

Husbandry, Ethics and Immunity in Poultry Production

It is perhaps uncommon for a technical manual on poultry vaccination to begin with a discussion about husbandry and ethics. There is good reason however to start off with such a discussion as it completes the framework of applied knowledge required for using poultry vaccines confidently, skilfully and successfully.

In today's modern poultry industry, vaccination programmes have become so common that we almost take them for granted without always understanding when vaccines should be used (or not), how vaccines work, what the immune system is all about and the reasons for needing to be meticulous when we administer vaccines to our flocks.

If we are responsible for the health and welfare of the flocks placed in our care and we are reliant on vaccines, then it is rather crucial that we develop an understanding of how vaccines and immunity work.

As the 'vaccinator', we play the most critical role in the vaccination process. A great deal of research, care in manufacturing, quality control, regulatory work and maintenance of the cold chain has seen to it that you have a reliable vaccine delivered to your farm. The entire process hinges on how well you carry out, not only the vaccination process, but also the husbandry skills that support the farm.

While we rely on vaccination to keep our flocks healthy, it is important to reiterate that principles of husbandry come first. Vaccination is no substitute for skilled husbandry but it is an insurance policy and backup protection against ubiquitous disease or breach of Biosecurity.

Ethics teaches us to think of the primary goal of vaccinating: that animals do not suffer from disease. While it stands to reason that we are vaccinating to protect our 'economic investment', it is an important adjustment in our thinking to realise that it is first and foremost carried out for the welfare of the animal.

There is an old adage of animal husbandry that teaches us to take care of our animals and in return, they will take care of us. This founding principle of animal husbandry is simply known as the 'Ancient Contract'.

The Ancient Contract directs us to develop and provide our skilled stewardship for animals placed in our care. It describes the ethical purpose of the relationship between man and animals.

Modern animal agriculture has changed the close relationship that we were intended to have with animals. Where once the cow, chicken, or sheep was viewed as a valued individual that returned our care for their milk, eggs, wool or protein, now they are often relegated to mere 'food units' where output is measured by dollars and cents and not the quality of their lives.

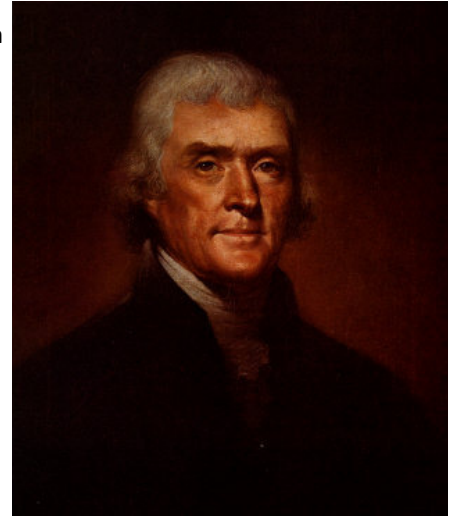
We often talk about 'sustainable' agriculture these days. Agriculture used to inherently be sustainable. Modern, intensive agriculture does not have a long history and, despite delivering higher yields and production performance, it still has to prove it is entirely sustainable over a long term. We now are trying to recover sustainability in agriculture as somewhere along the way we have become divorced from sustainable systems that incorporated skilled husbandry encompassing humans, animals, environment and community.

We need to understand how husbandry, ethics and immunity come together before we can develop and apply our knowledge to prevent disease through prudent use of poultry vaccines.

Husbandry

Unlike the proverbial question of 'what came first, the chicken or the egg', the question about what comes first in poultry production is easy: ethical husbandry trumps vaccination.

The objective of preventing disease through immunisation is not easily achieved without husbandry and ethical poultry rearing. A proper immune response to a vaccination is highly reliant on having a healthy chicken to begin with, and giving the care, nutrition, and comfort that is required to maintain the chicken's wellbeing.



"The wealth acquired by speculation and plunder, is fugacious in its nature, and fills society with the spirit of gambling. The moderate and sure income of husbandry begets permanent improvement, quiet life and orderly conduct, both public and private."

~Thomas Jefferson to George Washington, 1787



"Well...I guess that answers that question".

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But chickens are just like humans; no matter how well we take care of ourselves, there is always the possibility of contracting an infectious disease (unless we wrap ourselves up in a bubble and have no contact with the outside world).

No matter what kind of poultry production system we have, certain diseases are inescapable as they are ubiquitous in nature. Marek's Disease, even in well-managed operations, is difficult to control without vaccination in long-lived birds. Coccidiosis in floor-reared chickens is always a risk and vaccination becomes an obvious means of ensuring animal health and welfare is protected. Other diseases such as Infectious Bronchitis (IB), Fowl Pox, or Infectious Laryngotracheitis (ILT) may be endemic to a region and cannot always be predictably controlled by good Biosecurity, and thus require vaccination. While New Zealand remains free from Infectious Bursal Disease (IBD), this is not true of the South Pacific islands where IBD is endemic, and vaccination has been required to suppress the disease.

Other diseases, particularly bacterial diseases related to the failure to provide good biosecurity and hygiene, fall into a different category of diseases that can be controlled with better husbandry and farm management practices. *Pasteurella multocida*, the bacteria responsible for causing fowl cholera, or *Mycoplasma Gallisepticum*, responsible for chronic respiratory disease (CRD), can often be controlled by upgrading hygiene and moving to single-age housing. Vaccination against these diseases is an alternative where it remains difficult to eliminate the pathogen.

Why ethics in poultry production?

Ethics in agriculture might simply be described as society's expectations of the farming community to adhere to a set of values that asks us 'to do no harm' to animals, the environment or humans. Our ethical obligations are the same in poultry production.

So, who decides what is 'ethical'? As you might imagine, everyone has an opinion on the matter as to what constitutes ethical conduct. However, most of it is common sense: we simply think about what we do on our farm as never doing harm. We treat animals with respect for their lives, we do not let animals suffer, we do not degrade the environment, and we strive to support our community and the people that work for us.



There is often an attitude that agriculture is inherently ethical. In its traditional meaning, agriculture is sustainable and ethical, as 'to do harm' was to destroy the delicate balance of the family farm and erode its future productivity. If we neglected our husbandry, environment or community the negative effects we experienced were usually immediate and debilitating for our animals, the environment, our community—and our back pocket.

In today's agriculture, we have become reliant on technological inputs to resolve the problems that our modern agriculture methods may have created. We often embrace technological advances without realizing the hidden costs. We used antibiotics to overcome enteric disease in intensive animal housing and created concerns about bacterial resistance. Emerging diseases are met with a rush for more research to find a new vaccine, yet we do very little to correct the deficiencies of the animal production system that allowed the pathogen to find a foothold. The use of Marek's vaccines in broilers in the United States is a case in point.

Intensive poultry production was able to accelerate its growth by the development of Marek's Disease vaccines in the 1970's that helped suppress one of greatest disease risks of the poultry industry. With the success of Marek's vaccination, hygiene slackened off, litter was reused, and obligatory 'down times' between flocks became shorter and shorter. By the 1980's, Marek's became a problem again as early vaccines could no longer cope with the increasing pressure of the build-up of Marek's virus from the slacking off of hygiene and husbandry. The result was to allow the Marek's Disease virus to build up and overwhelm immunity. By the 1990's, new, improved Marek's vaccines became necessary to hold off the increasing disease challenge. The demand to find even better Marek's vaccines continues in the 21st Century.

This is a typical result of what biologists call 'The Red Queen Effect' - taken from the scene in Lewis Carroll's book, *Alice Through the Looking Glass*, where the Red Queen tells Alice that she has to 'run faster and faster just to stay in the same place.' The Red Queen metaphor is used to describe the effect of 'co-evolution', in which pathogens and the immune system are in a continuous race against each other to survive. In modern agriculture, we are very often on such a treadmill.

Vaccination helps relieve disease pressure; but if we do not use the 'health dividend' and simply ratchet up the pressure by slacking off hygiene or putting more chickens in the shed, we are only furthering the Red Queen Effect.

Thus, the link between ethics and poultry vaccination is highly relevant. Ethics guides our behaviour, how we treat the chickens in our care, the environment, and our responsibility to our neighbours and community. It is the essence of the Ancient Contract.

Understanding Immunity

Immunity is the ability of an animal to generate its own protection against infection and disease. Immunology is the science dedicated to the study of the immune system.

Immunology is a dramatically dynamic science as new discoveries of how the immune system works are made everyday. Immunology today is unrecognisable from the science we studied ten years ago. Textbooks on immunology written only five years ago are obsolete. That is a testament to how far we have come in our understanding of immunity. Even our fundamental understanding of the purpose of the immune system has undergone a complete change.

We used to 'simplistically' think the immune system was a separate biological system that had two primary functions: To recognise a pathogen organism (viruses, bacteria and parasites) and, secondly to generate an immune response to defend the animal against a future infection from the same organism.

Our new perspective of what the immune system does is far more comprehensive:

The immune system detects a broad range of "immunological stress factors" that signal 'danger' and accordingly activates the immune response to regulate many physiological systems.

In this contemporary immunology view, the immune system has a far deeper involvement with the animal's genetics and physiology. The immune system is therefore highly complex. The animal's genetic code dictates the animal's ability to respond to and resist disease.

We now understand the immune response is the 'superintendent' directing physiological processes as it regulates the maintenance of the animal's physiology ('homeostatic regulation'), decides the destination of resources as well as managing the entire immune response to recognise and respond to process invading pathogens (and vaccines).

Immunity and Immunological Stress

What is a fundamental element of our critical thinking about husbandry, ethics and immunity is the issue of immunological stress in our animals, i.e. any kind of stress that triggers the immune system.

Immunological stress is divided into two categories:

- Tissue Events caused by infectious agents or traumatic injury
- Life Events created by psychological stress

As noted previously, in our old view of immunity, we thought the immune system was only triggered by tissue events.

We now know that both tissue and life events are able to 'signal danger' to the immune system and generate inflammatory responses to help the animal cope and respond to the immunological stress.

While we all understood that the immune system responds to infection, we did not previously appreciate the critical issue that 'life events' created in animals.

Immunologists now appreciate just how deeply involved both the nervous and endocrine systems are with the immune system. Thus with any kind of stress that sets off a nervous or hormonal response, the immune system becomes involved in order to siphon off the physiological resources it requires to 'feed' an immune response.

In human terms, the equivalents of life events are the loss of spouse, financial worries, or relocation. We are aware that nervous stress is capable of disrupting normal physiological processes and increase our susceptibility to disease.

The equivalent life events in animals are immunological stressors resulting from unhygienic conditions, overcrowding, poor stockmanship, inadequate nutrition, or sudden environmental changes that excessively stimulate the immune system and decrease disease resistance. All of these stressors are the result of deficient husbandry.

We are learning that the physiological cost of excessively activating the immune system through immunological stress is far more expensive than previously thought.

The cost of disease is more than just pathogenic effects and cell damage. Immunological stressors trigger abrupt changes which generate inflammatory responses demanding high levels of protein that make up the components of an immune response.



The resulting cascade of immune processes is 'physiologically expensive', i.e. it results in metabolic changes that re-direct nutrient resources away from normal physiological processes, including the production of muscle and eggs. Even existing muscle tissue may be degraded in an attempt to supply sufficient amino acids needed for the protein responses to feed the inflammatory responses.

Thus, reducing immunological stress in our animals becomes a critical husbandry responsibility. It is necessary for the preservation of the integrity of the immune system and designed to protect its ability to maintain normal physiological processes. It demands we maintain an ethical attitude and awareness of conditions that are necessary to promote sustainable animal health and welfare.

We learn not to misuse or overly rely on the immune system as a substitute for proper animal management, biosecurity, and stockmanship. In managing poultry production, it is important to know what factors dictate the animal's competence to mount an immune response ('immunocompetence'), how to minimise the physiological cost and impact on the immune system, and when it is necessary to rely on vaccination.

Key points

- Poultry husbandry, ethics and immunity are tightly linked in sustainable, welfare-oriented poultry production.
- Successful use of poultry vaccination programmes requires personal insight and applied knowledge as to when, why, and how we incorporate and use vaccines in sustainable and ethical poultry production.
- Our view of immunity has changed. Immunity is not just about creating an immune response against an invading pathogen, but it also responds to psychological stress created by deficiencies of husbandry.
- Vaccination complements good husbandry; it is not a substitute.
- Immunological stress: The immune system responds not only to infectious agents and traumatic injuries ('tissue events') but also to psychological stressors ('life events') that send danger signals. Immunological stress is physiologically expensive.