Working together to better feed and protect the planet

With global population increasing, the world faces a growing demand for sustainable food. Phileo Lesaffre Animal Care works at the crossroads of nutrition and health and are committed to delivering animal health and performance solutions that contribute to food safety and the responsible use of antibiotics. In every country, their progress is led by the most advanced science as well as practical on-farm experience.

Their recent symposium in Rome, Italy, entitled Animal health with less antibiotics and more food safety – latest technologies, focused on three main topics:

- Antimicrobial reduction, how can we interfere?
- How immune training can improve vaccine responses.
- Latest insights on food safety.

International Poultry Production takes a look at some of the papers that were presented.

AN INTEGRATED INTERVENTION TO TACKLE EXCESSIVE ANTIMICROBIAL USAGE IN CHICKEN PRODUCTION IN VIETNAM

by Dr Juan Carrique-Mas, Wellcome Trust Major Overseas Programme at Oxford University Clinical Research Unit (OUCRU), Vietnam.

The Mekong Delta of Vietnam is a hotspot of antimicrobial use (AMU) and antimicrobial resistant (AMR) organisms. Worldwide, chickens are the target of the highest amounts of antimicrobials of all farmed species.

Commercial small-scale chicken production is on the increase in Vietnam, linked to increased demand for protein due to rapid economic development.

The ViParc project (viparc.org) is one of the first large-scale interventions of its kind to tackle excessive antimicrobial usage in southeast Asia.

The project, funded by the Wellcome Trust, has been formulated as a 'randomised before-and-after controlled study', targeting farmers raising small meat chicken flocks (100-2,000).

These flocks typically consist of birds of slow-growing native breeds, raised in confinement and managed as all-in-all-out. Through ViParc, farmers are provided with on-going technical support from trained poultry veterinarians who visit the farm at key time points during the production cycle.

The project has four components:

- A farmer training programme, where farmers are trained by local experts on good farming practices (i.e. biosecurity, cleaning and disinfection, pest control, brooding).
- A farm health plan, where project veterinarians provide targeted advice for each farm.
- A diagnostic support system, in order to determine the main chicken pathogens circulating in the area.
- Active engagement with local veterinary drug shop owners, who are a major source of advice to farmers on the health of their flocks.

The expected outcomes of ViParc are a reduction in mortality, disease, and associated AMU/AMR resulting from improved farming practices that reduce the need for anti-microbials.

Crucially, the project integrates socio-economic analyses that will provide insights into the drivers of antimicrobial usage, as well as an overall assessment of the cost-effectiveness of the intervention.

Lessons from ViParc will help tackle excessive antimicrobial usage in other productions systems in Vietnam and in the broader southeast Asian region. ■

THE ROLE OF THE POULTRY VET IN THE REDUCTION OF ANTIBIOTIC USE

by Dr Hilde Van Melrhaeghe, Academic Adviser, Univ. Ghent, Belgium.

'Ecology from Farm to Fork of Microbial Drug Resistance and Transmission' (EFFORT) is a five year EU FP7 project, from December 2013 until November 2018.

The project is based on field studies in 10 European countries that aim to link the antimicrobial usage (AMU), and antimicrobial resistance (AMR) in different food-producing animal, the (farm) environment, and food of animal origin as well as companion animals and wildlife to quantify the exposure of humans to AMR through different exposure pathways.

An important objective of the project is dedicated to the study of on-farm interventions tailored by veterinarians to assess their effect on AMU, animal welfare and performance. During the project intervention studies were performed in broiler farms in three different EU countries, involving more than 1,300 broiler flocks in 115 farms, to determine actions that can contribute to reduce AMU and to abolish the use of specific antibiotics which are critically important for use in humans.

A risk analysis was made for each individual farm based on information collected by the veterinarian in an audit questionnaire about the farmer, farm infrastructure and management, animal health status and disease management.

Data on performance and anti-microbial use were collected for each farm retrospectively and during the study.

Multi-level interventions have been implemented in the broiler farms and were evaluated by the veterinarian during regular follow up visits to the farms, assessing success and reasons of failures of different actions.

Most interventions focus on improving health status by improving diagnostics and prevention, other actions include training of the farmer to detect problems in early stages and to improve biosecurity and hygiene on the farm, and implementing innovative strategies in feed and water additives.

In Belgium, these farm specific interventions affected over 1.5 million broiler places. Most AMU in broilers in Belgium is because of intestinal problems so the focus is on improving intestinal health with better diagnostics to control coccidiosis and bacterial enteritis, implementing vaccination for coccidiosis and using feed additives.

Intestinal health can be improved by early feeding for early enteric development and with feed composition and additives to maintain a rich and diverse microbial community, and to control the host reaction through dietary immunomodulation.

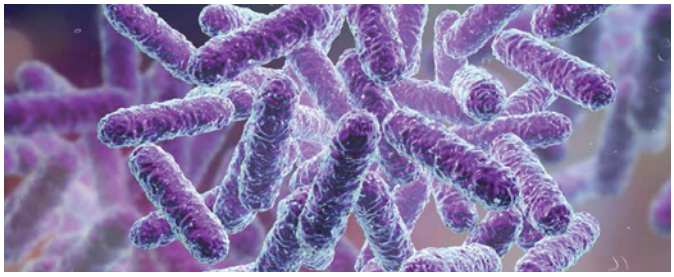
When using coccidiosis vaccination, the average days of treatment with antibiotics decreased from 8.8 days before vaccination to 4.5 days in the cycles after vaccination. Focusing on the treatment days for gut-health associated issues, there was a decrease of 54% of AMU.

Although less antibiotics were used, the performances were significantly improved during and after these vaccination rounds.

The positive effect on the EPEF could be seen up to three rounds after last vaccination. It is important to develop new tools to collect data not only on antibiotic use but also on health status, technical performance and management.

This will help the veterinarian to motivate farmers to improve performance with less AMU.

Reducing AMR by reducing AMU in farm animals is a challenge for the veterinarian and the farmer, it is also an incentive for the poultry veterinarian to assume his role as gatekeeper of food safety, animal health and welfare. ■



GERMINATION OPTIMISATION TECHNOLOGY AND ITS ADVANTAGES IN POULTRY PROBIOTICS

by Dr Robèr Kemperman, Head of Microbiology, Lesaffre, France.

Bacillus probiotics show excellent properties in relation to stability in product due to their spore nature. Equally, the spore nature requires that a spore needs to germinate in order to become a metabolically active functional probiotic cell.

This is a process that can take a significant amount of time. Moreover, the start, efficiency and duration of this process depends on environmental conditions, signalling the spore to germinate.

Under favourable conditions optimal germination is obtained while under sub-optimal or stress conditions, like those encountered in vivo, spore germination is reduced or halted.

For poultry applications, a three-strain spore probiotic has been developed using a novel proprietary technology to ensure optimal germination even under unfavourable conditions.

This is called GO technology for germination optimisation. It is based on the principle of bringing germinants in close proximity to the spore germination receptors, priming the spores for germination and committing them to vegetative cell development once exposed to a moist environment.

For the developed probiotic product three Bacillus strains have been selected based on the functional properties they deliver to the mix, all of them aimed at helping to enhance the health status of the animal.

B. licheniformis is present for acid production, B. amyloliquifaciens for its enzyme production capacity and B. pumilus for its immune stimulatory action.

To each of the strains we applied GO technology to ensure fast and consistent germination.

Through this technology the limited germination of general spore probiotic applications could be circumvented.

Consequently, this allowed the development of a superior product having the formulation and shelf life benefits of spores, whilst delivering quick metabolic activity and functionality like vegetative cell based probiotics. ■

BOOSTING INNATE IMMUNITY TO SUSTAINABLY PREVENT DISEASES

by Dr Julie Schulthess, Immunity R&D Manager, Phileo, France.

The immune system comprises two main components: the innate and the adaptive immune system. While the innate immune system is rapid and very effective to mount responses, these responses are non-specific due to the inability to specifically recognise pathogen strains. On the contrary, the adaptive-driven immune responses, while being slower to develop, are capable of specific recognition leading to the capacity to mount immunological memory responses specific for a given pathogen.

This immunological memory ability of the adaptive system is commonly used during daily vaccination. For decades, we were taught that immunological memory was solely carried out by the adaptive system.

Less than 10 years ago a team of academic researchers demonstrated that the innate immune system can be trained with a relevant application for host defence against infections.

The molecule able to promote the 'trained immunity' is beta-1,3 and 1,6 glucans. Phileo has been working on beta-1,3 and 1,6 glucans, from yeast, its interaction and ability to train innate immunity of farm animals and have an in vitro approach to characterise trained immunity. ■

SALMONELLA AND CAMPYLOBACTER INFECTIONS COMPROMISE BROILER HEALTH, WELFARE AND PERFORMANCE

by Dr Lisa Williams, Researcher, University of Swansea, UK.

There are several bacterial zoonoses that infect and/or are associated with poultry worldwide, including campylobacter, salmonella, Escherichia coli and Listeria spp.

In the UK during the 1980s an outbreak of salmonella linked to eggs made headlines, this led to most UK laying hens, reared under the Lion Code, to be vaccinated against salmonella.

This control measure led to a reduction in the number of cases in the human population seen in the UK. The industry also introduced routine salmonella testing within poultry flocks.

The reduction in salmonella cases in the human population led to campylobacter being the leading cause of bacterial foodborne illness, with the majority of cases being attributed to the consumption of poultry and poultry products.

Whether campylobacter is a pathogen or a commensal of poultry is a topic of debate in the wider campylobacter community.

Campylobacter has been shown to have a negative effect on the health and welfare of the birds, evidence of host adaptation and host-specific species leads us to believe that campylobacter is more than a commensal of chickens.

Whilst the general conception is that salmonella is no longer a problem it can still have an impact on the health and welfare of chickens. ■

SALMONELLA RESISTANT VS SUPER-SHEDDER BROILERS: HOW CAN WE IMPROVE BIRDS' RESISTANCE?

by Dr Philippe Velge, Director of Research at INRA, France.

Salmonella are enteric bacteria recognised as an important economic and public health problem worldwide. Salmonella-carrier animals are a serious food safety issue, because these asymptomatic infected individuals excrete high level of bacteria in their faeces, which can spread the pathogen and contaminate man through consumption of infected food.

However, despite the importance of salmonella persistence in these animals as a reservoir of disease for humans, little was known concerning the mechanisms at play.

Based on data obtained in classic models of infection where animal-animal reinfections are important, we thought that all animals, having the same genetic background, had the same chance to be infected.

The development of a new infection model in isolator, where animal reinfections and animal-animal cross-contaminations are greatly reduced, demonstrated that two main populations exist between chicks having the same genetic background.

The super-shedder individuals excreted high levels of salmonella in their faeces and had a high level of caeca colonisation. This population, which is the main source for pathogen transmission in natural conditions, constantly disseminates salmonella to the more resistant chicks, named low-shedders.

This second population, which excreted low levels of salmonella and had a low level of caeca colonisation in isolator, does not have a higher ability to eliminate salmonella than the super-shedders, but these chicks are more able to block the primary colonisation by salmonella. Despite this, these low-shedders are unable to maintain their colonisation resistance in the presence of super shedders. They are overwhelmed by the continual excretion of salmonella and, in turn, become super shedders themselves.

16S RNA gene sequencing showed that gut microbiota composition before infection partly determined the level of salmonella colonisation and the development of the super/low-shedder phenotypes.

Consistent with this idea, the transfer of gut microbiota, collected before infection from individuals that have later developed the high-shedding syndrome yielded to the development of the super-shedder phenotype.

Some gut bacteria present before infection in low-shedder animals could be used as protective probiotics or as biomarkers.

Taken as a whole, these results suggest that salmonella colonisation is inhibited and/or promoted by a subset of microbes naturally found, before salmonella colonisation, in varying abundances within the gut microbiota. ■