



HM Government

UK Biological Security Strategy

July 2018

UK Biological Security Strategy

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Foreword

Significant outbreaks of disease are among the highest impact risks faced by any society – threatening lives and causing disruption to public services and the economy. This is true whether such outbreaks occur naturally, such as pandemic influenza or emerging infectious diseases, or in the less likely event of a disease being caused by an accidental release from scientific or industrial facilities, or as the result of a deliberate biological attack. Large scale disease outbreaks in animals or plants can be equally significant in terms of economic, environmental and social impact.

These are threats that are not constrained by international borders. In our ever more interconnected world, diseases that emerge in one country can soon prove a global threat – either directly where disease spreads or by destabilising already vulnerable regions. Britain is a global nation, open to the world and outward facing. This means we are exposed to these risks, both at home and overseas, but it also gives us the opportunity to work with international partners to tackle such threats at source.

Globalisation is not the only way in which this risk landscape is evolving. As technology

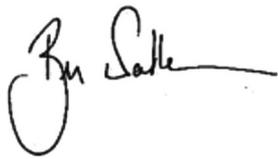
develops and improves we are better able to counter these threats but are also potentially exposed to new risks. As a global leader in biological sciences, we have an opportunity to demonstrate our expertise and be at the forefront of work to meet these challenges.

As a Government, we already act both at home and overseas to protect UK citizens and British interests from the risk of a significant disease outbreak, no matter the source. This strategy brings together, and sets out in one place for the first time, the wide range of activity that is carried out across Government to do this. It also explains how in the future we will co-ordinate our activity more strongly and take a truly comprehensive approach to meet the evolving risks (and opportunities) in this area. This will mean closer work between departments, so that prevention activity, the deployment of response capabilities, research programmes, and our engagement with international partners, industry and academia are aligned and their impact maximised.

The strategy also recognises the importance of intervening early to prevent biological threats from emerging, or from spreading once they emerge. To this end, it sets out how we will make best use of our international activity to help reduce the risks to the UK and our interests, at home and overseas. This includes our engagement with international partners (at local, regional and national levels) and forums.

Our investment in overseas biological security education and our international work on global health security, led by DHSC and DFID, is building resilience to health threats in developing countries. We achieve this through:

1. Strengthening developing countries' ability to meet International Health Regulations, and their health systems' preparedness and response capacity.
2. Supporting research to develop new/better vaccines, drugs, diagnostics against infectious diseases.
3. Tackling the threat of anti-microbial resistance through research, better surveillance and building lab capacity in developing countries.
4. Working with international donors and partners to strengthen global health systems and improving their response to emerging health risks.



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Finally, the strategy notes the importance of ensuring that we can rely on the right science capabilities in this field. The world-leading capabilities within Government and in UK industry and academia need to be sustained for the future. We also need to guarantee that in addressing biological risks we do not impede legitimate research and development activity that will be crucial to combating current and future threats, and which makes an important contribution to UK economic prosperity.

We cannot predict all the ways in which this risk landscape will evolve in the future, but it is by breaking down barriers, working in a co-ordinated way across and beyond Government, and thinking globally that we will be best prepared to meet the threat of significant disease outbreaks (however they occur).

Executive Summary

This strategy draws together for the first time the work that takes place across Government to protect the UK and its interests from significant biological risks, no matter how these occur and no matter who or what they affect. It reflects on the evolving landscape and sets out how we will build on our existing activity to further improve our ability to reduce and respond to risks, and to exploit opportunities.

Part One – The Context

The first part of the strategy describes the nature of the biological risks and the opportunities we face, and looks at how this landscape is continuing to evolve. It notes that while the likelihood of many of the worst case biological risks is low (particularly those that describe accidental releases or deliberate attacks), their potential impact is significant. Factors such as globalisation and developing technology will affect our risk picture – bringing both challenges and opportunities.

Part Two – Our Response

The strategy describes the four pillars of our response to biological risks:

- **Understand** the biological risks we face today and could face in the future.
- **Prevent** biological risks from emerging (where possible) or from threatening the UK and UK interests.

- **Detect**, characterise and report biological risks when they do emerge as early and reliably as possible.
- **Respond** to biological risks that have reached the UK or UK interests to lessen their impact and to enable a rapid return to business as usual.

In addition, two themes run through all four pillars and are drawn out separately:

- All elements of the Government's response must be underpinned by the right **scientific capabilities and capacity**, now and in the future.
- We must be able to take advantage of the **opportunities** that the biological sector offers the UK, as well as thinking about the risks.

Strategy Implementation

Governance for much of the activity described in the strategy falls within departments' existing portfolios and governance mechanisms. However, there are also commitments that can only be delivered if Government works together across departments. A new cross-departmental governance board will oversee these and any other new commitments. This governance board will report to the National Security Council (NSC), through the Security Minister. The Government Chief Scientific Adviser (GCSA) will maintain oversight of the strategy's outcomes.



Part One – The Context

A. Strategic context

There are many different definitions of biological security. In this strategy we use the term to cover the protection of the UK and UK interests from biological risks (particularly significant disease outbreaks) whether these arise naturally, or through the less likely event of an accidental release of hazardous biological material from laboratory facilities, or a deliberate biological attack. These risks could affect humans, animals or plants.

The risks

The 2015 National Security Risk Assessment (NSRA¹), based on a judgement of both likelihood and impact, identifies a major human health crisis (such as pandemic influenza) as one of the most significant civil emergency risks facing the UK (a Tier One risk). Such an outbreak could have the potential to cause hundreds of thousands of fatalities and to cost the UK tens of billions of pounds. Antimicrobial Resistance is also included in the NSRA as a Tier One risk. Lord O'Neill estimated, in his independent review on AMR, that if no action was taken, by 2050, AMR will account for an extra 10 million deaths a year globally.

Alongside this, a deliberate biological attack against the UK is a Tier Two risk in the 2015 NSRA – again based on a judgement of

both likelihood and impact. While the current placement is based on the assessment that this risk is low likelihood and high impact, the NSRA assesses that biological (and chemical) attacks against the UK or its Armed Forces, and the proliferation of chemical, biological, radiological and nuclear (CBRN) technology to state and non-state actors, are aspects of this risk picture that may become more likely over the longer term. The UK's counter terrorism strategy, CONTEST, also sets out the importance of preparing for the highest impact terrorist risks, including those using biological agents.

The impacts of major animal² and plant diseases³ are also far-reaching, and such outbreaks are more likely to occur. Alongside the continuous management of diseases endemic to the UK, there were 22 outbreaks of exotic notifiable animal diseases⁴ in the UK between August 2000 and December 2017. These individual outbreaks are estimated to have incurred costs to the Government ranging from £300,000 to more than £3 billion. Plant and animal disease outbreaks can also have significant effects on the environment and on human health. Around 60% of all human diseases and 75% of all new and emerging infectious diseases are zoonotic diseases – that is, naturally transmitted from animals to people.⁵

¹ Summarised in the *National Security Strategy and Strategic Defence and Security Review 2015*. Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/555607/2015_Strategic_Defence_and_Security_Review.pdf

² Significant animal diseases are also covered in the National Security Risk Assessment.

³ Within the context of this strategy, the terms 'plant diseases' and 'plant health' should be taken to cover plant pests as well as pathogens. Pathogens are micro-organisms - such as bacteria and viruses - that cause disease.

⁴ 'Notifiable animal diseases' are those that carry a legal obligation to report to the Animal and Plant Health Agency (APHA) – those that are 'exotic' are those diseases not normally present in the UK.

⁵ Taylor LH, Latham SM, Woolhouse ME, 'Risk factors for human disease emergence', *Phil. Trans. R. Soc. Lond. B* (2001) 356, 983–989.

Given the size of these potential impacts, the UK Government and Devolved Administrations already invest hundreds of millions of pounds each year to address biological risks. It is vital that we ensure that this investment is well co-ordinated across Government and that the public is getting the best possible value for money.

Changing risks and opportunities

The risk of high impact infectious disease is constantly changing. The continuing global trends of migration towards urban centres, and the expansion of international travel, increase the potential for diseases to spread. Other drivers such as changes in diets in urban populations and the rapidly rising demand for animal-sourced foods will increase the interactions between humans, domestic livestock and wildlife, changing the nature of the risk of new zoonotic⁶ outbreaks.

Since the 2014-16 Ebola epidemic in West Africa, the UK has substantially increased its international support and Official Development Assistance (ODA) funding for prevention and response to global health threats, led by the Department for International Development (DFID) and the Department of Health and Social Care (DHSC), as part of the wider government response. The Government's Independent Commission on Aid Impact (ICAI) carried out a learning review of the aid funded programme and research portfolio following the Ebola outbreak, and awarded an amber-green score overall in January 2018, highlighting progress made.

These diseases are not limited by international borders. Disease outbreaks that begin overseas, as seen with the Ebola epidemic, can quickly affect the UK and UK interests. This impact can be either direct, or indirect through the loss of regional stability negatively affecting trade, causing migration pressures and creating ungoverned spaces in which terrorism and criminality can flourish. In this context our international development programmes – which save and improve the lives of millions of people in the poorest areas

of the world by building capacity to combat infectious diseases and address increased drug-resistance through supporting the development of new diagnostics, drugs and vaccines – contribute to protecting UK citizens from significant disease threats and securing the UK's long term national security.

The pace of global technological change and the democratisation of scientific knowledge have the potential to shape the biological risk picture in the future – both positively and negatively. While a deliberate biological attack against the UK by a state or terrorist group is unlikely, technology and the spread of scientific knowledge online have the potential to bring the necessary tools within the reach of an increasing number of actors. However, these developments have potential to bring great benefit, creating opportunities for new preventive, diagnostic and treatment options for diseases of epidemic and pandemic potential, new means of detecting and addressing potential risks, and significant possibilities for our world-leading biological sciences sector – which generates more than 220,000 jobs and over £60 billion each year for our economy – to add to UK prosperity.

We often do not need cutting-edge technology to make major biological security gains. In less developed countries, transferring knowledge of basic infection control techniques, and better engineered and maintained infrastructure, have the potential to drastically reduce cases of endemic diseases such as cholera and malaria. To realise these benefits, we must encourage and facilitate legitimate research and technology development, while ensuring responsible science – including having the right controls in place to prevent misuse. DFID's work on strengthening health systems in developing countries continues to highlight the critical role of collaboration and partnership with local, regional and national partners (who understand the local context) if we are to build robust resilience to health threats.

⁶ Zoonoses are diseases that can be transmitted from animals to humans.

The global political context in which these risks and opportunities sit also continues to evolve. The UK is committed to promoting global peace, security and stability, and is a leading supporter of the international rules-based system. Our commitment to our extensive co-operation with international partners remains steadfast and we will continue to help ensure that the global community is able to respond to changing risks and identify opportunities. The UK is leaving the European Union (EU) and while our future relationship with the EU is still to be determined, we are not leaving Europe. We will want the strongest possible links with our European neighbours, as well as our close friends in North America, the Commonwealth and other important partners around the world.

A UK Biological Security Strategy

This document sets out our strategy for meeting these challenges and exploiting the opportunities – some of this will be achievable within this Parliament, while some will only be achievable in the longer term. Alongside this strategy we must be conscious of a range of other relevant national and international programmes, strategies and future work programmes. These include the vision set out in the 2015 Strategic Defence and Security Review, our Global Health Security and UK Antimicrobial Resistance Strategy, and our counter terrorism strategy CONTEST, the National Counter-Proliferation Strategy to 2020, the UK Influenza Preparedness Strategy, the Strategy for UK Life Sciences, the Vision and high level Strategy for UK Animal and Plant Health Research to 2020 and Beyond, and the Strategy for Agricultural Technologies and the Department for International Development's (DFID's) 2016 Research Review.

This strategy does not seek to duplicate or replace the work set out in those other documents (many of which focus on specific areas within this landscape in more detail), but rather to set out an overarching narrative for how the cross-Government effort fits together, and to highlight those areas where we will seek to do more collectively.

B. Main assumptions to 2020 and beyond

Alongside the broader strategic context set out in the previous section, there are a number of specific assumptions that inform our response to significant biological risks (including those risks highlighted in the 2015 NSRA). These are:

- The world will continue to become more physically interconnected through travel and migration – affecting both natural health security and deliberate threats. This will lead to challenges, but there will also be increased opportunities and capacities for strengthened global surveillance and early response.
- Advances in medical technology, genetic engineering and biotechnology will hold significant potential for UK prosperity and growth, as well as having a positive impact on our security by allowing us to address risks in new ways. However, such technology will also become more available to state and non-state actors, who may misuse it to endanger our security.

For natural biological risks

- Increasing international travel, trade and urbanisation will increase the potential for new infectious diseases to spread beyond the areas of the world in which they were once contained (such as the spread of Dengue over the last 60 years), and to do so rapidly. In many cases, such as Ebola, diseases originating with animals will affect humans.
- Unless the appropriate actions are implemented both nationally and internationally, we will see the increasing emergence and spread of antimicrobial resistance (AMR), which can lead to drug-resistant infections in both humans and animals, and will have a massive impact on both human health and the global economy.

- Disruption to immunisation programmes because of economic collapse or conflict has the potential to lead to an increase in the incidence of vaccine-preventable diseases, including polio, diphtheria and measles.
- Over the longer term, climate change will also increase the likelihood of pests and vector-borne diseases⁷ spreading to new areas of the globe, as they and their carriers are able to survive in countries where environments would previously not have supported their circulation.
- Repeated use of active ingredients in pesticides can lead to a build-up of resistance in pests (pathogens, invertebrates and weeds), creating new challenges for control.

For accidental biological risks

- The democratisation of scientific knowledge and technology, and the growth of biological sciences sectors in a greater number of countries, may increase the likelihood of an accidental release of hazardous biological material.

For deliberate threats

- While in the UK it is more likely that attacks will seek to use conventional or low sophistication methodologies (for example, bladed weapons, home-made explosives, vehicles, or firearms such as handguns or shotguns), it is plausible that a threat from crude biological weapons could become more likely in the future.
- The internet, in particular the 'dark web', provides increasing opportunities for our adversaries to obtain expertise, materials and equipment, including those associated with biological weapons, that may not otherwise be readily available in the UK.
- The 2015 NSRA states that biological (and chemical) attacks against the UK or its Armed Forces, and the proliferation of CBRN technology to state and non-state actors, may become more likely in the longer term (beyond 2020).

⁷ Diseases transmitted by the bite of infected arthropod species, such as mosquitoes and ticks.

Part Two – Our Response

The UK is globally renowned for the quality of our preparedness planning, and we have world-leading capabilities to address significant biological risks. Across local and national Government and the Devolved Administrations, and through our work internationally, the UK invests hundreds of millions of pounds a year in protecting against and preparing for disease outbreaks and biological incidents. However, these efforts have not always been as well co-ordinated as they could have been and we have sometimes failed to approach these issues with an international as well as a domestic perspective.

Effective co-ordination and a global world-view are essential if we are to avoid the risks of inefficiencies and of gaps going undetected or opportunities going unexploited. We may also fail to maximise the impact of our activities or to tackle issues as quickly as we need to. This approach is even more essential in the context of the evolving risk landscape described in Part One. This first UK Biological Security Strategy sets out how we will do the following:

- **Take an all-hazards approach – drawing together our work on natural, accidental and deliberate risks, for human, animal**

and plant health. By linking the existing cross-Government efforts on biological risks together under a single strategic approach, we can ensure a more effective and efficient response. This is critical in an area where not only do the risks themselves often overlap, but where their prevention and our ability to respond also rely on complementary and sometimes interdependent capabilities. A more strategic approach to this landscape allows those capabilities to be developed and maintained more efficiently, and also to be more effectively deployed and co-ordinated when needed.

- **Work overseas to reduce biological risks at source, recognising that in an era of globalisation events overseas can quickly escalate to become a direct threat to the UK or UK interests.** In this effort we will not only include those activities we undertake internationally specifically to protect the UK and its interests, but also acknowledge the way in which our international development programme directly benefits UK health security. While focused on delivering benefit for the world's poorest, the work of our development programme to help build health system capacity in countries overseas also reduces the risk of diseases and drug resistance spreading or reaching the UK by tackling these issues at source.

Therefore, while this strategy recognises and sets out areas where we want to do better and/or do more, much of its focus is on ensuring that our existing capabilities are fully coherent, fully exploited and able to flex to the challenges of a rapidly evolving world. We have learnt (and must continue to learn) from our responses to past disease outbreaks and biological incidents – recognising best practice and learning lessons where appropriate. For example, the 2001 foot-and-mouth disease outbreak in the UK led to a shift in Government's approach to managing a biological incident. The success of this was demonstrated by the way in which Government has responded to subsequent outbreaks, including the 2007 foot-and-mouth disease outbreak.

With these principles in mind, our cross-Government response is built around four pillars:

- A. **Understand** the biological risks that we face today and could face in the future.
- B. **Prevent** biological risks from emerging (where possible) or from threatening the UK and UK interests.
- C. **Detect**, characterise and report biological risks when they do emerge as early and reliably as possible.
- D. **Respond** to biological risks that have reached the UK or UK interests to lessen their impact and allow the rapid return to business as usual.

There will be a number of elements common to all four pillars, for example the need to learn lessons effectively from previous incidents (whether domestic or international) and to implement those lessons wherever they apply. However, there are two key cross-cutting themes that are worth considering separately:

- E. All elements of our response must be underpinned by the right **scientific capabilities and capacity** – now and in the future.
- F. We must be able to take advantage of the **opportunities** that the biological sector offers the UK, as well as thinking about the risks.

A. Understand

Understand the nature and sources of the biological risks that we face today and could face in the future.

Overview

Unless we understand the diseases that exist today and that may emerge in the future, we will not be able to address the risks they pose – we cannot effectively prevent, detect or respond to something that we do not understand. In order to do this we need to have access to robust and credible assessment capabilities, and the ability to share resources and information to ensure timely awareness of emerging or evolving biological risks. This section sets out what we already do across Government to understand biological risks, and how we plan to build on this in the future.

Understanding biological risks

Risk assessment is already part of the core business of Government. We have effective and well-developed systems for gathering information on current and emerging biological hazards and threats, bringing this together so that it can be assessed by experts and then feeding the results of this work into our policy making, planning assumptions, and science and technology activity.

At the highest level this risk assessment culminates in the National Risk Assessment (NRA) and the NSRA, which set out the most significant risks to the UK and UK interests overseas for which Government should prepare. The NRA includes a number of biological risks – from pandemic influenza to major notifiable animal disease outbreaks to deliberate biological attacks. This cross-Government risk assessment includes three key stages:

1. **Information collection** – The first step to understanding the risks we face is to have accurate and comprehensive

information. This includes collection on deliberate threats by the intelligence agencies and data collection on risks to public, animal and plant health by Public Health England (PHE), the Department for Environment, Food and Rural Affairs (Defra), the Animal and Plant Health Agency (APHA), the Veterinary Medicines Directorate (VMD), and equivalents within the devolved administrations, as well as UK researchers working across the globe. This also draws on our well-established links into international information feeds – through sharing arrangements with international partners, and global information systems and forums, working with, and building capacity in other countries – to monitor risks that emerge in other areas of the world.

2. **Information assessment** – This takes place as a matter of course within individual sectors and departments, and is brought together under the leadership of the Cabinet Office. Scientific assurance is provided through the network of Chief Scientific Advisers across Government, co-ordinated by the Government Office for Science (GO Science) alongside advice from the Chief Medical Officer. The NRA provides a central picture of all the risks the UK faces, including risks to human, animal and plant health.
3. **Assessment action** – Once the expert communities have considered the available information and evidence, the assessment is shared with policy makers, national and local operational planners, and science and technology leads. The latter lead on work to identify and fill gaps in our understanding of the threats and hazards we face – for example, work at the Defence Science and Technology Laboratory (Dstl), APHA, PHE and research institutes to understand the behaviour and characteristics of the pathogens and diseases of greatest concern, and model the progress of outbreaks. Where possible, this work is conducted in conjunction with international partners to reduce duplication and ensure burden-sharing.

As part of this process we have well-developed systems for knowing about and assessing risks on the animal/human interface, both national and international. We have embedded a strong 'One Health'⁸ approach, including through regular meetings of UK Government and Devolved Administration experts at groups such as the Veterinary Risk Group, the Human Animal Infections and Risk Surveillance Group and the United Kingdom Zoonoses, Animal Diseases and Infections Group. These forums consider emerging risks and identify, discuss and assess infections with the potential for interspecies transfer. We have also established a UK Government international health response network, which is responsible for scanning, preparing and responding to major international disease risks, on a One Health basis.

Alongside this assessment of current and emerging risks, work also takes place across Government to identify future risks. This includes the annual tracking of seasonal influenza strains and other biological threats and hazards to identify and predict future trends, so that responses can be prepared and improved. It also includes work by the UK's world-leading Government science capability, in conjunction with industry, the wider UK research base and international partners, to undertake horizon scanning for future risks or factors that could make biological risks more likely.

Following the 2014-16 Ebola Outbreak in West Africa, DFID established an internal epidemic threats or 'Epi-Threat' Group to horizon-scan, monitor and risk assess emerging epidemic threats to developing countries (including all DFID countries). This approach allows DFID to spot threats early, prepare quickly and respond smartly in a timely, coherent and coordinated manner when a potential threat unfolds. The Group allows DFID a formal way to escalate emerging risks to senior management as appropriate, and is a forum for collaboration on issues that cut across countries on thematic sectors.

In addition, should the risk of a domestic or international health emergency arise, departments leading the response can establish a precautionary GCSA Science Advisory Group in Emergencies (SAGE).

What next?

Building on this work there are a number of key areas where we will expand and strengthen our efforts to date.

Wider information gathering

- We will continue to ensure that we have strong systems in place for gathering the epidemiological intelligence that informs cross-Government horizon scanning, including a centrally produced monthly scan of emerging health risks.
- We will continue to strengthen our public health international intelligence work via the Global Health Security Agenda (GHSA), joint external evaluation, the UK Public Health Rapid Support Team and other rapid response teams.
- We will join up with non-biological sources of information (for example, on migration, trade and weather patterns).

Better information sharing and assessment co-ordination – within Government and with partners

- **We will ensure even more effective information sharing through a cross-Government biological assessment working group.** This will include:
 - better use of data sharing, including through exploring options for a cross-Government data platform to allow sharing between sectors; and
 - long term trend mapping of emerging biological risks.
- **We will improve our communication of risk information to the public, and our communication with the private, academic and third sectors, to enhance biological risk awareness and to drive innovation in addressing that risk, including by learning from areas of good**

⁸ The integration of work to obtain optimal health for humans, animals and the environment.

practice. In doing this we will build on work already undertaken such as the UK Plant Health Risk Register, which enables any interested party to see at what level Defra has rated the risk to the UK from more than 900 plant pests and diseases.

- We will continue to work with international partners to:
 - share understanding of the risks; and
 - understand where the UK and other countries have gaps in their capabilities.
- On animal and public health we will make use of links with international partners to better understand risk identification and to share information about emerging risks and hazards. This includes working with the USA, Australia, Canada and others on risk identification methodology, in an initiative being led by the US Department of Agriculture and Colorado State University.
- We will further co-ordinate our hazard assessment research and development work across Government and with industry, academia and international partners.

Better horizon scanning

- We will build our partners' capacity, and make best use of national and international horizon-scanning initiatives, to ensure timely awareness of future biological risks. This will enable us to ensure an appropriate balance of investment between work to address current and potential future risks. Investment in prevention or containment of emergent risk at an early stage is often more affordable and economically sensible than responding to a global pandemic or incident.
- Expanding upon DFID's expertise and experience of responding to health emergencies. This work highlights the vital, essential role of working through and with local, regional, national and international partners on both preparedness and response.
- We will consolidate work to understand global disease baselines – without understanding 'normal' and the natural variations that can occur, it is difficult to be clear on what an emerging risk looks or would look like.

Understand case study – Ebola

As this section sets out, a great deal of work takes place across Government to understand the risks that we face. By joining this work together we make best use of resources and ensure that we are able to draw on the full breadth of Government expertise. Following the outbreak of Ebola virus disease in West Africa in March 2014, the UK was at the forefront of responding to the epidemic in Sierra Leone. Scientific expertise was drawn from across Government, industry and academia to support the UK response – showing the value of scientific collaboration and cross-fertilisation between disciplines. For example, DFID commissioned Dstl to conduct rapid scientific research to understanding the biological and physical properties of the Ebola virus sub-type to help inform the in-country response. This knowledge and technical capability, supported the wider UK Government response during the outbreak by helping to provide robust science advice and evidence to underpin the in-country response led by local Sierra Leone partners. Dstl support included expertise and advice on safe working practices within the Ebola Treatment Centres and PHE-led diagnostics laboratories. In addition HMG (through DFID) commissioned rapid social science on safe burial practices that were cultural appropriate/sensitive. This work was critical in helping to inform the response and help finally to control the outbreak. DFID working with partners such as the Wellcome Trust and PHE also supported rapid research into point of care diagnostics and vaccines to help prepare for any further outbreaks.

B. Prevent

Prevent biological risks from emerging (where possible) or from spreading and threatening or reaching the UK and UK interests (including deployed UK military and other personnel).

Overview

Preventing biological risks from emerging, or from affecting the UK and our interests, is not something we can do simply by focusing within our own borders, and it is not something that we can do alone. No single nation can. Success here requires work at home and overseas, on a national basis as well as with international partners and through international forums. This is because prevention of biological risks includes building healthcare capacity and biological security in vulnerable regions of the world; being able to intervene rapidly alongside international partners to stop outbreaks of diseases with pandemic potential at source; and ensuring responsible access to and work with hazardous biological materials and expertise, both in the UK and overseas. As this section sets out, the UK is at the forefront of global preventative work, but there are areas where we can draw together our activity to be even more effective.

Preventing biological risks

Internationally

The UK is a leading supporter of the international rules-based system and is actively engaged in the international forums and organisations that work to strengthen biological security around the world. These include the:

- World Health Organization (WHO);
- Food and Agriculture Organization (FAO);
- World Organisation for Animal Health (OIE);
- Global Health Security Agenda (GHSa);

- Biological and Toxin Weapons Convention (BTWC);
- United Nations Secretary-General's Mechanism for Investigation of Alleged Use of Chemical and Biological Weapons (UNSGM);
- G7 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (GP);
- Australia Group;
- Global Health Security Initiative (GHSI);
- European and Mediterranean Plant Protection Organization (EPPO); and
- United Nations Inter-Agency Coordination Group on AMR (IACG).

We use our membership of, and association with, these organisations as an instrument to amplify our ability to strengthen international norms, promote our values and encourage effective international collaboration to identify and address biological issues (whether disease outbreaks, deliberate threats or the situations that might lead to accidental release) when they first arise.

To counter deliberate biological threats we work internationally to implement the UK's Counter Proliferation Strategy⁹ (published in March 2016), including seeking to control access to potentially hazardous biological materials, equipment and knowledge globally, to make it as difficult as possible for states or terrorists to acquire or develop biological weapon capabilities. Much of the relevant Government expertise now sits within the Counter Proliferation and Arms Control Centre (CPACC), incorporating officials from the Ministry of Defence (MOD), the Foreign and Commonwealth Office (FCO), the Department for Business, Energy and Industrial Strategy (BEIS) and the Department for International Trade.

Alongside our world-class diplomatic service and our commitment to spend 2% of gross domestic product on defence, our commitment to invest 0.7% of gross national income in international development

⁹ National Counter Proliferation Strategy to 2020. Available at: www.gov.uk/government/publications/national-counter-proliferation-strategy-to-2020

enables us to shape the world around us rather than be shaped by it. That is why we invest in development in line with the UK's aid strategy to tackle the global challenges of our time – poverty and disease, mass migration, insecurity, conflict and climate change. Our commitment to spend £120 million to develop vaccines for diseases with epidemic potential in low and middle income countries and investing over £500 million in tackling AMR internationally are just two examples of our direct preventative action for natural risks globally. Our wider work to support vulnerable regions to strengthen healthcare systems and tackle disease outbreaks at source, also ultimately reduces the likelihood of a disease outbreak affecting the UK. We work closely with globally respected UK non-governmental organisations – supporting their activity and receiving their support to Government objectives internationally.

[At the UK border](#)

While pests and diseases are not constrained by international borders, we do not discount the UK border as a critical line of defence and an opportunity to disrupt both deliberate and accidental threats and natural hazards. Work to exploit this opportunity includes:

- our well-established import and export controls (as part of the broader international system);
- pre-border activities – such as building the capabilities of trading partners and working with internet traders; and
- controls and checks at the border itself – particularly important for preventing the spread of animal and plant disease alongside international trade.

The UK's exit from the EU may require some changes to our animal and plant health control arrangements, with the aim of maintaining our protection against biosecurity risks and identifying opportunities to improve on existing arrangements. Defra will be exploring the opportunities that exist to improve on the existing arrangements.

[In the UK](#)

For natural diseases (whether human, animal or plant), significant work is undertaken to address the factors that can make the emergence of natural disease outbreaks more likely. This includes public awareness campaigns about the importance of effective hygiene in disease prevention, comprehensive public vaccination programmes, and guidance on biological security for farmers and other growers. Alongside this is a focus on detecting outbreaks early (see next section) so that they can be swiftly addressed and their spread prevented.

For accidental and deliberate biological risks, a critical element is the work undertaken by the Health and Safety Executive (HSE) and the National Counter Terrorism Security Office (NaCTSO) to control access to hazardous biological substances¹⁰ in the UK. This recognises the need to act proportionately to ensure that legitimate research and industry are not burdened, while safeguarding the materials they hold. This includes assessment of the physical and procedural controls in laboratories, the training and competence of individuals working with pathogens, and the suitability of organisational risk assessments.

The Government co-funds the AMR Benchmark, first published in January 2018. This highlights ways that the pharmaceuticals industry is tackling AMR, and areas where more action is needed – assessing firms' product pipelines, access and stewardship policies, and manufacturing and marketing practices.

[What next?](#)

[Internationally](#)

To achieve even more through our leading role in the international organisations that work to prevent biological risks, we will further enhance co-ordination across Government to deliver more coherent and effective engagement in international forums. This will include:

- Working closely with the WHO and international partners to ensure that

¹⁰ As set out in Schedule 5 of the Anti-Terrorism, Crime and Security Act 2001.

the WHO leads and enables effective responses to health emergencies, and provides technical leadership in support of country resilience, preparedness and response. This includes £16m to support implementation of the WHO's International Health Regulations 2005 in selected countries, as the primary international instrument designed to help protect countries from the international spread of disease, public health risks and emergencies.

- Playing a leading role in collaboration with international partners and initiatives – such as the GHSA and the GHSI – to ensure a co-ordinated and inter-sectoral approach to supporting global health security.
- Strengthening international collaboration on AMR is a fundamental strand of the UK strategy – working with and through a wide range of governmental and non-governmental organisations, international regulatory bodies and others to influence opinion, galvanise support and mobilise action to deliver the scale of change needed globally, including for the diseases of poverty (TB, HIV and malaria).
- Working with the OIE and the FAO to provide expertise and develop a better framework of diagnoses, tests, trade rules and disease control measures.
- Enhancing international regulation and awareness of plant health concerns and emerging risks, working with organisations such as the FAO (on the International Plant Protection Convention), and the EPPO.
- Continuing to engage with the USA, Canada and other international partners both bilaterally and in forums such as the GP, BTWC, UNSGM and Australia Group in order to:
 - maintain and enhance the international legal regime prohibiting biological weapons;
 - strengthen control of dangerous biological materials, associated equipment and expertise to prevent accidental release and deliberate or accidental misuse – this includes co-ordination of export controls to prevent

exports contributing to the development of biological weapons; and

- strengthen UN operational capabilities to investigate allegations of biological weapon use.

We will make more co-ordinated use of UK resources to raise capability levels in countries overseas. This will mean using the full range of UK levers and the UK footprint overseas, such as the Science and Innovation Network, to influence and support countries with capacity and capability gaps in their health systems and biological security practices. In particular:

- Our international development programme will help to build capacity in health systems in developing countries that will strengthen their ability to prevent disease outbreaks from occurring, and remove the conditions necessary for disease spread.
- We will continue to support the development of new diagnostics, drugs, vaccines and other products that are effective, affordable, can be stored without the need for refrigeration, will shorten or simplify existing treatment schedules to reduce the risk of inappropriate use (which can cause AMR), and can be delivered without the need for highly trained staff. This will include work as part of the Ross Fund portfolio, to support research to develop new diagnostics and drugs to control neglected tropical diseases and strengthen the implementation of disease control programmes.
- We will work with developing countries to continue to improve access to effective immunisations against transmissible diseases (including new treatments developed through our research work), particularly through the UK's leading investment in the Global Alliance for Vaccines and Immunization.
- We will make full use of the UK Public Health Rapid Support Team – established in 2016 as a full-time deployable team of multidisciplinary public health experts. The team can deploy within 48 hours to support low- and middle-income countries to investigate and respond to disease

outbreaks that pose a global threat, before they have the chance of become a global health emergency.

- We will work with international partners to implement projects overseas as part of our International Biological Security Programme (IBSP) to improve the safety and security of dangerous pathogens that represent a potential threat to the UK and UK interests.

At the UK border

We will continue to use the border as a key intervention point to prevent biological risks reaching the UK. In particular:

- We will continue to target our resources, including the use of detection dogs trained in seeking products of animal origin, at airports and ports for passengers carrying illicit items in their luggage and on illegal commercial trade.
- We will continue to develop and enhance our capabilities for plant health inspection at the border, through legislation, guidance and the development of new detection technologies.

In the UK

- We will continue to work with academia and industry (including online industry) to prevent the unauthorised acquisition or use of hazardous biological materials.
- We will ensure that our approach to legislation and regulation of the biological sciences sector is proportionate to the risk, so as to protect and preserve biological security without imposing unnecessary burdens or deterrents to economic prosperity.

In the UK and overseas

- We will work with international organisations and governments, and with industry and academia, to ensure that we have in place within the UK education and training promoting a responsible biological sciences research culture, and

to contribute to improving education and training on these issues overseas – including to make best use of IBSP-funded material (such as the Guide to Biological Security Issues, published in December 2015¹¹). This will include engagement with industry and academia within the UK to ensure that they are aware of and able to manage the risk from insider threat.

- We will work with industry and academia, including the UK Research Councils and other relevant organisations, to review and refresh the Government’s approach to dual-use research of concern, ensuring that this is proportionate. This will include establishing a central Government point of contact through which concerns can be raised (including by external partners).
- We will continue to ensure that we have the relevant capabilities and expertise to make safe both biological weapons and associated infrastructure – in the UK and overseas.

¹¹ Bradford University’s Guide to Biological Security Issues, consisting of *Preventing Biological Threats: What You Can Do* and *Biological Security Education Handbook: The Power of Team-Based Learning*. Available at: www.bradford.ac.uk/social-sciences/peace-studies/research/publications-and-projects/guide-to-biological-security-issues

Prevent case study – Promoting education on biological security

The UK International Biological Security Programme (IBSP) co-funded (with the Canadian Global Partnership Program) the production of freely available biosecurity educational material for undergraduate students. Led by the University of Bradford and published in December 2015, the biosecurity guide, *Preventing Biological Threats: What You Can Do*, aims to improve biosafety and biosecurity awareness among those studying and working in the biological sciences and related fields, and includes inputs from leading academics, countries and organisations including the US National Academy of Sciences, the BTWC Implementation Support Unit, and INTERPOL.

The guide includes: material on the potential biological threats in the 21st century and what states, organisations, scientists and the international community as a whole can do to deal with such threats; information on dual-use implications and responsible science; and details on the relevant international legal agreements. The guide is accompanied by the *Biological Security Education Handbook: The Power of Team-Based Learning*, which offers practical guidance on using the material in the guide as part of scientists' education. Both are freely available on the University of Bradford and BTWC Implementation Support Unit websites, and have so far been translated into Russian, Arabic, French and Ukrainian; translations into Spanish, Portuguese and French are in progress. The aim is that this material will provide an international standard for education in biological risks and threats, and promote a culture of scientific responsibility.

By providing free and widespread access to such materials, we can work towards ensuring that those involved in the biological sciences and related fields are aware of the risks that their work can be misused for weapons purposes, and are in an informed position to prevent or manage such risks.

C. Detect

Rapidly and effectively detect, characterise and report the presence and nature of harmful biological material, or pest and disease outbreaks that have the potential to represent a significant risk or threat to the UK or UK interests.

Overview

Where we are not able to stop a biological risk from emerging, we need the ability to rapidly and confidently detect outbreaks when they occur, or hazardous biological material when it is found, in order to prevent further spread and launch a tailored and timely response. Successful detection is therefore a critical enabler for success in the Prevent and Respond pillars of this strategy. Alongside this, our analysis and characterisation work needs to allow us to understand the provenance of the material or outbreak – what the material is, whether it originated naturally or deliberately (and where) – in order to prevent recurrence as far as possible and to support a health or law enforcement-based investigation.

Detecting biological threats

The UK has in place a comprehensive and well-tested system for rapidly detecting and identifying disease outbreaks. At the front line of this effort are our world-leading clinicians, veterinary surgeons, scientists and industry professionals who, on a day-to-day basis, identify and report the first signs of significant disease outbreaks or biological incidents. Supporting these professionals are a range of surveillance systems that aim to draw together isolated cases and events to identify patterns and provide an early warning system for the spread of disease. Examples include:

- PHE's real-time syndromic surveillance¹² team, who collect and analyse health data from multiple sources, indicating higher-than-usual levels of illness, and publish bulletins to keep public health professionals informed;
- surveillance and monitoring of AMR;
- well-developed biological laboratory surveillance systems and a strong One Health approach;
- animal surveillance led by APHA, and the Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland, including risk assessments on the potential introduction of animal health threats and consequent amendments in surveillance systems to ensure that these threats can be identified both at the border and in the national animal population;
- monitoring of diseases endemic to the UK – to identify when a risk changes, for example monitoring for notifiable diseases such as bovine tuberculosis;
- passive animal surveillance, including the investigation of suspected cases of rapidly spreading animal disease;
- plant health surveillance – led by plant health inspectors from APHA and the devolved administrations for horticulture and agricultural crops and by the Forestry Commission for forestry threats – including: detection at the border, risk-based inspection of plant importers, wholesalers, retailers, nurseries and forests, and outreach campaigns; and strengthening our surveillance of plant pests through the involvement of 'citizen science' in programmes such as Observatree¹³;
- well-established links with international detection networks for all biological risks, for example the International Plant Sentinel Network¹⁴; and
- vector surveillance as a cross-agency programme (PHE, APHA) supported by the Met Office.

¹² Syndromic surveillance is the process of collecting, analysing and interpreting health-related data to provide an early warning of human or veterinary public health threats that require public health action.

¹³ Observatree is a collaborative project aiming to help spot new pest and disease threats to UK trees: www.observatree.org.uk

¹⁴ The International Plant Sentinel Network is being developed to provide an early warning system of new and emerging pests and pathogen risks: www.bgci.org/plant-conservation/ipsn

Alongside this work to detect and characterise disease outbreaks through our health systems, we also continue to invest in our capabilities to rapidly detect and identify hazardous biological materials at a potential crime scene or in the food chain. These include first responders and food inspectors, supported by expert scientific advice and world-leading laboratory analysis capabilities that operate at the highest levels of confidence.

What next?

- **We will approach biological detection in an integrated way across Government** in order to ensure that our expert communities are supported by the right technology and data systems.
- We will continue to safeguard and invest in the Government's analytical capabilities – to retain our body of expert staff, keep pace with developments in technology and make these capabilities available to Government as a whole.
- We will ensure timely notification of outbreaks, accidents and incidents, and provide effective communication and guidance (where appropriate) to enable prompt action by an informed society.
- Through the £265 million commitment to the Fleming Fund, the UK will improve laboratory capacity for diagnosis as well as surveillance of AMR in low- and middle-income countries. Building national capability to detect and track trends in AMR in human and animal health, as well as in agriculture, will enable countries, regions and global actors to tackle AMR.
- The International Plant Sentinel Network is being developed to provide an early warning system of new and emerging pests and pathogen risks.

The people

- We will ensure the clinical (including first responder), veterinary, horticulture and agriculture communities are provided with the appropriate training, information and support to identify and report the signs of high consequence infectious disease.

The systems

- We will further improve our syndromic surveillance tools and links into international surveillance systems.
- We will explore gaps and potential opportunities in our use of big data (and open data) in our surveillance systems, including how effectively we use social media.
- We will continue to develop and exercise our modelling and epidemiology systems to ensure that they are fit for purpose in the context of current operational processes, changing technologies and emerging risks.
- We will ensure that systems are in place to support the effective sharing of information and reference materials between analysis centres.

The technology

- We will ensure that Government departments work together, as well as in partnership with industry and academia, as they seek to develop new detection capabilities.
- We will work with frontline responders to ensure that they continue to have access to a level of technology (proportionate to the threat) and real-time scientific advice to support detection and scene assessment as appropriate.
- We will continue to explore the options for wide area environmental detection and monitoring of biological hazards.
- We will continue to develop our analytical tools and databases, working with key international partners as appropriate, to ensure that we are able to distinguish a natural outbreak from an accidental or deliberate one, and also to determine the origin of the outbreak.

Detect case study – National outbreak of *E. coli* O157

On 21 June 2016, the South West PHE centre observed higher than expected notifications of *E. coli* O157 cases from local NHS and PHE laboratories. An outbreak control team was convened on 22 June to investigate this increase. Within two days, samples were confirmed as the verocytotoxin-producing *Escherichia coli* serogroup O157, a relatively rare cause of gastrointestinal illness in England. By 27 June, a significant increase in the outbreak strain was observed nationally, and the incident was declared and managed as a national outbreak by PHE.

The results of a rapid case control study led from the South West indicated an association with leafy salad vegetables and salad products; analytical studies that followed provided evidence that consumption of mixed salad leaves, particularly from catering establishments, was associated with infection. Traceability information provided by local investigators and the Food Standards Agency was used to identify the source of the outbreak and the voluntary removal of product and cessation of import of a specific foodstuff saw cases decline, with the outbreak declared over by 27 July. In total, 158 cases were identified with patient interviews suggesting the first cases had appeared in late May.

As this example demonstrates, PHE, working closely with partner agencies, has robust processes and analytical tools in place across the organisation to rapidly manage outbreak situations and minimise the harm. Through greater awareness of signs and symptoms among the population and local health practitioners, more powerful detection technologies in local laboratories and more sensitive surveillance mechanisms for diseases such as O157 at the community level, we can help to further improve the speed of initiating this type of response.

D. Respond

Have in place the right capabilities to respond effectively to significant disease outbreaks and biological incidents within the UK or affecting UK interests in order to lessen the impact, eradicate threats and ensure a swift return to normal.

Overview

No matter how hard we try, we will not be able to prevent all biological risks all the time – disease outbreaks will still occur. It is vital therefore that we have in place a swift, scalable and comprehensive response system that is flexible between risks and able to cope with new risks as they emerge. The UK is already well served against these criteria, but there is more that we can do to ensure that these capabilities are as co-ordinated and agile as possible to reflect the evolving risk landscape.

Responding to biological risks when they occur

The UK has in place world-leading human, animal and plant health systems that are able to respond to a wide range of potential crises – from frontline responders to expert treatment.

In the event of a significant disease outbreak in the UK, these day-to-day health systems are supported by extensive cross-Government response arrangements, including detailed contingency plans, to allow effective co-ordination and leadership – reinforced through a regular programme of training and exercises. This planning takes place at a local as well as a national level – working with Local Resilience Forums and strategic co-ordinating groups to support a UK-wide response. We maintain appropriate stockpiles of clinical countermeasures for diseases of concern (whether outbreaks are caused naturally or deliberately) and we work

to ensure these are as flexible as possible to provide effective coverage against a wide range of potential scenarios. We have a strong public communications capability, to ensure that we are able to engage swiftly and clearly with the public about any action they might need to take to protect themselves or support an effective response.

Supporting this we have access (both within Government and beyond) to a cutting-edge biological sciences research and development community working to increase the effectiveness of our response, for example through development of new medical countermeasures for infectious diseases.

The UK plays a major role in strengthening the international health system-preparedness, response and resilience. We support the WHO, including through:

- the WHO's Health Emergencies Programme, which leads the global response to health emergencies and has a world leading surveillance and information network filtering through 5000 disease "signals" a month looking for outbreaks of pandemic potential: the UK is one of the biggest funders and has recently doubled our commitment to £10m pa;
- the WHO's Contingency Fund for Emergencies, which can release funds within 24 hours of a suspected disease outbreak, enabling a rapid response to prevent its escalation to pandemic level. The UK is one of the largest contributors;
- GOARN – the Global Outbreak Alert and Response Network, a system to deploy technical expertise from around the world to an emergency situation to support the national response. The UK's Public Health Rapid Support Team works with GOARN.

We also fund capacity-building programmes in partnership with the WHO and others, including: (a) supporting developing countries to assess and improve their own capability to manage outbreaks, and prevent AMR; (b) assessment and research into outbreaks, including risks and preparedness, including

with the Wellcome Trust; and (c) ensuring that extra expertise is available quickly to countries experiencing outbreaks, where needed, through PHE and DFID’s Emergency Medical Teams.

UK aid programmes work with partner governments in low and lower middle income countries to strengthen health systems, so that they are better able to prevent, identify, and respond to outbreaks. The Tackling Deadly Diseases in Africa Programme, led by DFID, supports around 20 African countries in tackling disease outbreaks before they turn into epidemics that destroy communities and threaten prosperity. The UK’s investment will support WHO Regional Office for Africa (AFRO) reform and contribute to strengthening African countries’ health systems, training staff, and enhancing data and surveillance systems to prevent and respond to disease outbreaks quickly.

What next?

Ensuring effective planning for a UK response

- We will continue to ensure that we have in place proportionate, flexible and well-tested plans to cover a range of biological risks. While acknowledging the specific challenges presented by particular diseases, these will (where possible) be impact focused and not focused on the characteristics of specific diseases, in order to allow an effective response to new and emerging risks.
- We will continue to develop our planning for the highest impact risks in the NRA, which include naturally occurring diseases and biological attacks.
- We will take forward cross-Government work, drawing on key capabilities within PHE and APHA, to develop an overarching plan for responding to the risk of mosquito-borne diseases entering the UK.
- We will develop a UK Government response plan for major international diseases to ensure that the Government

is fully prepared to respond as quickly as possible to new disease outbreaks. This will build on our existing overseas crisis response planning, which ensures that we have effective mechanisms in place to communicate with, and provide consular assistance to, British nationals overseas, to support Government staff, and to ensure an effective international response.

- We will work with industry and operational partners to build resilience and ensure that we are better protected against animal and plant diseases and other hazards, with strong response and recovery capabilities.
- We will regularly review our capability to respond to plant and animal disease threats and take action as required to manage the risk.
- We will ensure we have in place effective contingency plans, both for specific known plant pest and pathogen threats, but also generic plans to counter outbreaks of previously unknown threats to the plant health sector.

Supporting first responders

- We will continue to make it a priority to protect first responders through ensuring that they are equipped and trained properly.
- We will complete the implementation of the new Specialist Operational Response in 2018,¹⁵ ensuring that we have a well-developed and well-tested response to biological incidents where there is a crime or incident scene (whether attacks or accidental releases of material). This will build on the significant specialist capabilities to respond already in place within the police and military.
- We will continue to support the International Animal Health Emergency Reserve agreement signed between the UK, Ireland, USA, Canada, Australia and New Zealand to provide veterinary and technical staff in the event of an outbreak of animal disease.

¹⁵ The Specialist Operational Response is the mobilisation, arrival and deployment of specialist responders and capabilities for a contamination event after the initial emergency response.

- We will ensure our inspectors and citizen science volunteers are sufficiently trained to identify potential UK plant health threats.

Delivering strong health systems

- We will use the High Consequence Infectious Diseases (HCID) programme to strengthen the commissioning of NHS services in the UK, and will ensure through the HCID programme that we address identified weaknesses in the system. This programme will include:
 - a defined, tiered operational response, service specifications, clinical policies and commissioning tools;
 - response arrangements for first contact agencies;
 - a governance framework for the use of novel and experimental therapies for treatment of HCID;
 - standards and mechanisms for responsive clinical research protocols to be implemented rapidly and effectively;
 - arrangements for the training, assurance and testing of facilities;
 - agreed arrangements for mutual aid;
 - arrangements for the transfer of patients across the UK to the most appropriate facilities; and
 - a defined response to an HCID outbreak overseas requiring medical evacuation to the UK.

Better communication with the public

- We will ensure that we have effective plans in place for communication of biological risk information to the public, that these are regularly reviewed and that information is easily accessible – for example, PHE awareness raising about seasonal public health risks or Defra guidance on where to report pests and pathogens of concern.

The right drugs, vaccines and treatments – used appropriately

- We will continue to ensure that we have the appropriate stockpiles of medical countermeasures to address crises, and that there is resilience in our supply chains for key medical countermeasures.
- We will work together with the vaccines and pharmaceuticals development industries to improve the speed with which relevant products reach market, or can be generated rapidly on demand in an emergency. We will do this by:
 - making significant investments in the development of vaccines against diseases that are a recognised threat to health security, including through a DHSC-led programme focused on developing vaccines for diseases with epidemic potential;
 - investing in early-stage vaccine platform technology and vaccine manufacturing technology that will in future allow for quicker clinical development of vaccines and easier manufacture; and
 - developing, for the first time, an end-to-end process map of the vaccine development process in the UK, and use this to develop an understanding of the rate-limiting steps in this process, so that they can be addressed in a coherent, structured manner by a broad range of cross-Government partners (including DHSC, PHE, the Office for Life Sciences (OLS), and Dstl).
- Through the UK's Global Health Security programme, we will invest in processes to accelerate the deployment of vaccines during response periods.
- The UK Antimicrobial Resistance (AMR) Five Year Strategy takes a One-Health approach and covers the period 2013-2018. The Government also set new ambitions in response to the O'Neill Report,¹⁶ to:

¹⁶ O'Neill J (2016) *Tackling Drug-Resistant Infections Globally: Final Report and Recommendations*. Available at: www.amr-review.org.

- reduce healthcare associated Gram-negative bloodstream infections in England by 50% by 2020/21;
 - reduce inappropriate antibiotic prescribing by 50%, with the aim of being a world leader in reducing prescribing by 2020/21;
 - set an overall target for antibiotic use in livestock and fish farmed for food, cutting use to 50mg/kg by 2018; and also ensure strict oversight of the use in animals of antibiotics which are critical for human health – including supporting restrictions or even bans where necessary; and
 - ensure that tests or epidemiological data are used to support clinical decision making, implement our vision and deliver high quality diagnostics in the NHS in support of the other ambitions.
- A UK wide refresh of the strategy is underway.
 - We will work with HSE's Chemicals Regulation Division to ensure that effective chemical control methods are available to stakeholders in the event of a plant health outbreak – through extension of use and under a Plant Health Order.

Effective and proportionate capabilities for decontamination and return to normal

- We will ensure that, through Defra, we have in place effective and proportionate strategies to decontaminate a scene or area within the UK that has been contaminated by hazardous biological material, in order to allow a return to normal as soon as possible.

Respond case study – Asian longhorn beetle

The Asian longhorn beetle (*Anoplophora glabripennis*) is a major international plant pest that is capable of killing or severely damaging a wide range of broadleaved trees, such as maple, sycamore, horse chestnut, birch, elm, poplar and willow. In urban areas, severely infested trees soon become a hazard. The beetle is native to the Far East and can be transported in untreated wood packaging material. Introductions have led to the establishment of populations in parts of Europe and North America, where control costs have run into hundreds of millions of dollars.

In early 2012, the first recorded outbreak of Asian longhorn beetle in the UK was found at Paddock Wood in Kent, near small commercial premises that had previously imported stone and slate from China.

Defra responded to the outbreak by bringing together a multi-agency incident management team (IMT) which followed a contingency plan put together by inspectors, researchers and policy teams.

Key to the effectiveness of the response was the identification and removal of infected host trees, and those close by, before any new adult insects could emerge that summer, as there is no effective option for treating trees infested with live Asian longhorn beetles.

To achieve this, the incident management team deployed trained staff from Animal and Plant Health Agency (APHA), Forestry Commission England (FCE) and Forest Research. In addition, the team made use of FCE framework agreements to contract experienced tree climbers.

A feature of this response was the inclusion of the local public so that they were able to help officials look for the beetle, both at the time of the outbreak and during subsequent years. This involved a public meeting, local press and radio, mail shots and even presenting at local primary schools to ask children to look and report anything suspicious.

Many novel techniques were used or tested during this outbreak, including the use of lures and traps to attract beetles and the arrival of two detection dogs trained in Austria that can smell the beetles in trees.

At the end of the first year's survey and destruction activity, 1,500 trees had been felled and burned from fields and roadsides plus a further 700 from commercial premises and private gardens. FCE liaised with owners to ensure that property damage was minimised and to provide advice on replacement trees.

To declare confidently that the outbreak has been eradicated, annual surveys must take place for two life cycles of the beetle, with 2017/18 the final year; to date, no further evidence of the beetle has been found.

E. A strong science base

Science and technology run through every element of our response to significant biological risks – from understanding the nature of the risks to responding to events that we are unable to prevent, everything Government does in this space must be underpinned by high quality science and evidence if it is to be effective. Accessing this science and advice involves the critical scientific capabilities within Government as well as working very closely with industry, academia and international partners. In some cases, the Government needs to support capabilities where the commercial market is insufficient in scale or predictability, to assure a responsive capability in very low likelihood, high impact scenarios.

Both within the Government’s own science base and in the wider UK science and research community, we are able to draw on world-leading capabilities and experts. This supports the commercialisation of science that is of benefit to the UK’s prosperity agenda (see next section for further details) but is also critical for helping to ensure that we are able to protect the UK and UK interests from significant biological risks, now and in the future. We cannot, however, afford to be complacent. Risks evolve and we need to ensure that our science capabilities evolve as well – to keep pace with the challenges of today and to be better able to predict those of tomorrow. In addition, we will need to ensure that we are able to respond to, and build on, any other changes likely to affect this space, including managing the impacts and opportunities of the UK’s exit from the EU on the UK’s international science networks.

Our requirements

To address the biological risks set out in this strategy, we rely on physical assets (laboratories and equipment), specialist personnel and expertise, and supporting functions such as sample collection and transport, legal frameworks, enabling communications and infrastructure. All of these elements are required to have a

functioning capability, and all have to work in a crisis as well as during normal business. In addition, our key capabilities are not necessarily just those directly owned by Government – but also, in some cases, those owned or operated and funded by industry and academia.

In order for them to be effective and respond to the full range of Government requirements, we need to ensure that these science capabilities can not only address business as usual needs and respond to reasonable worst-case scenarios, but are also sufficiently flexible to be able to adapt to an evolving threat picture and allow us to effectively respond to future crises.

What next?

Work is already in train across Government to look at how we can make the best possible use of our critical science capabilities – from more effective co-ordination between sectors, to reaching out more to industry and academia, to championing new approaches to innovation. We are also investing to allow these capabilities to remain cutting edge within a rapidly evolving technological landscape. Our approach is set out in a range of strategies and programmes, including the 2015 SDSR. When it comes to the capabilities that relate to biological risks in particular, there are a number of areas where we will seek to do even more.

We will do more to develop a common understanding within different Government departments and Government science capabilities of any science and technology challenges and gaps in relation to biological risks. Where appropriate, we will make use of resources such as Blackett Reviews to look at specific challenge areas (drawing on the example of the 2014 *Blackett Review on Wide-Area Biological Detection*¹⁷). Where common problems are identified, we will where necessary commission joint programmes between departments to address them as effectively as possible.

¹⁷ Government Office for Science (2014) *Blackett Review on Wide-Area Biological Detection*. Available at: www.gov.uk/government/uploads/system/uploads/attachment_data/file/279345/14-590-blackett-review-biological-detection.pdf

We will explore how to better co-ordinate our specialist biological science capabilities. This will build on work already under way – for example, we will use the planned PHE move to Harlow to further consolidate our scientific base through the development of a £400 million public health science hub to create a centre of excellence for research, health improvement and protection.

We will protect our science base for the future. Government-funded research via research councils and universities is ring-fenced. We will also protect the world-leading capabilities and scientific expertise within Government, so that our policy making, planning for and response to biological risks continue to be underpinned by the highest quality evidence. This will include work to:

- sustain niche capabilities – particularly in relation to low likelihood, high impact risks; and
- protect a sustainable pathway for expertise. We will look at whether there is more we need to do to further develop the supply chains for biological expertise into Government (through university courses and in-house training, for example). In this we will aim to learn from areas of best practice – such as the Fera Science/ Newcastle University joint Institute for Agri-Food Research and Innovation, or BEIS’s funding of Centres of Agricultural Innovation which provide a portal to the best expertise and equipment across the whole agri-food supply chain.

We will work even more closely with industry and academia. Many of the best ideas and solutions to biological risks will come from outside Government and we must make sure that we are able to take advantage of these, including from non-traditional partners. A great deal of work is already under way to do this. For example, by 2020, through the UK Science Partnership for Animal and Plant Health,¹⁸ the UK will have created and harnessed new research

knowledge and technology that will transform our ability to:

- systematically predict, detect and understand key current UK animal and plant health problems and emerging threats in real time; and
- direct sophisticated and rapid responses to effectively and efficiently prevent and mitigate impacts on our agri-environment and wider ecosystems and landscapes.

In parallel, this partnership will create the best possible environment for developing and trialling new interventions, stimulating inward investment, and the commercial development of new biological security products and services. However, we must go further and apply our learning from these successes to other areas of the biological risk landscape. To do this we will work to better communicate Government requirements and problems to the biological sciences community, particularly in those areas (such as deliberate biological threats) where we have traditionally been more cautious.

We will work closely with, and learn from, our international partners, ensuring the UK remains a valued source of expertise on the early warning of global biological risks. This collaboration will include investment in joint research programmes, and UK support to the WHO Blue Print: a research and development programme that aims to fast track development of vaccines and countermeasures for pandemic threats. Many of our key allies and partners are facing similar challenges and looking to address these in a similarly joined up way. Wherever possible we will use our existing science relationships (and build new ones) to share the burden, avoid duplication of effort, share information and resources, and ensure the exploitation and maintenance of our key scientific capabilities.

¹⁸ HM Government (2016) *A Vision and high-level Strategy for UK Animal and Plant Health Research to 2020 and Beyond*. Available at: www.bbsrc.ac.uk/documents/1601-animal-and-plant-health-report-3

F. The role of industry and academia in biological security

This strategy so far has largely considered biological risks, but this is also an area of great opportunity. The UK biological sciences sector is world leading, and makes a considerable contribution to UK economic prosperity and the health and care of its citizens. We must ensure that we are able to support and facilitate this sector, and that the measures that we have in place to encourage responsible science and prevent misuse of hazardous biological materials or scientific knowledge are proportionate and do not impede vital legitimate research and industry – not only for the sector's role in UK prosperity but because of its importance in ensuring that we can more effectively address the risks described in this strategy, and perhaps even one day eliminate them.

World-leading research and biological industries

The UK has an acknowledged pre-eminent research and development base, with UK research accounting for approximately 11% of the world's citations within biological sciences. It also has considerable clinical and field research expertise, aided by the NHS's and APHA's particularly rich data-sets. The life science sector employs almost 240,900 people, approximately 1.0% of all UK private sector employment. There are 5,649 businesses in the sector, generating approximately £70.3bn in annual turnover.¹⁹

We have made sure that we are able to turn this research into action. For example, the National Institute for Health Research (NIHR) – with £1 billion per annum funding through the DHSC in England – is the most integrated health research system in the world. The NIHR is designed to help health researchers and the biological sciences industry to support the clinical development of drugs, devices and diagnostics. Through its investment in biomedical research centres

and other research infrastructure in the NHS, the NIHR provides research funding, world-class facilities and expertise that support the clinical development of innovations and new healthcare interventions. The NIHR encourages collaborations across the research infrastructure, helping to build national research capacity, and enabling researchers and the biological sciences industry to use this expertise and have access to patient cohorts.

The UK has a strong science base and it is vital that we build our capabilities to develop commercial opportunities from these strong foundations. The UK bioindustry published an Advanced Therapies Manufacturing Action Plan in November 2016.²⁰ Although this new class of medicines – Cell and Gene Therapies – is still an emerging sector, it is set to be transformative. The action plan estimates a global market of £9 billion to £14 billion by 2025 and £21 billion to £32 billion by 2030. Cell and Gene Therapy is a growing area of UK biosciences business having received £1.3bn in investment to date. There are currently 64 companies working in this field, employing more than over 1000 people.²¹

Our established bioscience capabilities, networks, facilities, infrastructure, knowledge and expertise, together with a strong heritage of discovery and innovation in this field, make the UK an attractive destination for researchers and investors. The Government has long recognised the value of the biological sciences sector – demonstrating our commitment through the launch of the UK's 10-year life sciences strategy in 2011 under the leadership of the Office for Life Sciences (OLS). August 2017 saw the publication of the Life Sciences Industrial Strategy (LSIS), written by Professor Sir John Bell, and drawing on the input of a wide range of views across the sector.²² Government and sector partners took the first step in delivering on the Strategy with the ground-breaking Life Sciences Sector

¹⁹ bioscience-and-health-technology-database-annual-report-2017

<https://www.gov.uk/government/publications/bioscience-and-health-technology-database-annual-report-2017>

²⁰ Advanced Therapies Manufacturing Taskforce (2016) *Advanced Therapies Manufacturing Action Plan, Retaining and Attracting Advanced Therapies Manufacture in the UK*. Available at: www.bioindustry.org/newsandresources/bia-news/action-plan-for-uk-to-capture-next-generation-of-meds-manu

²¹ Cell and Gene Therapy Catapult Annual Report 2017 <https://ct.catapult.org.uk/resources/publications>

²² The Life Sciences Industrial Strategy <https://www.gov.uk/government/publications/life-sciences-industrial-strategy>

Deal, published in December 2017.²³ This is intended as the first in a series as part of an ongoing, collaborative partnership with the life sciences sector to support the LSIS's ambition to make the UK a top tier global hub for biomedical and clinical research and medical innovation. In addition, BEIS has begun work with the life sciences sector and others to develop a strategy for the bioeconomy. Its aim is to stimulate and facilitate the huge potential of the sector to contribute significantly to the UK's economy and food and energy security: from transforming waste into valuable economic resource such as bioethanol, to the possibilities for bioenergy to contribute 8% to 11% of the UK's energy needs by 2020.

The role of biological security in biological opportunity

Biological security is an integral and critical facet of work in this sector. UK biological industries, institutions and infrastructures contribute immeasurably to our ability to influence and develop global biological security, and in turn grow the UK bioeconomy by marketing their considerable expertise in this field.

Prosperous and productive biosciences contribute to the provision of the evidence base to ensure timely awareness of, and the development of effective strategies to limit the occurrence and impact of biosecurity problems. For example, national agricultural and medical bioscience expertise and capability are acknowledged to be key to ensuring that UK food and farming are more resilient to plant and animal disease, and that the NHS is able to cope with emerging infectious diseases. Sustainable growth and development in the biological sciences and agri-tech industries are therefore important for the biological security of the UK.

UK growth in this area is also a positive resource for wider global biological security, offering further options for business expansion and propagation of niche UK expertise to address global needs. In many areas the UK is seen as the exemplar of

best practice and the existing contribution by the UK (such as WHO/OIE reference laboratories based in the UK) is internationally valued and influential. UK-based individuals and institutes are already providing research and innovation that support biological risk awareness, prevention, detection, response and control policies and strategies around the world. Furthermore, anticipated global and technological change and emerging risk are expected to create further opportunities for the export of biosecurity-relevant UK technologies (detection platforms; diagnostic tests; human, animal and plant treatments and countermeasures), intellectual property and expertise (education and training, capacity-building programmes). The medicines regulator, the Medicines and Healthcare products Regulatory Agency (MHRA), helped the Jenner Institute at the University of Oxford overcome the scientific and regulatory challenges it faced when developing a vaccine for malaria that made innovative use of viral vectors using non-human DNA.²⁴

However, the biological sciences sector can be a source of biosecurity risk. At the level of the individual organisation, insufficient, inadequate or ineffective biological security and safety policies and practice (whether international or national) can present the risk of contamination and may lead to containment failures that could damage productivity or the viability of that organisation. For organisations where biological materials are manipulated, stored or used, local biosecurity failures have potential ultimately to result in the UK being the source of a global biological security problem, or to the UK being isolated in terms of trade or collaboration. As well as the immediate health and welfare consequences, such a breach would have a lasting negative impact on the bioeconomy (and more widely), not least through the erosion of public and governmental trust. Finally, we also need to be aware that as biotechnology develops and related scientific knowledge is shared online, there is an increasing interest in this

²³ The Life Sciences Sector Deal <https://www.gov.uk/government/publications/life-sciences-sector-deal>

²⁴ 'Case study: MHRA supports innovative vaccine development at the University of Oxford'. Available at: www.gov.uk/government/case-studies/innovation-mhra-supports-innovative-vaccine-development-at-the-university-of-oxford

area from the public and those outside the traditional biological sciences sector. This will have implications for biosecurity and for the Government's response in terms of available guidance and advice.

These issues necessitate a coherent vision for biological security across the biological industries and research organisations and bio-dependent sectors. However, this response must focus on minimising the physical risks associated with inadequate containment and poor biosecurity and on good governance of research. It is critical that measures do not encroach on innovation, which might not only stifle industry and in particular the developing bioeconomy, but could also limit our capability to respond to new threats. The current UK approach to managing biological security is strong and supported or enabled by established safety, security and quality control frameworks, guidelines, regulations and legislative measures. The HSE's inspections, investigations and enforcement aim to minimise the risks associated with legitimate work with pathogens, through assessment of compliance with legal requirements and subsequent action to ensure that any gaps are addressed. This is supported by routine assessment of physical and procedural controls in laboratories, the training and competence of individuals working with the pathogens, and the suitability of laboratory risk assessments.

In implementing this strategy, we will seek to ensure that these underpinning instruments of biosafety and biosecurity continue to be (or evolve through continuous improvement to become) practicable, proportionate and effective enablers of bio-dependent businesses. Our approach will support a resilient, responsive, agile and successful bioeconomy, maximising the use of this sector's outputs for the benefit of domestic and global biological security.

In our work to UNDERSTAND biological risks:

- i. We will seek to use the knowledge within UK biosciences industries and academia to support our understanding of bio-risk and opportunity.
- ii. We will ensure that the Government's understanding of risk is more effectively propagated to the bioeconomy businesses – to inform their risk management approaches and to make them aware of business development opportunities.

In our work to PREVENT biological risks from emerging:

- i. We will work with bioeconomy businesses to provide proportionate, effective and practicable regulation that supports both biosecurity and opportunities for business growth.
- ii. We will develop biosecurity awareness education and training packages that support UK biological sciences practitioners at all stages of their career.
- iii. We will promote UK bioeconomy business and expertise to overseas partners where their input can meet or support biological security needs.
- iv. We will work with the biological sciences sector to explore possible technological solutions to prevent threats emerging (such as resistant strains of crops).

In our work to DETECT, characterise and identify biological risks:

- i. We recognise that the UK biological sciences industries are well placed to provide the technological solutions to our detection needs. We will provide opportunities to the UK bioeconomy through better articulation of our research requirements.
- ii. We will explore synergies between the detection requirements of different biological risk areas to drive cross-fertilisation of ideas and to maximise the potential for existing technologies to improve human, animal and plant health outcomes and NHS efficiency.

In our work to RESPOND to biological risks if they occur in the UK or in relation to UK interests overseas:

- i. We will ensure that we have the systems in place to draw on the world-leading capabilities within the UK biological sciences sector to deliver effective responses to biosecurity crises where appropriate.
- ii. Our biological sciences, bioeconomy and AMR strategies will collectively seek to ensure strategic resilience, supporting our response to biological security risks, for example providing a resilient and flexible production capability for medical countermeasures to infectious diseases.

Strategy Implementation

Minister responsible – Security Minister

Governance structure

Governance for much of the activity described in this strategy falls within departments' existing portfolios and governance mechanisms. This strategy brings together that activity to ensure that a cross-Government approach to biological security is maintained, while avoiding duplicating existing mechanisms and activities.

Many of the commitments can only be delivered if Government departments work together, in many cases across sectors that have not previously systematically engaged with one another. These commitments (as well as any new work or identified gaps that emerge when work on biological risks is being co-ordinated) will be owned by a cross-Government director-level governance board, made up of representatives from the following departments:

- Home Office
- DHSC (including PHE representation)
- Defra (including APHA representation)
- Agri-Food and Biosciences Institute (AFBI)
- MOD (including Dstl representation)
- FCO (including the Science and Innovation Network)
- BEIS

- DFID
- GO Science
- Cabinet Office
- HSE
- OLS
- Department for International Trade
- the Devolved Administrations

This governance board will report to the Threats, Hazards, Resilience and Contingencies Subcommittee of the National Security Council, through the Security Minister, to ensure that a forum at the highest level of Government holds departments to account. The Government Chief Scientific Adviser will maintain an oversight of developments under the strategy.



Annex A – Departmental roles and responsibilities

The **Civil Contingencies Secretariat (CCS)** is part of the National Security Secretariat within the Cabinet Office. CCS co-ordinates civil emergency planning and response, including ensuring that Government is ready to respond to, and recover from, a variety of challenges and is able to provide effective and co-ordinated crisis management. CCS also ensures that effective arrangements exist for short and longer term risk assessment at national and local levels and that appropriate capabilities and plans are in place internationally, nationally and locally to deal with the full range of significant risks.

The **Department for Business, Energy and Industrial Strategy (BEIS)** ensures that the economy grows strongly in all parts of the country, based on a robust industrial strategy and secure energy supplies that are reliable, affordable and clean. It encourages investment and innovation that fully utilise the UK science, engineering and technology base.

- The **Office for Life Sciences (OLS)**, a joint team between BEIS and the DHSC, champions research, innovation and the use of technology to transform health services. It leads on Government policy for the UK's health and biological sciences industries (biopharmaceutical, medical technologies and digital health).
- BEIS (along with Defra) has responsibility for developing funding and regulatory strategies for both the agri-food industry and the wider bioeconomy.

- BEIS has responsibility for science and innovation policy and research funding, including through UK Research and Innovation. BEIS oversees the allocation of funding to these partners, who in turn provide support to universities and to key institutes that underpin the biosecurity strategy. BEIS also works with the research base as it develops policies for research integrity to ensure the highest standards of ethical research.

The **Department for Environment, Food and Rural Affairs (Defra)** has responsibility for safeguarding the natural environment against animal and plant diseases, flooding and other hazards, supporting the world-leading food and farming industry in England, and sustaining its thriving rural economy. For deliberate animal and plant disease threats Defra is responsible for co-ordinating the national recovery effort.

The **Department of Health and Social Care** leads the health and care system in England to help people to live better for longer. It ensures that people have compassionate services that protect and promote health and give safe, effective and efficient care. This includes work under all four pillars of the Biological Security Strategy, to understand the public health threats we face, prevent these where possible, rapidly detect any that occur, and respond effectively to disease outbreaks.

The **Department for International Development (DFID)** leads the UK's work to end extreme poverty – tackling the global challenges of our time, including poverty and disease, mass migration, insecurity and conflict. DFID contributes to the biological security of the UK and UK interests through its work to help developing countries strengthen their healthcare systems and address disease outbreaks – leading to a healthier, more stable world.

The **Foreign and Commonwealth Office (FCO)** has responsibility for safeguarding the UK's national security by countering terrorism and weapons proliferation in co-operation with allies and partners, and for strengthening the rules-based international order. In line with the National Counter Proliferation Strategy, it aims – including through the Counter Proliferation and Arms Control Centre, the Crisis Management Department (CMD), and Consular Work – to:

- maintain the international legal prohibition on biological weapons;
- encourage all states to adhere to international norms and treaties on the development and use of biological and toxin weapons; and
- make it as hard as possible for states or terrorists to acquire or develop capabilities by reducing the proliferation of information and materials.

The **Health and Safety Executive (HSE)** is the national regulator for workplace and workforce health and safety, including microbiology and biotechnology issues. Its purpose is to:

- promote standards of safety that are proportionate to the risks from high consequence micro-organisms, and reassure the public that appropriate controls are in place; and
- keep pace with change and anticipate, and tackle, new safety challenges, to enable the science and technology to develop.

The **Home Office** has responsibility for the UK's homeland security. The Home Office contains the Office for Security and Counter Terrorism, which protects the public by working across Government and with international partners to reduce the risk of terrorism against the UK or UK interests overseas through the counter terrorism strategy, CONTEST. This includes work to protect against the highest impact terrorist risks – including those involving a biological weapon.

The **Ministry of Defence (MOD)** has responsibility for defending the UK and its interests overseas from deliberate threats. MOD contributes to all four pillars of the UK Biological Security Strategy, with support from the Defence Science and Technology Laboratory (Dstl). This includes expertise and capabilities for disease and pathogen detection, analysis and attribution; provision of intelligence assessments to support cross-Government risk assessments of potential biological agent use by adversaries; strengthening international efforts to counter the risk of hostile use of biological agents; providing capability to make safe both biological weapons and associated infrastructure; and the ability to deploy resources in extremis as part of Government's response to disease outbreaks or biological agent use.

Annex B – Glossary

Animal and Plant Health Agency (APHA)

An executive agency of the Department for Environment, Food and Rural Affairs responsible for safeguarding animal and plant health for the benefit of people, the environment and the economy.

Antimicrobial resistance (AMR)

Resistance of micro-organisms which cause infection to a medicine that would normally kill them or stop their growth.

Attribution

The linkage of biological material to a particular source through comparison of the characteristics of the material in question to those of a known origin.

Australia Group

A co-operative and voluntary group of 42 member states (including the EU) working to counter the spread of materials, equipment and technologies that could contribute to the development or acquisition of chemical and biological weapons by states or terrorist groups.

Biologic medicines

These are manufactured in a living system such as a microorganism or plant or animal cells. Examples of biologic products include vaccines, blood and blood products for transfusion.

Biological and Toxin Weapons Convention (BTWC)

The BTWC prohibits the development, production and stockpiling of biological and toxin weapons and, as recognised by its Review Conferences, effectively prohibits their use. It entered into force on 26 March 1975. The UK is one of three depository states for the Convention.

Brexit

The UK's withdrawal from the EU.

CBRN

Chemical, biological, radiological and nuclear.

CONTEST

The UK's counter-terrorism strategy.

Counter-Proliferation and Arms Control Centre (CPACC)

Consolidates in a single location expertise and policy making on international counter-proliferation and arms control issues, drawing staff from the Foreign and Commonwealth Office, Ministry of Defence, Department for International Trade, and Department for Business, Energy and Industrial Strategy.

Dark web

Parts of the internet not normally accessible by the public or commercial internet search engines.

Defence Science and Technology Laboratory (Dstl)

An executive agency of the Ministry of Defence that supplies specialist science and technology advice and expertise for UK defence and security.

Department for Business, Energy and Industrial Strategy (BEIS)

A UK Government department supported by multiple agencies that brings together responsibilities for business, industrial strategy, science, innovation, energy and climate change.

Department for Environment, Food and Rural Affairs (Defra)

The UK Government department responsible for safeguarding our natural environment, supporting our world-leading food and farming industry, and sustaining a thriving rural economy.

Department for International Development (DFID)

The UK Government department leading the UK's work to end extreme poverty – building a safer, healthier, more prosperous world for all of us, which is firmly in the UK's national interest.

Department of Health and Social Care (DHSC)

The UK Government department responsible for leading, shaping and funding health and care in England.

Devolved administrations

The Scottish Government, Welsh Assembly and Northern Ireland Executive.

Fera Science

A UK science organisation, part owned by the Government and part privately owned, that works across the agri-food supply chain.

Fleming Fund

A £265m project which aims to improve laboratory capacity for diagnosis as well as surveillance of antimicrobial resistance (AMR) in low and middle income countries across Asia and Africa.

Food and Agriculture Organization (FAO)

The international organisation within the United Nations that leads international efforts to defeat hunger.

Foreign and Commonwealth Office (FCO)

The UK Government department responsible for promoting the UK's interests overseas and supporting our citizens and businesses around the globe.

G7

A group of seven of the world's leading industrial nations: Canada, France, Germany, Italy, Japan, UK and USA, along with representation from the EU.

Global Health Security Agenda (GHSA)

Launched in February 2014 to advance a world safe and secure from infectious disease threats, and to bring together nations from all over the world to make new, concrete commitments and to elevate global health security to a priority at the national leadership level.

Global Health Security Initiative (GHSI)

An informal, international partnership among like-minded countries to strengthen health preparedness and the global response to threats of CBRN terrorism and pandemic influenza.

Global Partnership (GP)

The G7 Global Partnership Against the Spread of Weapons and Materials of Mass Destruction has 31 member states, and addresses non-proliferation, disarmament, counter-terrorism and nuclear safety issues through co-operative projects.

Government Office for Science (GO Science)

The UK Government agency responsible for ensuring that Government policies and decisions are informed by the best scientific evidence and strategic long term thinking.

Health and Safety Executive (HSE)

The UK regulator for workplace and workforce health and safety, including microbiology and biotechnology issues.

Home Office

The UK Government department responsible for immigration and passports, crime, drugs policy, fire, counter-terrorism and police.

International Biological Security Programme (IBSP)

Programme managed by the UK Ministry of Defence, which represents the UK's contribution to the G7 Global Partnership in the field of biological security.

International Health Regulations

An international legal instrument with the aim to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide.

Ministry of Defence (MOD)

The UK Government department responsible for protecting the security, independence and interests of our country at home and abroad.

National Risk Assessment (NRA)

A classified assessment of the risks of civil emergencies facing the UK over the next five years.

National Security Council (NSC)

The main forum for collective discussion of the Government's objectives for national security and how best to deliver them. It currently has four subcommittees, including the Threats, Hazards, Resilience and Contingencies Subcommittee.

Office for Life Sciences (OLS)

The UK agency that leads on Government's policy for the UK's health and biological sciences industries.

OIE (World Organisation for Animal Health – 'formerly' Organisation International des Epizooties)

The international organisation within the United Nations responsible for improving animal health worldwide.

Public Health England (PHE)

The UK Government executive agency which works to protect and improve the nation's health and wellbeing, and reduce health inequalities.

Ross Fund Portfolio

A £1 billion fund announced by the UK Government, to describe a portfolio of investments by DFID and DHSC, for research and development of products for treating infectious diseases and to strengthen health systems to deliver new products.

UK Research and Innovation (UKRI)

Unified organisation championing UK research nationally and internationally, bringing together the seven Research Councils, Innovate UK and Research England.

UNSGM

United Nations Secretary-General's Mechanism for Investigation of Alleged Use of Chemical and Biological Weapons.

Vector

Agent responsible for the transmission of a pathogen. Typical examples include mosquitoes, midges, biting flies and ticks.

Veterinary Medicines Directorate (VMD)

An executive agency of Defra, which aims to promote animal health and welfare by assuring the safety, quality and efficacy of veterinary medicines.

Virus

Infectious agent that replicates only inside the living cells of other organisms.

World Health Organization (WHO)

The international organisation within the United Nations responsible for directing global health responses.

Zoonoses

Diseases that can be transmitted from animals to humans. The animals may not show clinical signs, while the humans may be severely affected. Examples include Salmonella, *E. coli*, rabies and West Nile fever.

Science and Innovation Network (SIN)

Comprising 100 science and innovation attaches, working out of British Embassies, High Commissions and Consulates in 40 countries, the Science and Innovation Network (SIN) supports delivery of the UK's top international science and innovation priorities, covering prosperity, security and international development.

The Home Office, 2 Marsham Street, London, SW1P 4DF

July 2018