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## Provision of viral diversity

Avian influenza viruses possess two properties that favour diversity within the viral population. These are a high mutation rate and the ability to reassort gene segments. Both of these provide opportunities for the avian influenza virus to rapidly change and adapt. This, in turn, enables the establishment of viral infection in new hosts.

## Antigenic drift and its implications

Influenza viruses can differ significantly in amino acid sequence, especially and specifically in their surface glycoproteins, haemagglutinin and neuraminidase. These differences in amino acid sequencing cause changes in antigenicity such that antibodies to the haemagglutinin type 1 (H1) avian influenza virus will only neutralise H1 viruses and not those of any other subtype of the virus. This obviously has real implications when it comes to vaccination as vaccinal and field strains need to be of the same H subtype. This means that many current vaccines are limited in that they provide specific subtype protection.

Changes in antibody specificity can produce viruses better able to escape/avoid the host's antibodies to control infection and this results in greater replication and transmission of these viruses (mutants). It is the accumulation of these amino acid changes at these sites that is the antigenic drift, which results in avian influenza vaccines becoming less protective over time.

## Emergence of new viruses

Comparison of viral sequences is the basis for identifying when new viral variants are occurring and the frequency of these occurrences.

From the information derived from this we can identify the best viral antigens for cross haemagglutinin studies. If human field strains in the cross haemagglutinin studies show a fourfold or greater difference in inhibition this is regarded as being indicative that the current vaccine strain could well be ineffective, as it is at this level that antibody specificity affects vaccinal protection.

Antigenic drift also occurs in poultry but its importance and interpretation is much more complicated. An additional complication is the wide variety of influenza viruses that can affect poultry.