The value of Poultry Diseases Surveillance in South Africa

1. Introduction

The South African poultry industry has few but very important trade sensitive and economically important diseases. Until recently, the poultry industry was producing primarily for domestic consumption. However, recent developments with the increase in the amount of imported poultry products have challenged the industry to become more innovative and look beyond the local market for opportunities. The animal commodities are more difficult to trade internationally due to the challenges posed by trade sensitive diseases. The burden of proving freedom from disease is placed solely on the country looking for trade opportunities to prove freedom from disease.

This requirement has necessitated that the South African poultry industry do some introspection and saw it fit to implement programmes that will push the industry towards better trading opportunities. This paper aims to highlight the surveillance projects and why they were deemed important to develop and initiate. This paper provides a glimpse of the developments within the poultry industry to non-poultry focused veterinary professionals. The paper focuses on both trade sensitive pathogens as well as the pathogens of economic importance.

2. Defining Surveillance

Surveillance is defined as the monitoring of the behaviour, activities, or other changing information, for the purpose of influencing, managing, directing, or protecting an object. Surveillance will highlight changes in the environment that allows for action to be taken. Ideally it should provide timeous information resulting in with timeous actions that prevent catastrophic events. Animal disease surveillance is defined as: all regular activities aimed at ascertaining the health status of a given population with the aim of early detection and control of animal diseases of importance to national economies, food security and trade.

In humans and animals, surveillance is important for early detection of diseases. Animal disease surveillance is important for early warning of diseases, planning and monitoring of disease control programmes, provision of sound animal health and advice to farmers, certification of export livestock and livestock products and international reporting and
proof of freedom from diseases. It is critical for animal disease emergency preparedness (Geering, et al.)

**Passive disease surveillance**

Passive disease surveillance is the routine gathering of information on disease incidents from sources such as requests for assistance from farmers, reports from field veterinary officers and livestock officers, submission of diagnostic specimens to laboratories and the results of laboratory investigations. Routine disease reports may also come from other sources such as abattoirs and livestock markets.

**Active disease surveillance**

Active disease surveillance requires purposeful and comprehensive searching for evidence of disease in animal populations or for verification that such populations are free of specific diseases. Active disease surveillance programmes may be of a catch-all nature to detect any significant disease occurrences, targeted against specific high-threat diseases or designed to monitor the progress of individual disease control or eradication campaigns.

The components of successful active disease surveillance programmes are:

- close integration between the activities of field and laboratory veterinary services;
- regular visits to farming communities for farmer interviews about diseases, provision of animal health advice, clinical examination of livestock and, when appropriate, post-mortem examinations and collection of diagnostic specimens including serum samples. Emphasis should be given to critical areas identified by disease risk analyses and other epidemiological assessments;
- participatory rural appraisal programmes for epidemiological evaluation of specific diseases;
- utilization of disease information from all potential sources in the public and private sector, including veterinary inspections at abattoirs, private veterinary practitioners and veterinarians in commercial livestock industry positions;
- gathering of ancillary information to support prioritization and decision-making on animal health programmes, e.g. livestock production and socio-economic data;
periodic targeted serological surveys in animal populations. These may be used either to detect the spread of infection or to prove freedom from infection. They are also occasionally used to monitor the effectiveness of vaccination campaigns. Serological surveys should be carefully designed to yield statistically valid information on the disease status of animal populations. There is often an inherent difficulty in interpreting the results of serological surveys where both vaccination and natural infection are occurring, but this may be overcome to some extent by selecting appropriate serological tests (Geering, 1999).

In South Africa, both methods are used in the poultry industry. Passive surveillance is generally undertaken by the commercial poultry producers for the purposes of maintaining healthy flocks, economics and also for prevention of the introduction of zoonotic pathogens to the food-chain.

The active surveillance activities are undertaken to research purposes and also to protect the national flock. These are done to establish the burden of the most important diseases and also to actively investigate possible control solutions. These activities are performed through coordinated efforts between the farmers, their veterinarians, government veterinarians, researchers and laboratories.

3. Building the Active Surveillance programmes for SA Poultry Industry

The poultry industry plays an integral role in the South African economy as the largest agricultural industry in the country. Poultry meat is the largest commodity on the retail shelves. It is the largest producer of animal protein at 65.5%. In 2012, the poultry industry produced a combined meat and eggs total of 2.44 million tons, 31.5% higher than the combined total for beef, pork, mutton and goat. It is therefore plausible that the industry should be doing all it can to protect itself to ensure food security is achieved. (South African Poultry Association, 2012)

If surveillance is aimed at detecting potential disease threats and preventing potential catastrophes, then the poultry industry has to interrogate its efforts towards early detection and prevention. There re of course the added benefits of trade outside the South African borders that are presented by having good data to prove freedom from various trade sensitive pathogens.

Several steps are required to ensure adequate, timeous and useful surveillance. Such steps are outlined in detail in the section below.

3.1. Establishing the farm locations
In order to effectively fight diseases, it is essential that the farm locations are established. This also helps to mobilise the appropriate resources in an event of a major disease outbreak. The accuracy of the data is very important as demonstrated by figures 1 and 2 below. Figure 1 show the farms locations created from the data received from the farmers. It is quite clear that the data was somewhat lacking on that there are farms falling outside the South African borders and some even in the Indian Ocean.

It is possible that this was a product of lack of understanding of the importance of the data submitted, the purpose for which it is intended and what benefit it would be to the farmers. With further communication between the farmers and SAPA the compliance and accuracy of the data improved as shown in figure 2. The locations have moved farms in the ocean, Mozambique, Lesotho and even further north to farms being limited to within the South African borders. This is an area where continued improvements will be critical to further improve the data accuracy.

Figure 1: Map of farm locations based of 2013 coordinates
3.2. Avian Influenza Surveillance changes and improvements

Notifiable avian influenza is defined by the World Organization for Animal Health (OIE) as "an infection of poultry caused by any influenza A virus of the H5 or H7 subtypes or by any avian influenza virus with an intravenous pathogenicity index (IVPI) greater than 1.2 (or as an alternative at least 75% mortality)". The OIE further classifies avian influenza as HPAI or LPAI according to the following criteria:

- **HPAI** viruses have an IVPI in 6-week-old chickens greater than 1.2 or, as an alternative, cause at least 75% mortality in 4-to 8-week-old chickens infected intravenously. H5 and H7 viruses that do not have an IVPI of greater than 1.2 or cause less than 75% mortality in an intravenous lethality test should be sequenced to determine whether multiple basic amino acids are present at the cleavage site of the hemagglutinin molecule; if the amino acid motif is similar to that observed for other HPAI isolates, the isolate being tested should be considered as HPAI.

- **LPAI** are all influenza A viruses of H5 and H7 subtype that are not HPAI viruses. (OIE, 2008)

The OIE definition is likely to change soon because the OIE wants Avian Flu to refer only to the H5 and H7 strains of Avian Influenza. This will complicate issues for
countries who are interested in controlling other non-H5 and H7 strains of Avian Flu.

It is now a known fact that in order to demonstrate freedom from Highly Pathogenic Avian Influenza, mandatory biannual testing should be conducted by all farmers. The government is responsible for the testing of backyard and smallholder farms. The commercial farmers are responsible for testing of their own flocks. Routine testing is important to maintain or initiate trade with other countries.

The current routine surveillance protocol is embedded in the AI contingency plan, which is quite a cumbersome document, but still very important document. Since routine testing is conducted twice a year, the surveillance protocol would serve the industry better as a stand-alone easily accessible document. In South Africa, all avian influenzas are controlled diseases. This means that any positive influenza result has to be reported to the state vets.

It is for this reason that changes are being made to the protocol to highlight the need to start testing with a screening ELISA and then typing any positive results into whatever influenza that it may be. The positive results again need to be reported to the state vets. This serves as a tool to keep track of the influenza circulating in the environment, including the ones that can potentially destroy the industry. It is also important to note that all kinds of influenzas are routinely isolated in wild birds, meaning the threat is never far away as evidenced by the ostrich situation. Countries encourage farmers to keep testing and also to submit results to the local state vet for record keeping.

3.3. Food-borne Diseases Surveillance

In this era of food security and food safety focus, the role played by food-borne pathogen cannot be over-emphasised. As the main supply of animal produced protein in the South Africa, poultry producers have a fundamental role to play in this regard. Food-borne diseases are important for their zoonotic properties, as well as their trade sensitivity.

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3.3.2. *Salmonella spp*

*Salmonella* infection, or *salmonellosis*, is a bacterial disease of the intestinal tract. *Salmonella* is a group of bacteria that cause *typhoid* fever, *food poisoning*, *gastroenteritis*, enteric *fever* and other illnesses. People become infected mostly through contaminated water or foods, especially meat, poultry and eggs. In 2004 US authorities announced that *Salmonella* was responsible for 42% of human bacterial infections, followed by *Campylobacter* 37%, *Shigella* 15%, *E. coli* O157:H7 2.6% (Medical News Today).

In South Africa the reporting of the cases is not very good and therefore the cases are generally under reported and as a result underestimated. Given the socio-economic situation in the country, the lack of cold storage and other factors, it is safe to say that the cases would be significantly higher.

The *Salmonella* of importance for the poultry industry, veterinary public health and Department of Health are:

- *Salmonella enteritidis* and *Salmonella typhimurium* (and others in the paratyphoid group)
- *Salmonella gallinarum* and *Salmonella pullorum* (important in poultry)

3.3.3. *Listeria monocytogenes*

*Listeria monocytogenes*, an aerobic, gram-positive coccobacillus, has emerged in the last 20 years from relative microbial obscurity to become an important foodborne pathogen of humans. Most foodborne pathogens plaguing human populations cause significant morbidity but little mortality. Listeriosis, however, is a commonly fatal infection of the bloodstream and CNS. Its recent importance has little to do with altered pathogenicity of the organism but everything to do with late 20th century changes in food processing and distribution in the “global village” as well as the increased prevalence of host factors that enhance the risk of infection. (Schlech III, 2000)

3.3.4. *Campylobacter spp*

*Campylobacter* is a major cause of acute bacterial diarrhea in humans worldwide. In humans, the clinical symptoms of campylobacteriosis are watery or bloody diarrhea, abdominal cramps, and nausea. Acute diarrhea, *Campylobacter*-related mortality, and residual effects of GBS are the main determinants contributing to
this disease burden. Campylobacteriosis in humans is induced mainly by *Campylobacter jejuni* (about 90% of cases), and the remaining fraction is induced predominantly by *Campylobacter coli*. *Campylobacter* is part of the normal intestinal flora of birds, and humans are not the reservoir for infection. As a result, poultry is a major source of infection (Janssen, Krogfelt, Cawthraw, van Pelt, Wagenaar, & Owen, 2008).

### 3.3.5. The surveillance for food-borne diseases

A national study has been initiated to examine the prevalence of *E.coli, Salmonella spp, Listeria spp* and *Campylobacter spp*, in processed poultry meat in the processing facilities. The study will provide valuable data that will be instrumental in planning for the industry. The results will be match back to the farms to establish the levels of contamination as well as the sources of contamination. This will be pivotal for resource planning and deployment to ensure the production of safe protein for the population. The results of the survey will be mapped according to farm locations and focus will be on the areas with very high levels of pathogens.

South Africa should do more to ensure that the population gets safe food in light of the high HIV infections and the state of the immune systems of the AIDS patients. Reduce the levels of potential infective pathogens will ensure the safety of the people.

### 3.4. Mycoplasma Surveillance

Mycoplasmas are the smallest self-replicating organisms. Mycoplasmas do not survive well outside the host animal. They however are very common in the poultry industry and are very difficult to eliminate once they are introduced into a poultry population. Antibiotics are generally used to fight off infections, however the controls are very temporary and the infection recurs shortly after the treatment is completed. Vaccination is also used as an aid, but so far has demonstrated limited effectiveness. *Mycoplasma gallisepticum* is the most common of the poultry mycoplasmas, usually as a primary pathogen in respiratory diseases, reducing the birds’ immune system and predisposing them to secondary bacterial infections. This result in a respiratory disease complex called Chronic Respiratory Disease (CRD). *Mycoplasma synoviae* is the second most common mycoplasma of poultry and affects the respiratory system and joints of chickens of various ages. Other mycoplasmas of importance in poultry are *M. meleagridis* and *M. iowae* seen in turkeys.

Mycoplasmas are probably the most important group of diseases in poultry due to their resilience and tendencies to stick around despite all efforts made to eradicate them from farms. Most producers accept that they have to farm with Mycoplasma and make the best of a very difficult situation.
As recognition of this, a research into the local mycoplasma situation and working towards finding solution to the problem has been initiated. The first stage of the project is to collect circulation field strains and doing full genome sequencing to establish the various types of strains, how they related to the available vaccines and also how they differ from area to area. The target populations are the table egg layers as well as all types of breeders. This project is very important to the fight against mycoplasma as it will shed some light on the type of mycoplamos circulating in the field, how they relate to the vaccines being used and whether more should be done to improve the diagnostic tools and the management protocols.

4. Conclusion

Surveillance is critical to planning and deployment of resources. The knowledge gained from active surveillance is important when it comes to trade and the protection of an industry against introduction of foreign pathogens or strains not yet isolated in a country. Having knowledge of the industry and the population distribution of the animals is pivotal to any efforts for resource allocation. This level of work requires full collaboration between the industry concerned, the government as well as testing facilities to ensure coherence and to minimise wastage. The knowledge that will be generated from the planned surveillance will catapult the industry way into the future, allowing for better food safety and food security for the South African population, while opening up many opportunities both regionally and internationally for the industry.

Bibliography


