

# Equine Flu: We Know It's Out There – Do You?

## Surveillance

Equine influenza (EI) is one of the most contagious diseases of domestic and sports horses that requires ongoing chains of transmission to persist within the equine population. However, in reality EI is not as commonly diagnosed as it should be for such a persistent and propagating infection for which there is neither a carrier state in the horse nor other natural reservoir hosts. There may be several reasons for this, including delays in owners calling vets to their horses and vets, and owners perhaps not recognising mild clinical disease such as influenza, especially in vaccinated horses.

The Animal Health Trust's (AHT) equine influenza surveillance team, supported by the Horserace Betting Levy Board (HBLB), confirmed 52 occurrences of EI in the UK in 2014 and 2015. These are of course only snapshots of the problem as many cases are not investigated, or if they are, samples may be taken too late in the infection to give a positive diagnosis.

Surveillance of any disease is vital for gaining an optimal understanding of its spread, in order to prevent its propagation locally, regionally or globally, as well as to investigate how the pathogen is evolving so that effective vaccines can be produced. As an OIE (World Organisation for Animal Health) Reference Laboratory for EI, the AHT investigates how EI viruses evolve through studying outbreaks and viral isolates from around the UK and the rest of the world. Through enhanced awareness of risk, rapid and accurate diagnoses and effective communication to inform appropriate actions to block opportunities for spread; the AHT's EI surveillance scheme aims for the successful control of EI globally.

In order to be successful in building the national and global map of virus outbreaks and strains, the surveillance scheme relies on both the HBLB's ongoing support and samples sent in by practising veterinary surgeons that have registered with the AHT's EI surveillance scheme. At the AHT, EI can be diagnosed using either quantitative PCR (applied to nasopharyngeal swabs) to detect the presence of viral RNA, or serology (paired clotted blood/serum) to detect rising antibody levels produced by the horses' immune system following infection. For a successful diagnosis, swab samples should be taken as soon as possible, within 2-3 days of a horse showing clinical signs. Paired blood samples should be taken 2-3 weeks apart, with the first sample taken as early as possible.

Veterinary surgeons signed up to the AHT's EI surveillance scheme receive free testing kits and usually receive test results within 24 hours of submission of samples to the AHT's diagnostic laboratories. Not only are vets then able to advise on the correct diagnosis and administer the most appropriate

and timely treatments, but they also provide essential viral samples to the AHT's expert scientists to investigate changes within the virus which may allow it to escape immunity provided by current vaccines, and hence spread more easily and widely among vaccinated as well as non-vaccinated horses.

The AHT scientists monitor changes in the surface glycoproteins of the virus, haemagglutinin (HA) and neuraminidase (NA), by isolating live virus from submitted swabs. Viral genes that code for HA and NA are amplified and sequenced to compare the amino acid sequences against those from the vaccine strains and other viruses circulating in different parts of the world. This helps to identify any important changes between the vaccine strains and the current circulating EI viruses. In addition to this, antigenic studies are also conducted on the new virus isolates to determine whether the vaccine strains are still likely to work against the latest circulating viral strains. Ultimately this work leads to recommendations being put forward to vaccine manufacturers to produce the most up-to-date and effective vaccines that veterinary surgeons will then use in their clients' horses.

Confirming a positive diagnosis for equine influenza is necessary in order to best manage the clinical situation, so that infectious transmission might be minimised and, where possible, steps taken to implement timely and geographically relevant booster vaccination initiatives. However, the AHT takes diagnosis one step further, by analysing the strain of the virus in order to achieve better future immunisation. To maximise the chance of isolating live virus, samples should be collected within the first few days of the horse showing clinical signs, when virus shedding is at its highest level. This also improves the chances of gaining a positive result by qPCR. It is therefore important that there is awareness regarding the ongoing persistence of EI in the UK horse population and in particular the need to sample infected animals as quickly as possible after signs develop, among horse owners as well as their veterinary surgeons. Together, owners and their vets are the most important part of the EI surveillance scheme operated by the AHT, as without them there would be no viral trail to follow.

Further details and updates are also posted on our EquiFluNet website at <http://www.equiflunet.org.uk/>

## Prevention

Vaccination is one of the most effective methods of prevention against EI, alongside effective surveillance, biosecurity and movement restriction. Several different EI vaccines are available in the UK, but the overall principles apply to all of them. EI vaccines are expected to significantly

reduce the clinical signs of disease to improve overall welfare and recovery in the case of infection, and reduce the virus shedding to limit the risk of transmission and disease propagation. However, EI vaccines rarely induce so-called sterilising immunity (i.e. no infection, no disease, no viral shedding and no seroconversion). Protection against EI induced by vaccination is mostly dependent on the production of circulating antibodies, which will recognise and neutralise the EI virus before it can infect the horse. The following elements should be taken into consideration to optimise the effectiveness of EI vaccination and subsequent protection of the horse:

- The vaccine should be stored in a cool place or as recommended in order to avoid its degradation
- The vaccine should be well agitated and thoroughly mixed before administration
- The route of administration (intra-muscular injection in most cases) and frequency of immunisation should wherever possible be respected. This is important for EI vaccines in order to maximise levels of protection
- Only horses in good health should be vaccinated
- Immuno-suppressive treatment may reduce the effect of vaccination.

Protection induced by EI vaccination will fluctuate through time:

- Protection against EI usually appears at around two weeks following the second vaccination
- Protection could significantly decrease between immunisations, especially following the second dose of the primary course of vaccination when an immunity gap frequently occurs between the second and third vaccinations. The third immunisation of the primary course is extremely important for inducing long-lived immunity
- Vaccination of the pregnant mare is useful as maternal protective antibodies will be passed to the foal through colostrum ingestion, which will provide protection to the young foal for several months after birth
- Protection induced by EI vaccination may be reduced in aged horses due to a reduction in the immune response in older animals.

As for all vaccines, administration of an EI vaccine may induce some reactions, such as transient fever and local inflammation. These reactions, which indicate that the horse's immune system is responding to vaccination, are not unexpected but should remain limited in terms of duration and severity.

The AHT immunology group is heavily involved in the evaluation, characterisation and/or registration of all EI vaccines currently licensed for sale in Europe. Several vaccine trials are conducted every year for all of the major vaccine manufacturers to understand the immune responses produced following vaccination and the protection conferred. This work plays a pivotal role in the granting of product market authorisations and to evaluate the performances of

EI vaccines.

Photographs & Videos:

Images can be requested from the AHT press office.

Additional notes:

- The Animal Health Trust (AHT) is an independent charity, employing over 200 scientists, vets and support workers. It aims to improve the health and welfare of horses, dogs and cats through research. It also provides specialist referral services and continuous education to vets. Visit the website at [www.aht.org.uk](http://www.aht.org.uk)



**Romain PAILLOT** (Diplome de l'EPHE, Ph.D)

Head of Immunology and Equine vaccine study Investigator, Animal Health Trust (AHT)

Romain's main research looks at equine immunity and equine respiratory pathogens (EIV, EHV and Streptococci). His work aims to improve our understanding of immunity induced by the pathogens during infection and by vaccination. Romain's research also seeks to elucidate specific mechanisms used by pathogens to evade or

deregulate the equine immune response (primarily streptococcal superantigens). He is strongly involved with veterinary vaccine manufacturers in the evaluation of equine influenza vaccines.

Romain Paillot's research career began in 1995 in the field of transplantation Immunology. He studied the immunosuppressive drug methotrexate and described a new mechanism of action. From 1998 to 2004, he worked in the Discovery Research Department for a Veterinary Vaccine Manufacturer to develop new immunological assays in several veterinary species.

In 2004, Romain moved to the Animal Health Trust to start a PhD on cell mediated immunity induced by EIV and EHV-1. He held the position of Immunology Team Leader in the department of infectious diseases at the AHT from 2007 to 2012. His work focused on immunity and protection induced by several modern equine vaccines. Recently, several superantigens produced by *Streptococcus equi* and *Streptococcus zooepidemicus* were identified and investigated.

Dr Paillot is currently Head of Immunology and now runs his own research group as well as being strongly involved with all European Veterinary Vaccine Manufacturers for the evaluation, characterisation and/or registration of equine influenza vaccines. Since June 2013, Romain developed a collaborative research program between the U2RM unit of the University of Caen Basse-Normandie, the Frank Duncombe Laboratory and the AHT in order to investigate field poor-response to equine influenza vaccination (Chair of Excellence, Equine Immunology).

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Adam Rash has a BSc degree in Biomedical Science and is currently a Research Assistant at the AHT working towards his Phd. He has worked in the virology group on the AHT Equine Influenza Surveillance programme since 2006.

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