



# Learning to live with bird flu

**Bird flu is an unpredictable threat for both poultry farming and humans. But it would be impossible to eradicate the disease; vaccinations are an emergency measure that can only give temporary relief. The Central Veterinary Institute at Wageningen UR is therefore considering a warning system to keep the risks down to a level that is acceptable for both consumers and poultry farmers.**

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**‘H**aving a proper diagnostic test for the bird flu virus and working on the development of a vaccine — that’s our institute’s core business,’ says Ruth Bouwstra, a vet at the Central Veterinary Institute (CVI), Wageningen UR. ‘That will not change but this alone is no longer enough. We will never be able to eradicate bird flu so we will have to learn to live with it.’ That means that different social concerns need to be weighed against one another. Bouwstra thinks a multi-disciplinary approach will be needed then to decide on priorities. One example is animal welfare. The CVI expects consumer pressure to lead to an increase in the number of free-range poultry farms. But the probability of being infected with a bird flu virus is almost eight times higher for these farms compared with farms where the birds are kept permanently indoors. Chickens that roam around outside are more likely to come into contact with infected waterfowl. And that makes it not quite such an animal-friendly option. There have already been two outbreaks this year: laying hens had to be culled on farms in Milheeze and Tzummarum. Not that the virus they found — a mild H5 variant — was particularly dangerous. But European rules stipulate this rigorous approach as a mild bird flu virus can mutate into a more malignant variant.

### INTO THE DESTRUCTOR

A more worrying outbreak was in November 2014 when the CVI detected a contagious variant of H5N8, first in Hekendorp and then in Ter Aar, Kamperveen and Zoeterwoude. Hundreds of thousands of chickens were culled. In Barneveld — the heart of the poultry industry — thousands of ducks were slaughtered as a preventive measure because a truck that had also been used in Kamperveen had been on the poultry farm. Bouwstra agrees that these are tough measures. ‘But this does prevent the disease from spreading. We soon had the outbreak under control thanks to our intensive inspections of poultry farms and rigorous measures, whereas the disease has been circulating for nearly a year now in Canada and the USA, where they have less stringent checks. The important thing is to find effective strategies that are acceptable from both a social and an economic perspective.’ The Netherlands has been particularly on the lookout for bird flu ever since 2003, when the highly pathogenic H7N7 was found in Scherpenzeel (also in the main poultry industry area). This avian flu virus had not been seen in the Netherlands since 1926. More than 30 million chickens, ducks and turkeys met their end, either because they became infected or because of preventive culling to

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stop the infection from spreading. The disease was not confined to birds: one vet died from bird flu and dozens of preventive workers became ill. H7N7 is far from being the most dangerous variant for humans. In particular H5N1, the variant that so far has mainly been restricted to Asia, has caused the deaths of hundreds of people.

### NEW VACCINE

One consequence of the 2003 epidemic in the Netherlands was that 15 million euros was made available for research. In that programme, both the CVI and Utrecht University developed a new vaccine, each for a different bird flu variant. But little can be done in practice with that scientific knowledge in Europe at the moment because the EU has a ban on vaccinations. An individual country can introduce emergency vaccinations but the vaccinated poultry cannot be exported as not all countries are able to distinguish between the antibodies in the blood of vaccinated birds and those in the blood of infected birds. That presents an export-oriented country like the Netherlands with a dilemma: trade or animal welfare? Italy did decide on vaccination in 2003 in order to contain the epidemic.

There are also numerous methodological and practical objections to vaccination. Human flu is fairly predictable as it comes our way during the winter, usually from Asia. But outbreaks of bird flu generally appear suddenly without warning. Given this, how can vaccine manufacturers make sure that there are sufficient stocks of the inoculum — or the vaccine spray in the case of a barn with hundreds of thousands of chickens — for the right virus type? It also takes a few weeks after the vaccination before the birds have built up enough resistance to bird flu. So vaccination is not an option during an outbreak as the virus spreads faster than the resistance created by vaccinating. Vaccinations are regularly carried out in Asia, says Bouwstra. That curbs the spread of the virus, but the effect is limited and only temporary due to low vaccination rates.

Bouwstra also thinks it is an illusion to imagine that preventive measures can stop the disease entering the Netherlands. As the research programme prompted by the 2003 disaster showed, there is a permanent >

## BIRD FLU

Infection with an avian flu virus may result in mild symptoms, severe symptoms or even death, depending on the variant. Humans can become infected too occasionally. There is a danger of a new flu pandemic erupting due to the virus being transmitted from the host to humans. Previous pandemics led to the loss of millions of human lives.

## Prevention

Bird flu is found worldwide. Since the early twentieth century there have been hundreds of recorded outbreaks among poultry in Europe, Asia, the USA and Africa.

Countries with bird flu between 2010 and 2015

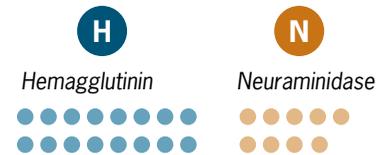


## Variants

There is a mild form of bird flu and a dangerous form, also known as fowl pest. The mild form can mutate to become the highly infectious variant known as Highly Pathogenic Avian Influenza (HPAI).



Avian influenza virus variants are classified on the basis of the two proteins on the virus surface:

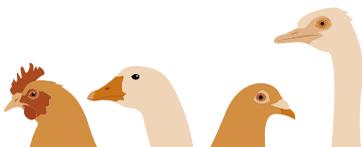


At present, 16 H-types and 9 N-types have been identified, with various possible combinations.

Fowl pest is caused by highly pathogenic strains of influenza. So far, they have all belonged to the H5 or H7 subtype. The virus leads to severe illness and death.

## Infection

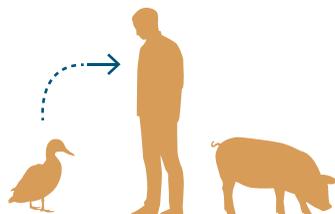
Bird species that can get bird flu are:



Gallinaceous birds (chickens, pheasants, etc.), ducks, geese, swans, pigeons and ratites (flightless birds such as ostriches, etc.).

Infections occur through direct contact with infected birds or materials (feed, crates, vehicles and people).

In rare cases, some variants of the virus, including H5N1, can also infect humans or other mammals such as foxes and pigs, but this is only possible if they come into very close contact with infected waterfowl or poultry.



## Pandemic

The transmission of an HPAI virus from infected poultry to humans could lead to a new global flu epidemic (pandemic) as the virus adapts to its new host. That is probably what happened in 1918 with the Spanish flu (about 40 million deaths).

Bird virus genome segments can also mix with a human influenza virus. That could well have been the cause of the Asian flu pandemic in 1957 and the Hong Kong flu pandemic in 1968 (2 to 3 million victims each).

reservoir of bird flu viruses among waterfowl. Those birds might get a bit snotty at most but they can still pass on the disease. The H7N7 in 2003 was probably brought by ducks coming from Siberia. Once the virus had got inside a barn, it turned into a mass murderer. There was circumstantial evidence pointing to wild birds as a source last year too. In the area around the farm affected by H5N8 in Hekendorp, the same virus was found in the droppings of widgeons. An analysis carried out by the CVI showed that this variant came from an H5N8 strain that was circulating in China in 2009 and subsequently spread to South Korea and Japan. According to Bouwstra, that is supporting evidence for the hypothesis that H5N8 was passed on among migratory wild waterfowl in their breeding areas in Siberia and then carried to Europe by migrating waterfowl.

It is not yet clear how the virus took the final step and was actually carried into the Hekendorp farm, which is not free range. Perhaps rodents were responsible, or perhaps the droppings of wild birds were carried into the barn on visitors' shoes.

## VIRUS RESERVOIRS

Bouwstra says you can never completely prevent bird flu from getting into Dutch barns. 'We are working with ecologists to see whether you can make the area around poultry farms unattractive for waterfowl. But there will always be some risk as long as those 'virus reservoirs' are flying over the farms. We will need to learn how to live with that threat. Farmers are wondering whether we could prevent the wild birds from entering the Netherlands in the first place but I don't expect broad public support for the mass shooting of wild ducks, geese, swans and seagulls.'

But she says that does not mean we should stand by and do nothing. 'We should work worldwide on improved monitoring so that we know which viruses are circulating in the populations of wild birds. I'd like to link this information to an alarm system that could say: the wind is blowing in that direction in Siberia, or it has been very cold for several days now, so ducks can be expected to fly our way. Then we know what is coming when and we can prepare for it. You could temporarily keep the chickens indoors, for example, and carry out extra checks, especially if a virus like H5N1 is involved that can be transferred to humans.'

The researcher thinks we need to find an approach where the degree of risk incurred is acceptable for various groups in society. Farmers are quite prepared to take even more rigorous hygiene measures, thinks Bouwstra. 'But this has to be practicable. Not everyone

wants to shower ten times a day and change their clothes 20 times. And the financial prospects need to be sufficiently attractive for them to continue farming.' On the other hand, they may need to make concessions to appease consumer concerns. Bouwstra: 'The risk of contamination can be reduced substantially by keeping chickens indoors but that is diametrically opposed to consumers' wishes to have farm animals ranging outdoors as that is closer to their natural behaviour. So we need to weigh up these different viewpoints. And you need more than just veterinary expertise for that.' ■

[www.wageningenur.nl/global-one-health](http://www.wageningenur.nl/global-one-health)



## INVESTMENT THEME GLOBAL ONE HEALTH

Countless infectious diseases can be transmitted from animals to humans. Ebola for example comes from apes, Q fever from goats and sheep. The connectivity between the health of humans and animals is termed One Health, explains Wim van der Poel, a researcher at the CVI Wageningen UR and professor of Emerging and Zoonotic Diseases at Liverpool.

'At Wageningen UR we are taking the investment theme Global One Health one step further. We are not just looking at infectious diseases; we also want to keep people healthy in interaction with their environment. A key factor in this respect is the need to have sufficient food and a varied diet, to build up disease resistance for instance, and hygiene, environmental conditions, water and the provision of advice are also important.'

Van der Poel gives the example of type 2 diabetes, a disease linked to consumption habits that is increasingly prevalent in developing countries. 'It is not enough to simply treat the disease. That will not stop the source of the problem; people's behaviour has to change. To achieve this through Global One Health, it is important for different disciplines to work together.'

He says Ebola forced us to face facts in that respect. A focus on nursing and developing vaccines will only get you so far. 'Cultural aspects also play a role in West Africa. People have a lot of bodily contact with the deceased during the mourning process. That exacerbated the epidemic considerably but there was insufficient recognition of this effect and it seems difficult to change,' says Van der Poel. 'We need to produce students and PhD candidates who are used to broad interdisciplinary collaboration.'