AI – a global response for effective control?

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Over the years, avian influenza (AI) has repeatedly highlighted the vulnerability of the poultry sector to the threat of disease. That threat is far from confined to the health and profitability of our commercial flocks and its implications are far reaching with the potential to devastate economies, international trading agreements and consumer confidence, on an epic scale.

In Asia over the past year, the situation has been further compounded by the continuing attention of the mainstream (consumer) media, not only for highlighting the detrimental effects of AI on commercial poultry flocks and associated industries, but also for underlining the risk, whether real or perceived, posed to human health.

News media worldwide have maintained their focus on AI, as part of their responsibility to inform consumer markets. The result is that consumer interest in AI has also been maintained.

Meanwhile, within the poultry world, we have had to count the cost of the mass destruction of infected flocks, while at the same time facing concerns over a loss of consumer confidence in our products and production systems.

Yet pathogens are inevitable in the production chain and, as producers, it seems clear enough that we should learn from the experiences gained in dealing with a disease epidemic of this magnitude, to co-operate for the development of effective strategies that will safeguard our businesses and the interests of the consumer in the future.

This article is intended as a starting point for discussion. While it focuses on managing AI in poultry, its principles are just as relevant to commercial duck, goose and even ostrich farming around the world.

Understanding the virus

Developing effective strategies for the management of a disease demands an understanding of the virus involved.

In the case of AI, as far as we know, no vertical transmission occurs. The virus is sensitive to most disinfectants and, once it has infected a living animal, produces no specific diagnostic symptoms.

A live poultry market in Asia. Is it really an avian influenza market?

There are, however, a couple of points to note:

- Influenza viruses are found in many different animals, ranging from man to fish. The 'influenza A' subtype is the type found in vertebrates.
- Within the A subtype, there are several subclasses, each with different surface proteins, named haemagglutinins (H) and neuraminidases (N). Each subclass has a specific H and N protein. Today, we are aware of 15 'H' and nine 'N' variants.

Every subclass of the virus has the capacity to easily recombine, to produce a new variant of the influenza virus.

However, as far as we know at present, the only subclasses that can produce a highly pathogenic poultry killing disease are H5 and H7. This does help us in our attempts to define a control strategy, because we can read and sequence the genome of an H5 or H7 subtype, and we have the ability to predict with great accuracy whether it has the potential to become highly pathogenic or not, which is immensely valuable in developing and applying effective control strategies.

Yet, as has been made clear by the Asian situation, the potential for influenza viruses to mutate and become infectious to other species, including man, is a complication that must also be managed. The situation is further compounded because wildlife, and especially waterfowl, act as a reservoir for influenza viruses.

We can have little or no control over these free and migrating birds!

A highly mobile environment

Today, poultry production is dominated by large integrations, which serve large geographic areas. From these areas, the integrations serve both domestic and export markets, with the increasing centralisation of hatcheries, processing plants and feed mills resulting in a great deal of poultry movement within a given area.

Several integrations are often active in the same area, so a criss-cross of bird movements is inevitable.

In the case of an outbreak, we have seen that all this movement can quickly lead to the spread of disease and, since areas overlap, viral spread from area to area is inevitable.

In this ease of movement, the poultry sector is the least restricted, perhaps with the exception of pigs, where in some countries we do see a similar freedom and range of movement. But, in other animal production systems, for example in cattle production, movements are limited and confined to much smaller geographic areas.

Against this backdrop of relatively free poultry movement in many countries around the world, the vast majority of birds are commonly vaccinated against diseases like Newcastle disease, yet not routinely against avian influenza.

In some geographic areas, and particularly in Asia, there is also a thriving local economy for broilers and eggs, with facilities ranging from free range, yards and backyard or village chickens, to live animal markets, where chickens (including broilers, pullets and even fighting

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Maintaining positive air pressure is an important line of defence.

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cockerels) are sold live or slaughtered to order.

Most of these markets are open seven days a week and have little or nothing in the way of effective cleaning and disinfection programmes. It is here, in these environments, that we create ample opportunity for the spread of disease and the live chicken is undoubtedly an excellent incubator for AI!

Impact of pets and exotic birds

We know that wild birds are 'reservoirs' for the AI virus, and that their migratory patterns are believed to have significant impact on the spread of the disease. The huge numbers of all kind of birds moved from one country to another, both legally and illegally, compounds this factor still further.

From humming birds to ostriches, governments worldwide are trying to prevent trade in bird species, and especially in the trade of endangered species, not least to limit the spread of disease. But total control has so far proven almost impossible.

While this often illegal trade continues, we must consider that some species either do not appear to become sick or do not develop antibodies against influenza. But, they do carry the AI virus and may shed it intermittently anywhere on their often extensive travels.

If we accept that the disease challenge presented by AI is greatly magnified by the global dynamic of the poultry sector, then it is clear that international co-operation is required to develop effective strategies for the future.

There is little we can actually do to control wild bird populations and controlling the trade of endangered species is unlikely to be resolved in the near future. However, there is still much that can be done, based on what we do know and can control, to reduce risk for the commercial poultry sector in the future and the following three recommendations are intended as a basis for discussion:

- **World wide H5-H7 watch.** Since H5 and H7 are the only subtypes known to produce highly pathogenic disease, RNA sequencing in national screening or surveillance programmes would be an effective tool for determining whether low (LPAI) or high (HPAI) pathogenic disease challenge is present in a given area.

The outbreak in Asia brutally demonstrates the impact of not understanding which subtypes are present in certain areas, although since the outbreak several countries have been quick to initiate surveillance programmes.

A surveillance programme should focus on three key areas:

- The serological control of commercial poultry (breeders and layers) older than 12 weeks of age. Testing broilers is generally not successful, because they do not have enough time to give a good serological response.
- Virus control in live markets. Lessons learnt in Hong Kong and the USA have shown that these markets are an excellent barometer of virus challenge actually present in a population.
- The serological and/or virus control of wildlife. Here, we can expect to find the subtypes that represent a future threat to commercial poultry.

Cost is often presented as a barrier to developing intensive testing programmes on such a large, global scale – yet it is not actually necessary for each country to facilitate expensive laboratories to do this job.

Worldwide influenza accredited laboratories already exist and, through these, an ongoing testing programme could be co-ordinated very effectively.

● **Control by compartmentalisation.** Compartmentalisation is highly effective as a strategy for controlling the movement of flocks within a given territory or country. In the case of an outbreak, these self supporting areas or 'compartments' facilitate the import of raw materials and the export of final product, so preventing the risk of cross contamination by animal movement between regions.

To be effective during an outbreak – the feed mill, hatchery and slaughterhouse must operate exclusively within each compartment. Co-operation between all operating companies within the compartment effectively closes down the area, to allow only the export of final products, which is safe both for consumers and for the chickens.

During the 2003 AI crisis in the Netherlands, compartmentalisation of this type, combined with the one-to-one cleaning and disinfection of transport, was highly successful in containing the spread of the AI virus. The success of this approach certainly depended upon open co-operation between the different integrations involved. Its value was proven beyond doubt!

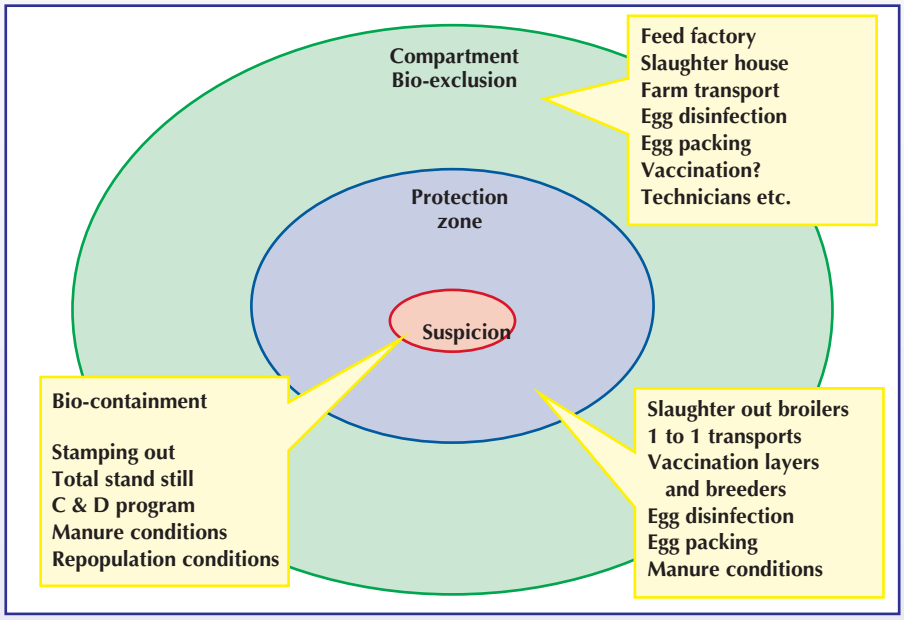

Fig. 1. The principles of compartmentalisation.

These compartments must, for the purpose of planning and co-operation, be created in 'peace time', that is when there is no evidence of AI, or the threat of a serious outbreak. In this way, planning and agreement as to the contingencies and measures to be taken in times of outbreak can be fully mobilised quickly and effectively in 'war time', and should be further supported with regular (annual) evaluation and review by the compartment's stakeholders.

At the point of outbreak, agreed suspicion and protection zones or 'buffer areas' are important (again, as mobilised during the European outbreak in 2003), to create effective, physical barriers that prevent the spread of the virus from one area to another. At the same time, these buffer areas serve as a strong, physical reminder that we must, when working around livestock, take responsibility for our own observance of measures to prevent cross-contamination.

● **Prevention by primary protection.** Primary protection is achieved by a combination of excellent farm biosecurity and vaccination.

During the European AI crisis in 2003, Hybro's basic breeding farm (the nucleus of our operations worldwide) was situated inside a restricted area. Our unique breeding material, the product of generations of genetic improvement, was under severe threat. There can be no doubt that had this facility fallen prey to the virus, Hybro's future would have been seriously, if not irreparably damaged.

However, Hybro employs the most stringent of biosecurity policies at all its facilities and nowhere is this more evident than at our breeding farm. Our biosecurity policy centres on the use of a FAPP (Filtered Air, Positive Pressure) system, whereby microfilters clean incoming air and an internal air overpressure (around 25 Pascal minimum) prevents unfiltered air from entering through any minute breaches in the building structure.

Further measures include strict hygiene policies, which govern access to the facility for authorised personnel only. Anyone working at or visiting the facility routinely showers and changes clothes before entering the farm. Employees observe a complete veto on their ownership of pets or animals at home.

While these measures may seem

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almost dictatorial, their strict observance and the use of the FAPP system proved highly effective in combating the threat of AI, which Hybro achieved with 100% success.

Together with effective biosecurity, vaccination does require a clear understanding of 'the enemy', that is which subtype of the virus is present, as there is no cross protection between the different virus subtypes. Vaccination against H5, for example, will not be effective in dealing with an H7 subtype virus.

To be fully effective, even a good vaccination policy can only work in tandem with an excellent surveillance programme, as described in the first point. With the threat of high pathogenic outbreak, the use of inactivated vaccines only is indicated.

However in the future, the example set by the World Health Organisation's (WHO) human flu strategy may also prove entirely practical in the management of diseases in livestock.

Worldwide, human screening programmes annually determine which virus subtypes are present for the deployment of effective vaccines the following year, and vaccine availability is managed accordingly.

DIVA systems (Differentiation between Infected and Vaccinated Animals, based either on serology or on tracer animals) are also applied in one area of Europe.

DIVA too is a good, highly effective system – but it does depend on a reliable virus identification system and easy access to laboratory facilities.

Vaccine producers are actively and continuously researching new protection strategies. We can certainly expect to see new developments in the future.

The AI debate – conclusions

Experts around the world tell us that the frequency and severity of AI outbreaks is increasing on a global scale and that we should expect more, not less, of a risk from AI in the future. Yet, extensive research combined with technological and biological development has already provided us with many highly effective tools to challenge this disease with great success and it is widely acknowledged that prevention is ultimately far cheaper than elimination.

Preventative strategies do require a co-ordinated, worldwide commitment and funding and against this political and economic minefield, elimination may, to some, seem like a more palatable option, whereby only those directly affected by AI have to pay the price. However, the true cost of disease in the food production chain is far from limited to those affected directly by an outbreak of AI, nor of any other poultry disease. World markets for poultry meat and egg products are on the increase, yet while we fail to co-ordinate our actions, this and every other crisis we face will serve only to dent consumer confidence still further.

This affects all producers, not just those who have suffered loss as a direct result of disease. Without effective remedial action we all suffer. For, rather than enjoying the benefits of a growing and buoyant sector worldwide, our progress and growth is hindered by our inability to manage disease effectively and co-operatively on the worldwide stage. As mentioned in the introduction, this article is intended as a starting point for co-operation and discussion on how to manage AI specifically, and disease risk generally, in the future for the good of the commercial poultry producers and their markets worldwide.

It is only a start. This author supports the call for wider debate and an opportunity for those in poultry production with ideas about how to manage disease risk successfully to be heard. But, let us not spend months and years simply talking about it!

There is a great deal that can, and should, be done to mount an effective counter attack on poultry disease right now. Every day that we do not combine our expertise to take tangible actions, is another day that could bring the ruin of yet another poultry business.

The safe way to market poultry products in Asia!

In the case of a new outbreak, it is clear that rapid, co-ordinated action by governments and poultry producers worldwide is essential for the prevention of an epidemic.

Early warning systems and good laboratory facilities are equally essential, to mobilise effective remedial actions as quickly as possible. Time is of the essence and to use the analogy of fire fighting the sooner you find the fire, the less water you need to put it out!

Certainly there are fundamental differences from one country to another – from disease type, to social, economic, political and geographic challenges and pressures that vary enormously.

Yet with the suspicion of an emerging disease challenge or crisis, an open, rapid and co-operative worldwide response is perhaps one of our strongest routes to minimising risk and successfully avoiding a crisis. There is now no doubt that on detection of the first case of AI we can safely assume that there will be more to follow.

As we have seen, that can impact on every area of the poultry production chain with alarming speed.

With incubation time and horizontal spread taken into account, immediate reporting of the first case to mobilise rapid, co-operative action is our best route to avoiding what can, as we have seen, so easily become an international crisis of massive proportions. ■