School of Animal Biosciences
Department of Animal Science

Animal nutrition in the context of One Health

(Διατροφή των ζώων στο πλαίσιο της Ενιαίας Υγείας)

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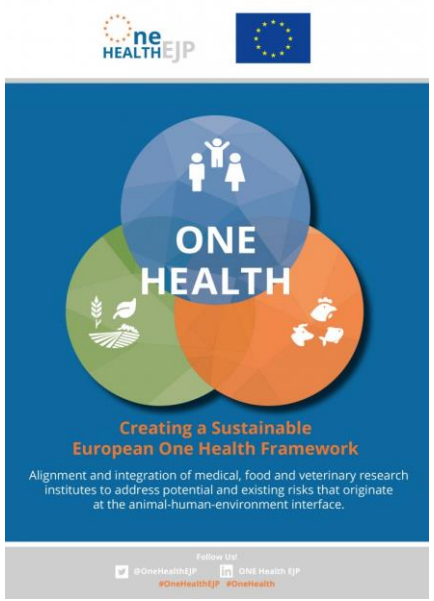
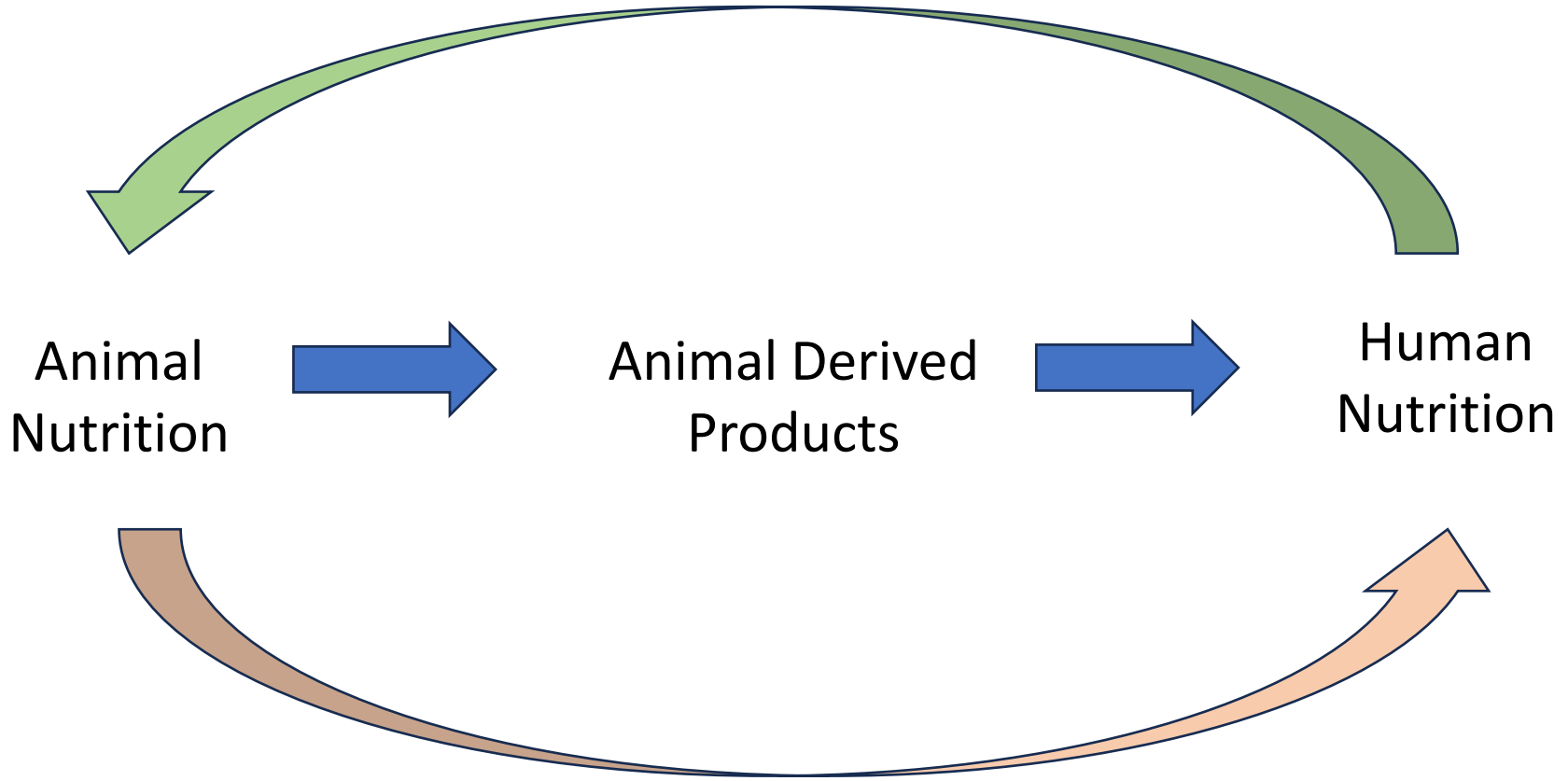
World Health Organization



'One Health' is an integrated, unifying approach to balance and optimize the health of people, animals and the environment

Animal Nutrition is directly linked with Human Nutrition



Animal derived products are highly important for a balanced human nutrition

Animal nutrition is also directly competitive for human nutrition for resources and *vice versa*

- the livestock sector is vital to global food security and health
- sustainable development requires the simultaneous tackling of multiple challenges (Environmental, social, economic and protection of health)

Challenges for Animal Production

Global competition for feedstock commodities

Increasing demand for protein (> ×2 until 2050)

Biosecurity issues – food safety concerns

Food crisis –traceability

Animal welfare (*welfare indicators: e.g. stocking density, footpad dermatitis, rearing, transport, slaughter)*

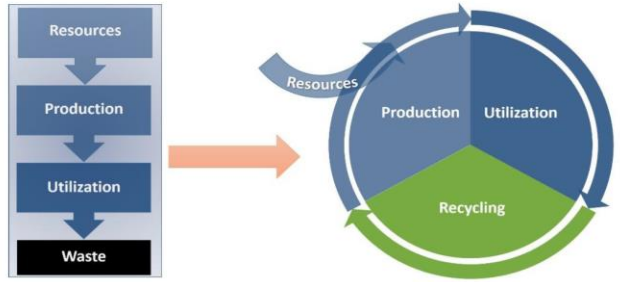
Climate change

Environmental acts – minimize pollution

less organic matter excretion (N& P)

less pathogenic load, Carbon footprint

Green deal & circular economy roadmaps = ***need to shift our production so as to maintain or produce more with less***



Need to reduce antimicrobial consumption due to increasing AMR risk for public health

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

AMR THREAT …….IS SPREADING

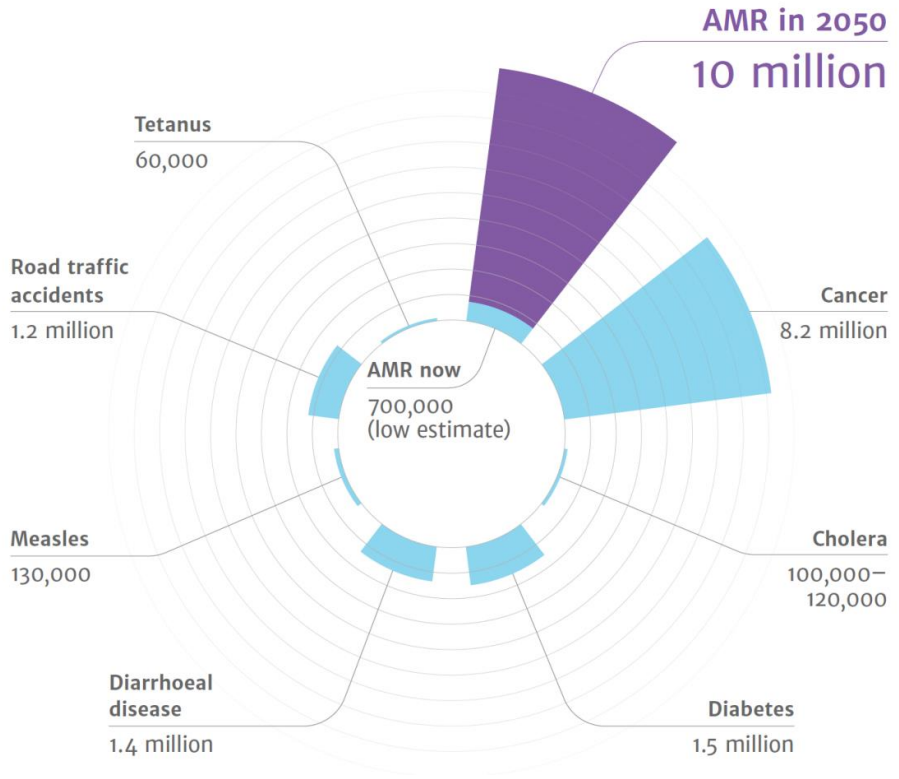
Review on Antimicrobial Resistance

Tackling drug-resistant infections globally

O' NEILL report 2016 - estimated if no action:

Human death toll:
from 700,000 to 10 million / year

Economic loss until 2050:
100 trillion USD



Worldwide human deaths per year

EU One Health Action Plan against AMR

among key policies

- Highlight **prevention** measures rather than cure
- Increase awareness and understanding
- Emphasis on the **Prudent use of all antimicrobials** in humans and animals (veterinary medicines)
- monitoring of AMR in the environment
- **Promote animal husbandry that support good animal health and welfare to reduce antimicrobial consumption**

Pathogen control at farm level
Reduction of shedding pathogens

Food chain safety ↑

Good animal health and control of pathogens at farm level requires more than just alternatives to AGPs and antimicrobials !!!

Scenario: what if there was one alternative to antimicrobials ?

…….No AMR ..**OK**

Would that be enough for

enhancing animal resilience, animal welfare & sustainability of production ?

…… No Why??

Good animal health and control of pathogens at farm level requires more than one or many alternatives to AGPs and antimicrobials !!!

Facts

- At farm level animals are exposed to an array of challenge stressors (e.g., diet changes, mycotoxins, pathogens, temperature)
- If stressors are not adequately controlled and counteracted they will lead to oxidative stress & inflammation
- subsequently stressed animals in a pre-disease state will develop disease
- Therefore, strategies to improve **animal resilience** to challenge stressors are required

Good animal health and control of pathogens at farm level

Requires a Holistic Approach & need to combine:

- Farmer education
- Genetics (select for resistance)
- Management
- Prevention (sanitation, vaccinations)
- Early identification of pre-disease states (biomarkers, monitoring tools)
- **Balanced animal nutrition**
- **Application of suitable bioactive feed and water additives**

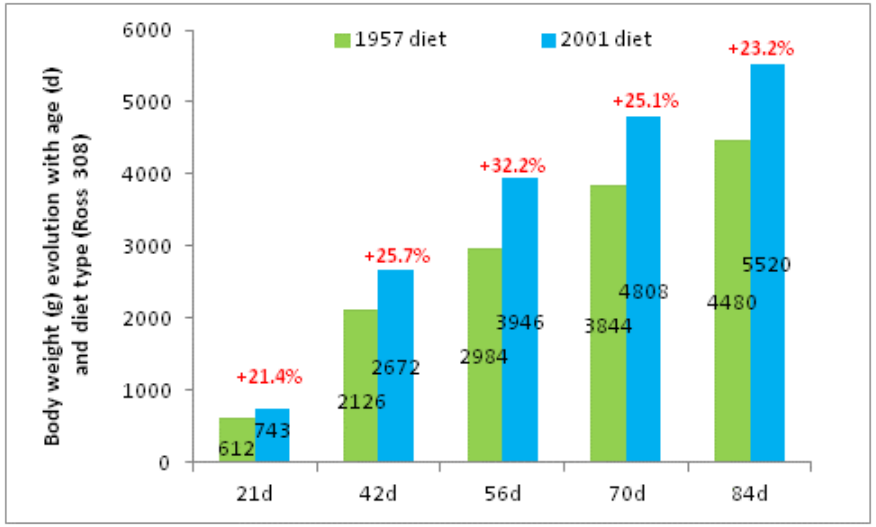
Role of Animal Nutrition:

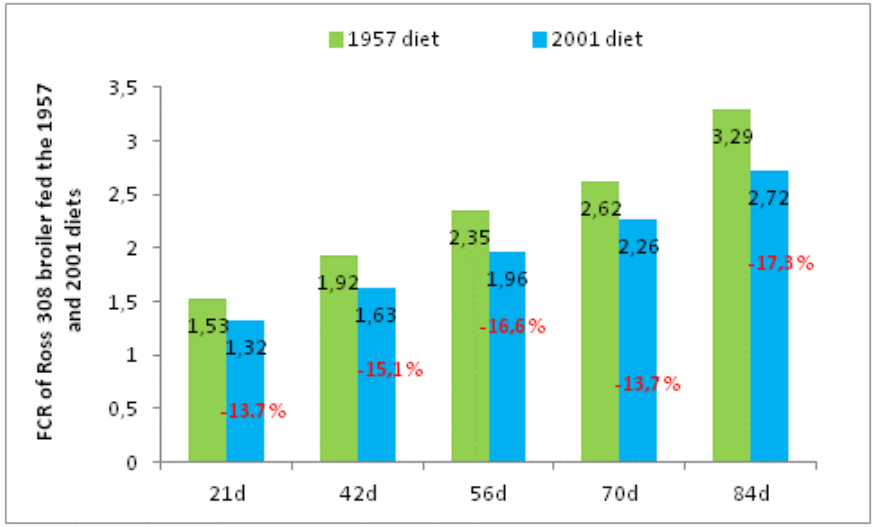
to nourish and also reinforce animal

defense against stressor challenges

Nutritional interventions targeting to induce and amplify the adaptive animal capacity to counteract oxidative stress and inflammation hold the key

Significant scientific and technological developments in Nutrition





Progress in diet formulation (Havenstein et al 2003)

Sustainable & Circular

Tailored applications of bioactive feed additive additives

Second generation GMP with upgraded nutritional profile

New feedstuffs (microbial biomass, microalgae, insect meal)

Nutritional upgrade of agro-food waste with biotechnology

Management of natural and sown pastures for nutritional quality and yield of grazed land

Precision nutrition

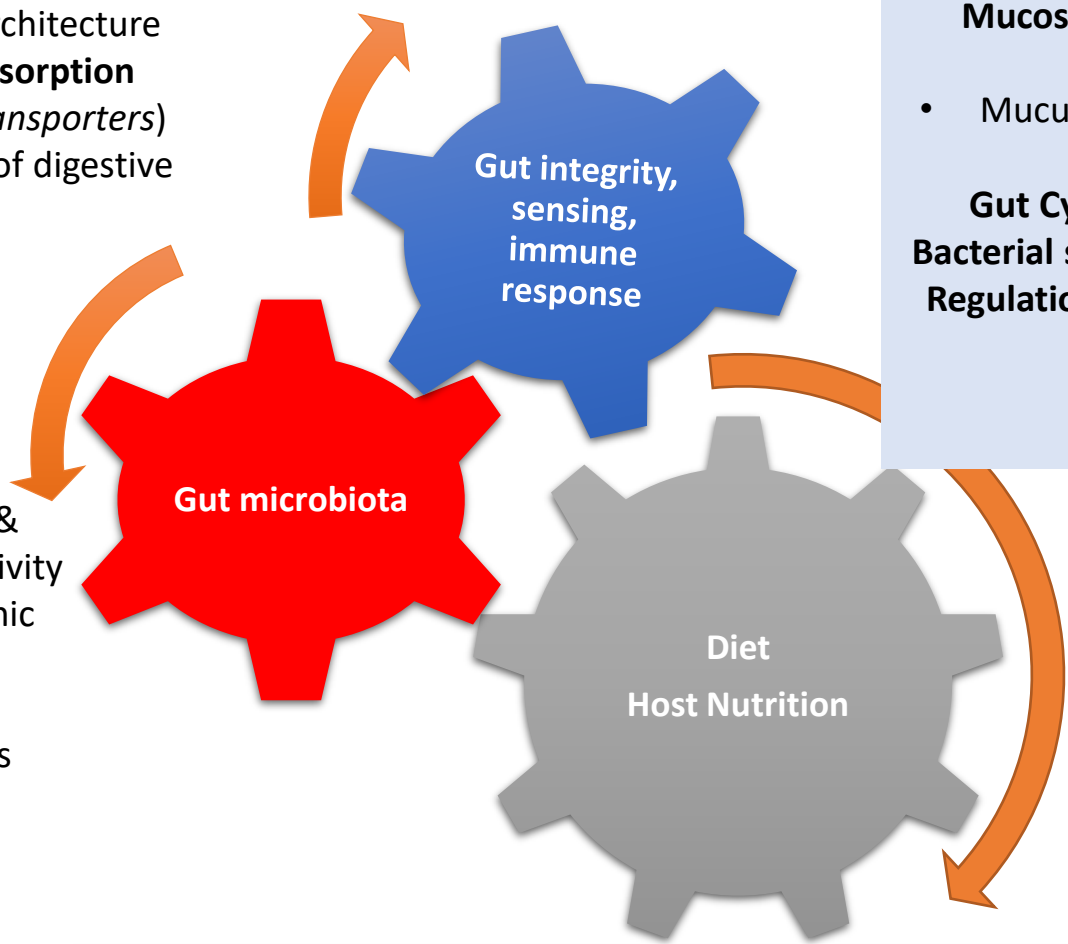
=

zero nutrient waste

Application of "omics" technologies for in depth understanding of nutritional effects

Increasing evidence for Diet role in Modulating Gut Homeostasis ?

Epithelial architecture
Nutrient absorption
(*nutrient transporters*)
Expression of digestive enzymes



Mucosa and epithelial integrity
- Tight junctions
- Mucus layer / mucin composition
- sIgA

Gut Cyto-protective elements
Bacterial surveillance (Toll-like receptors)
Regulation of inflammation(cytokines and factors)
Gut Renewal

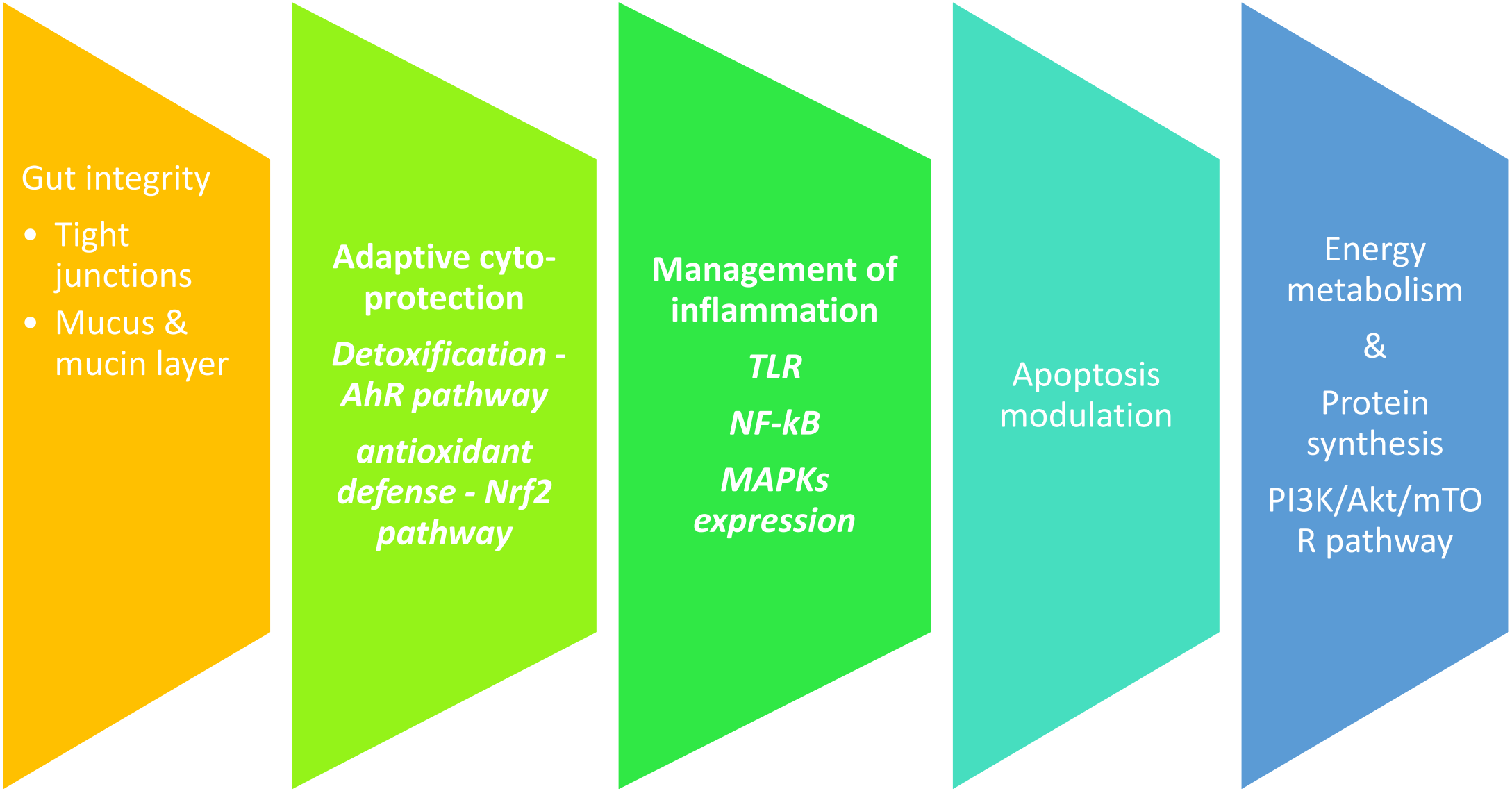
Composition & metabolic activity
Anti-pathogenic activity
Digestion improvements

- Nutrient digestibility & utilisation
- Anti-nutritional factors (e.g. NSP)
- **Presence of xenobiotic & bioactive compounds** (e.g. antibiotics, mycotoxins, other additives)
- GI transit time

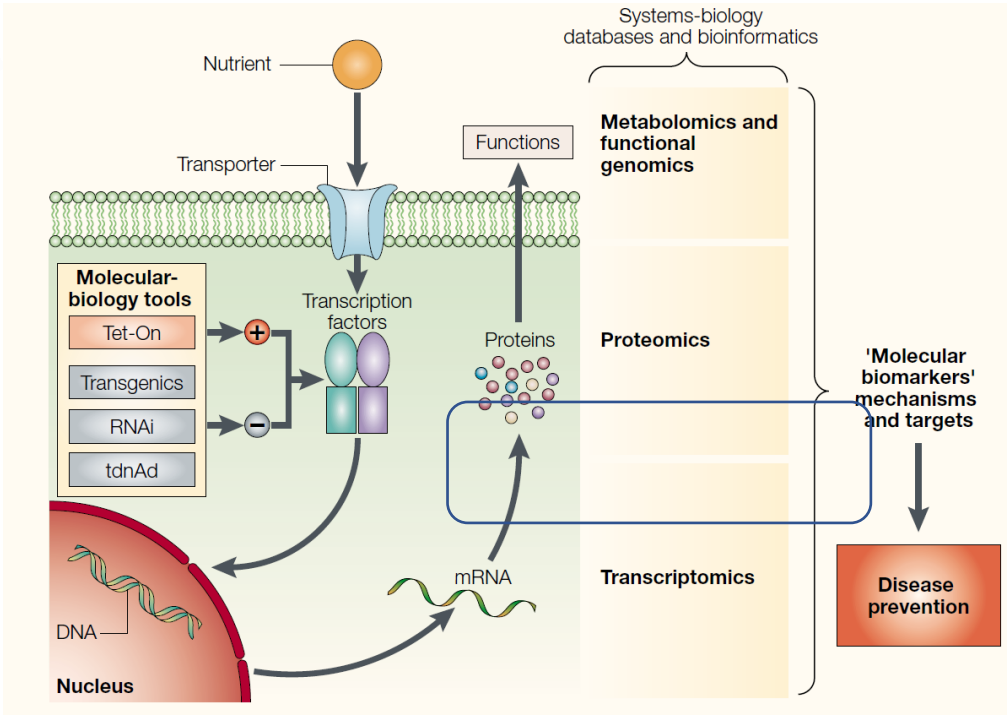
GUT FUNCTION & HEALTH

Zootechnical Performance & Disease Prevention

Biomarkers to measure cellular fitness to counteract stressors at gut and systemic level



The Future of Animal Nutrition:
Nutrigenomics - Immunonutrition & Immunometabolism



Immunonutrition = modulating the immune response through nutrition

Immunometabolism = the relationship between immune response and nutrition/metabolism
= new knowledge on effects of nutritional and environmental cues on immune cells
metabolism and function = immune system competence to counteract pathogens

Bioactive feed additive additives and Immunonutrients targeting gut function and animal health

Representatives include:

- Microbials / Probiotics
- Prebiotics
- Postbiotics
- Enzymes
- Anti-mycotoxin agents – mycotoxin binders – detoxifiers
- Organic acids (acidifiers & MCTs)
- Phytogenics (plant bioactive compounds, essential oils, flavonoids)

glutamine, arginine, sulfur amino acids, polyunsaturated fatty acids (omega-3), nucleotides, taurine, vitamins A, E and C, beta-carotene and trace elements such as zinc and selenium

Thank you for your attention !

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