

Microbiology Society written evidence to the Department of Health and Social Care on the antimicrobial resistance national action plan

The Microbiology Society is a membership charity for scientists interested in microbes, their effects and their practical uses. It is one of the largest microbiology societies in Europe with a worldwide membership based in universities, industry, hospitals, research institutes and schools. Microbiology is the study of all living organisms that are too small to be visible with the naked eye.

Our principal goal is to develop, expand and strengthen the networks available to our members so that the science of microbiology provides maximum benefit to society.

We note that our submission reflects the views expressed by nine members of the Microbiology Society who responded to our call for input. We present evidence provided by our respondents and provide recommendations where appropriate.

The Threat of AMR

Question 1: How has the scale of the threat of AMR changed since the national action plan was published in 2019?

1. The threat of AMR has increased since 2019

Question 2: There are several drivers of AMR, which may differ between sectors. In your opinion, what are the top 3 drivers of AMR?

2. The **use and misuse** of antibiotics in humans, agriculture and animals is a key driver of AMR. Many factors play into this, including the behaviours of the public (i.e., poor knowledge and understanding of the dangers of AMR) and of healthcare professionals faced with pressures, time constraints and lack of diagnoses.
3. The **reliance on a small number of (often broad-spectrum) antibiotics** increases the selection pressure steadily day on day and year on year, leading to the inevitable emergence of resistance.
4. The **lack of choice for interventions**, including with regards to vaccines and diagnostic technologies, undermines antibiotic performance and health gains.
5. An underlying driver is the lack of knowledge about the overall cost of AMR now and in the future, as well as about the economic viability of potential solutions.

Priority interventions for tackling AMR

Question 3: The current **national action plan** focuses on 3 key ways of tackling AMR:

- reducing the need for, and unintentional exposure to, antimicrobials - (including preventing and controlling the occurrence of infections, vaccination, and limiting exposure to antimicrobials through food and the environment)
- optimising the use of antimicrobials (including ensuring that the right drug, time, dose, duration, patient/animal, and route are taken)
- investing in innovation, supply and access (including supporting the development, supply, and access to old and new antimicrobials, vaccines and diagnostics)

Which of these areas would you most like to see prioritised over the next 5 years?

6. We are not responding to this as we think that prioritising one over the other would be detrimental.

Question 4: Are there any actions you think are required to tackle AMR that do not fall within one of these categories?

7. Yes

Question 5: Please specify actions you think are required to tackle AMR

8. With regards to the question “Which of these areas would you most like to see prioritised over the next 5 years”, we believe prioritising an area over the others would severely hinder progress in tackling AMR. We hope that the Department of Health and Social Care understands that these interventions are by no means mutually exclusive and prioritising a single one will be detrimental to the steps we have already taken in tackling AMR.
9. Other actions required to tackle AMR include:
 - a. **Reinvigorating the pipeline** with mechanisms to bring new antimicrobials and diagnostics to the market.
 - b. **Fuelling innovation through direct funding**, including of academics and SMEs working on the development of new therapeutics, diagnostics and other interventions.
 - c. **Using evidence to drive decision-making**. In particular, more evidence is required with regards to:
 - i. The optimum length of course for antibiotics.
 - ii. The degree to which a general vaccination program directly and indirectly affects the use of antibiotics.

- iii. The extent of the problem and control of environmental contamination by AMR of water and the environment.
- iv. The inappropriate use of antibiotics

Learning from previous action to tackle AMR

Question 6: Within the UK, what are the key successes we should look to maintain or develop in responding to AMR?

10. The UK is a **world leader** in the fight against AMR:
 - a. Dame Sally Davies managed to put AMR on the G7 and G20 agendas and is a vocal spokesperson leading the field globally.
 - b. The new economic push and pull models for developing antibiotics in the UK are gaining acceptance internationally as a good policy move towards using drugs sparingly without economic loss for producers.
 - c. The Fleming Fund funded the Global Research on Antimicrobial Resistance (GRAM) Project which estimated the global burden of AMR for the first time and is supporting capacity building in many LMICs.
 - d. However, cuts in UK Aid and Official Development Assistance are threatening to undermine the UK's leading position in tackling AMR.
11. The UK currently benefits from a **strong research base** that covers a broad range of disciplines from basic science to epidemiology, clinical trials and applied research. The successes of our researchers are due in no small part to the support and investments that they have received in the past. If the financial and infrastructural effort to maintain and develop the research base is not sustained, the UK is at increased risk of losing talent and undoing many of the great achievements and innovations that have been made in the AMR field.
12. **Antimicrobial stewardship** in the UK has **evolved dramatically in the last 15 years**. However, it needs to be expanded further and implemented at all levels of care. Additionally, it needs to be supported with improved infrastructure of pathogen identification and antimicrobial testing to ensure the correct antibiotic selection for the infection. This can be improved through continued funding for NHS microbiology laboratories as well as the sustained funding for development of rapid diagnostics, use of whole genome sequencing in diagnostics and understanding how AMR evolves.
13. The **acceptance by the farming communities** that antibiotic growth promoters and broad prophylactic dosing of poultry and pigs is poor management has been important. The dramatic reduction (80-90%) by the British Poultry Council members shows a serious intention and delivery of improved management and subsequent reduction of AMR.

Question 7: Within the UK, what are the areas that require more focus or development to address AMR?

14. Training and research

- a. There is an urgent need to widen the cross-cutting nature of infectious disease teaching and training in medical schools and other academic environments.
- b. While maintaining a good sequencing base enables looking into molecular epidemiology and the evolution of resistance mechanisms, it is not a replacement for the fundamental microbiological research that feeds into it. Clinical microbiologists must be trained to understand the phenotype as well as the genotype because the two parts inform one another.
- c. AMR is fundamentally an evolutionary problem, however there is insufficient understanding on the evolution of AMR in the clinical context to fully control AMR development. Current evolutionary studies are performed in growth media, which are not representative of the clinical environment and therefore do not provide the full information on AMR evolution.

15. Surveillance

- a. The microbiology surveillance needs to be more uniform, including in veterinary medicine. For example, research has shown that four out of ten pig farms in the UK have livestock-associated MRSA on the premises. Our members reported that there had been a deliberate decision to not investigate this further.

16. Diagnostics

- a. Rapid diagnostics assays, including the use of whole genome sequencing, are desperately needed to help select the correct antimicrobial to treat an antibiotic infection. Currently, funding is not adequate to enable the development of this technology quickly enough.

17. Increase production capacity

- a. The UK should seek to build up pharmaceutical manufacturing capability (supporting particularly SMEs) to protect from global supply shortages (as seen recently with the invasive Group A Streptococcal infections).

Question 8: Within your sector, do you think the UK has sufficient capacity and capability to tackle AMR?

- 18. No

Question 9: Please explain your answer

- 19. There is a **weakness in surveillance**, in human microbiology (for example in the community setting) but more so in the environment and in agriculture. In veterinary medicine, the

number of isolates included in surveillance is only a tiny fraction of the number of organisms that exist, and a similar situation exists for environmental isolates. There is a need for properly designed, broad geographical spread surveys that provide a view of how much antibiotic resistance there is in the community (in humans), agriculture and in the environment.

20. For our sector to be successful, it needs the **back-up of the wider society**. This is not currently the case in the UK where we are still dumping raw sewage into seas and rivers and are yet to introduce AMR into the education system, primary and secondary levels or even in professional degree programmes such as dentistry, medicine and pharmacy.

Question 10: Since 2019, several capabilities required to tackle AMR have changed. This includes our sequencing capability, surveillance capabilities, diagnostic lab capability, and antimicrobial stewardship activity. What additional capacity and capability is needed in your sector to effectively tackle AMR?

21. There is an urgent need for more **diagnostics** across the board to understand the value to treat.
22. Our sector requires **centralised funding** for antimicrobials via early-stage discovery in universities, which can then, with the help from pharmaceutical companies, develop these antimicrobials from hits to leads. These can then be taken forward to clinical testing.
23. **Centralised research institution and networks** are needed to inspire collaboration between groups and expertise. An example could be the establishment of a major UK institution focused on the National Action Plan or on a One Health approach to encompass: a) methods to remove antibiotics, AMR bacteria and antibiotic resistance genes from natural environments, b) alternatives to antibiotics in aquaculture and food animal husbandry, c) knowledge base for antibiotic discovery and d) feasible policies to reduce inappropriate antibiotic use and AMR.

Question 11: In your opinion, what are the key barriers to making progress on tackling AMR in your sector?

24. **Lack of dedicated funding for AMR research.** Research funding for AMR is significantly below other areas of clinical importance such as cancer. To enable the support of AMR research, sufficient, long term research funding is required. Additionally, funding in this space should be specifically for AMR and not for projects which are tangentially related.
25. **Return on investment.** Antimicrobials represent a poor return on initial investment for pharmaceutical companies compared to drugs developed for chronic conditions. We must either adapt trials procedures to allow for “cheaper” deployment of new drugs, or increase incentives to have an active antimicrobial programme through enhanced ring-fenced funding for research and development.
26. **Lack of centralised research networks.** Duplication of research and efforts holds back research and development, especially when studies do not work and are not published, resulting in wasted research funding. A centralised network would enable discussions

between groups, collaboration and remove duplication. Additionally, with funding often going to the same research groups, innovative ideas are often overlooked at smaller/less well funded universities/groups.

International efforts to tackle AMR

Question 12: What, if anything, do you think we can learn from other countries' responses to AMR? Please be specific about which countries you are referring to in your answer.

27. Whilst the Netherlands are ahead of many, this is due to a large amount of investment and a healthcare system that is funded in a completely different way to that of the UK.
28. When it comes to AMR, every country is building the wheel from scratch according to their own national plans and priorities. Therefore, cross-country collaboration can be very difficult. For example, different countries collect MRSA strains for completely different reasons, type them differently and do different things with the information that they generate. We lack a consistent and harmonised approach at the European/international level.

Opportunities from COVID

Question 13: We saw an unprecedented level of cross-disciplinary working during the COVID-19 pandemic with government, industry and researchers collaborating to respond to a significant public health challenge. The toolbox we used to tackle COVID-19 will be similar for AMR. As reported by the Academy of Medical Sciences, diagnostics, surveillance, therapeutics and vaccines are crucial aspects of the AMR response and can draw on the COVID-19 experience. In your opinion, which of these tools should be prioritised for adapting to use in tackling AMR? Rate in order of priority.

29. **We are not answering this question as all aspects are equally important.**

Question 14: In your opinion, are there any other tools that should be adapted from use during the COVID-19 pandemic for tackling AMR?

30. Yes

Question 15: Please specify what other tools should be adapted from use during the COVID-19 pandemic for tackling AMR.

31. The development of **rapid diagnostics** for COVID-19 was outstanding and should be adapted to tackle AMR.

32. The **COVID-19 ONS survey** could be adapted into a population surveillance system of AMR and widened to include national sequencing across the country to have the first true, country-wide epidemiology study which would inform sampling frameworks globally in the future.
33. The ability and will to **share genomic data** globally to help the understanding of COVID-19 and develop diagnostics was fundamental to the ability to control COVID-19 and detect new emerging strains. This has not yet been replicated to the same degree for AMR.
34. The **sequencing** capacity put together for COVID-19 should be maintained, but some of that capacity should be used for AMR surveillance. A national coordination of bioinformatic resources managed effectively and the data made available openly to anybody interested in manipulating the sequenced data would be extremely helpful in tackling AMR. In that way, anyone with a query about an unusual pattern of antibiotic resistance would immediately be able to see the local picture across the country. A facility of this type would up the UK's game from a surveillance point of view.
35. **Wastewater** based epidemiology has been implemented during the pandemic and that can easily pivot to AMR surveillance which could be triangulated with other surveillance data to detect new emerging resistance.

Question 16: Do you believe the changes in ways of working within your organisation due to the COVID-19 pandemic have affected efforts to respond to AMR, such as delivery of the current national action plan (NAP)?

36. Yes

Question 17: In what way have they affected the response to AMR or delivery of the NAP?

37. **Loss of funding.** Funding for AMR has been, understandably, redirected to COVID-19. However, funding has not returned and has in fact reduced.
38. **Loss of research time.** Due to lockdowns, research time has been severely impacted, and often not compensated, to help complete projects. Plus, the funding from many projects finished mid-way through or soon after return to work after the pandemic creating difficulty when completing the work, analysing and publishing the results.
39. **Loss of expertise.** Due to job losses/lack of funding, there has been a loss of expertise from the UK in terms of research.

Question 18: Are there other ways in which the COVID-19 pandemic has altered the AMR risk landscape?

40. **Over-prescription of antibiotics** (the increase in AMR resulting from increased prescription for respiratory illness relating to COVID-19 at the beginning of the pandemic was understudied).

41. Increased **scepticism** around the underpinning science: vaccine scepticism/public apathy towards hygiene measures following lockdown and misinformation which was shared on social media during the pandemic.
42. **Potential decreased background immunity** to common pathogens due to lack of contact between people.
43. We are as yet unaware of how important the re-introduction of **international travel** to AMR spread and its impact following COVID actually is.
44. The **detection of COVID in sewerage systems** reminded the community how useful this approach could be with AMR.

Question 19: Are there other global events, such as supply chain disruption or the conflict in Ukraine, that have changed the UK's ability to respond to AMR?

45. Yes

Question 20: How have other global events changed the UK's ability to respond to AMR?

46. The early part of the **supply chain** for active pharmaceutical ingredients exemplifies a fragility of the medical supply chains around the world. The UK must bring back what has been offshored for several years and build a more robust national infrastructure. Guaranteeing access to resources like amoxicillin is a question of national security.
47. **Brexit** has led to workforce shortages that are affecting the NHS, universities, and research. It is crucial that governments work together to facilitate international research funding and better movement and support of people.

Measures of success

Question 21: In your opinion, what are the best measures of success in tackling AMR?

48. Reductions in the number of people who die or suffer a pathology as a result from an antibiotic resistant infection.
49. The continual increase year on year of investment into AMR research and surveillance.
50. Increases in the number of antibiotics entering the various stages of clinical development.
51. Reductions in hospital and community AMR infections detected through effective surveillance.
52. Food Standards Agency reports showing UK reductions in AMR in foodstuffs, especially ready-to-eat.
53. More diagnostic tests being used and the results informing patient treatment.

Question 22: During the COVID-19 pandemic, public awareness of infection spread increased, along with prevention and control measures and acceptability of point of care diagnostics. Do you believe that there is sufficient public and professional awareness of AMR?

54. No

Question 23: What should be done to increase awareness of AMR?

55. In general, AMR has a significantly smaller footprint of awareness compared to other conditions such as cancer.
56. While the public may be aware of the issue, they don't see the potential longer term threats posed by AMR and they tend to be apathetic. A way to address this would be to include AMR education in schools and universities.
57. While healthcare professionals are aware of AMR and it is integrated as part of their training (basic hygiene, prescribing policy, etc.), microbiology is often a very insignificant part of their overall studies. Enhancing their microbiology knowledge could lead to better outcomes.
58. Disinformation can be fuelled by a handful of qualified scientists making outlandish statements. Continuing to focus on high-quality education for medical professionals so that they can access and share evidence in the right way, including with the media, is key.
59. The scientific community should endeavour to send a strong message about the use and mis/inappropriate use of antibiotics in clinical and farming contexts to the media so that the topic can gain an interest similar to that of climate change, which AMR has been likened to.

Further information

Question 24 : Is there any other evidence you would like to tell us as we develop the 2024 to 2029 national action plan?

60. Instead of processing raw sewage, in the UK we dump it into our oceans and this will increase the burden of AMR over the next five years. This desperately needs to be addressed in the national action plan as this is an outcome we can change.
61. The current situation with raw sewage and the management of associated risk is symptomatic of a bigger issue. When outsourcing water and sewage management, there has to be an understanding of who is responsible for managing the risks. The UK used to have a very substantial public health body that had expertise across a broad breadth and would make sure that issues came across to accountable policy-makers. Outsourcing of these areas has transformed their management into money-making operations primarily answering to shareholders. This has led to a lack of connectedness and accountability; there needs to be better communication between organisations. AMR affects society as a whole – from the individual level up to the population level. At present, we are not dealing with it as

effectively as we might because of the disjointed and disconnected nature of the state apparatus.