

Learning to live with avian influenza

Avian 'flu has been present in Asia for many years, erupting only occasionally, but the present crisis is altogether different and its repercussions are being felt throughout the world. Study of the disease and hard lessons from history point the way to changes that must to be made in the way we produce and market poultry products. Without these changes, the author sees a bleak future. We have been warned. — Dr Terry Mabbett

On 23rd January 2004, Sir John Skehel, director of the National Institute of Medical Research in the UK and a leading expert on influenza, said that the rapid and extensive spread of AI through South Korea, Japan, Vietnam, Thailand and Cambodia was unprecedented. This was clearly an understatement because in the following week, the disease was confirmed in Indonesia, China, Laos and Pakistan. International reaction was swift. The EU and Japan slammed the door shut on Thai poultry products and other countries moved to fill the gaps.

The first confirmed outbreak came as an unwelcome Christmas present in South Korea, with cases in Japan, Taiwan and Vietnam confirmed in the following three weeks. The relatively mild H5N2 strain was the culprit in Taiwan but not in Japan and Thailand, where the deadly H5N1 strain reared its head. Japan had been free of AI since 1925 but lost 6000 chickens to the disease with 30,000 more culled at Yamaguchi, 500 miles south west of Tokyo.

The disease swept through flocks in Vietnam and claimed its first human victim on January 11th. By

February, AI had infected flocks in Indonesia and Laos, and leapt into China where infected ducks were reported in Guangxi province bordering Vietnam. By the middle of February, more than 20 people had died of AI in Thailand and Vietnam.

However, it was AI in Thailand – with poultrymeat exports of over half a million tonnes per annum – that awoke the rest of the world. Exports in 2003 included 275,000 tonnes to Japan and 165,000t into the EU (European Union). Great Britain, the second largest EU importer after Germany, took 36,533t of Thai chicken, marginally less than the 36,573t imported from Brazil.

Lost markets

The bulk of Thai poultrymeat was exported to the EU as frozen chicken by sea on a journey lasting 6 to 8 weeks. The ban applied to all chicken slaughtered after 1st January 2004 but many in the British poultry industry said this was not sufficiently early, given the Thai government was accused of covering up their problem. Most Thai chicken entering the EU was heat-treated to 70°C during processing prior



Intensive indoor production with close control of the environment and tight biosecurity may be the only way to avoid AI in future. (Photo courtesy of Micron Sprayers Ltd)



Backyard poultry are one of the weak links in the containment of AI

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to export and was used in ready-made convenience foods. This was exempt from the EU ban although Thailand had already placed its own voluntary ban on all poultry exports.

The UK's National Farmers Union, anxious to support the country's 2000 poultry producers

in plugging the gap between supply and demand, called for increased production. But there was no way that home production could satisfy the country's appetite for chicken. As food manufacturers started to look for alternative supplies, key Latin American producers such as Brazil, Argentina and Uruguay were pushing at the door.

An assessment by the UK's Department for the Environment, Food and Rural Affairs (DEFRA) rated the risk to the US\$ 2.0 billion-a-year British poultry industry as low but not negligible. The outbreak in the Netherlands in 2003, tackled under optimum conditions, had taken longer than first anticipated to clear up. It was thought unlikely that Thai chicken would be back on European supermarket shelves within six months.

Brazil, the world's biggest exporter of chicken with \$1.8 million sales in 2003, was already beginning to fill the gap left by disease-stricken Asian suppliers. "We are the natural alternative," said Julio Cardoso, head of the Brazilian poultry exporters' association in early February 2004. Prices were already being driven higher. "Since the end of December, the price on shipments to Japan have risen by more than 50%," said Antonio Carlos Shimabuku, export manager at the Brazil's Aurora Meat Company.

Wild bird disease reservoir

Six months down the line, AI is not yet over. There have been several 'all-clear' announcements only to be followed by dashed hopes. On 15th March, a boy died from AI in Tay Ninh province in Viet Nam, just one day after the government said it expected to announce the country free of the disease by the end of that month.



Wildfowl are thought to be responsible for the rapid spread of AI

And indeed it did, only to report a small outbreak of H5N1 in the southern province of Dong Thap in early May, followed by a much larger one – 4500 birds on three farms in the Mekong Delta province of Bac Lieu – at the end of June. The Thai authorities have similarly 'jumped the gun', with the disease appearing on a Chiang Mai University Research Farm in northern Thailand on or about the 21st May. This occurred just days after government officials had expressed confidence that the country was free of the disease.

Clearly the nature, scope and spread of AI is to blame. Early fears that it is harboured and spread by wild birds now appear to be justified. AI virus was isolated from wild birds early during the outbreak, with fears and indications of it being carried and spread by migratory wild fowl. This tied in with solid information that domestic ducks harbour the H5N1 strain of AI.

Claims of predatory and carrion-eating wild birds testing positive for AI prompted a precautionary mass culling of crows in Singapore. This was followed by isolation of the H5N1 strain from carcasses of Japan's jungle crows. These are not, as the name suggests, birds of the forest, but aggressive carrion-eating corvids living off kitchen waste and sometimes attacking children or the elderly. Reports from Okinawa claimed the genetic make up of AI

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virus particles isolated in Japan were almost identical to those in South Korea, suggesting migratory birds had brought the disease into the country.

The presence of the virus in wild birds – and especially migratory populations – places a new and dynamic dimension on disease spread and development. West Nile Virus for which wild

birds, especially corvids, are an important reservoir of disease, spread across the entire width of the USA in just three years, killing thousands of people on the way. Furthermore, there are implications for international trade and not just in poultry products. The Philippines, which is AI-free, has banned the import of feed grain (maize) from its

Southeast Asian neighbours – Vietnam, Thailand and Indonesia – where AI has been recorded. Loading grain attracts large numbers of wild birds whose droppings could contaminate the feed and put local poultry at risk.

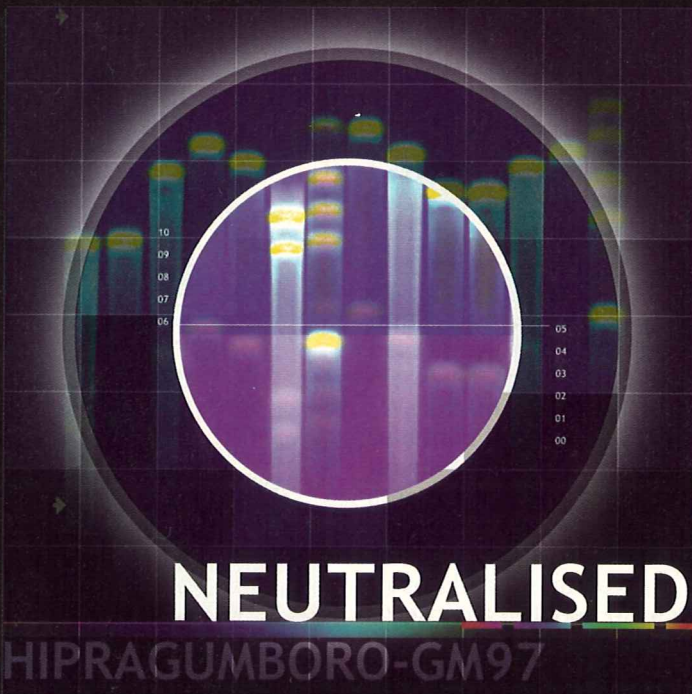
Poultry, pigs and people

Central to the seriousness and rapid spread of AI in Asia are claims of government cover-up, which destroys the confidence of poultry importers and holds back scientists and technicians trying to deal with the problem.

The Thai authorities were accused of hiding outbreaks that occurred weeks before the first confirmed case in South Korea in December 2003. High rates of chicken mortality were passed off as avian cholera and bronchitis said reports, quoting a Thai senator. Indonesia was accused by the World Health Organisation of at least being slow off the mark.

The most disturbing accusations were made by the respected *New Scientist* magazine in the UK and related to the situation in China. Unnamed experts were cited as saying that the outbreak actually began in the first six months of 2003 following a misconceived vaccination programme in China. The authorities used poorly matched vaccine, it said, that allowed the virus to replicate, although affected animals did not show AI symptoms. The disease was then spread to other parts of Asia by poultry smuggling, it alleged. The Chinese vehemently denied these accusations. If true, it would imply that the current outbreak is essentially a continuation of the late 2003/early 2004 outbreak in Hong Kong that is thought to have originated in China.

AI strain H5N1 has affected several large cats at Bangkok zoo, killing a rare leopard and infecting a tiger, and therefore showing it can jump from birds to mammals other than humans. Reports have claimed H5N1 identification in nasal swabs taken from pigs in Vietnam. A report from a UN organisation in



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Hanoi was played down by WHO, which claimed that pigs were simply contaminated, stressed the absence of symptoms in pigs and emphasised that the animals' immune system had to be defeated before the disease took hold.

AI, including the H5N1 strain, is clearly a widespread zoonosis, i.e. a disease that can be spread from reservoirs of infection in animals to humans. However, its occurrence in pigs could open up a real quagmire of potential human disease.

Scientists' fears

The AI virus and those causing human 'flu belong to the group of coronaviruses. The different strains are usually quite species-specific. AI strains attack birds and the human 'flu strains infect people. Pigs are known to be susceptible to both bird and human types. As such, pigs may offer the ideal mixing vessel in which bird and human 'flu strains mutate and mix with a re-assortment of genetic material. This could produce a new strain with the virulence of H5N1 and the capacity for fast and easy human-to-human infection.

Furthermore, scientists fear that such mixing of genetic material could take place directly in the human body if, say, a poultry worker suffering from the human 'flu virus came into contact with AI. Scientists at the Veterinary Research Institute in China have suggested a pig/duck relationship as the route to even more dangerous forms of AI. Ongoing research started in 1999 indicates that the ability of the AI virus to jump back and forth between ducks and pigs may make some strains more dangerous to mammals including humans.

Key to whether a 'flu virus can overcome the body's defences lies in its two surface proteins. These are constantly undergoing small mutations. This is the reason why we require new vaccines every year for comprehensive updated human 'flu protection.

The name H5N1 given to this strain of AI refers to its surface

proteins called haemagglutinin and neuraminidase. Ongoing small changes to the surface proteins are not normally serious because the human body is primed to recognise the main human 'flu viruses. Much bigger genetic changes involving incorporation of surface protein genetic material from strains that normally affect animals will not be recognised, and will therefore leave

the body wide open to infection. This is what is thought to have happened in the big human flu epidemics over the last 80 years.

A lesson from history: Spanish 'flu

Much has been made of the 1918 Spanish 'flu pandemic (H1N1) and rightly so. It killed at least 20 million people and

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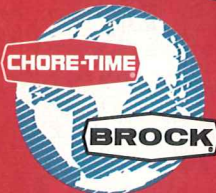


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perhaps double that number when the world's population stood at only 1.8 billion and before the advent of mass international travel. Medical historians believe the outbreak may have begun in 1917 at a huge transit camp for allied soldiers from all over the world at Etaples in northern France at the height of the Great War (1914-1918).

Millions of troops passed through the camp but it was not just the number, concentration and diversity of soldiers that sparked the problem. It was the close proximity of self-supporting pig and poultry farms that the soldiers ran themselves, feeding, managing and slaughtering animals for food. Scientists claim that an AI strain mutated and mixed with a human strain, probably in pigs, to produce the now notorious Spanish 'flu virus strain. This was subsequently spread around the world – to Europe, North America, Australia, Africa and Asia – when the soldiers returned home. A recent exhumation of the body of a woman known to have died of Spanish 'flu during this period confirmed the viral nucleic acid material to be of poultry origin.

Such closely integrated situations involving people and farm animals no longer exist in the West, where consumers have no contact with live animal production, slaughter and processing. But it does still exist in many parts of Asia where farmers often even live in the same buildings as farm animals and where live birds are sold in urban markets, slaughtered there or even taken away by consumers to be slaughtered at home. Until more consideration is given to these aspects of poultry production and marketing, and real attempts are made to modernise the industry, with properly managed slaughterhouses and meat processing plants, then AI will continue to present real problems for much of Asia.

Hope for a successful vaccine

All eyes are now on the development of a vaccine to arrest the spread of the H5N1 strain and prevent future outbreaks on this scale affecting poultry and people. The complications are enormous and there are currently no vaccines available that can protect

humans against AI.

And once again, chickens could have the last say. Standard human 'flu vaccines are made by injecting innocuous strains into chicken embryos in eggs, along with the disease-causing strain against which they want protection. The two strains mix their genes and some of the progeny get the two surface proteins from the disease strain and the rest of their genes from the harmless virus. This strain is selected and multiplied in millions more chicken eggs, then purified, killed and marketed as vaccine. But this will not work with the H5N1 strain of bird flu. Being lethal to chickens, it kills the embryo when injected into the egg.

New technology is being used to overcome these constraints and there are promising reports of new vaccine developments in several countries including China. But with the propensity for mutation in these RNA viruses, it seems that AI could stay one step ahead of humans as well as the birds.

Lessons to be learned

The world is a small place especially when you are a major exporter, as Thailand has found to its cost. Lost markets are notoriously hard to regain and demand strict reappraisal of new requirements. For Thailand and other Asian countries, this may involve bird welfare as well as biosecurity and sanitation.

Southeast Asian nations in particular have been forced to cull millions of birds in a short space of time. There were reports in some Western newspapers, supported by 'shocking' pictures, of chickens being buried and burned alive. West European attitudes to poultry welfare are entirely different from those in parts of Asia. Irrespective of who is right or wrong, Asian exporters should be aware that this sort of coverage will not help to regain markets in many EU countries when AI is finally stubbed out.

The message is certainly getting through to Charoen Pokphand Foods (CPF), one of the 22 Thai chicken companies now allowed to resume exports of chicken to Japan and also focussed on the European



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Union. It claims to be the only non EU-company certified for good animal welfare by Tesco, the giant British retail chain of supermarkets and superstores.

Like other Thai companies, e.g. Betagro group and Saha farms, CPF intends to concentrate and build up its exports of cooked chicken at the expense of fresh poultrymeat — the 'safest' option. Other aspects of production and processing are likely to change too. No longer will large, intensive and exported-gear enterprises sit comfortably alongside backyard chicken farms and sheds in the same area of the country. Big importers like Japan and the European Union will see to that. Not only do they have to answer to their consumers but also to their own and powerful producer lobbies like those in the Netherlands.

The net result can be projected. Whole areas — even provinces —

will be exclusively reserved for big commercial producers. In those regions, backyard chickens and ducks will be increasingly excluded and banned. Live markets may become a thing of the past, despite being deeply embedded in most Asian economies, societies and cultures.

AI now appears to be endemic in Asia, harboured and continually circulated by wild bird populations. Tight biosecurity is the only way to counter threats of this kind. Many western consumers increasingly demand improved poultry welfare with more freedom of movement for birds and with products like 'barn' eggs and free-range poultrymeat preferred. With the risk of the spread of AI by migratory birds from south to north and over thousands of miles, production trends may have to move in the opposite direction.

In Asia at least, the only way of

escaping AI may mean poultry production in environmentally controlled and biosecure conditions. If outbreaks do occur, then it is clearly vital that the authorities promptly give full information on the location, scale and nature (strain) of outbreak before starting clean-up operations.

AI is now established as a zoonotic disease but considering the massive exposure of people across Asia to infection, human cases and the accompanying death toll have been mercifully low. But there is no time lose, as subsequent outbreaks in North America have shown. It looks like the world poultry industry may have to learn to live with yet another disease. The UN's animal health department has assessed that eradication of AI virus may now be impossible.

— Dr Terry Mabbett, Potters Bar, UK.

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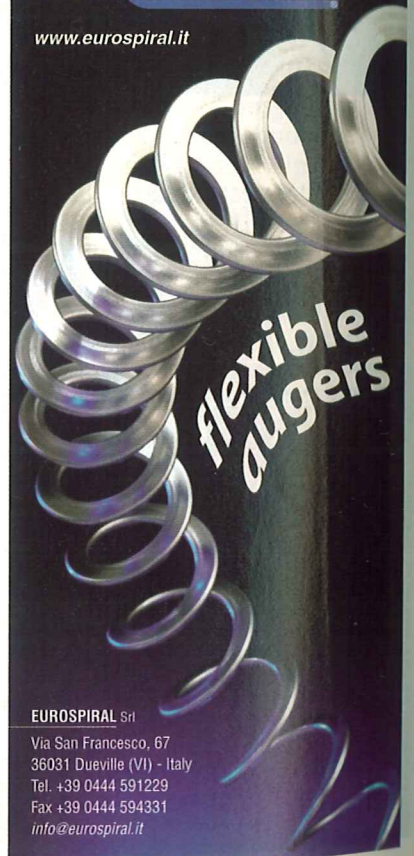
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