

Go to <http://www.wattnet.com>



PAGE



ZOOM FACTOR



Select Issue:



Contents

Features

- Watt Celebrates 90 Years in Poultry Publishing
- Renewable Sources Will Power the Future
- Poultrymeat Processing Becomes Sustainable
- IT Gains an Overview of the Indian Poultry Industry
- What Will Supersede AGPs?
- Nanotechnology: The Potential and Risks for the Food Industry

Departments

- Around the World
- Products
- Science into Practice
- In the News
- International Diary
- Marketplace
- Advertisers' Index

# The end of the AGP paradigm?

Cutting-edge technology offers the opportunity to control the micro-organisms in the gastrointestinal tract of poultry. Could 'quorum sensing' succeed the industry's use of antibiotic growth promoters within the next decade?

David Garnett

Today, there is an industry-wide understanding that the interplay between animals and the bacteria that live within their gastrointestinal (GI) tract is highly complex. The GI tracts of both monogastric and ruminant animals contain beneficial bacteria that contribute to the health and nutrition of the animal as well as deleterious species that deprive the animal of its nutrients or, worse still, cause disease. The GI tract contains a diverse ecology of micro-organisms, all competing for reproductive advantage. Control of this gut flora has been a most useful tool in modern agriculture both in terms of performance and animal health.

Historically, antibiotic growth promoters (AGPs) have targeted those types of bacteria that share a common characteristic. Most in-feed AGPs select against gram-positive bacteria although some of this group

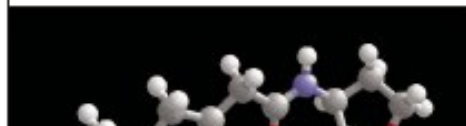
contribute to the overall health of the animal. For example, both lactobacilli and bifidobacilli are gram-positive and, indeed, are frequently found in probiotic additives. Equally, formulations designed to promote and nourish beneficial bacteria very often support pathogenic bacteria just as well as the intended recipient. These are in-built limitations on the effectiveness of our current strategies: the use of antimicrobial agents – natural or otherwise – is a hit-and-miss approach.

## New technology cracks the communication code

Recent advances in microbiology suggest that an entirely new group of molecules may offer a way of precisely targeting individual species of bacteria and allow the promotion of beneficial micro-organisms while at the same time diminishing the threat from pathogens. Bacteria have been found to possess a communication system, called 'quorum sensing', that gives them the benefits of co-operation using small molecules to 'talk' to

a defence for the host. This would be impossible without a communication circuit between the millions of bacteria required to produce a visible light. In just the same way for individual bacteria in the gut, switching on or off virulence factors in isolation will have a negligible overall effect but a co-ordinated attack of many millions of cells can profoundly alter the balance of power in the gut.

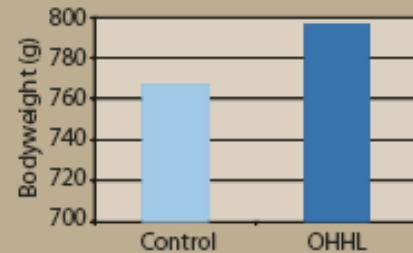
So far, a couple of dozen signals have been identified although the interaction of these compounds in mixed bacteria populations is less well understood. One problem in the elucidation of these interactions is that any particular auto-inducer may act as both an antagonist and an agonist depending upon conditions and isomeric structure. Most of the research carried out on these chemicals has been focused on ways to use them in medical science. There is hope that this work will reveal new ways of dealing with intractable infections such as methicillin-resistant *Staphylococcus aureus* (MRSA), which causes a significant number of deaths each





*Chemical structure of the new molecule, OHHL*

**Results of a broiler trial comparing a control diet with one containing OHHL**  
(mean 21-day bodyweights; g)



each other. These molecules, called auto-inducers, are signal molecules that activate or de-activate different behaviours of bacteria. For example, a particular auto-inducer may cause one species to express surfactants, toxins or to attack another species using defence chemicals. Another auto-inducer may 'switch off' those same behaviours. Bacteria have evolved these sophisticated trigger mechanisms so that recognition of, and reaction to, their own cell densities and the population of competing types of bacteria is possible. A good example is the light-emitting bacteria that live symbiotically on certain deep sea jellyfish. Here, the bacteria are able to flash on and off en masse providing

significant number of deaths each year in hospitals as the result of poor hygiene following surgical procedures.

## Using the technology in poultry feed

Once auto-inducers had been discovered functioning in the gut of animals, it was only a matter of time before scientists attempted to control gut bacteria artificially by adding additional signal molecules to the feed. It has now been shown that one such signal oxo-hexanoyl homoserine lactone (OHHL) can increase dry matter digestion in ruminants. It was also shown to have lowered mortality and increased daily growth in poultry, as shown in the accompanying table