![Animal & Plant Health Agency logo]

Annual Science and Evidence Review 2020

Summary Report

August 2021

OGL

Contents

1. Introduction

This document sets out a summary of science highlights achieved throughout the year in support of the refreshed Animal and Plant Health Agency (APHA) [Science Strategy 2021-2026.](#)

Important achievements are also published regularly on the [APHA science blog](#) on GOV.UK. The aim of the blog is to improve the communication of our science to a wider audience. It covers a range of scientific highlights from special interest stories on our scientists through to more detailed reports on the excellent science we do.

2. Foreword

As part of the government's budget announcement in March 2020, APHA received substantial financial investment to redevelop and future proof the specialist research and laboratory facilities at Weybridge. The financial commitment also highlights the importance of the agency, our global reputation as experts in animal and plant health science and the critical role we have in protecting the UK and the economy from animal and zoonotic disease risk. This has been a year like no other:

a) We have dealt with the largest outbreak of avian influenza (AI) in the UK, sustained over many months.

b) The UK left the European Union at the end of January 2020, a number of functions have been repatriated and are now delivered by APHA.

c) The COVID-19 pandemic has tested us all personally and at work. APHA's flexible science capability has been used to support the pandemic response and protect the nation.

Capability has been strengthened to deliver our increased scientific responsibilities, enhance resilience and international links.

In the summer of 2020 APHA was awarded UKRI designation as a Public Sector Research Establishment (PSRE), allowing for diversification of funding streams and aiding academic collaboration.

Dr Kath Webster

APHA Director of Scientific Services

3. Science Key Achievements

Animal and Zoonotic Viral Diseases Portfolio (AZVDP)

APHA's UK National Reference Laboratory for Avian Virology and Mammalian Influenza has contributed to a torrent of outbreak investigations this year, enabling the national network of scientific expertise, laboratory testing, field staff and innovative approaches to respond to the highest level of bird flu outbreaks seen to date, in order to protect our poultry industry and the food that we eat.

APHA African swine fever specialists have taken great steps forward to undertake targeted research and testing, in association with other world-renowned institutions to enhance the UK's response to the threat of an African Swine Fever (ASF) epidemic, which could decimate the UK pork industry.

The Mammalian Virology team have utilised a model for Hepatitis E virus (HEV) infection in pigs, for a better understanding of HEV transmission to assist Defra, PHE, Food Standards Agency (FSA) and industry with hypothesis driven studies in both the laboratory and field settings to investigate dissemination in medium to longer term scenarios.

APHA also has wildlife experts who have identified harmful viruses in much-loved wildlife, such as Stone Martins, Squirrels, Hedgehogs and Bats. This work will directly support the conservation of these species and help focus the impact of disease on biodiversity within our own wildlife.

Other APHA virologists have used APHA's state-of-the-art laboratory techniques to detect and study vector borne viral diseases such as Zika, Usutu (USUV) and tick-borne viruses, amongst others, helping to safeguard animal and public health.

Bacterial Diseases and Food Safety (BDFS) Portfolio

Surveillance and outbreak response to protect animal health from notifiable bacterial diseases and minimise risk to public health from endemic zoonoses, toxins and antibiotic resistance in livestock and food continued through the year, following adaption for COVID-19 security. There was some evidence of impact of COVID-19 restrictions on surveillance trends.

A case of Contagious Equine Metritis (CEM) was diagnosed from a pre-breeding test on an imported stallion in Scotland. This was the first case in the UK since 2012. The organism was cultured and provisionally identified by a private laboratory, and sent to APHA Penrith the national reference laboratory where its identity was confirmed by PCR.

The current status of *Salmonella* in UK pig herds and evidence on which interventions would reduce *Salmonella* in pigs and their cost-effectiveness was assessed. The evidence has led to a *Salmonella* [vaccine being licensed and available in the UK](#) and advice given to pig production companies on its use for control of *Salmonella*.

APHA has worked closely with PHE on an emerging public health and animal health and welfare issue in imported rescue dogs and puppies infected with *Brucella canis*. During 2020 there were 10 separate *B. canis* cases, many of which comprised multiple dogs and premises and many human contacts. All of these cases were associated within imported dogs, primarily from Eastern Europe. Prior to 2020 there had only ever been three reported dogs with *B. canis* in GB (these were also imports from Eastern Europe). One of the 2020 cases involved the first confirmed instance of within GB dog to dog transmission of disease and also transmission between premises. Human *B. canis* serological testing has been carried out by APHA, at the Brucella Reference Laboratory, to support PHE's surveillance of people in contact with infected dogs as there is no alternative national capability.

The APHA is designated as a [Reference Centre for Antimicrobial Resistance (AMR)](#) by the Food and Agriculture Organisation of the UN (FAO), in partnership with Veterinary Medicines Directorate (VMD) and Centre for Environment, Fisheries and Aquaculture Science (Cefas). The Reference Centre's first annual report was submitted to FAO in November 2020 and summarised the delivery of in-country scoping visits, technical and scientific training sessions, and policy and governance support to ten countries: Bangladesh, Ghana, Nigeria, Laos, Philippines, Ethiopia, The Gambia, Qatar, Oman, and United Arab Emirates. During the COVID-19 pandemic the Reference Centre continued to support its international partners in 2020, for example as host institute for two Nigerian Fleming Fund professional fellows, supporting their development and the building of strong One Health communities of practice.

One Health is integral to **APHA science**

"Working with partners across animal-food-human and the environment interfaces protects health from unsafe food and the threat of untreatable disease due to antibiotic resistance."

Sarah Evans
Lead Scientist for Bacterial Diseases & Food Safety

Bovine Tuberculosis (bTB)

Many colleagues across the APHA contributed to government's response to the Godfray Review of the bTB Strategy for England published on 5 March 2020. The full response and an executive summary are available on gov.uk.

Defra's ambitions as set out in the response to Godfray (2020), pillar 2: 'Improving diagnostics, surveillance and epidemiology to root out bTB', also include a number of measures to increase the use of increased sensitivity tests and/or combinations of tests. This will include a significant increase to the demand (and hence the need for capability) for Interferon Gamma testing and faster confirmatory tests. In response to this policy need, APHA are investing in the capability by bringing online a third gamma testing laboratory and rollout of a PCR confirmatory test.

APHA received the required Animal Test Certificate's (ATC) approval from the VMD to proceed with field trials for the Cattle BCG vaccine and associated DIVA (Differentiating Infected amongst Vaccinated Animals) skin test. This is a highly complex programme of work to facilitate Her Majesty's Government (HMG) response to the Godfray review (2020) 'Acceleration of work to develop a deployable cattle bTB vaccine as part of a wider programme of bTB research'.

The agency worked to mitigate the effect of COVID-19 pandemic on the integrity of the GB cattle TB testing programme. TB skin testing was reduced by c. 8% in the year compared to 2019, despite the impact of COVID-19 lockdown and further restrictions. Over 285, 000 samples were submitted for gamma testing during 2020, only a 14% reduction on 2019.

International Science Development

Throughout 2020 the APHA International Science Development Team's (ISD), principal focus was preparing for European Union (EU) Exit Day 1 at the end of the Transition Period in December 2020. The ISD team has taken an oversight and coordination role for EU Exit readiness that has ensured various parts of the APHA Science Directorate (SD) were fully prepared for EU Exit by working across the agency and in liaising with various Defra project boards.

In preparation for the new EU Animal Health Regulations in 2021, Defra has assigned APHA as the National Reference Laboratory (NRL) for 22 additional pathogens and Designated Laboratory (DL) for 4 additional pathogens, enhancing our visibility nationally and internationally.

Scientific expertise, advice and world-class laboratory testing provided by the Animal and Plant Health Agency, have helped deliver 1000 breeding pigs to China despite COVID and EU Exit. APHA's collaboration with the industry ensured that the pigs arrived healthy and disease-free improving China's breeding stock and the new export relationship between the UK and China.

APHA were successful in a One Health technical assistance programme bid for Official Development Assistance (ODA) funding with a specific focus on Food Safety & Security and Preparedness for Pandemic Disease. This was a cross-agency project running until March 2021, with Ghana, Bangladesh, Ethiopia and Egypt, broadening global engagement and outreach
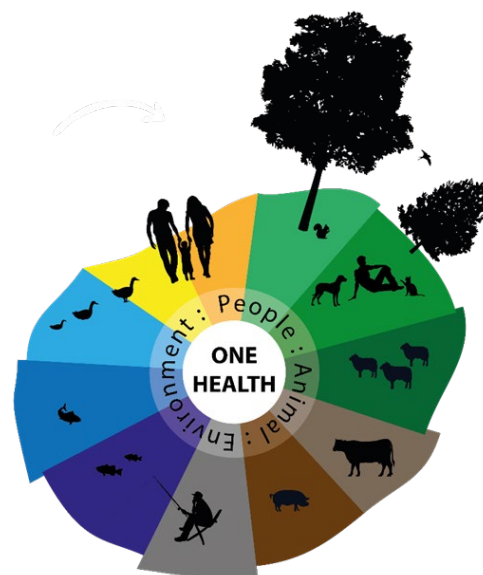
Plant and Bee Health

In 2020 APHA performed 6,850 plant health inspections at nurseries, distribution, wholesalers and retail sites. This surveillance resulted in numerous findings including: First findings of Tomato Brown Rugose Fruit Virus at a number of tomato fruit production sites and the first finding of *Eriophyidae* mites detected on leaves and stems of *Agapanthus praecox* at a Hereford nursery. The mite is believed to be a new species and resulted in significant tracing activity at other Agapathus growers. Risk assessment, the success of treatment and findings at other sites indicating widespread distribution resulted in a policy decision to allow industry to take responsibility for this problem.

2020 saw a reduction in confirmed incursions of Asian Hornet (*Vespa Velutina*) into the

The invasive Asian Hornet that poses a risk to the UK's bees and pollinators.

UK. Between July and September, APHA's National Bee Unit (NBU) responded to just one incursion involving this non-native species, where a nest had been established. Inspectors used track and trace, with the use of hornets trained to bait stations to locate nests and are currently in the process of testing an NBU and APHA developed track and trace app for use by inspectors in the field. This will improve track and trace efficiency during outbreaks.

Over the last year, the Plant Health and Seeds Inspectorate (PHSI) received advanced notification of the landing of 143,753 consignments of controlled goods of which 66,044 were subject to physical checks. This is 34,705 more consignments than 2019 figures. A total of 55,880 Inspections were performed on this regulated material, 310 consignments

failed physical plant health checks (0.5%) and 37 (0.03%) due to the document issues. These failure rates were slightly lower than the previous year. In addition PHSI also conducted 1,082 inspections on non-regulated cargo and 3,250 inspections on packages at postal depots. Most activities were performed to meet EU statutory requirements; however, others are to meet wider plant health biosecurity threats such as against new and emerging pests and diseases.

COVID-19 Activities

During 2020 APHA played a significant role in the COVID-19 response within the UK, helping to set up and run key laboratories, develop new relationships with The Department of Health and Social Care (DHSC) and rapidly innovate new testing approaches for COVID in humans and in animals.
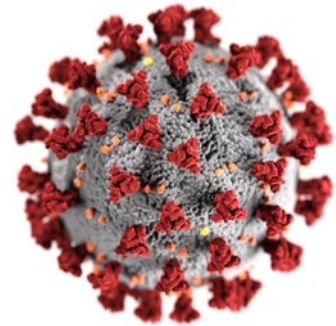
The APHA Animal Health Advices Service (AS) Team produced a joint Risk Assessment with Defra policy, contributing to the Human and Animal Infections and Risk Surveillance Group (HAIRS) Risk Assessment on SARS-CoV-2 in animals, particularly pets and drafting the Official Veterinarian Briefing 2020/18 with the case definition for pets and official sampling. Work was also undertaken on SARS-CoV-2 with the development of detection tool boxes for animal infections at the interface with humans. This included ferret studies and an options paper developed to assess susceptible species for mitigating infection risks. This proved useful in the light of the subsequent discovery of the detection of mink infections and viral variants across Europe.

A team from the Department of Epidemiological Sciences (DES) and the EpiRisk group provided a risk assessment for the introduction of SARS-CoV-2 to the UK via human international air travel. This work was commissioned by PHE and provided a valuable opportunity for data scientists at APHA to utilise their expertise in the ongoing pandemic. This work has been submitted for publication and received a Civil Service Awards in the Science Category.

This work, ensures that APHA, in collaboration with the whole of Government and academia, is contributing to a One Health approach to keep our nation secure and provide rapid world-class response in the event of future outbreaks. Additionally it has further developed the capability of APHA teams and demonstrated the value of our skilled, multidisciplinary and flexible science resource.

Surveillance Intelligence

Cases of acorn toxicity, resulting in renal failure in sheep have been diagnosed during the autumn of 2020 across the surveillance network. 2020 was a "mast year" for Oak trees

(*Quercus spp)* resulting in a bumper crop of acorns. This excess production occurs nationally every 5-10 years and is suggested to allow increased numbers of saplings to germinate.

Non-suppurative myocarditis in a young pig was found to be associated with positive porcine circovirus 3 (PCV3) labelling by *in situ* hybridization during investigation of a wider disease issue confirmed as *Klebsiella pneumoniae* septicaemia. This finding prompted enhanced surveillance through scanning surveillance submissions to investigate the occurrence of non-suppurative myocarditis in postnatal pigs, and its potential association with porcine circoviruses 2 and 3. Up until the end of 2020, outbreaks (as opposed to single pigs with inflammatory lesions) of disease associated with PCV3 had only been identified in APHA submissions from three breeding herds (in 2014, 2018 and 2020) with increased non-viable neonates and/or stillbirths, some with limb deformity. The enhanced PCV3 surveillance will aid understanding of the frequency of detection of this virus in pigs with myocardial inflammation and help assessment of its clinical relevance.

Unusual diagnoses recorded in small and backyard flocks have included two cases of inclusion body hepatitis (IBH), caused by fowl adenovirus (FAdV) identified in non-commercial flocks. This illustrates the value of surveillance, as presence of IBH in a small flock raises the possibility of a new FAdV strain emerging. Although strain identification was not undertaken in this flock, APHA is monitoring the situation carefully for changes in the pattern of IBH in commercial poultry.

Earlier in the summer of 2020 one of our partners, the Institute of Zoology, identified mortality in blackbirds (*Turdus merula*) found dead in London through scanning surveillance and the Garden Wildlife Health scheme, from which APHA diagnosed Usutu virus (USUV) for the first time in the UK. APHA have been aware of this potential threat for some time, as a result of horizon scanning activities and recognising that it has become endemic on the European continent. Collaborative (Institute of Zoology (IoZ), Zoological Society of London (ZSL) and PHE) follow-up detected USUV in mosquito vectors indicating circulation over the season and additional funding has been sought to determine if overwintering is possible into 2021.

Enhancing Surveillance and Improving Outbreak Response

During 2020 many of the key personnel that work on this portfolio were redirected to work on COVID-19 response activities and in addition provided a full National Emergency Epidemiology Group (NEEG) response to the Highly Pathogenic Avian Influenza (HPAI) H5N8 outbreak across GB (2020 – 2021). These personnel included experts in Risk

Assessment and Analysis, Epidemiology, Mathematical Modelling and Project Management and they made use of techniques, methodologies and tools developed as part of this portfolio.

Following significant changes to dog movements into the UK from a number of European countries a Quantitative Risk Assessment on the likelihood of rabies introduction into the United Kingdom via the entry of dogs from European Union Member states has been updated and produced for Defra and the Devolved Administrations. The results demonstrate that whilst the annual probability of rabies entering the UK from European Union Member States is currently very low, evidence of increasingly high number of dogs of unknown provenance entering the UK raises the concern that the risk of other pathogens, such as *Leishmania* and *Echinococcus multilocularis* , entering the UK is increasing.

Prior to COVID restrictions being imposed, APHA hosted the 'One Health: Strengthening Animal & Plant Health Surveillance' Conference on the 26th February 2020 in Weybridge, Surrey. This is the first time the Surveillance Intelligence Forum extended the reach to external surveillance providers, including representatives from across government, the Devolved Administrations, academia and the industry sector, receiving very positive feedback. The event welcomed over 80 participants, with representation across the agricultural sector, providing an excellent opportunity for building professional networks as well as providing information on the cutting edge of surveillance developments. Different aspects of the One Health approach were explored in three sessions, and covered all areas from terrestrial and aquatic animal health, plant health and biodiversity, new technologies and public health.

TSE (Transmissible Spongiform Encephalopathies)

The use of animal proteins in animal feeds is strictly regulated. As APHA's role as National Reference Laboratory for animal protein detection in feedstuffs three significant feed testing incidents were investigated in 2020 with additional testing performed at Weybridge and Penrith, which were cleared swiftly and restrictions lifted, resulting in an award for the testing teams.

Camelid prion disease, first detected in camels in Algeria in 2018, remains the most recently diagnosed TSE. An assessment by APHA staff of the probability of entry of this pathogen into the United Kingdom suggested that potentially contaminated products were associated with the highest risk, particularly legal milk and cheese imports and illegal meat, milk and cheese products.

Work was started in 2020 to optimise the highly sensitive real-time quaking-induced conversion (RT-QuIC) assay for detection of prions. This requires generation of recombinant prion protein as substrate, and proteins from different species are currently evaluated for use in this method. RT-QuIC has become a promising method to detect and discriminate TSE isolates in minute quantities and may provide an alternative, quick and sensitive *in vitro* method to bioassays in live animals to address research questions.

Wildlife

The NRL for *Trichinella* and *Echinococcus*, run from Sand Hutton, continued to submit data, via the European Food Safety Authority (EFSA), to the European Commission as supportive evidence to allow the UK to retain its *Echinococcus*- free listing. We are awaiting to see if this reporting to EFSA will continue after the transition period. In 2020, 464 fox faecal samples were processed, all negative for *E. multilocularis*. The NRL, through a memorandum of understanding with the FSA, also tested wild boar supplied by wild game hunters for *Trichinella* species. A total of 687 wild boar meat samples were analysed in 2020, all of which tested negative for *Trichinella*. Following a new contract with Food Standards Scotland, an additional 16 Scottish samples were also tested and found to be negative for *Trichinella*.

Our modelling team also delivered the latest round of work on the EFSA funded ENETWild project (Wild boar distributions in Europe). This includes an analysis of the wild boar-domestic pig interface across Europe. The mammal recording app – iMammalia was launched in October 2019 and has recorded over 6700 mammal sightings by the end of 2020 despite COVID lockdown restrictions. The camera trapping platform MammalWeb launched European projects in late 2019 and has received over 50,000 image sequences by the end of 2020. Both these projects ran in a small number of selected countries and are slowly being expanded. The FAO supplied additional funding for iMammalia to translate it into Serbian and Macedonian, and add the functionality to report wild boar carcasses that can be used by local authorities to investigate possible ASF deaths. A paper modelling ASF in the UK Forest of Dean was published demonstrating that ASF was unlikely to be self-sustaining in the isolated population.

The National Wildlife Management Centre (NWMC) completed its project on the fertility control for managing free-living feral cattle and buffaloes in Hong Kong. This demonstrated the success of using fertility control (Gonacon) in cattle with a second booster making 100% of cattle infertile for at least one year. A model was produced to determine the effort required to achieve zero population growth.

At the start of the AI outbreak in 2020, NWMC staff re-organised the delivery of ornithological support of outbreak sites. A three phased approach (desk top assessment for most cases, a field survey for complex cases and the preparation of in-house ornithology training) was developed and deployed, permitting a rapid response that was found to be invaluable to decision-makers managing outbreaks and during the NEEG meetings that discuss the epidemiology of the cases.

High Throughput Sequencing (HTS)

Utilizing HTS to characterize the whole genome sequence (WGS) of pathogens for routine surveillance and outbreak response has been gaining traction over recent years. Whilst the laboratory part of the process has previously been accredited to ISO17025, this year has seen a focus placed on ensuring that the data analysis processes are robust.

TB WGS Phase1 – 'implementing WGS as a business as usual tool' has been completed. The new WGS Clade ID has replaced the old genotype code, and the additional data will provide greater resolution to differentiate between the highly related TB isolates. This project has involved a cross-agency team implementing new lab systems; a bespoke bioinformatics pipeline to handle the WGS 'big data' from the sequencing process; updating the Laboratory Information Management System (LIMS) and other APHA outwardly facing tools.

Molecular biology and rapid WGS have again played an important part in the AI outbreak over the winter months and continuing into 2021. Presence of the virus itself is confirmed by detection of nucleic acid which is specific to the virus by PCR. This has been supplemented with HTS of selected samples to generate complete genome data leading to a better appreciation of how the virus is evolving and being transmitted.

Use of WGS, field investigations and expert knowledge of the poultry industry has supported PHE and the FSA in outbreak control, limiting the impact of *Salmonella* Enteritidis in imported hatching eggs, free-range laying flocks and egg packing centres. Major developments were made in molecular epidemiology that significantly increase our capability to track and trace the origins of outbreaks of zoonotic diseases. We have continued to explore the use of WGS data to determine antimicrobial resistance. WGS offers the advantage of being able to screen bacteria for multiple genes, mobile genetic elements and mutations, which can help predict susceptibility to antimicrobials and 'epidemic potential'. WGS is increasingly used to assess the risk posed by newly identified resistance genes. A number of investigations were carried with PHE to assess potential threats detected through veterinary surveillance, including in raw meat pet food.

The Defra DNA Centre of Excellence brings together molecular biologists from across the Defra group; APHA, Cefas, Environment Agency, Natural England, Forest Research, Kew, Marine Management Organisation (MMO), Forestry England, Joint Nature Conservation Committee (JNCC) and core Defra, to provide a focal point of leadership for DNA

technology uptake, deployment and utilization. APHA's experience in the area is widely recognised, as the Centre of Excellence (CoE) looks to build expertise and capacity to apply molecular methods to many areas of Defra's overarching remit.

Epidemiology

Epidemiology is a critical discipline and skillset used within APHA. One key example is the re-emergence of H5N8 Highly Pathogenic Avian Influenza initially detected in Kazakhstan and Russia. Newly developed links with competent authorities in Kazakhstan provided an opportunity to study the virus earlier and data scientists from epidemiology and virology workgroups provided genetic and GIS (geographic information system) analysis. The subsequent spread to wild birds and poultry in the UK via migratory birds from Eurasia demonstrated the ability of APHA data scientists to gather essential evidence for policymakers on disease eradication in a timely manner. Outbreak conditions show how quantitative approaches support field epidemiology and diagnostics through collaboration and empirical outputs.

Within the area of food safety and zoonoses, epidemiological input continued to be provided on surveillance design and reporting as well as outbreak investigations in livestock linked with human illness with PHE.

The APHA is part of an OIE (World Organisation for Animal Health) Collaborating Centre in Risk Analysis and Modelling in collaboration with the Royal Veterinary College (RVC). As part of this Centre, work has commenced on the development of a training programme. An APHA risk analyst was invited to be a member of an *ad-hoc* OIE workgroup for COVID-19.

The delivery of high quality research and training continued to be a focus. An example of this are research studies into *Salmonella* and Hepatitis E virus in pigs with European partners, which combines complex analysis of data from previous studies; different types of field studies; and expert opinion workshops. The results will provide key evidence of which biosecurity measures at farm and slaughterhouse help control these pathogens.

A mathematical model was built to represent transmission of a pathogen within and between pig farms. This model can represent the impact of a range of control measures on the spread of infection, as well as a range of surveillance strategies. GEM-pigs (Generic Epidemiological Model) has detailed representation of different production stages so is better able to model endemic diseases that do not have rapid spread through the herd.

Publications, representation and qualifications

Publishing in scientific journals is a key objective for APHA scientists and is almost always an important objective in any research project we work on. Whilst we aim to publish in top scientific journals wherever possible we are also mindful that APHA's science is predominantly applied, translational and customer focused. This means that some of our work will be published in trade journals or as information booklets etc. – essentially somewhere that is accessible to our wide range of stakeholders.

In terms of peer reviewed publications, we have maintained a good publication rate with the publication of 212 papers across all our science portfolios. This number is a 10% decrease from 2019, attributed to the challenges of COVID during 2020. Of the 212 we were lead author on 51.8%.

We have continued with our apprenticeship programme – offering programmes in Bioinformatics, Data Science, Laboratory and Animal Technician as well as Leadership, Digital and Marketing. We continue to investigate other appropriate apprenticeships such as Systems Design Thinking and MBA apprenticeships.

Twenty five staff from APHA or studentships linked with APHA were undertaking PhDs during 2020, twenty one had already registered before 2020 and four new PhDs were registered in 2020. In addition, twenty two are undertaking MScs including eight registered in 2020.

We continue to develop our representation on appropriate national committees (247 representatives on 147 committees) and international committees (146 representatives on 127 committees) demonstrating the strong scientific reputation of APHA and our scientists. Appropriate representation and influence at international level is increasingly important particularly now that the UK has left the EU.

4. Glossary

Term	Description
AI	Avian Influenza
AMR	Antimicrobial Resistance
APHA	Animal and Plant Health Agency
AS	Advices Services
ASF	African Swine Fever
AZVDP	Animal and Zoonotic Viral Diseases Portfolio
BDFS	Bacterial Diseases and Food Safety Portfolio
bTB	Bovine Tuberculosis
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CEM	Contagious Equine Metritis
CoE	Centre of Excellence
DES	Department of Epidemiological Sciences
DHSC	Department of Health and Social Care
DIVA	Differentiating Infected amongst Vaccinated Animals
DL	Designated Lab
EFSA	European Food Safety Authority
EU	European Union
FAdV	Fowl adenovirus
FAO	Food and Agriculture Organisation of the UN
FSA	Foods Standards Agency
GEM	Generic Epidemiological Model
GIS	Geographic information system

Term	Description
HAIRS	Human and Animal Infections and Risk Surveillance Group
HMG	Her Majesty's Government
HPAI	Highly Pathogenic Avian Influenza
HTS	High Throughput Sequencing
IBH	Inclusion body hepatitis
IoZ	Institute of Zoology
ISD	International Science Development
JNCC	Joint Nature Conservation Committee
LIMS	Laboratory Information Management System
MMO	Marine Management Organisation
NBU	National Bee Unit
NRL	National Reference Laboratory
NEEG	National Emergency Epidemiology Group
NWMC	The National Wildlife Management Centre
ODA	Official Development Assistance
OIE	World Organisation for Animal Health
PCR	Polymerase Chain Reaction
PHE	Public Health England
PHSI	Plant Health and Seeds Inspectorate
PCV	Positive porcine circovirus
PSRE	Public Sector Research Establishment
RVC	Royal Veterinary College
SD	Science Directorate

Term	Description
TSE	Transmissible Spongiform Encephalopathies
UKRI	UK Research Institute
USUV	Usutu virus
VMD	Veterinary Medicines Directorate
WGS	Whole genome sequence
ZSL	Zoological Society of London