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The causal agent

Newcastle disease is a paramyxovirus (PMV-1). An important property of Newcastle disease virus is that it haemagglutinates red blood cells and this property was utilised in one of the first serological tests for the virus – the haemagglutination inhibition test – which can be used on blood samples from chickens to show exposure to Newcastle disease infection or, if the chickens have been vaccinated, the level of vaccinal immunity induced by that vaccination.

Newcastle disease virus can be inactivated by treatments including heating, irradiation, pH effects and various chemicals. The fact that cooking destroys the virus means that poultry meat and commercial egg products can be traded in the cooked form but not the fresh form from countries with Newcastle disease.

Strains of Newcastle disease virus

A strain is a defined, characterised isolate of the virus and knowing the strain of the virus can help identify where an infection came from and whether the virus is a field or vaccinal strain.

Pathogenicity

Pathogenicity varies with viral strain and the host. For example, chickens are highly susceptible showing signs and mortality, whereas the same strain infecting ducks will induce few or no clinical signs with zero mortality. Generally, the younger the chicken the more acute the disease. In nature the natural routes of infection are nasal, oral and ocular and these routes are associated more with respiratory disease. Artificial routes of infection, such as intravenous, intramuscular and intracerebral, appear to be more associated with nervous signs.

Historically, three theories seem to be implicated in the emergence of very virulent strains of Newcastle disease and these are:

- The virus has always been in poultry but was unnoticed before commercialisation of poultry production.
- The virulent virus was present in another avian species in which it showed no disease or disease with milder clinical signs.
- The virulent virus arose from a less virulent strain by mutation.

In the last 15-20 years evidence is emerging to support the third of these theories. For example, in the 1998-2000 outbreak in Australia studies showed that the virulent viruses responsible for outbreaks were very closely related to each other and to a virus of low virulence isolated from chickens in the same area.

Distribution

Nowadays the virtually universal use of Newcastle disease vaccines makes it hard to assess the true geographic distribution of Newcastle disease.

Virulent Newcastle disease is either endemic or causes regular epizootics of disease in Africa,

Asia, Central America and parts of South America. In areas where the poultry industry is more developed, such as Western Europe or North America, sporadic epizootics occur from time to time in the face of widespread vaccination.

Since Newcastle disease was identified four pandemics have occurred. These were:

- The initial outbreaks were in south east Asia and moved slowly to Europe.
- The second started in the Middle East in the 1960s and reached most countries by 1973.
- The third started following widespread use of vaccines which protected birds but allowed viral replication and spread of a virulent virus around the world in the late 1970s.
- The fourth pandemic occurred in pigeons from the 1970s when it started in the Middle East and spread rapidly to all parts of the world. Spread to chickens occurred in several countries including the UK where 20 outbreaks occurred in unvaccinated chickens fed feed contaminated with pigeon droppings.

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