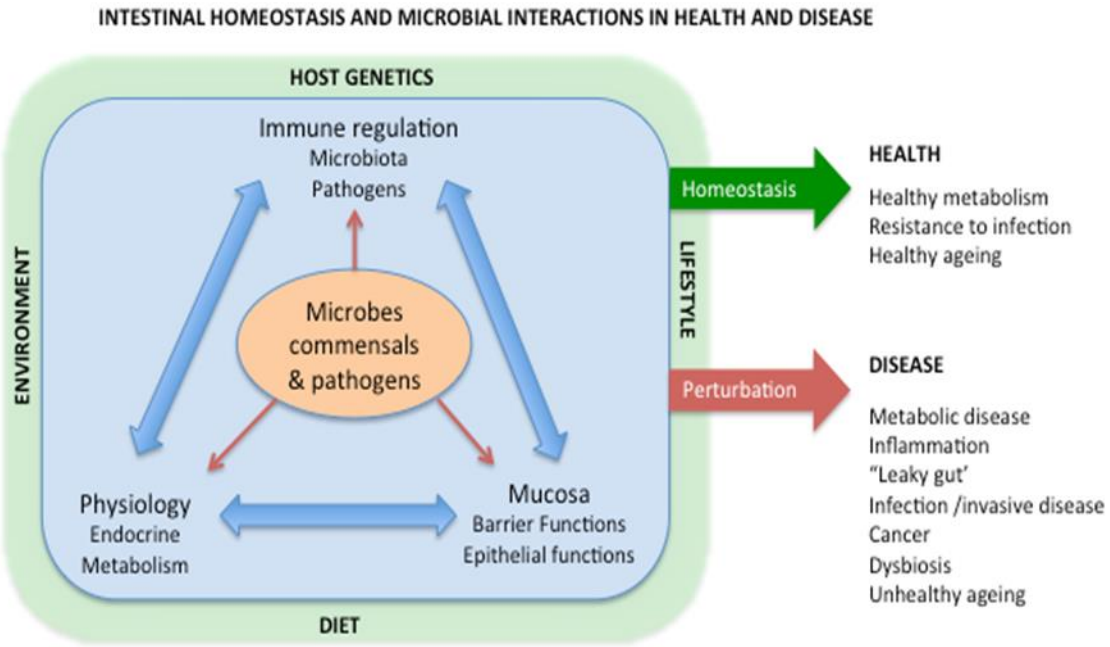


PhD Irene Walstra, Lotte van de Ven

Example 4: Transgenerational Gastro-intestinal Health Promotion

Epigenetics

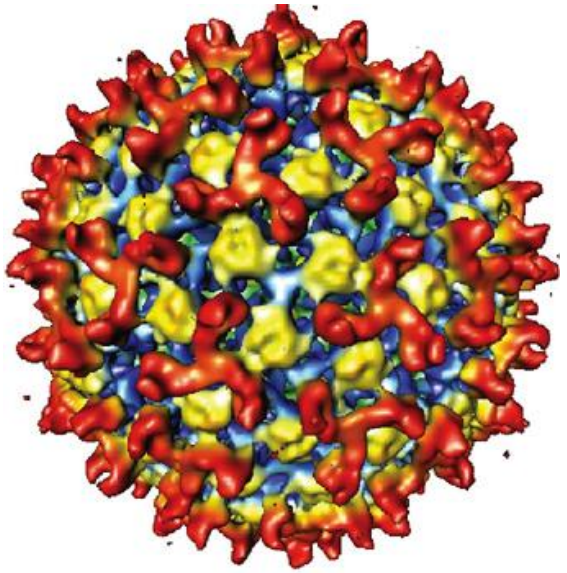
Example 5: Microbial Antagonism of Pathogens



Proof of Principle: isolates for specific commensals inhibiting *Streptococcus suis*

Example 6: Reverse Genetics to Produce Live-GMO Vaccines

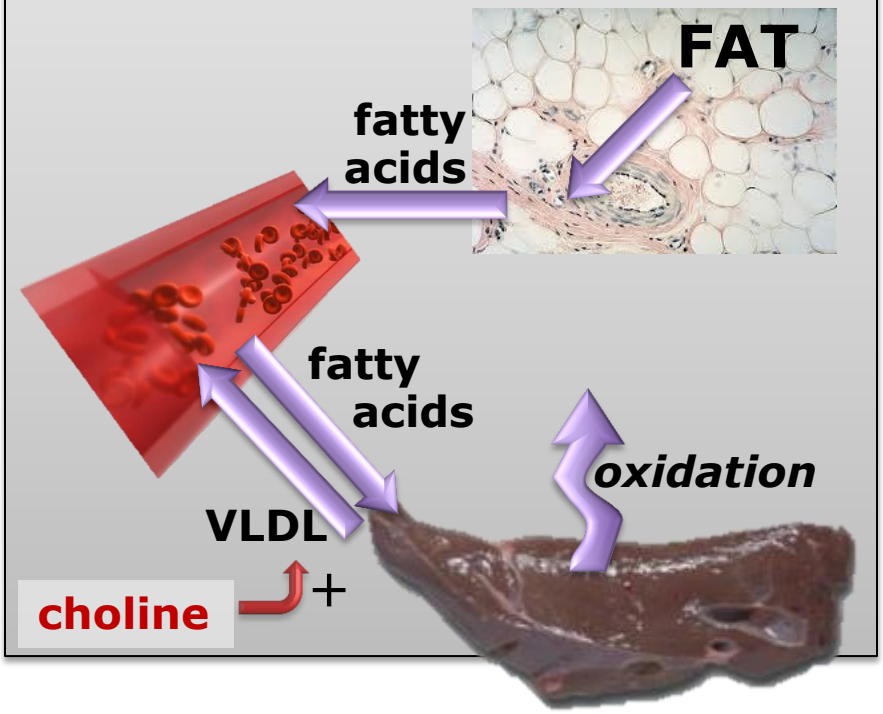
- Rapid response against emerging RNA viruses
  - Schmallenberg (SBV)
  - Bluetong (BTV)
  - Rift Valley (RVFV)
  - African Horse Sickness (AHSV)



Example 7: Choline Improves Liver Health

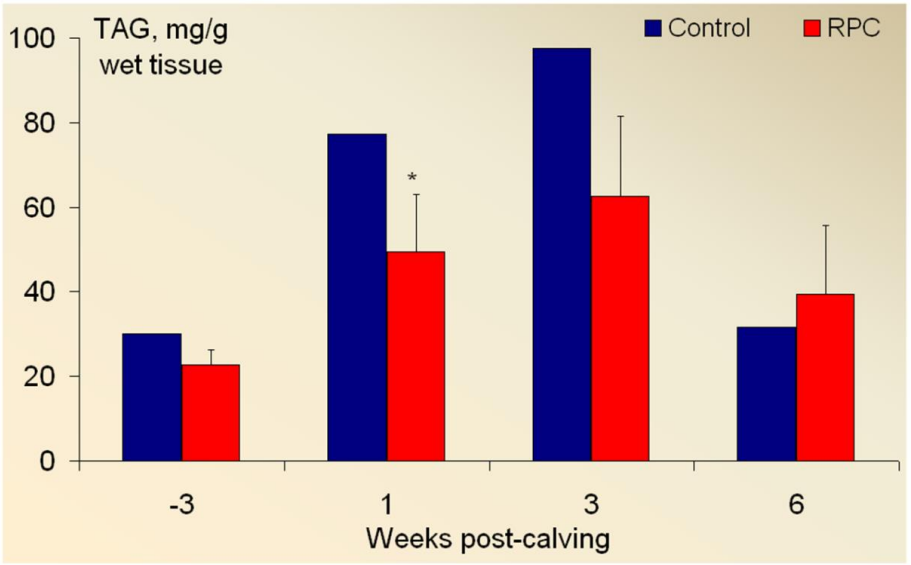
Fat metabolism dairy cow

prevent accumulation of fatty acids in liver by stimulating VLDL export



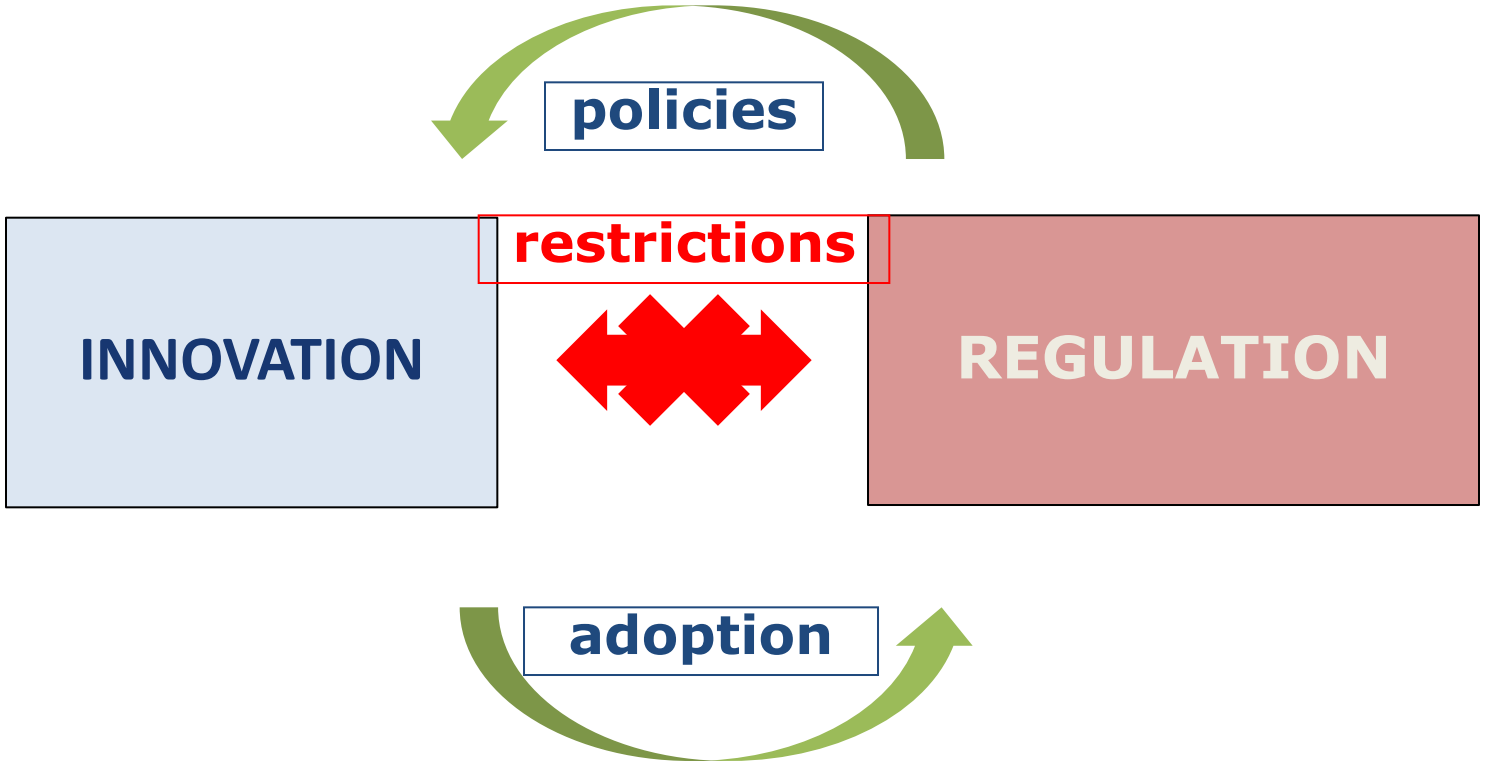
Feeding choline around calving

- reduces fat content of liver
- improves feed intake & cow health



Zom *et al.*, 2011; Goselink *et al.*, 2013

Innovation vs Regulation



Food for Thoughts

- Can we adopt technologies such as biologicals to meet the societal challenges regarding food production and nutrition security?
- May we foster our animals to a better welfare quality and connected health by using biologicals?
- Is this use or abuse of the potential of nature to improve the quality of life?

Your opinion now?

"Sustainable Livestock Farming with Care should refrain from using Biologicals"

yes/no

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Please remind!

it always starts with looking at the animal !

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Thanks!

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