

Workshop 1

Introduction and spread of avian influenza

Chairman: Arjan Stegeman

Issue 1. Monitoring of wild birds

Arjan Stegeman: Yesterday Kennedy Shortridge and also Ron Fouchier argued that surveillance is very important. Fouchier's goals for surveillance were mainly from a laboratory point of view; having enough skilled technicians and enough reference material when there is an outbreak. Shortridge suggested that monitoring could give an idea of threats to commercial poultry and humans.

The question is: is it worthwhile to put a lot of effort in monitoring wild birds. Shortridge and Fouchier showed us that there is already an enormous amount of information. Almost all H and N types have been found in wild birds. Can we get a specific threat out of that or does it only gives us worries?

Trevor Ellis: We were very surprised in our recent outbreak in waterfowl parks in Hong Kong with the death of little egrets and grey herons. Is there a proposal or system of dead-bird monitoring in the Netherlands, rather than live-bird swab taking? I think a system of regular submission of dead birds is something we've got to maintain very strictly, having seen what happened in Hong Kong.

Ron Fouchier: We certainly do not do surveillance of diseased or dead birds.

Tjep de Vries: No, we only work with farm poultry.

Guus Koch: In our institute there was a programme for looking at dead birds, mainly because of poisoning. If there was an indication at the *post mortem* we did virus-isolation but that programme was stopped because the government wouldn't support it.

Peter Cargill: There is a large number of species carrying viruses. I don't see it being practical to have a surveillance scheme across Europe, with which you would probably need to cover all those species. Maybe first stage should be whether to identify which kind of species form the biggest risk for commercial poultry, because their behavioural differences will influence the potential risk to commercial poultry. Once you have made that decision you can focus surveillance on species that we recognize as the risk.

Ilaria Capua: If you look for influenza viruses in wild birds you are going to find them. Ron Fouchier picked up the first H7N1, maybe in 1999, which was the progenitor of the Italian virus. What could we have done? Not much. These studies are very important in retrospect, but if we are trying to find an indication from what we obtain from wild birds to what we are supposed to do in our domestic poultry, this

Workshop 1

is very difficult. We have seen from what Dennis Senne said that some of these lineages or viruses get established and some don't. How are you going to predict that this H5N2 is going to be a problem and this H7N1 is not? We are only concerned with H5 and H7. You would need an enormous amount of data, which is not indicative or predictive.

Ron Fouchier: I agree. We've seen the H5-related virus in The Netherlands and we did nothing about it, and it did nothing in The Netherlands but it took off in Italy. We did not detect the H7N7 beforehand, so perhaps surveillance is not useful as early-warning system. It is useful for getting your hands on the strains that are circulating. Due to the threat of zoonosis in humans we needed to produce a recombinant vaccine from duck virus for use in humans. Having these strains available at all times is what surveillance studies are good for.

Stefano Marangon: Monitoring and surveillance are important in risk assessment. If we are looking for risk factors for virus introduction in the domestic population you should know where the virus comes from. Surveillance in wild birds and other possible reservoirs should be included in those exercises. In our area we introduced a large number of potential reservoirs, like quails and domestic ducks. If we want to have an idea where critical points are you must have surveillance of reservoirs of AI.

Arjan Stegeman: Do you see any prospective use? Could it predict something is going to happen?

Stefano Marangon: Yes, especially if we are talking about densely populated poultry areas, like the northern part of Italy, if there is a risk of virus introduction you need a strategy and to plan biosecurity measures. I would like to avoid having free-ranging flocks in areas where there is risk of introduction of virus. If we want to plan possible use of vaccination you should know what viruses go around so you should have vaccine banks, modulated to the viruses that are going around. These data could be used in practice but you need to have a strategy.

Sjaak de Wit: Predictive effect is rather low but it is an important warning for the poultry industry that there are viruses around. You want the industry to be aware of the virus so they will invest money. You must show that there is something around with the data from Ron Fouchier.

Arjan Stegeman: So it is a method of keeping the awareness. Stefano Marangon brought us to the second issue. He said that a surveillance system could be used for advising outdoor-housed flocks to be housed inside when they are at risk.

Issue 2. Outdoor-housing risks

Stefano Marangon: Not exactly. You should be able to identify the ways the virus is introduced in the poultry sector. You can blame free ranging flocks but if your live-birds markets are already infected you're probably wrong. You have to study the structure of the industry in the area, the presence of backyard flocks and the critical points for virus introduction; then you can make a statement like that. Otherwise it is difficult to argue with farmers.

Arjan Stegeman: In The Netherlands like other parts of Western Europe for years a debate is going on that we have to pay more attention to the welfare of birds, and outdoor ranging is a big issue in this debate. Now we have a large number of big free-ranging flocks and an increasing number of organic flocks. These birds have more contact with wild birds so probably the risk of introduction of the virus is bigger than it has been previously. Poultry was kept outside for ages already, but now also in an industrial way. There are flocks with tens of thousands of hens that can go outside and wild birds are dropping there faeces in that area. Is that an unacceptable risk, could we make risks acceptable or do we have an idea on research in that direction?

Goossen van den Bosch: I don't like the contradiction between welfare and outside. Our grandfathers have brought up poultry inside for welfare reasons. You can have good welfare inside the houses.

Arjan Stegeman: That is a welfare discussion; let us keep the discussion focused on the risk of AI

Dennis Alexander: In Minnesota they decided last year or the year before to move all the turkeys inside after rearing them outside for years and years. Is this true?

Dennis Senne: Yes. For many years, in the late nineteen seventies and eighties, Minnesota was considered the AI capital of the world, because of the number of infections that were appearing in turkeys (by the way, Minnesota is the number-1 turkey-producing state in the United States). It happens to be in a central flyway for migratory waterfowl. They had done a lot of studies in the seventies and eighties trying to establish a predictive way for various subtypes that may appear in turkeys by sampling waterfowl. In recent years, that has gone by the waste site because funding is not available for this kind of research, because it doesn't provide a lot of information that can protect the poultry industry.

In almost all of our cases of flu in commercial poultry we rarely establish a method by which the virus enters the poultry houses. We assume that these viruses are associated with live-bird markets because the virus that we get from commercial poultry is almost identical to the virus in those markets and we can't find it elsewhere. But we don't know how the virus is getting from the reservoirs into commercial poultry. So the key that we're trying to preach to the industry is biosecurity. You can't control what is out in nature so you can only increase the biosecurity level. Unfortunately that level of biosecurity does not exist in US poultry production and I doubt that it exists in other parts of the world.

Stefano Marangon: I agree that you cannot control spread of virus in the wild, but you should know what is happening. Biosecurity measures are very important but are not easy to sustain in the long term. Location of farms can effect the contact with wild birds. Everything should be studied to make sound decisions. How viruses enter our domestic bird population is difficult to say. It is very difficult to decide upon the index case, the farms in which the virus was first introduced. With LPAI you don't see any clinical symptoms in the beginning. In some epidemics we do identify some of these factors. Farms where more than one species is reared and free-range flocks with contact with wild birds are risk factors for virus introduction.

Workshop 1

Arjan Stegeman: So you are saying that based on monitoring of wild birds you can take measures in the flock; like increasing biosecurity.

Stefano Marangon: Not really. It is not that you find the virus and then take measures. You know that there is a risk and where the risk is and then you can plan how biosecurity measures should be in this area or you can advise farmers what to do. You can say that it is better not to have free-ranging flocks. It is not an action that follows after detection of the virus. It is an overall strategy to make plans concerning the poultry sector in this area.

Dennis Alexander: Where we know HPAI has arisen, we know the flock in which it occurred, either as an initial introduction and very rapid mutation or later mutation, we have never known it to arise in an outdoor flock.

Arjan Stegeman: We strongly think that this was the case in The Netherlands.

Dennis Alexander: But you don't know where it arose in The Netherlands. I'm thinking more of outbreaks like the Chile one where we knew the flock in which the LPAI arose, I'm thinking of the Great Britain 1991 outbreak, where it only occurred in one flock in one house, so you know the mutation must have occurred there. If you go back to 1963 and 1979 in Britain; if you look at all the outbreaks where you knew it must have arisen, never once we have seen HPAI in outdoor flock. The Netherlands might be an exception but you never know where it first arose.

Arjan Stegeman: You may be postponing the problem. We are trying to prevent introduction of an LP virus that subsequently would change into an HP virus.

Dennis Alexander: Just making an observation. If we know that in 1991 in Britain and Chile the virus was introduced and became HPAI very quickly, why shouldn't that have occurred with much more frequency in free-ranging flocks.

Guus Koch: Why should it mutate in poultry? Why couldn't it mutate in the wild fowl? It's present in a minor percentage of the population and then it's selected when it comes into poultry. I think that happened in The Netherlands twice, but I will go into more detail about that in my presentation.

Goossen van den Bosch: How can we tell a poultry farmer to do biosecurity and separation between outside and inside? We wash hands, change clothes etcetera. There is no need to do that when the poultry is outside. It is very difficult to do that 100%; we should have a wall around the farm between the dirty outside world and the clean inside. And that is impossible when we have the poultry outside.

Tjep de Vries: I agree that it is easier to have poultry inside, but in Western Europe it is a given situation that there will be poultry outside. Because there are certain types of wild birds that may be infected and others may not, and we have also seen pictures of situations that are attractive to waterfowl, would it be feasible to reduce the risk of introduction of AI in outside poultry just by making surroundings unattractive to birds that might be transmitters of AI virus?

Ron Fouchier: As soon as you throw out feed for the chickens outside it will also attract wild birds.

Tjep de Vries: Feed should be inside, that is no problem.

Arjan Stegeman: In general the idea here is that it is difficult to prevent the risk in outdoor housing.

Stefano Marangon: Organization of the poultry sector based on risk assessment is important in the area.

Arjan Stegeman: If we would give you (Fouchier) a lot of money and let you monitor wild birds in The Netherlands to make a risk assessment for the poultry in the neighbourhood, wouldn't you be afraid of finding all kinds of viruses everywhere?

Ron Fouchier: Absolutely, I would not take this challenge on my shoulders. Sampling bias and timing in the year is an issue. Are we going to do this year-round on all the wild birds that are near the farms? How many birds should we test? One out of ten? We could just miss birds with the virus.

Dennis Senne: What is the turnaround time between collection of the samples and when you have the information? Because if it is not in real time, it is of no value to the poultry industry, because we already know these viruses are out there. And unless you prevent the introduction of these viruses through biosecurity you can have all the predictions you want, but it is not going to help the producer.

Ron Fouchier: I fully agree. The first two years we were doing these studies we were already two years behind. Now we can do it real time but there is still a delay of at least one to two weeks. We can't have people collect the samples and bring them to the lab the same day. The organization of studies like this in real time is very difficult.

Peter Cargill: I think Marangon's point is really critical about the organization of the poultry industry. Because there are really two issues that are important. Preventing introduction: the problem is that we can't do that all the time. And by time we know we have a problem we have spread it all over our operation. So we have to prevent it from being introduced and prevent it from spreading. And that is something we're bad at as an industry. Preventing it from spreading is more critical than preventing it from coming in. Because it is in one flock you can go in and recognize it quickly and kill it; this is not an issue. But the problem is that we spread it over the country before we realize we have it.

Stefano Marangon: So what we want is targeted surveillance. If you are able to define the risk of virus introduction broadly you can target your surveillance. You cannot implement a surveillance programme in the whole country. With this information you can speak about surveillance, vaccination and so on. We should have a better knowledge of the problem to understand what to do. And if you are able to target your surveillance we have a system that is sustainable in the medium term.

Remco Schrijver: Could you specify what would be the targeted surveillance? I would be interested to know what we can do, different from what we do today, to

Workshop 1

improve the situation. Then we could better prioritize among the things we do or integrate our surveillance systems.

Stefano Marangon: We are going too far because this is the first session. You have to put everything together to get to the final conclusion. I can say what we are doing now, which is almost nothing; we can only improve.

Dennis Alexander: I want to go back to Minnesota. Because they they kept their turkeys on range, and they were just south of the great lakes, they knew that when the migratory waterfowl went through they would get avian influenza. They used to do what you practice here; targeted surveillance. They looked for the viruses that were going to be in their migratory waterfowl when they passed over their turkey flocks in Minnesota. And they would make a vaccine and vaccinate the turkeys in a very short time. In my opinion it did not work. And that is the highest level of surveillance you can get and it did not work. For example in 1997 they were only monitoring ducks and not gulls and an H9 virus came in, which is thought to be more present in the gull population than in the duck population. We are talking about something that was tried and tested in Minnesota and was found lacking and their solution was to move all their turkeys back indoors.

Tjep de Vries: I understand now that it is not feasible to react immediately to the findings of any kind of surveillance. But if you would have information over the years that in a certain area or in a certain season you will never find influenza, it might be information useful for the industry that at least at that time and in that area you could safely have your poultry outside and for the rest keep it inside.

Arjan Stegeman: But I understood from Fouchier's talks that if you would give him more money and he would look better he would find AI everywhere.

Ron Fouchier: I would agree with De Vries that if you sent out your chickens in the summer
you would have less of a risk of transmission than in the winter.

Issue 3. Live-bird markets

Arjan Stegeman: I would like to discuss now a subject that is related to what Senne told us. He told us about the circulation of virus in the live-bird markets and the impact it could have on the commercial poultry flocks. Do we see that within one nation, if we would say that there were different populations of poultry, the AI virus could be combated in a different way in these populations? From Senne we had the example of the live-bird markets and the commercial poultry flocks. He stated that we really have to do something about the live-bird markets. In The Netherlands we had a big debate between people who keep chickens for a hobby and the commercial holders. In the society that debate is very much dominated by the hobby keepers because they by far outnumber the number of people who keep poultry for commercial reasons. Hobby keepers get into the media a lot and they argue that they don't want their hobby chickens killed for something that they don't have any association with: the commercial interest of the poultry industry. Who would like to give his opinion whether we could have different types of disease control within the same country?

Kennedy Shortridge: I would like to emphasize at least for us the importance of surveillance in live-bird markets. Surveillance outside the markets, in the wild birds, is a far more complex issue. But within a market you can monitor with a certain degree of freedom. That would depend on the nature of the market and who is running it, etc. I think the H5 story is a good one in the sense that in the early days we did pick up H5 viruses and none of them were highly pathogenic and then they faded away. We didn't see them for a long time. The next thing that happened was that the H5 appeared in farms in the new territories and they were highly pathogenic. After that they were picked up in the markets. This is a very good example of a virus that was highly pathogenic not only to poultry but also to humans. The fact that these sorts of situations haven't occurred elsewhere is irrelevant, I think. They can occur elsewhere; viruses are on the move. There is a case here for regular surveillance. So I strongly recommend the surveillance of the markets. How you go about it depends on the nature of the market, who is running it, the complexity of the market, and type of bird you are going to monitor. When it comes to monitoring a lot depends on the throughput in the markets; if the birds are in the market for a long period of time, there is a good opportunity for the virus to multiply.

The good example here is the quail. What we found, which gave us one of the big clues as to the involvement of the quail in the genesis of the HP virus in 1997, was that initially we did not pick up any viruses in the quail. Soon after the bird flu came we were picking up a small percentage of quail that were positive for H9. Those numbers built up to about 16% of quail we were isolating virus from. This means that there were a lot more birds infected. This led us to a way of controlling the possibility of the 1997 H9N5 virus from reappearing; this was taking quail out of the markets. The market people saw this as the beginning of the end of the markets as they knew. By monitoring we possibly may have averted another serious situation, which could have arisen explosively. I realize these are extremes to what you people experience. The situation there is extreme, and in a way I'm not unconvinced that you don't have extremes in other markets around the world in which a new virus can arise explosively. Senne tells a point about a market in New York where they kept on getting the virus. They would clean it every weekend and then the virus reappeared the next week. The man in the market had a pet bird that was silently shedding the virus. And he would take it home for the weekend when the market was being cleaned and the virus would be reintroduced by this silent shedder.

Arjan Stegeman: You are saying that incidences can have a major impact on what is happening. As Senne told us this morning, we can't prevent these guys in the live-bird markets from making a living. It is very high in the American law to be able to do that. So, in the commercial holdings you could also say; we give that responsibility to the commercial holders; they have to keep up a high level of biosecurity. They should try to prevent as much as possible to get the virus from the live-bird markets into the commercial holders or from the hobby chicken to commercial holders. So then we don't have to bother persons who are having hobby chickens with mass-elimination strategies. Or we should allow them to vaccinate? Is there anyone who has an idea whether a differentiated approach to disease elimination is possible for these separated poultry populations?

Workshop 1

Kennedy Shortridge: If you rely on market people or people in the community to vaccinate and do whatever they're supposed to do, they will not do it. It is a total waste of time. You must have a legislative component to enforce that. People in the markets are stubborn people.

Arjan Stegeman: But you could have legislation on compulsory vaccination, of course.

Peter Cargill: You have to go back a stage, because I don't believe we really know enough about live-bird markets, cock fighting etc. that we know are important in the disease. We don't know what happens in those countries. Until we know how it's operating and how birds are moving we can't target a strategy to control it. I'm aware of live-bird markets in the big cities in the UK, but we don't know how they're structured, how they're sourcing the birds. And I don't think the authorities know. The only time we are trying to find out is in the middle of an outbreak, like with Newcastle last time. Maybe a first stage is to try and ascertain what the structure of these markets is in the different countries. I was in France a couple of months ago. There was a caravan with every bird species you wanted to buy in the streets. At the end of the day they drove off. They are driving that around France.

Dennis Alexander: We are all discussing two entirely different things. Hobby birds are entirely different to the sort of thing Shortridge and Senne are talking about; which are live-bird markets; selling birds for food. Particularly in Hong Kong all the birds are marketed like that. Nothing like that occurs in Europe at all. The live-bird markets for food in the UK are monitored carefully because people are concerned about *Salmonella*; they are investigated by the Food Standards Agency and by the Environmental Health people. So we do know about live-bird markets where the birds are sold for food. We may not know what occurs with hobby birds. We must not confuse them. I think in Europe there are more controls on birds for food consumption. Our problem would be more with pet birds: hobby birds and show birds.

Remco Schrijver: What struck me was what Senne said: we don't know enough about the live-bird markets and we cannot fully control it; and what Cargill said: we should know more about how it is structured and know more about the epidemiology. So we need to do more work into the risk assessment of live-bird markets – how would the introduction and transmission of the virus occur there – to have better intervention strategies. Is that a recommendation that would make sense?

Ilaria Capua: I just wanted to make a point. Every country is different, backyard flocks are different from live-bird markets. You have to know what the real situation is and then make some recommendations. You cannot have a general rule for all situations because not all markets are the same.

Remco Schrijver: So we should have targeted risk assessment depending on the situation. We need more information on how the virus is behaving and is being transmitted.

Peter Cargill: I don't think we should be focusing on the virus. To me it is understanding. For the live-bird markets the issue is not necessarily that they are

bringing large numbers of birds together, it is the fact that there is some guy who is going from farm to farm to get the birds. The virus may not be there now, but when it appears they are a prime risk for transmitting the virus to every other poultry operation. In the UK I have seen a lot of 'fringe activity' where these people are picking up tens, maybe hundreds of birds and moving on.

Arjan Stegeman: We talked about monitoring of wild birds. We didn't come to an agreement. We don't see any sense for it now, until in a targeted way it could have some use. For the free range: the majority thinks that free range increases the risk of introducing AI virus. Should you do that on a large scale, you should do it by a targeted risk assessment; making it feasible in certain situations and not in other situations. And that would give a research question: what are the factors to look at? As for difference in control strategies between different kinds of poultry populations, commercial vs. live-bird markets or vs. pet chickens: there is not much to say about it in general, because apparently there are a lot of differences between countries, so that we cannot make a general statement about it. We should make a risk assessment based on the contact structures in these situations. These are my conclusions of this session.