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Research and development case study



National Audit Office

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# Animal and plant health research



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# Introduction



This case study on **animal and plant health research** is one of a series that we have developed to support and complement our published report on research and development.

Our examination of animal and plant health research focused on arrangements to coordinate the funding of research into pests and diseases of plants and animals.

Other case studies focus on research relating to:

- advanced materials;
- climate;
- energy;
- human health; and
- robotics and autonomous systems.

If you would like to know more about the National Audit Office's work on science and research, please contact:

### Sian Jones

Director for value for money audit work on business, skills, science and industry

✉ [sian.jones@nao.gsi.gov.uk](mailto:sian.jones@nao.gsi.gov.uk)

☎ 0191 269 1889

### Heather Thompson

Audit manager

✉ [heather.thompson@nao.gsi.gov.uk](mailto:heather.thompson@nao.gsi.gov.uk)

☎ 020 7798 7690

If you are interested in the NAO's work and support for Parliament more widely, please contact:

✉ [Parliament@nao.gsi.gov.uk](mailto:Parliament@nao.gsi.gov.uk)

☎ 020 7798 7665

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# Summary



## 4 What did we find?

There is a broad consensus on the need for coordination and leadership; mechanisms for setting strategy and sharing information are being developed

- There is a broad consensus on the need to align priorities, and an approach to this is being developed
- There is a recognised need for coherent information
- There is a broad consensus on the need to do more collectively to demonstrate the impact and contribution of investing in research; some work has been attempted



## 1 Who is involved?

Funders, coordinators, researchers, influencers



## 3 How much is spent?

Government's annual investment in animal and plant health research is estimated to be around £200–250 million



## 2 What happens?

Stages of research activity

### Video ▶

[The real world view:  
Fighting viruses](#)

# 1 Who is involved?



## The funders

- UK government departments (including the Department for Environment, Food & Rural Affairs (Defra))
- Research councils (including the Biotechnology and Biological Sciences Research Council)
- Innovate UK
- Industry (including agriculture sector)
- European Union



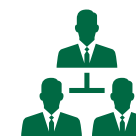
## The co-ordinators

- UK Science Partnership for Animal and Plant Health
- Centres for Agricultural Innovation



## The researchers

- Research institutes (including the Pirbright Institute and the Animal and Plant Health Agency)
- Universities
- Industry
- International



## The influencers

- Policymakers and parliamentarians
- Learned societies
- Charities

## 2 What happens?



### Stages of research activity

#### Description of research

#### Purpose of research

#### What is involved?

#### Funders include

#### Basic

**Knowledge expansion** – asks questions about animal and plant health. Research is approached as a scientific study rather than to address specific needs

Experiments by academics and researchers at university laboratories or research institutions

Government departments; research councils; higher education funding councils

#### Applied

**Solutions-focused** – research is concerned with finding a solution in response to a specific question or problem

Experiments and modelling at university laboratories, government agencies, and research institutes

Innovate UK; industry; government departments; research councils

#### Translational

**Product development** – takes the findings from basic or applied research and uses them to develop new products and treatments

Development of new products at laboratories

Innovate UK; industry; government departments; research councils

#### Examples of successes

**Enhancing the survival of bumble bees** – a research study on wild bumblebee populations found that flower-rich habitats are key to enhancing the survival of bumblebee families.

Results are expected to help farmers and policy-makers manage the countryside more effectively to provide for the declining pollinators.

#### Examples of current programmes and projects

**Investigating avian flu virus** – Research to gather intelligence on the avian flu virus and the epidemiology of the disease to understand more about the diversity of this virus to try to predict the likelihood of a possible UK outbreak.

**Immune response of farmed chickens** – research found that the immune response of farmed chickens does not develop fast enough to fight off the *Campylobacter* infection. This has important implications for developing a vaccine for the bug (the UK's leading cause of food poisoning).

**Ash dieback modelling** – a government research project used models to predict the spread of ash dieback in the UK, improving strategies for monitoring the disease and slowing the spread. The research helped to determine where the disease will spread most rapidly and cause most damage, and assessed mitigation strategies, to help with the emergency response.

**Tackling fish diseases** – salmon farmers reduced the number of fish dying from infectious pancreatic necrosis (IPN) after researchers discovered the gene responsible for resistance to the disease. A Scottish company used this to breed IPN-resistant salmon and estimated that, once IPN resistance becomes established in their fish populations, death rates from the disease will be reduced from around 25% to near zero.

**On-site detection technologies** – early detection and identification of pests and diseases helps prevent their establishment and spread. A research programme developed novel on-site detection technology to produce faster, test results.

## 3 How much is spent?



### Who are the principal funders?

The government's annual investment in animal and plant health research is estimated at around £200–250 million.

The principal funders of research activity are:

- Defra and its network of agencies (including the Animal and Plant Health Agency, the Veterinary Medicines Directorate, and the Centre for Environment, Fisheries and Aquaculture Science), which invest in research to predict risk, prioritise areas for intervention, build resilience and resistance, and manage disease;
- research councils, most notably the Biotechnology and Biological Science Research Council, the Economic and Social Research Council, and the Natural Environment Research Council, which invest in underpinning research in animal and plant health;
- the devolved administrations in Scotland and Northern Ireland, which fund research into animal and plant health;
- Innovate UK, which funds competitions to find solutions to animal and crop disease; and
- The Department for International Development, which co-funds international animal and plant health projects to help address issues of global concern.

### Additional pots of funding for animal and plant health research (non-domestic)

The Global Challenges Research Fund and the Newton Fund make funds available to researchers to address research challenges related to animal and plant health in developing countries.

## 4 What did we find?



### **There is a broad consensus on the need to align priorities and an approach to this is being developed**

The UK Science Partnership for Animal and Plant Health has identified priority areas for improved coordination and is identifying areas for improved collaboration and co-ordination and developing a more detailed action plan.

The Partnership expects that, with concerted action, some challenges can be addressed within five years. It has developed a vision and a high-level strategy for UK animal and plant health research. This sets out the current challenges and recognises that there is a need to improve the distribution of resources and high-level coordination across the sector, particularly through:

- more effective and efficient approaches to horizon scanning and risk assessment;
- opportunities to better apply a wide range of knowledge, skills and resources to research challenges; and
- integrated and aligned strategies and a balanced skill base.

In its [strategy and vision for animal and plant health research](#), the Biotechnology and Biological Sciences Research Council and other funders set out that the Partnership should prioritise research investment and align strategic agendas and research programmes around three main themes:

- 1 improved understanding of current and emerging pathogen and pest threats and how they may be controlled – growing and maintaining world-class interdisciplinary science capability;
- 2 new technologies to detect and control pests and pathogens – enhancing the UK's ability to develop, validate and use them; and
- 3 integrated approaches to monitoring, modelling and managing endemic problems and emerging threats – guiding precision intervention at both a local level and more widely.

## 4 What did we find? *continued*



### There is a recognised need for coherent information

A joint Government Office for Science/Defra [review of animal and plant health capability](#) found that there was too much scope for duplication and gaps in science infrastructure, skills and generating evidence, which it concluded risked reducing the cost-effectiveness of government investment.

The review identified a range of areas where there are current skills shortages or potential future gaps in strategically important areas. It recommended that further work should be done to prioritise these skills shortages in the context of the UK's needs and strategic priorities.

In response, Defra has undertaken a **capability mapping exercise** to identify gaps in skills and to address career pathways in the area of animal and plant health. Based on expert opinions from interviews, workshops and published reviews, a range of areas were highlighted where capabilities were assessed as vulnerable or sub-optimal, predominantly within plant health.

To address shortages in plant health skills, Defra has helped to launch a new register of plant health professionals and in 2016, plant health was added to the GCSE curriculum for the first time. Defra is working in partnership with academia to develop the UK's first Masters course on plant pathology and bespoke one week training modules for post-graduates. These courses, launched in the 2016/17 academic year, offer post graduate students vocational training and preparation for PhD studies and careers in plant pathology.





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