

The many forms of HN viruses

Definition of the viruses

The avian influenza virus is a small, infectious micro-organism (approximately one hundred millionth of a millimeter). It is made up of a dozen proteins and of a genome sequence segmented into 8 strands of ribonucleic acid (RNA). Like all viruses, the bird flu agent is by necessity an intracellular parasite: it can only replicate itself within a cell in which it has taken over the metabolism. To enter a cell, the virus must bind onto a specific receptor on the surface of the host cell. This capacity determines which cells are sensitive to infection and which species are vulnerable to becoming infected. Thus, influenza viruses are highly host-specific, avian viruses having much more affinity for avian cells than for human cells (and vice versa). The virus must adapt to a new species in order to jump across the species barrier.



*Traditional brooder house
in Vietnam, 2005
Vincent Porphyre, © Girad*

The influenza viruses

Members of the Orthomyxoviridae family placed in the Influenza genus, all avian influenza viruses have in common internal type A antigens.

The subtypes that affect birds are characterized by external antigens, some are haemagglutinins H (16 different kinds are known, from H1 to H16), others are neuraminidases N (9 different kinds are known, from N1 to N9).

There are 23 known H-N associations (of which 15 are found in birds) out of 135 potential ones. A slight modification or recombination of viruses of different lineages is sufficient for the creation of new and potentially virulent strains. On numerous occasions (e.g., in Italy and Mexico) H7N1 and the H5N2 strains, which initially were not very pathogenic, became extremely virulent in just a few months.

The pathogenic power of H

Numerous strains of the avian influenza virus, including the subtypes H5, H7, and H9, exist completely unnoticed in wild and domestic bird populations. In contrast, certain strains belonging to the same type may be very virulent and provoke up to 100% mortality. The pathogenicity of a strain is linked closely to the ability of haemagglutinin to cleave into two functional subunits required for the virus to penetrate the cell. This catalysis is facilitated in highly pathogenic strains by the presence of basic amino acids duplicated at the cleavage site, rendering it more accessible to the enzymes involved. Genome sequencing of the cleavage site reveals the pathogenic character of an avian influenza virus strain.



*Traditional local commerce of hunted wild birds in Mopti, Mali, 2006
Alexandre Caron, © Cirad*

A fragile virus?

If it is protected by moist organic material, the virus can survive well in the environment. It remains infectious for 4 days at 22°C, 30 days at 0°C in contaminated water, and 40 days in poultry droppings. However, it may be destroyed by exposing it to temperatures of at least 70°C for one second during the preparation of food products (meat, eggs...).