

Written evidence from the Scottish Universities Life Sciences Alliance (SULSA)

Written evidence submitted by Scottish Universities Life Sciences Alliance (SULSA) which highlights the work of SULSA members contributing to the delivery of the AMR strategy.

About SULSA

1. The Scottish Universities Life Sciences Alliance (SULSA; <http://www.sulsa.ac.uk>) is a strategic partnership of nine Scottish Universities (Aberdeen, Dundee, Edinburgh, Glasgow, Heriot Watt, Napier, Robert Gordon, Strathclyde, and St Andrews) that aims to drive the life sciences research sector in Scotland to ensure its global competitiveness. Our main strategic aims are to build competitive consortia and win major research funding, support research facilities and networks, and help early career researchers advance their careers. We also provide policy advice on behalf of the Scottish life sciences community.

Response:

2. The UK AMR Strategy 2013-18 set out the following 3 strategic aims:
 - i) Improve the knowledge and understanding of AMR
 - ii) Conserve and steward the effectiveness of existing treatments
 - iii) Stimulate the development of new antibiotics, diagnostics and novel therapies

Within these three aims, there were 7 key areas for future action identified. Below we have given examples of where SULSA members have contributed to these focused strategic areas.

Area 1: Improving infection prevention and control practices

3. SULSA members at the **University of Aberdeen**¹ have produced findings which have helped underpin the European Food Safety Authority (EFSA) scientific opinion on quantifying the risk of human campylobacteriosis posed by consumption of broiler meat in the EU (EFSA Panel on Biological Hazards (BIOHAZ)). This provided the impetus for EFSA to produce an opinion on control options and performance objectives in broiler meat production for *Campylobacter* which resulted in the Commission setting performance objectives for *Campylobacter* in broiler production within the EU. The results from the CaMPS studies have fed into the latest Advisory Committee on the Microbiological Safety of Food report on *Campylobacter* that is due to be

¹ <https://www.abdn.ac.uk/smmsn/research/impact/combating-campylobacter.php>

released later this year and published/presented/cited by Food Standards Scotland and Food Standards Agency.

Area 2: Optimising prescribing practice

4. SULSA members at the **University of Strathclyde** have been involved in the development, implementation and evaluation of antibiotic guidelines². Adult guidelines for vancomycin and gentamicin prescribing and monitoring were developed and implemented throughout Scotland in 2009. Evaluation of these guidelines identified practice issues that led to the development and implementation of new prescribing support resources. A recent re-audit has demonstrated improvements in practice. Further development of vancomycin guidelines for obese patients is underway. Other studies have achieved an improvement in the use of vancomycin in neonatal and paediatric intensive care patients. Current work is underway to evaluate amikacin dosing guidelines for the treatment of mycobacterial infections and antibiotic dosage regimens for infection prophylaxis in colorectal surgery.

Area 3: Improving professional education, training and public engagement

5. In April 2018, SULSA held a two-day conference on AMR³ with the aim of informing and coordinating fundamental and applied research activity on AMR within SULSA universities and other relevant organisations in Scotland. The meeting, with 160 delegates, covering both research and policy related to AMR is featured in a blog⁴. Because of the conference, SULSA was shortlisted for 2018 Public Health England's Antibiotic Guardian Awards⁵ in the research category. These awards champion those organisations and individuals who have demonstrated achievement in tackling antimicrobial resistance at a local, regional or national level.
6. SULSA commissioned a comic⁶ (Written by Isabel Vincent, drawn by Gary Erskine and coloured by YelZamor) highlighting the history of antimicrobial discovery, how antibiotic resistance is spreading, and the impact overuse antibiotics are having. In collaboration with **Public Health England**, these comics will be freely available for distribution in the near future.
7. SULSA Director, Mike Barrett, has written a SULSA report Scotland's War on Germs⁷, detailing Scotland's role in the history of antibiotic discovery, and in assuring an antimicrobial future. This report has been sent to funders, journalists and Government stakeholders.
8. SULSA members at **University of Strathclyde**, **Edinburgh** and **Edinburgh Napier University** are active within **Microbiology Society** and **Society for Applied Microbiology** both of which promote education and engagement with

² <https://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=42287>

³ <http://www.sulsa.ac.uk/amr/>

⁴ <http://blogs.biomedcentral.com/bugbitten/2018/05/18/scotlands-contribution-to-the-fight-against-antimicrobial-resistance-highlights-from-the-sulsa-meeting/>

⁵ <http://antibioticguardian.com/antibiotic-guardian-2018-awards-shortlist/>

⁶ <http://www.sulsa.ac.uk/amrcomic>

⁷ <http://www.sulsa.ac.uk/sulsa-reports/>

AMR, primarily through Learned Societies Partnership on Antimicrobial Resistance (LeSPAR).

9. The Microbiology Society's Antibiotics Unearthed⁸ programme has been adopted in to undergraduate curricula at **Glasgow, Edinburgh and Edinburgh Napier Universities**⁹ to promote student engagement with AMR.

Area 4: Developing new drugs, treatments and diagnostics

10. Following the two-day AMR conference, SULSA launched a call for seed funding to stimulate collaborative projects to address the challenges **surrounding antimicrobial resistance**¹⁰.
11. **The Scottish Biologics Facility (SBF)**¹¹ at **University of Aberdeen** has developed a portfolio of monoclonal antibody-based biologics for the early detection, diagnosis and treatment of bacterial and fungal infections. The SBF has a strong research interest in developing novel therapeutics that can prevent bacterial infections by controlling the expression of virulence factors in Gram negative organisms. These 'anti-pathogenic' drugs are less likely to encourage the development of resistance in bacteria compared to conventional antibiotics.
12. With funding from Innovate UK¹², the **University of Dundee** has created an Antibacterial Drug Discovery Accelerator (ADDA)¹³ with the aim of carrying out early phase antibacterial drug discovery. This involves translating fundamental discoveries from microbiologists across the UK into drug discovery projects, to develop novel drug-leads to partner with not-for-profit or commercial partners. This is an area for which it is difficult to obtain funding, but is critical to the AMR agenda to develop novel mode-of-action antibacterials.
13. Researchers at the **University of Glasgow**¹⁴ have been involved in research to improve the synthesis of Teixobactin-derived compounds with potent activity against *Staphylococcus aureus*.
14. An antibiotic developed at **University of Strathclyde** is about to enter a phase 2 clinical trial. In collaboration with MGB-BioPharma, Innovate UK has awarded £2.78 million to fund the phase 2 clinical trial of MGB-BP3, the first in a new class of drugs for treating *Clostridium difficile*¹⁵.
15. SULSA/MSD funding contributed to the development of the studies of minor groove binders for DNA discovered at the **University of Strathclyde** (known as S-MGBs). S-MGBs include individual compounds active against bacteria¹⁶, fungi, and parasites. The SULSA/MSD¹⁷ funding principally paved the way for a successful collaborative bid to BBSRC for the project 'A new drug discovery platform for animal African trypanosomiasis'¹⁸, a project involving the

⁸ <https://microbiologysociety.org/education-outreach/antibiotics-unearthed.html>

⁹ <https://microbiologysociety.org/education-outreach/antibiotics-unearthed/undergraduate-programme.html>

¹⁰ <http://www.sulsa.ac.uk/seed-funding/>

¹¹ www.abdn.ac.uk/sbf

¹² <https://www.dundee.ac.uk/news/2017/innovate-uk-grant-to-boost-discovery-of-new-antibacterial-drugs.php>

¹³ <http://www.drugdiscovery.dundee.ac.uk/portfolio/antibacterial-drug-discovery-accelerator-adda>

¹⁴ <http://www.chem.gla.ac.uk/jamiesonlab/#>

¹⁵ <https://www.strath.ac.uk/whystrathclyde/news/fundingof278mforclinicaltrialssoftreatmentdiscoveredatstrathclyde/>

¹⁶ [https://pure.strath.ac.uk/portal/en/projects/the-differing-biological-fates-of-dna-minor-groovebinding-mgb-antibiotics-in-gramnegative-and-grampositive-bacteria\(be25e1ea-f41d-48ac-b3f7-48d845d114e7\).html](https://pure.strath.ac.uk/portal/en/projects/the-differing-biological-fates-of-dna-minor-groovebinding-mgb-antibiotics-in-gramnegative-and-grampositive-bacteria(be25e1ea-f41d-48ac-b3f7-48d845d114e7).html)

¹⁷ <http://www.msd.com/about/our-work/amr.html>

¹⁸ [https://pure.strath.ac.uk/portal/en/projects/a-new-drug-discovery-pipeline-for-animal-african-trypanosomiasis\(ea4465e8-c3b6-4e8e-be03-1131f5c63a1b\).html](https://pure.strath.ac.uk/portal/en/projects/a-new-drug-discovery-pipeline-for-animal-african-trypanosomiasis(ea4465e8-c3b6-4e8e-be03-1131f5c63a1b).html)

Universities of Edinburgh, Glasgow, and Strathclyde. The drug discovery component of this project is moving well towards identifying development candidates.

16. **Longitude Prize** Discovery Award to researcher at the **University of Strathclyde** to develop 'The Microplate' to a new diagnostic test for antimicrobial susceptibility¹⁹. Using an interdisciplinary approach (electrical engineering and microfabrication with microbiology), the project combines cutting-edge aspects of these research areas to develop a new antibiotic susceptibility testing that can rapidly test antibiotic sensitivity on a single microchip.
17. Till Bachmann²⁰ from The **University of Edinburgh** is contributing to the UK strategy on AMR diagnostics through the UK AMR Diagnostics Collaborative and his advisory and judging roles for the Longitude Prize and Discovery Award.
18. Funding from the **Industrial Biotechnology Innovation Centre**²¹ in collaboration with GSK is being used to develop stable strains of *Streptomyces* to improve clavulanic acid production at University of Strathclyde.
19. Funding from the Daphne Jackson Trust is supporting a fellow to investigate novel *Actinobacteria* for the production of novel antibiotics at the **University of Strathclyde**.
20. Dr Till Bachmann from The **University of Edinburgh** is the Coordinator of the Transnational Working Group Rapid Diagnostic Tests (AMR-RDT)²² funded through the Joint Programming Initiative on Antimicrobial Resistance (JPIAMR)²³. Formed in 2017, AMR-RDT²⁴ is a multi-sectoral, multi-stakeholder and interdisciplinary working group with global reach. It brings together over 50 key individuals and organisations from 15 countries worldwide that are active in the field of diagnostics and antimicrobial resistance. This group aims to identify barriers for the development and implementation of rapid diagnostic tests to tackle AMR.
21. The Scottish (SULSA) Assay Development Fund has a call currently open²⁵. Many scientists in SULSA universities have discovered scientifically interesting, high quality, novel molecular targets and assays. However, they are a long way from being in an HTS compatible assay format. This fund helps researchers progress assays to readiness for industry- standard HTS campaigns. The fund covers consultancy by experienced screening scientists, a pilot screen of ca. 5000 compounds, and consumables.

Area 7: Strengthened international collaboration

22. Examples of international collaborations of SULSA members at **University of Strathclyde** include:

¹⁹ <https://www.strath.ac.uk/whystrathclyde/news/discoveryawardforteamworkingtotackleantibioticresistance/>

²⁰ [https://www.research.ed.ac.uk/portal/en/persons/till-bachmann\(4c731049-5ce7-4f71-9984-fb216ee36fab\).html](https://www.research.ed.ac.uk/portal/en/persons/till-bachmann(4c731049-5ce7-4f71-9984-fb216ee36fab).html)

²¹ <http://www.ibioic.com/>

²² <https://www.ed.ac.uk/pathway-medicine/antimicrobial-resistance/jpiamr-amrrdt>

²³ <https://www.jpiamr.eu>

²⁴ <https://www.ed.ac.uk/pathway-medicine/antimicrobial-resistance/jpiamr-amrrdt/overview>

²⁵ <http://www.sulsa.ac.uk/z1x2c3/wp-content/uploads/2018/05/More-Information.pdf>

- i) Santander/**University of Strathclyde** International Research Fellowship to Federico Santa María Technical University, Valparaiso, Chile; 2018
 - ii) SULSA Early Career Research Exchange (PECRE) to Wageningen University, The Netherlands “Bioinformatics approaches to antibiotic discovery); 2017
 - iii) Marine Alliance of Science and Technology Visiting Fellowship (Mexico), Assessing the biotechnological potential of Antarctic and sub-Arctic sediment cores - a new resource for sustainable antibiotic drug discovery; 2016 – 2017
 - iv) KMITL Academic Melting Pot, Characterisation of antimicrobial activity from Mangrove Swamps in Thailand; 2018 – 2019
 - v) Genomic characterisation of antibiotic producing bacteria from the Chilean altiplano; 2015 – 2019
23. International collaboration of SULSA members at **University of Glasgow** and CIDEIM, Cali, Colombia to examine drug resistance in parasites, bacteria and mosquitoes. Institutional links were achieved by a variety of bilateral training exchanges, together with workshops and symposia (**Newton Fund**). More than 100 neglected tropical disease researchers benefited, and new inter-institutional collaborations were established, which continue to develop and sustain reciprocal training and research programs between Colombian and the UK towards understanding and mitigating the impact of neglected tropical diseases in Latin America.
24. International collaboration led by **University of Edinburgh** and researchers at **Indian Institute of Technology, Delhi**. The project ‘*User Driven Diagnostics Solutions in a One Health Approach to Tackle AMR*’ (**Newton Fund**)²⁶ will address the lack of appropriate affordable diagnostics in use in India, by engaging with the user in the community in human healthcare, veterinary and environmental setting to map existing practise and gather user needs to generate target product profiles and user personas. This information will be used to select existing diagnostics and develop novel test in a usable format, and performance and prototype services.
25. Dr Till Bachmann (University of Edinburgh) is the founder of the Antimicrobial Resistance Diagnostics Challenge²⁷ (AMR DxC; @AMR_DxC), an annual international competition and event series that aims to galvanise the next generation of researchers into action. This competition is inspired by the Longitude Prize²⁸ and driven by the idea that innovation needs interdisciplinary and unbiased thinking as well as international collaboration.

Key actions and priorities for the Government’s next AMR strategy that were identified at the SULSA AMR Conference in April 2018 were:

26. Increased funding and support for anti-fungal research and development. This is currently an area of critical concern with the increasing emergence of resistant fungal pathogens.

²⁶ <https://esrc.ukri.org/files/funding/funding-opportunities/uk-india-amr-shortlisted-summaries/>

²⁷ <https://www.ed.ac.uk/pathway-medicine/antimicrobial-resistance/antimicrobial-resistance-diagnostics-challenge>

²⁸ <https://longitudeprize.org>

27. Delegates identified a need for a world-wide facility like the Synchrotron for structure elucidation of natural products. E.g. National Centre for Metabolite Analysis
28. Gaps in drug discovery funding (particularly in translation into larger screens – SULSA is addressing this via the Scottish SULSA Assay Development Fund).
29. Better surveillance data (capture and assessment), and integration and collaboration across agriculture, healthcare and the environment.
30. Increased funding for data: whilst there is good funding for data generation, there remains very little for data analysis and mining, and integration of data from different sources.
31. Improved communication between researchers and policymakers.
32. Increased support for development of diagnostics: of all the key points explored during the conference, the ability to have faster, cheaper and more sensitive diagnostic ability was a clear priority.
33. Improved education around antibiotic use for veterinary and health workers, as well as the general public.
34. As AMR is a One Health issue, which crosses many disciplinary boundaries, strong networks of researchers from different fields, clinicians, industry and policymakers are essential to drive a coordinated, strategic approach to tackling AMR.