# FOCUS ARTICLE

## Equine Veterinary Surveillance Network (EVSNET) for the UK horse population

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### Importance of equine disease surveillance

Animal health surveillance is defined as "the systematic (continuous or repeated) measurement, collection, collation, analysis, interpretation, and timely dissemination of animal-health and -welfare data from defined populations. These data are essential for describing health-hazard occurrence and to contribute to the planning, implementation, and evaluation of risk-mitigation actions" (Hoinville et al., 2013). Animal and human health surveillance have an important role in health care and provide essential information for management and prevention of disease. Surveillance data have been utilised for developing policies, guidelines and protocols, early detection and prevention of epidemics as well as for disease management, treatment, control and prevention (World Health Organization, 2000; Public Health England, 2017; UK Surveillance Forum, 2020).

Accurate and reliable equine health and disease surveillance is important for the detection of emerging diseases and re-emerging endemic diseases. Rapid and actionable data on diseases can help to minimize the consequences of an outbreak. For infectious diseases (such as, equine herpes virus, equine influenza [EI], strangles), surveillance will enable effective management, control and prevention. For example, EI is highly contagious and can result in significant economic losses; surveillance programmes are necessary to inform on outbreaks, antigenic variants and on the necessary control strategies (Cullinane et al., 2010). Other specific diseases with zoonotic potential have public health implications, and equine surveillance has the potential to support human disease control. An example of this is West Nile virus, where the horse could serve as sentinels for human infection (Leblond et al., 2007). Surveillance systems can also provide vital population health data to facilitate research into specific diseases which may investigate the risk factors, pertinent history, clinical information, utility of diagnostic methods, treatment efficacy and management/ prevention strategies.

Traditional equine surveillance efforts have been based on passive reporting of laboratory diagnostic test results and disease reporting by clinicians/ owners and often focused on a particular disease of interest or a list of notifiable diseases. Such systems are reliant on the veterinarian suspecting the disease in the first instance, the availability of reliable antemortem diagnostic testing and client's financial means to afford confirmatory diagnostics. The under reporting of cases frequently associated with such systems may reduce the responsiveness of surveillance, and delay outbreak detection (Dórea et al., 2011; Wagner et al., 2001).

Syndromic surveillance seeks to address some of these limitations and has been increasingly utilised in human (Public Health England, 2021) and small animal medicine (SAVSNET, 2021; VetCompass, 2021). Such surveillance utilises real-time, continuous, health-related data which precedes a definitive diagnosis (Dórea et al., 2011; Katz et al., 2011; Hoinville et al., 2013).

### Traditional/disease-specific UK equine surveillance

Equine surveillance systems exist based on reporting laboratory diagnostics on an aggregate level (e.g., DEFRA [Department for Environment, Food and Rural Affairs] quarterly surveillance reports currently) and reporting of specific disease (e.g., notifiable diseases, EI, strangles and Equine Grass Sickness [EGS]). Below are some examples of these equine surveillance systems implemented in the UK.

The International Collating Centre (ICC) generates equine infectious disease outbreak reports (ICC, 2021) with many countries feeding into this international surveillance effort. The surveillance data from the UK are generated with a combined effort between the government (DEFRA), British

Equine Veterinary Association (BEVA) and historically the Animal Health Trust (AHT). They work with the majority of UK diagnostic laboratories to generate aggregate data on a specific subset of equine diseases and report the number of positive diagnostic laboratory test results.

Other government-based initiatives include the Veterinary Antimicrobial Resistance and Sales Surveillance (VARSS) which is a collection of reports of UK antimicrobial wholesales and antimicrobial resistance data (UK-VARSS, 2020). The Veterinary Medicine Directorate (VMD) collates antimicrobial resistance data from clinical submissions for culture and antimicrobial sensitivity profiling to government laboratories, however, the use of government laboratories and submissions from horses are low and hence this is unlikely to accurately reflect the UK horse population. Equine clinicians more frequently utilise private and commercial laboratories and the value of these data in monitoring antimicrobial resistance patterns of relevant bacteria in equines has recently been demonstrated (Isgren et al., 2021), although ongoing surveillance is now needed to understand emerging and changing patterns of resistance.

There are also disease surveillance efforts for specific infectious diseases such as, EI (EquiFluNet, 2021) and Strangles (Surveillance of Equine Strangles [SES], 2021). EquiFluNet provides regional information of UK cases and outbreaks. SES project collates data from UK laboratories and also contains information on regional outbreaks. Furthermore, the diagnostic laboratories also submit isolates to the project for sequencing and antigenic characterisation.

Other surveillance systems are based on voluntary questionnaire reporting of specific diseases such as EGS (Equine Grass Sickness Fund [EGSF], 2021). This scheme collates owner and veterinarian reported cases of EGS of both confirmed and suspected cases. This has limitations of unknown data reliability, it is time consuming for the participant and relies on the willingness to report confirmed and suspected cases.

## Syndromic surveillance

Syndromic surveillance is the process of collecting and interpreting health-related data to provide an early warning of a health threat and often uses health-related data that precedes a definitive diagnosis. This may be a less specific method (unconfirmed cases), but it has an improved timeliness which is important for near-real-time warning systems (Dórea et al., 2011).

The rapid digitalisation of health records provides a new "big data" resource for research and surveillance. Syndromic surveillance utilising electronic health records (EHRs) from general practice and hospital records has been widely rolled out in human medicine and enables accessible data for surveillance and research into priority areas (NHS, 2018; NHS Digital, 2018; Public Health England, 2021). Although there have been studies that have affirmed the value of EHR data in equine veterinary medicine (Welsh et al., 2016; Welsh et al., 2017; Allen et al., 2018; Duz et al., 2019), the potential health and welfare benefits that would come from large-scale, continuous national EHR surveillance system for horses are still lacking. In contrast in the small animal sector, there are established nationwide UK surveillance systems that utilise EHRs e.g., VetCompass from the Royal Veterinary College and Small Animal Veterinary Surveillance Network (SAVSNET) from the University of Liverpool.

## Integrated surveillance efforts

An integrated surveillance approach utilising both laboratory data and EHR data would provide complementary data. Syndromic reporting from the EHR enables immediate reporting (suspected cases, which will enable an immediate response trigger) and facilitates the wider detection of emerging disease conditions. Laboratory data are useful for monitoring temporal and spatial changes in known pathogens and for confirmation of cases and can act as a source of clinical diagnostic material that may be used to inform on novel and emerging infectious diseases.

An example of such a complementary, integrated surveillance effort was illustrated in an approach to an outbreak of severe vomiting associated with a canine enteric coronavirus variant, which was detected and investigated by SAVSNET (Radford et al., 2021). A triangulation of data were obtained from EHRs for dogs presented for gastroenteric reasons to participating sentinel small animal veterinary practices, including treatment data, a bespoke questionnaire and diagnostic laboratory data (including microbiological and genomic analyses) (Radford et al., 2021). This highlights the value of real-time analysis of the syndromic data extracted from the EHRs for early detection of a novel disease in a population which may have been otherwise overlooked in the absence of this

multidisciplinary surveillance approach (Radford et al., 2021).

## A new equine surveillance initiative

The Equine Veterinary Surveillance Network (**EVSNET**) is a new project aiming to develop an equine surveillance system that will harness electronic health data for rapid and actionable research and surveillance in the UK equine population (Figure 2). This initiative at the University of Liverpool and funded by The Horse Trust aims to build on the success of SAVSNET.

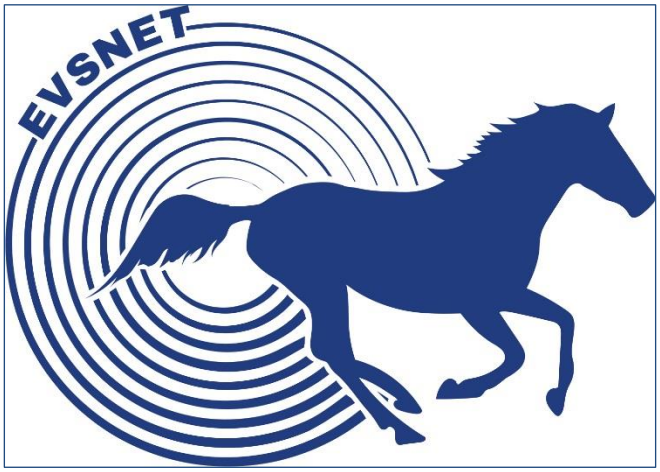


**Figure 2:** Equine Veterinary Surveillance Network (EVSNET) for the UK horse population logo.

SAVSNET surveillance utility has been proven and we believe these approaches and tools will be of real value for the equine veterinary sector. Examples from SAVSNET can be accessed:

- Further information about SAVSNET laboratory data can be found here: https://www.liverpool.ac.uk/savsnet/about/savsnet-lab/
- A demonstration of real-time use of laboratory data here: https://www.liverpool.ac.uk/savsnet/real-time-data/
- Example of SAVSNET-Vet benchmarking portal for the veterinary practitioner can be found here: https://www.liverpool.ac.uk/savsnet/taking-part/information-for-veterinary-practices/savsnet-portal/

**EVSNET** will also use two distinct but complementary approaches:

- **EVSNET-Lab:** Routinely collected data from collaborating laboratories to understand and monitor the diseases affecting the equine population. Data fields collected for the samples may include the horse's signalment, practice postcode, type of sample and date taken/analysed. Test specific information includes assay type, assay method, results and interpretation.
- **EVSNET-Vet:** Collect data from EHRs from a sentinel network of collaborating equine veterinary practitioners. In addition to collecting the full EHR we would integrate an EVSNET main presenting complaint (MPC) window in the practice management system (PMS) to facilitate syndromic surveillance (Figure 3). This will be a single click function. Data flow will be automatic through the PMS without the need for the veterinary surgeon to input additional data or initiate submission. EVSNET-Vet consent for owners will be on an opt-out basis (similar to processes in the NHS and SAVSNET) and all data will be de-identified and anonymous at publication.

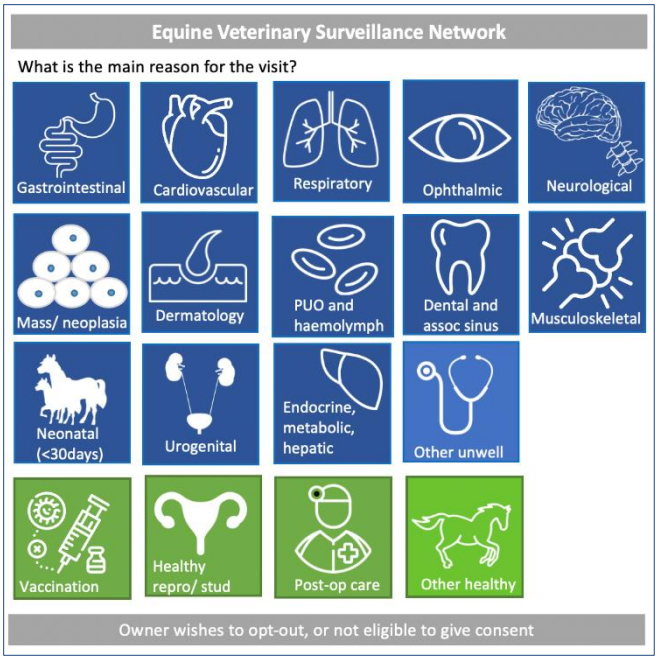


**Figure 3:** Equine Veterinary Surveillance Network (EVSNET) mock up (draft) of the main presenting complaint window used for syndromic monitoring. *Abbreviations: assoc – associated; PUO – pyrexia of unknown origin; repro – reproduction; post-op – post-operative; haemolymph – haemolymphatic.*

The vision for EVSNET is improved ability to respond to a wide variety of challenges in equine health and welfare and to contribute to evidence-based medicine in equine veterinary practice including:

- Enhanced syndromic surveillance to facilitate identification of emerging and remerging endemic and exotic diseases in the UK equine population.
- Monitoring diseases and syndromes in horses over time including trends in key

equine pathogens and identifying populations at risk.
- Enhanced surveillance on antimicrobial use and antimicrobial resistance to inform stewardship.
- Research specific equine diseases and monitor treatment responses and outcomes.
- Providing ethically sourced data resources for researchers, veterinarians, horse owners and others.

Since EVSNET launched in September 2020, we have obtained University of Liverpool ethical approval for EVSNET-Lab and are in the process of formulating ethical approval for the EVSNET-Vet arm of the project. EVSNET will operate under strict ethical guidelines, will be fully GDPR compliant and aims to provide maximum benefit throughout the equine industry.

Participation in EVSNET-Vet and EVSNET-Lab brings numerous benefits for those involved including near automated data extraction, access to free enhanced benchmarking tools and data and involvement in contributing to evidence-based veterinary medicine.

We are currently enrolling equine diagnostic laboratories and if you are a laboratory and would like to contribute, please contact us at evsnet@liverpool.ac.uk. If you are a veterinarian and are interested in contributing practice data, please also contact us to take part. Our aim for EVSNET is to facilitate and enhance data submission to the DEFRA Equine Quarterly Disease Surveillance Report.

We hope you will join us in this endeavour to provide new opportunities to improve the health and welfare of the equine population and protect it from emerging threats and to add to the evidence base for equine research and surveillance.

**The Equine Veterinary Surveillance Network**
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**Important Note**
The views expressed in this focus article are the author's own and should not be interpreted as official statements of Defra or BEVA.