Feed Additives may play a role in animal welfare?

EAAP 2013, Nantes

J.Brufau

IRTA

28 /8/2013, Nantes

The objective of the presentation is :

Improvement of performances through gut health is Animal Welfare indicator?

Is the health improvement easily measurable ?

What are the main indicators to be considered ?

Can these indicators be connected to animal performance ?

How is immunity involved in animal performance ?

Naturally , Farm animals are challenged by different stressors

"**All farm animals** will experience **some level of stress** during their lives. Stress reduces the fitness of an animal, which can be simply expressed through failure to achieve production performance standards or targets , or more drastically , through disease and death" **(Rostagno 2009)** .

Stress factors excessively affect animal production :

I. Inadequate nutrition
II. Deprivation of water/ or feed
III. Heat/Cold
IV. Overcrowding
V. Handling (interaction human manipulation)

"Stress and the Gastrointestinal Tract"

The enteric nervous system (ENS) is an integrated network located within the wall of the gastrointestinal tract. (Brain-Gut interaction).

Stress may not only be responsible for functional disorders, but may **contribute to inflammatory disorders and infections of gastrointestinal tract.**

Neurotrasmiters play a role in animal responses to challenges/stressors (Norepinephrine-naturally **intestinal mucosal**).

There is crosstalk between neuroendocrine and immune systems .

An **imbalance** on these systems in **response stress** can lead to significant change **in immune response** and consequently susceptibility to infection.

IRTA

Campylobacter in chickens and potential interactions with welfare

British Poultry Science Volume 47, Number 4, (August 2006) pp. 379–391

Taylor & Francis

GORDON MEMORIAL LECTURE

Are happy chickens safer chickens? Poultry welfare and disease susceptibility[1]

TOM HUMPHREY

School of Clinical Veterinary Science, University of Bristol, Langford, England

Abstract 1. Contaminated chicken meat remains an internationally important vehicle for human infection with *Salmonella* and *Campylobacter* spp. In addition, the last 20 years has seen an international pandemic of human salmonellosis caused by the contamination of eggs with *Salmonella* Enteritidis.
2. It has been a long held scientific view that *Campylobacter* spp. and most, if not all of the common zoonotic salmonella, are essentially commensal in chickens. They usually form part of the gut flora and contaminate chicken carcases, for example, by faecal spillage at slaughter. Even when certain salmonella serovars like *S*. Enteritidis are invasive in laying hens overt evidence of clinical disease is rare and the birds appear to behave normally.
3. Are these bacteria just 'passing through' the avian host and only transient members of the bacterial flora or is there a more dynamic perspective to this infection/colonisation process? Chickens mount antibody responses to both pathogens, which indicate something other than commensalism. Such immune responses, however, do not always result in the clearance of the pathogen.
4. Not all animals in a group will carry salmonella or campylobacter, even under experimental conditions, and will vary, especially those that are outbred, in their responses to pathogen challenge. Identifying the reasons behind this could have important implications for disease control.
5. Both salmonella and campylobacter are more likely to be found in animals, which are compromised and this may explain at least part of the variations seen. Animals are more susceptible to infection when they are in a poor environment, fed a poor diet and/or under physical or psychological stress.
6. Work in this area has naturally focused on pathogens of medical significance and has shown that neurotransmitters such as noradrenaline can markedly alter pathogen behaviour. Other host responses like Interferon γ can also affect host tissues in a way, which facilitates invasion by pathogens and may also interact directly with certain bacteria.
7. From a food safety perspective, there is evidence that egg contents contamination *in ovo* may be linked to transient stress in the hen. Current work at the University of Bristol on the epidemiology of campylobacter in broiler production is also showing a potential link between gut health and campylobacter colonisation and challenging the concept that these bacteria are common commensals.
8. The poor economic returns received by the egg and poultry industries mean that intensive production methods are common. Is it possible to rear chickens under these conditions in such a way as to exclude zoonotic pathogens like salmonella and campylobacter? Data from the UK strongly suggest that this is possible with the former pathogen. Can similar advances be achieved with campylobacter?

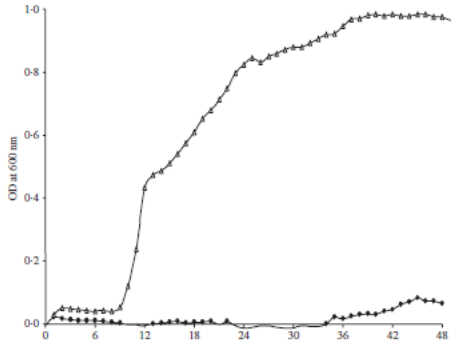


Figure 2. *Effect of noradrenaline (100 μm) on the growth of* C. jejuni *in iron-restricted media (DMEM containing 10% serum). Closed circles show the growth profile of the control cultures. Open triangles show cultures plus noradrenaline. Data from Thomas* et al. *(unpublished).*

Effect of NA on the growth of *C.jejuni*

"Stress and the Gastrointestinal Tract"

Stress releases catecholamine and results in :

I. Decrease gastric acid production

II. Delayed gastric emptying

III. Accelerated intestinal motility

IV. Accelerated colonic transit

Consequently increased pH in the stomach increases probability of survival of food borne pathogens (E. coli, salmonella and Campylobacter) and colonization of the gastrointestinal tract.

Why Animal Welfare criteria are not yet implemented in the evaluation of Feed Additives ?

OPINION

Welcome to our world

Now that scientists have belatedly declared that mammals, birds and many other animals are conscious, it is time for society to act, says **Marc Bekoff**

ARE animals conscious? This question has a long and venerable history. Charles Darwin asked it when pondering the evolution of consciousness. His ideas about evolutionary continuity – that differences between species are differences in degree rather than kind – lead to a firm conclusion that if we have something, "they" (other animals) have it too.

In July of this year, the question was discussed in detail by a group of scientists gathered at the University of Cambridge for the first annual Francis Crick Memorial Conference. Crick, co-discoverer of DNA, spent the latter part of his career studying consciousness and in 1994 published a book about it, *The Astonishing Hypothesis: The Scientific search for the soul.* The upshot of the meeting was the Cambridge Declaration on Consciousness, which was publicly proclaimed by three eminent neuroscientists, David Edelman of the Neurosciences Institute in La Jolla, California, Jonathan Low of Stanford University and Christof Koch of the California Institute of Technology. The declaration concludes that non-human animals have the neuroanatomical, neurochemical, other creatures, including octopuses, also possess these neurological substrates."

My first take on the declaration was incredulity. Did we really need this statement of the obvious? Many renowned researchers reached the same conclusion years ago

the declaration did not include fish, because the evidence supporting consciousness in this group of vertebrates is also compelling.

Nevertheless, we should applaud them for doing this. The declaration is not aimed

consciousness to the rest of t
The import
is: will this de
a difference?
scientists and
do now that t
consciousnes
in the anima
I hope the
used to prote
being treated
inhumanely
scientific kn
animal cogn
consciousne
in animal we
for example
chickens dis
this knowle
factored int
Animal Wel
25 million o
including fi
research ea
for more th
animals use
US. I'm con
that those v
regulations
ignored the
Not all le
science. Th
Treaty of Li
into force o

When we talk about Animal Welfare: there is a big question " Are animals conscientious".

According to Darwin the evaluation of consciousness : differences between species are differences in degree rather than kind.

New European model of animal production since 2002

AP should be sustainable in the EU and based on:

Animal Protection.
Consumer Protection.
Environment protection.

Travelling to 2030

Outline questions

1. Why Animal Welfare criteria are not yet implemented in Feed Additive evaluation?.

2. The concept of Animal welfare is under revision in EU. Strategies are in progress 2012-2015.

3. Which parameters are much more accepted by farmers in order to consider Animal Welfare benefits

4. Feed additive have to be evaluated under GOOD HEALTH conditions. ?

5. **Feed additives may play a role on animal welfare assessment?.**

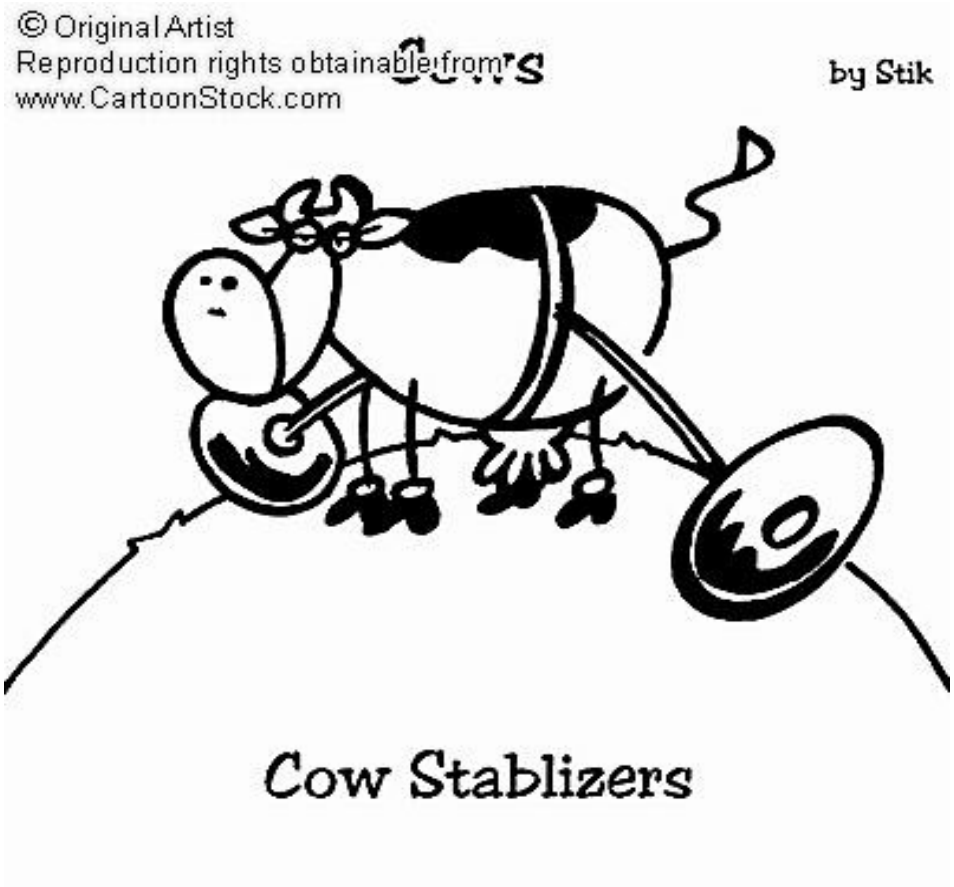
Feed additives

Regulated By EC 1831/2003

Substances, micro-organisms or preparations, other than feed material and premixtures, which are intentionally added to feed or water in order to perform, in particular, one or more of the functions mentioned in Article 5(3)

- ✓ Favourably affect the characteristics of feed or animal products
- ✓ Favourably affect the colour of ornamental fish and birds
- ✓ Satisfy the nutritional needs of animals
- ✓ Favourably affect animal production, performance or **welfare**
- ✓ Have a coccidiostat or histomonostatic effect

A zootechnical additive is any additive used to favourably affect the performance of animals in good health, or to favourably affect the environment



EFSA Scientific opinion /Self-task FEEDAP/ 2008

The purpose was to :

.- examine the scientific basis for the existing functional groups

.- propose, if necessary, based on this review, the establishment of additional functional groups (or categories).

➢ Potential new categories

1. Additives which favorably affect **animal welfare :**

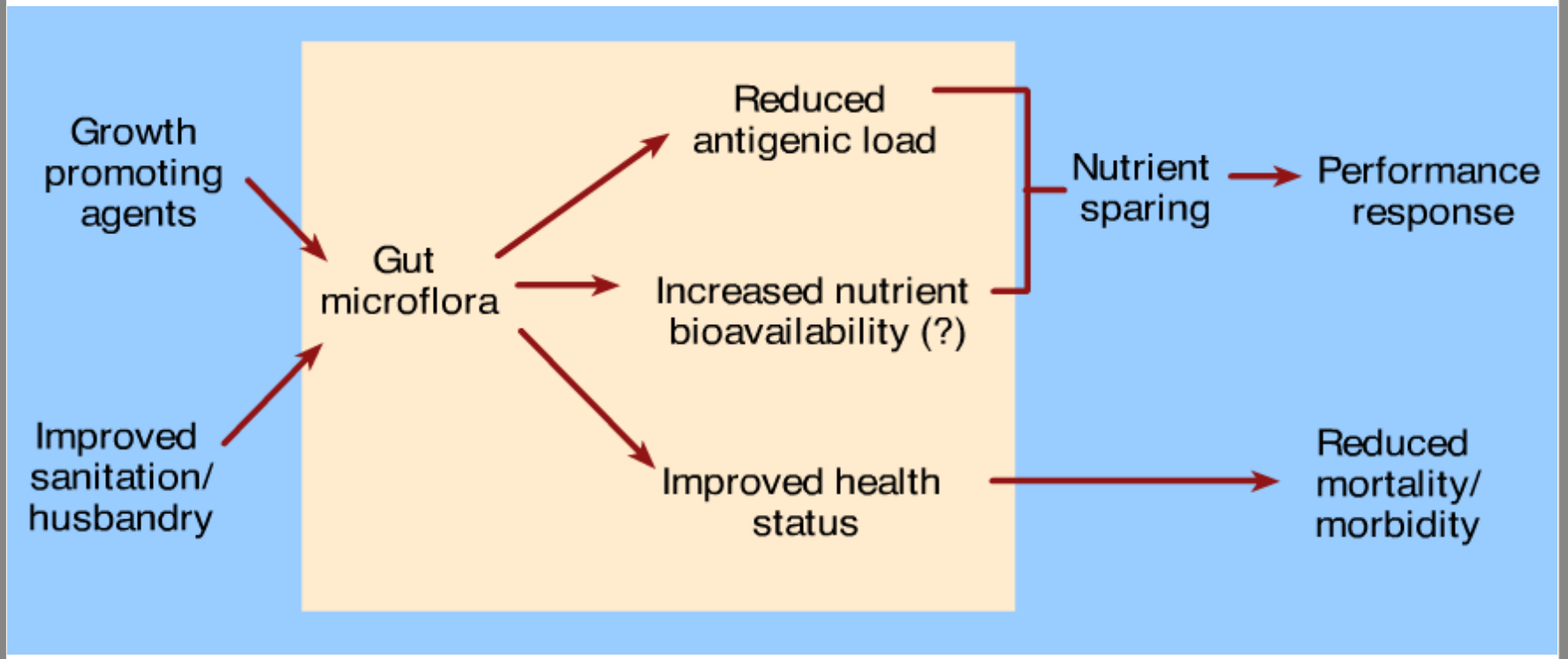
   Metabolic regulators. Immuno-modulators, Detoxifiers.

2. Additives which improve **product quality :**

   Microbial contamination controllers, Nutritional value enhancers, Sensory additives

Assessment of alternatives substances

Animal nutrition and Gut microflora interactions (Animal protection).



Andrew Chesson

Mucosal surfaces place for “dialogue”

The intestinal epithelium : an interactive barrier

.- Physical barrier

.- Innate immunity

.- Adaptive immunity

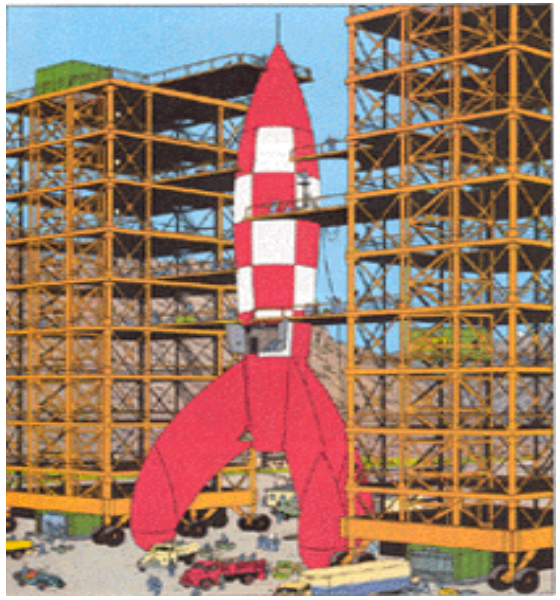
Crosstalk between commensals and mucosae

Crosstalk between pathogens and mucosae

Philipe J. Sansonetti 2004

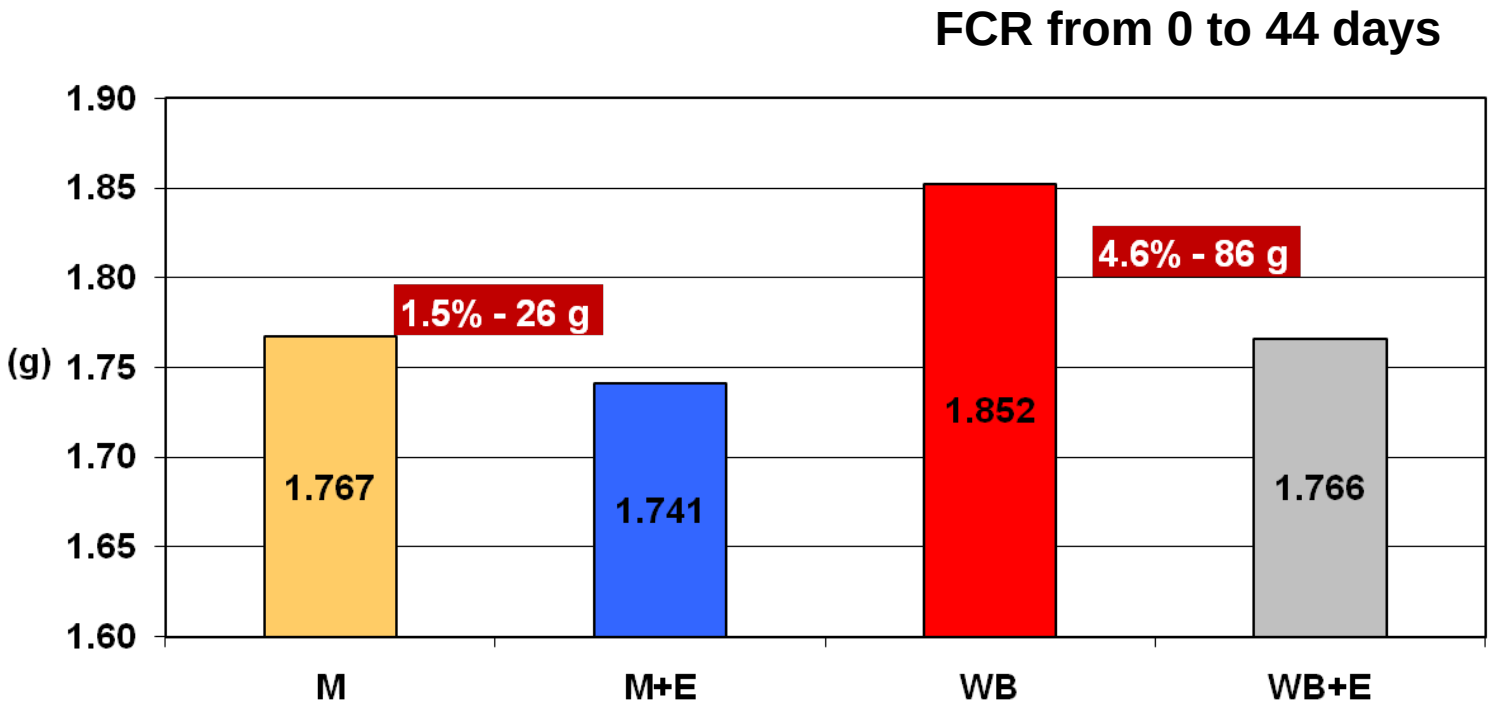
Alternatives feed additive products

- **Organic acids.**
- **Enzymes preparations.**
- **Micro-organisms (Probiotics).**
- **Oligosaccharides (Prebiotics).**
- **Immunity enhancers.**
- **Highly available minerals.**
- **Herbs and essential oils.**



Nutrition plays a role on animal welfare

Effects of enzymes on birds vaccinated against coccidiosis fed with maize or wheat-barley



Effects of **low and high NSP diets (maize or wheat-barley) and enzyme addition** on performance and coccidial and necrotic enteritis (NE) lesions of broilers vaccinated for coccidiosis.

Francesch *et al*., 2006

Effects of enzymes in vaccinated birds fed with maize or wheat-barley

Degree and incidence of shedding of *C. perfringens* counts and Necrotic Enteritis lesions at day 22

		M	M+E	WB	WB+E
Paracox	Log CFU/g	0.09 c	0.13 c	2.44 a	0.68 b
	Incidence *Cl.* +	1/12	1/12	12/12	6/12
	No Lesions NE	3/12	4/12	1/12	6/12

Francesch *et al*., 2006

Examples : Efficacy assessment on immune processes

Contents lists available at ScienceDirect

Veterinary Immunology and Immunopathology

journal homepage: www.elsevier.com/locate/vetimm

Short communication

β 1-4 mannobiose enhances *Salmonella*-killing activity and activates innate immune responses in chicken macrophages

Masahisa Ibuki [a], Jennifer Kovacs-Nolan [b], Kensuke Fukui [a], Hiroyuki Kanatani [c], Yoshinori Mine [b,*]

British Poultry Science

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/cbps20

Immune-modulatory effects of dietary Saccharomyces cerevisiae cell wall in broiler chickens inoculated with Escherichia coli lipopolysaccharide

R. Morales-Lopez [a] & J. Brufau [a]

[a] IRTA - Animal Nutrition, Health and Welfare , E-43120 , Constanti , Spain

Accepted author version posted online: 11 Mar 2013.Published online: 07 May 2013.

Suggested End-points for Efficacy demonstration/ Animal welfare

In vitro studies : (majority of the experimental conducted until now). However they are essential for the first step .

In vivo studies : to conduct studies with animals under certain conditions and to look the benefits of the products on the mucosal and epithelial cells from intestine . Morphology, Immunity reaction and microflora development should be performed .

i.e. Blood analysis .- cortisol, heat shock protein, Neutrophils /linfocites ,

i.e. Mucosal .- epithelial morphology , innate immunity of IEC.

i.e. Microflora .- Reduction of zoonotic bacteria population.

The animal performances studies may be also involved in order to justify the interaction, mainly Feed Intake.

Are we able to answer all the questions generated ?

The most important action will be to understand the interaction between Animal welfare and the concept of stress and the physiology of the gastrointestinal tract.

Animal health improvement is difficult to assess , especially when we are dealing with benefits of Feed Additives in order to satisfy Animal welfare indicators.

The indicators should be clearly well identified under stress conditions first.

Immune indicators must be considered to determine the degree of animal defense in order to prevent damage by the stressors.