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postnote

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WILDLIFE DISEASES

Wildlife diseases can have negative consequences for biodiversity, human and livestock health, animal welfare and the economy. At present UK wildlife disease surveillance is poorly coordinated. The lack of a cohesive approach stems from a division of responsibility and a dominant focus on livestock and human health. This POSTnote examines the impacts of wildlife diseases, the current status of surveillance in the UK and the options to strengthen policies.

Background

Many harmful biological agents (pathogens) can infect a broad range of species, including humans.[1] Wildlife play a major role in disease transmission and so is important when addressing certain diseases in domestic animals or humans. Wildlife diseases are also important in their own right, with impacts on biodiversity and animal welfare. Climate change is expected to lead to substantial changes in wildlife disease patterns and frequency.[2] As conservation programmes expand and contact between humans, domestic animals and wildlife increases, conflicts between biodiversity conservation, public health and domestic animal health may intensify.[3]

Historically wildlife diseases have usually been of interest after they have directly impacted livestock or human health. Because of this, responsibility for their surveillance and management is spread between many organisations. The Department for Environment, Food and Rural Affairs (Defra) is the government agency responsible for environmental issues. Defra employs one wildlife health veterinarian but has no specific budget dedicated to the subject.

Impacts of Wildlife Disease

Human health

Zoonotic diseases are diseases of animals that can be transmitted to humans; for example avian influenza, anthrax and rabies. Wildlife plays a key role by providing a 'zoonotic pool' from which new diseases may emerge. The majority (60%) of emerging infectious diseases in humans are caused by zoonotic pathogens and 72% of these have a wildlife origin. Human encroachment on shrinking wildlife habitats can cause increased wildlife population densities which can boost disease transmission risks.[2, 4] Also, increased human population density is linked to a rise in the number of zoonotic infections in humans.[4]

Domestic animal health

Domestic animal disease can have serious economic effects. For instance, the 2001 Foot and Mouth Disease outbreak is estimated to have cost the UK £1.2 billion. Most (77%) infectious diseases of domestic animals are common to wildlife[5], so the control of a disease in domestic animals can be impeded by its presence in wildlife. Movement of domestic animals for trade and farming can help to spread disease. While culling infected livestock can reduce levels of disease, if the disease exists in wildlife it can be passed back to domestic animals at a later point.

Biodiversity

It is increasingly accepted that diseases can affect biodiversity and contribute to species declines (Box 1).[6,7] For example, squirrel poxvirus is contributing to the decline of the red squirrel population, and crayfish plague is considered responsible for declines in native white-clawed crayfish numbers (POSTnote 303).[6] Diseases also impact on conservation efforts. For example in 1995, a release of captive-bred field crickets in England was suspended for two years due to infection with a parasite which posed a possible threat to other wild species.[2]

Animal welfare

Diseases such as mange in foxes and myxomatosis in rabbits (Box 1) can impact on the welfare of wild animals. In the UK, there is a great level of public concern regarding livestock, laboratory animal and pet welfare. Disease is a normal process in nature but human

interventions can directly cause disease outbreaks in wildlife. In these cases, the Universities Federation for Animal Welfare states that we have a moral obligation to address the consequences.

Box 1. Myxomatosis
In the early 1950s, the myxomatosis virus was deliberately introduced to Europe as a bio-control agent for the population management of rabbits. Current estimates are that approximately 20 million rabbits are infected in Europe each year, causing tumours and high mortality. The introduction of myxomatosis has had a major welfare impact on wild European rabbits, and on pet and farmed rabbits. The introduction of myxomatosis to Britain resulted in unintentional population declines in stoats, buzzards and owls.[2] It also led to extinction in the UK of the large blue butterfly 30 years later through a series of complex ecological interactions.[6]

Disease surveillance

Surveillance allows the identification of new infections and changes to existing ones. However, it is not economically viable to survey all species for all diseases. Certain species called 'sentinels' can be screened for diseases as indicators of the health status of a broader range of species. While sentinels may offer a cheaper option to surveillance of a wide range of species, their use is limited to certain known diseases in defined species.[8]

EU surveillance obligations

There are no EU directives addressing disease monitoring for nature and biodiversity. There are disease specific directives and some generalist directives for agriculture and food safety.[9] The World Organisation for Animal Health (OIE) is the intergovernmental organisation responsible for animal health surveillance worldwide. The OIE is under the control of an international committee consisting of delegates designated by the Governments of 172 member countries. The OIE lists diseases of perceived risk, termed 'notifiable' diseases. The UK is obliged to compile an annual report for the OIE on the presence of notifiable diseases and diseases with significant mortality or zoonotic potential. Annual OIE reports are analysed for the appearance of new diseases or changes in disease trends.

Government surveillance in the UK

Surveillance and management schemes are in place in the UK for specific notifiable diseases which impact on human or livestock health. Nationwide reporting mechanisms for wildlife mortalities and surveillance for non-notifiable diseases are limited.

The Veterinary Laboratories Agency (VLA), an executive agency of Defra, is primarily responsible for livestock diseases. It has a small budget and limited capacity for wildlife disease surveillance via the Diseases of Wildlife Scheme, which examines several hundred wild animal carcasses each year. Approximately 2% of the VLA's scanning (assessment of carcasses) surveillance budget is spent on wildlife health surveillance.

The Central Science Laboratory (CSL), also an executive agency of Defra, is primarily responsible for ensuring environmentally sustainable food production. The CSL provides surveillance of wildlife deaths caused by pesticides via the Wildlife Incident Investigation Scheme. The VLA issues questionnaires to institutions that work on wildlife to collate information for the OIE reports. However, not all laboratories and research groups submit records of wildlife diseases to the report, or have the time and resources to produce full reports of their activities and findings.[10] As culling is the most widespread disease management strategy, the Royal Society for the Prevention of Cruelty to Animals states that some organisations may be reluctant to submit samples to government laboratories. This is likely to result in an underestimation of disease prevalence.

Non-governmental surveillance

Surveillance and control of diseases at a local level is best addressed by veterinarians and wildlife workers with specialist expertise.[11] Individuals and NGOs such as the Zoological Society of London and the Wildlife Veterinary Investigation Centre perform a large proportion of UK wildlife disease surveillance and management. Population monitoring occurs as part of research and conservation projects, and within the environmental consultancy sector. Many organisations hold samples that could be used for retrospective surveillance (Box 2). However, a lack of integration between disciplines means that data are not shared.

Box 2. Retrospective surveillance
Well maintained archives of tissue taken from dead wildlife would allow large numbers of samples to be screened quickly without expensive and laborious sample collection. The Central Science Laboratory (CSL) archives wildlife tissues after post-mortem examinations and maintains a database of these samples. The VLA and many non-government laboratories throughout the UK also have wildlife tissues in storage. The CSL has plans for a centralised web-based database of wildlife tissue samples, but no funds are available.

The role of the public in surveillance

The public has a great level of interest in wildlife; over 400,000 volunteers took part in the 2007 Royal Society for the Protection of Birds 'Big Garden Birdwatch'. Widespread public education may be a valuable method of reducing disease risks. Defra is keen to encourage the public to report incidents but limited resources mean that not all samples submitted are accepted by government laboratories. The Institute of Zoology believes that the public are undervalued as a surveillance tool. Responsible media coverage is important as there is a risk of public antagonism towards wildlife due to a perceived threat to human health.[12]

Predicting trends in wildlife disease

Assessing risks posed by future wildlife disease threats has been identified by the CSL as a weakness in the UK. Zoonotic disease risks are assessed by the joint Human Animal Infections and Risk Surveillance group, with

members from the Health Protection Agency, Defra, VLA, and the Department of Health. The VLA and CSL receive funds from Defra for specific disease or species issues but no core funds for horizon scanning. A key issue is climate change, which is expected to cause diseases to spread to new areas as many pathogens survive better at warmer temperatures.

Disease management

How diseases are spread

Movements of animals provide a route for the transfer of pathogens between animals and the spread of diseases to new areas.[2,3,11] Movement of animals occurs for the pet, laboratory, food, farming and hunting trades as well as for conservation, reintroductions and rehabilitation (Box 3). These trades are large, increasingly globalised and without adequate disease surveillance.[6] Globally, outbreaks resulting from wildlife trade have caused hundreds of billions of dollars of economic damage.[5] Increasing human and pet travel are also partly responsible for the spread of diseases.[3]

Box 3. Wildlife rehabilitation

Wildlife rehabilitation involves the collection of diseased or injured wildlife, euthanasia, or treatment and release into the wild. Defra estimates that there are about 700 animal sanctuaries in the UK. Of particular concern to the British Wildlife Rehabilitation Council (BWRC) is the potential for rehabilitated badgers to spread bovine tuberculosis (bTB). No bTB screening is required by law, and badgers can be released in an area different from that where they were found. There is as yet no reliable test available for bTB in badgers so the only effective risk mitigation strategy is to release solely at the place of capture. The BWRC issues guidelines on preventing infections in units but there is currently no obligation to perform disease screening, or to contribute to disease surveillance. A licensing system for the release of non-native species and species listed on Schedule 9 of the Wildlife and Countryside Act (1981) exists but there is currently no legislation regulating the movement of native species or re-introductions.

Limiting transmission of disease

Preventing diseases entering and spreading in animal populations is the most efficient and cost effective way of managing disease.[13] Natural England issues licences for movement of some protected species, for example the great crested newt. Defra reviews licence applications from a veterinary perspective to assess known disease risks. While many approaches to management are disease specific, improved regulation of movements of animals by people may provide broader protection. However, regulation of animal movements between countries could impede international trade. Regulation of animal movements within the UK is logistically difficult to enforce but could act as a deterrent if not a solution.

Controlling outbreaks

Wildlife deaths are often not apparent until a mass mortality has occurred, by which time it may be too late for successful management. Modelling disease outbreaks and spread can provide valuable information for the development of management strategies (Box 4).

Box 4. Modelling diseases

Modelling involves studying disease distribution and patterns of spread to determine the scale of a problem. This information is used to develop a model which can predict the spread of disease. Modelling can be used to assess potential disease impacts and develop contingency plans. For example, modelling was used to show that red squirrel population declines are 17-25 times higher in regions where squirrel poxvirus (carried by grey squirrels) is present.[14] The model predicted that a grey squirrel population control where more than 60% are killed would stop red squirrel declines in Cumbria. Disease modelling requires prior knowledge of animal population distributions and ecology, diseases present and methods of disease transmission. The strength of modelling is in the comparison of management options; it can help to identify where resources would be best invested, potentially improving the cost-effectiveness of management schemes.

Existing methods of surveillance and management of human and livestock diseases are often not suitable for use in wildlife.[2] Wildlife populations are usually too large for individual animal treatments. Vaccination of free-ranging wildlife is difficult to implement and few suitable vaccines are available. In spite of this, vaccination of foxes has been successful in the control of rabies in Europe and North America. Vaccination and individual treatments are considered most valuable for controlling disease in endangered species.

EU strategy dictates that if a livestock disease outbreak is detected, movements of livestock are restricted and an eradication programme is initiated.[9] Disease outbreaks in aquatic species are addressed in a similar way (Box 5).

Box 5. Managing diseases in aquatic species

Fish farming and angling rely on healthy wildlife as wild fish form a component of their stock and so are of direct economic importance. The Centre for Environment, Fisheries & Aquaculture Science (Cefas), an executive agency of Defra, has the legislative powers, financial resources and diagnostic power to deal with notifiable disease outbreaks. Diseases that show no symptoms in fish but that affect other wildlife may be an additional risk. Cefas considers that, despite contingency planning, a disease outbreak on the scale of the 2001 Foot and Mouth Disease epidemic may overwhelm the available resources. In August 2008 a new EU Directive will give Cefas more power to control new emerging diseases.

Culling is the most common management method for wildlife yet is often impractical, expensive and raises ethical issues. It can have unexpected side effects, for example a large-scale study found that removal of badgers in one area was linked with increased incidences of tuberculosis in cattle in adjoining areas. The removal of some badgers is thought to result in the remaining badgers ranging more widely and spreading disease further.[15] Husbandry education for livestock owners could help to reduce the contact rates between livestock and wildlife. However, while complete prevention of such contact may be desirable, it is usually not feasible.[11]

Strengthening policy approaches

Successful wildlife disease management policies rely on sound scientific evidence and require input from a range of specialists including researchers, veterinarians and government. At present, disease policy is reactive and opportunistic as opposed to pro-active and structured. When novel diseases emerge in the UK, responses are hampered by disjointed policies and poorly defined responsibilities (Box 6). Much of the necessary expertise and infrastructure to address diseases in wildlife exists but remains uncoordinated and under funded.

Box 6. Amphibian disease in the UK

Chytridiomycosis, a fungal disease, is a significant threat to amphibians. In some regions it is estimated that 50% of amphibian species and 80% of individuals disappear within 6 months of disease introduction.[16] It is likely that human movement of wildlife has resulted in the pandemic of chytridiomycosis. The fungus has been reported in amphibians in the pet trade, food industry, zoo animals, laboratory animals, and those used as bio-control agents. Treatment of infected amphibians and disinfection of captive environments is possible, but control within a natural environment is unlikely to be successful without severe disruption to the ecosystem.[17]

Chytridiomycosis was first recorded in the UK in 2004; the potential impacts are unknown. In 2006 proposals were sent to the OIE to list this disease as notifiable. This is expected to be approved in May 2008 and, if so, the disease would become notifiable in January 2009. The UK chytridiomycosis surveillance scheme began in early 2008, funded by Natural England and the Zoological Society of London. The surveillance scheme aims to see whether the disease remains isolated in a few populations or whether it is now widespread. If it has spread widely, eradication is unlikely to be viable. Under World Trade Organisation agreements, Great Britain is unable to restrict trade in amphibians based on presence of chytridiomycosis without enacting comprehensive eradication programmes. Four years passed from the initial reports of chytridiomycosis in the UK to the implementation of a surveillance system, in which time the disease is likely to have spread. Disease management decisions rely on the surveillance results.

In an attempt to coordinate wildlife disease policy better, Defra will publish a Wildlife Health Strategy in mid-2008. This is expected to recommend that government intervention is warranted for the following purposes: protection of human or domestic animal health; protection of biodiversity or conservation; to safeguard trade and the economy. The strategy's aims represent wider stakeholder recommendations:

- that the implications of the disease status of wildlife are considered more widely and a responsible approach to human/wildlife interactions is adopted;
- a proportionate, risk-based approach to wildlife disease surveillance and prevention is adopted, and where necessary, appropriate interventions are made; and,
- a holistic and coordinated approach to wildlife health across Government and interested parties is realised.

There is a broad consensus from stakeholders, academics and government agencies on the need for Defra to coordinate an effective and unified national strategy. However, Defra is experiencing major budgetary and staffing cuts; there is a risk that the aims of the strategy will not be achieved if funding is not allocated to it. National and international structures for the rapid dissemination of reliable information between scientists, policy makers and the public are a key area for government intervention.[18] Identification of where responsibilities lie is also important.

Overview

- There is a lack of awareness of the implications of wildlife diseases. They affect biodiversity, animal welfare, human health and livestock health.
- Disease management is often considered only once a disease has already become a problem. Alternatives include the development of predictive approaches and the regulation of animal movements.
- Better coordinated collaborations are required to provide an improved nationwide reporting mechanism for wildlife mortalities and an improved surveillance scheme for non-notifiable diseases.
- There is a consensus on the need for a unified strategy and increased funding.

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