



*UK Antimicrobial
Resistance Strategy
and Action Plan*

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Foreword

Resistance to antimicrobial agents is a universal problem, a problem which needs to be tackled by universal action.

This UK strategy recognises the need for a wide range of activities which are required to support the control of antimicrobial resistance and the need for commitment from a wide variety of players. It has been developed by a number of Government departments. The strategy is endorsed by all countries of the United Kingdom and will lead to sustained action to combat this problem.

Microbes are dynamic organisms. And so our approach to tackling their resistance to antimicrobial agents must also be dynamic. I therefore welcome this strategy which signifies the first three years work of what will need to be a sustained long-term programme which will be kept under review and developed as necessary.

John Denham MP
Minister of State (Health)

I. Introduction

The Government's response¹ to the House of Lords Select Committee on Science and Technology's report 'Resistance to antibiotics and other antimicrobial agents'² indicated its intention to take forward a comprehensive strategy to tackle the problem of antimicrobial resistance. The key elements of the strategy were outlined and the Government gave a commitment to a tranche of activities to support it.

This document expands on the strategy, its rationale and objectives, and outlines the key actions required. It is a base for the use of individual Departments and organisations in building up their own action plans. It takes into account the recommendations of the Standing Medical Advisory Committee (SMAC), in its report 'The Path of Least Resistance'³, recommendations from the World Health Organization's (WHO) former Division of Emerging and Other Communicable Diseases Surveillance and Control⁴, the recommendations of the European Conference on 'The Microbial Threat' in Copenhagen in September 1998⁵, and the World Health Assembly Resolution of May 1998⁶.

The strategy recognises the need for action across a wide range of interests and by many organisations and individuals. Since microorganisms do not recognise geographical boundaries and are increasingly spread through international travel and commerce, it also recognises the need for the UK to play its part internationally, as well as at local and national levels.

This plan is intended to cover work over the next three years. It will be kept under review, and will evolve with time to take account of achievements, scientific developments and organisational changes. This will be undertaken by the Interdepartmental Steering Group which is overseeing and co-ordinating the work in this field (Annex A), advised by the new Expert Advisory Committee on Antimicrobial Resistance which is being set up.

2. Background

The following paragraphs give a very brief outline of the significance of the problem of antimicrobial resistance for those not familiar with the field. Further background information and a detailed account of the current situation are given in the House of Lords and SMAC reports referred to above^{2,3}.

The increasing prevalence of antimicrobial resistant micro-organisms, especially those with multiple resistances, is causing international concern.

Antimicrobial resistance makes infections more difficult to treat. It may also increase the length and severity of illness, the period of infectiousness, adverse reactions (due to the need to use less safe alternative drugs), length of hospital admission – and costs.

Antimicrobial resistance ultimately jeopardises not only our ability to treat infectious disease and infection, but also the use of other technological advances in medical and veterinary treatment that depend, in part, on our ability to control infection.

The emergence of resistance represents adaptive selection by micro-organisms which is to some extent an inevitable result of the therapeutic use of antimicrobial agents: killing or suppressing drug-sensitive organisms allows naturally drug-resistant ones to emerge which can then not only spread but also transfer their resistances to other organisms. This makes it imperative that measures are taken both to slow – or at least delay – the emergence of resistance, to existing agents and to new ones as they come into use, and to limit its spread.

3. Aims

The overarching aims of the Government's strategy are :

In the face of the ability of micro-organisms resistant to antimicrobial agents to emerge and spread, the increasing prevalence of resistant strains and the dearth of new agents likely to be available for therapeutic use in the near future,

- i. to minimise the morbidity and mortality due to antimicrobial resistant infection;
- ii. to maintain the effectiveness of antimicrobial agents in the treatment and prevention of microbial infections in man and animals.

4. The Basis of Control

The three key, inter-related, elements of the strategy to control antimicrobial resistance are:

Surveillance: to monitor ‘how we are doing’, and provide the data on resistant organisms, illness due to them and antimicrobial usage necessary to inform action;

Prudent antimicrobial use: to reduce the ‘pressure for resistance’ by reducing unnecessary and inappropriate exposure of micro-organisms to antimicrobial agents in clinical practice, veterinary practice, animal husbandry, agriculture and horticulture;

Infection control: to reduce the spread of infection in general (and thus some of the need for antimicrobial agents) and of antimicrobial resistant micro-organisms in particular.

All these need to be supported by the provision of tailored information, education, communication, research, the necessary infrastructure (including information technology), organisational support and, where necessary, legislation or regulation.

To be effective, the strategy requires a sense of ownership and partnership across Government departments and a wide range of individuals and organisations, including members of the pharmaceutical industry and the general public. It is essential also that it is co-ordinated and monitored against its stated aims and objectives.

5. Objectives

The main objectives of the strategy are grouped into eight action areas.

Action area 1: General

- (i) to gain commitment from all players and a co-ordinated, focussed approach to the problem at local, national and international levels.

Action area 2: Surveillance

- (i) to establish and maintain systems in the UK and as part of wider international networks to improve the data and information available on antimicrobial resistant organisms and illness due to them in order to
 - assess the clinical impact and the burden of disease
 - monitor trends
 - determine risk factors and the main drivers of resistance
 - detect new and untoward events
 - inform clinical practice
 - inform veterinary and animal husbandry practice
 - assess the effects of interventions;
- (ii) to establish and maintain appropriate systems to monitor antimicrobial use in the UK in order to
 - support optimal prescribing policies and practice
 - relate data on patterns of use and antimicrobial resistance in the UK, as part of national and international efforts to improve knowledge on how use may lead to the build up of resistance;
- (iii) to improve the correlation of data on patterns of antimicrobial use, antimicrobial resistant organisms, and illness due to them, in animals and man.

Action area 3: Prudent antimicrobial use in humans

Through a wide range of measures in the UK, and by encouraging co-ordinated action in this field with other European Union Member States,

- (i) to promote optimal antimicrobial prescribing in clinical practice, through
 - professional education
 - tailored information, guidelines and prescribing support
 - organisational support;
- (ii) to improve diagnostic and antimicrobial susceptibility testing methods and reporting systems in order to provide more rapid information to prescribers (while preserving surveillance);
- (iii) to encourage realistic public expectations for antimicrobial prescribing, and emphasise the public's role in reducing the problem of antimicrobial resistance, through
 - a public information campaign
 - regular routes for promulgating patient information
 - health professionals
 - patient involvement in prescribing decisions
 - schools
 - other, innovative approaches
- (iv) to use the regulatory framework to improve optimal prescribing (in the UK and Europe) where appropriate.

Action area 4: Prudent antimicrobial use in animals

- (i) to promote optimal antimicrobial prescribing in animals, through
 - professional education
 - treatment guidelines;
- (ii) to reduce unnecessary and inappropriate use of antimicrobials for non-therapeutic use in animals;
- (iii) to use the regulatory framework to improve optimal prescribing (in the UK and Europe) where appropriate.

Action area 5: Prudent antimicrobial use in other spheres

- (i) while the use of antimicrobials in arable agriculture and horticulture is not currently an issue in the UK, to maintain that position and to support action to reduce inappropriate use in Europe and elsewhere (including the use of antimicrobial markers in genetically modified crops).

Action area 6: Infection control

- (i) to strengthen infection control practices and processes in hospitals and the community, and promote collaboration between the Member States of the EU and the WHO European Region to this end, through
 - establishing best practice
 - education and training
 - establishing and monitoring standards
 - organisational support.

Action area 7: Information technology

- (i) to ensure that developing information technology systems take account of the needs of antimicrobial resistance surveillance and prescribing monitoring and support, and that they allow effective international co-operation in this field.

Action area 8: Research

- (i) to promote a co-ordinated programme of research, responsive to policy needs, including
 - basic research into mechanisms of resistance and its spread
 - applied research to further investigate risk factors, clinical impact and best practice for control in the UK and in the international context.
- (ii) to encourage the development of new and novel agents/technologies to detect, prevent and treat infection and overcome resistance.

6. Key Players

The following list indicates the range of Government Departments, organisations, groups and individuals with an interest in this strategy. It is by no means – nor is it intended to be – exhaustive.

Department of Health

- Public Health Group
- National Health Service Executive
- Medicines Control Agency (MCA)
- Medical Devices Agency (MDA)
- Finance Division

Ministry of Agriculture, Fisheries and Food (MAFF)

- Chief Veterinary Officer's Group
- Animal Health Group
- Veterinary Medicines Directorate (VMD)
- Veterinary Laboratories Agency (VLA)

Scottish Executive

- Scottish Executive Health Department
- Scottish Executive Rural Affairs Department

National Assembly for Wales

Northern Ireland

- Department of Health and Social Services
- Department of Agriculture for Northern Ireland

National Health Service

- Health Authorities, Primary Care Groups (PCGs), Trust Managers
- Health professionals
- Clinicians, nurses, pharmacists, dentists, public health physicians and their relevant professional societies
- Veterinary professionals, veterinary practitioners and nurses and their relevant professional societies

The Food Standards Agency

Public Health Laboratory Service (PHLS)

Scottish Centre for Infection and Environmental Health (SCIEH)

Northern Ireland Communicable Disease Surveillance Centre (CDSC N/I)

Royal Colleges

British Medical Association General Practitioners' Committee

British Veterinary Association

Medical Research Council (MRC)

Biotechnology and Biological Sciences Research Council (BBSRC)

Centre for Applied Microbiological Research (CAMR)

Health and Safety Executive (HSE)

Department of Trade and Industry (DTI)

Office of Science and Technology (OST)

Pharmaceutical and Diagnostics Industry

The Association of the British Pharmaceutical Industry (ABPI)

National Office of Animal Health Ltd (NOAH)

Department of Education

Department of the Environment, Transport and the Regions

National Farmers Union (NFU)

Responsible Use of Medicines in Animals (RUMA) Alliance (co-ordinated by the NFU)

The whole food chain, including the Food Industry

The general public and consumer groups

7. The tasks involved: The UK's Action Plan

This section is concerned with how the Government intends to deliver on the Strategy to meet its Aims and Objectives. It expands on the commitments given in the Government's response to the House of Lords report (which includes acceptance of the SMAC Committee recommendations on clinical prescribing). The actions are listed under the relevant objectives, which, as before, are divided into eight action areas. *It should be noted that where initiatives are attributed to DH, parallel activity is generally being undertaken by the other UK Health Departments who will 'translate' the plan as appropriate to their own needs and resources. In Wales, the strategy is being taken forward within their already established overall communicable disease control strategy. MCA and VMD have UK-wide remits.*

Action area 1: General

- (i) To gain commitment, focus and co-ordination
 - Implementation of the strategy will be overseen and co-ordinated through the Interdepartmental Steering Group (Annex A) which was initially established to co-ordinate the Government's response to the House of Lords Report;
 - An expert advisory committee will be established to advise the Government on its future strategy;
 - At EU level, the UK will provide input to the European Commission's Scientific Steering Committee. The UK will also argue for the future framework for European action in the field of public health to make antimicrobial resistance a priority for action;
 - At international level the UK will press for antimicrobial resistance to be given priority in WHO's next global and biennial work programmes.

Action area 2: Surveillance

- (i) To establish and maintain systems in the UK and as part of wider international networks to improve data and information on antimicrobial resistant organisms and illness due to them
 - PHLS will establish and develop a national antimicrobial resistance surveillance programme taking account of user needs;
 - PHLS, SCIEH and CDSC NI will liaise to provide compatible UK-wide databases;
 - PHLS will take steps to improve national surveillance of methicillin resistant *Staphylococcus aureus* (MRSA);

- In Scotland, a national framework for Hospital Acquired Infection surveillance for the NHSiS will be developed using the 1999 SoDOH publication 'HAI: A framework for a national system of surveillance for the NHS in Scotland' as a focus for the work
 - PHLS will continue to monitor antiviral resistance through the new virus reference laboratory;
 - DH will review the wider clinical and policy requirements of antimicrobial resistance surveillance following on from the seminar held at the Department in July 1998;
 - DH will take forward, in liaison with colleagues, a statutory scheme of reporting by laboratories at the earliest opportunity that Parliamentary time permits;
 - MAFF will improve collection and reporting of antimicrobial resistance data in foodborne pathogens at the point of harvesting, and will collate and publish information on other pathogens as well as salmonella;
 - PHLS will provide the lead for the UK input into the current EU and WHO drug resistance surveillance projects;
 - The UK will continue to press for priority to be given to antimicrobial resistance surveillance in the new EU communicable disease surveillance network.
- (ii) To establish and maintain appropriate systems to monitor antimicrobial use in the UK
- DH will address issues surrounding collation of prescribing and clinical data as part of the new NHS health information strategy, including through research;
 - the Nosocomial Infection National Surveillance Scheme steering group will consider the feasibility of including prescribing data, as well as organism/drug susceptibility data, in future NINSS modules (especially that for surveillance of HAI in intensive care units);
 - MAFF will commission a baseline survey of patterns of antimicrobial use as veterinary medicines and growth promoters.
- (iii) To improve correlation of data on patterns of antimicrobial use and antimicrobial resistance in humans and in animals
- MAFF, DH and PHLS will work together to co-ordinate surveillance programmes.

Action area 3: Prudent antimicrobial use in humans

- (i) To promote optimal prescribing in clinical practice, through

Professional education

- DH will take the lead in continuing to press for greater coverage of this subject in undergraduate and post graduate curricula (medical, dental, nursing and pharmacy) and in continuing professional development, through the GMC, the Royal Colleges, Nursing Boards and the NHS (HAs, hospitals, PCGs), and for better integration of antimicrobial teaching into teaching about the infections for which they are to be used.

Prescribing support

- DH will work with the NHS through HA prescribing advisers to encourage optimal prescribing;
- national guidelines: DH will promote the development and promulgation of evidence-based national guidelines, suitable for adaptation for local use, for the management of certain infections (exploring also the role of NICE);
- local guidelines: the NHS Executive will ensure all HAs, PCGs and Trusts develop, implement and review (at least annually) policies and guidelines on the management of infections and the appropriate use of antimicrobials; at the minimum these should contain standard information on drug, dosage and duration, and information on local drug susceptibility patterns and how to interpret them;
- DH will continue the roll out of the PRODIGY prescribing support system in primary care;
- DH will test one or more prototype computerised prescribing – support systems in selected hospitals [SMAC recommendation] (see also Objective 6);
- DH will encourage innovative approaches to prescribing support such as prescribing workshops;
- DH will review the results of commissioned research on the influence of doctor and patient pre-conceptions and the effect these have on prescribing;
- DH will co-ordinate a national professional education Campaign on Antibiotic Treatment (CAT) along the lines recommended by SMAC ('Four things you can do to make a difference');
- DH will feed into the Royal Pharmaceutical Society of Great Britain (RPSGB) programme on shared goals between pharmacists and other healthcare professionals.

Organisational support

DH will

- use the clinical governance framework;
- provide PCGs with the necessary information, tools and support;
- feed back examples of good practice, in order to support prescribing monitoring, audit, performance management and feedback.

(ii) To improve diagnostic and antimicrobial susceptibility testing methods and reporting systems

DH will:

- encourage improvements by PHLS, CAMR, and the Diagnostics Industry;
- encourage rationalised use of expensive tests;
- encourage improvements in laboratory reporting;
- plan the introduction of near-patient tests so that quality is assured and surveillance is not jeopardised;
- as part of wider work on communicable disease control, consider the need for guidance on the public health role of NHS clinical microbiology laboratories.

(iii) To encourage realistic public expectations for antimicrobial prescribing

DH will:

- run a paid publicity campaign (National Advice to the Public – NAP) in support of the professional education initiative in primary care recommended by the HOL committee and SMAC;
- provide supporting information;
- encourage local initiatives;
- use the new strategy for nursing to reinforce the role of nurses in public education;
- investigate the use of the Healthy Schools Initiative and other ways of promoting understanding in the whole school community;
- encourage inclusion of antimicrobial resistance in the national curriculum (including information on the benefits of a normal bacterial flora) [SMAC recommendation];
- explore other innovative ways of increasing public awareness of the problem of antimicrobial resistance.

- (iv) To use the regulatory framework to improve optimal prescribing (in the UK and Europe) where appropriate

MCA will:

- through the Committee on Proprietary Medicinal Products, work to develop European-wide guidance to the pharmaceutical industry which deals with pharmacodynamic and pharmacokinetic data which might support the choice of dose regimen studied in phase III clinical trials of antibacterials;
- seek improvements in the consistency, and regular updating, of Summaries of Product Characteristics;
- review the legal status of antimalarial, antiviral and antifungal agents currently available without prescription in the UK;
- promote adherence to prescription only status for antibacterials within the EU and elsewhere.

MDA will:

- monitor and evaluate, if indicated, the need for action to restrict dressings containing antibiotics in the UK (and the need to educate health professionals about the potential dangers of their use).

Action area 4: Prudent antimicrobial use in animals

- (i) To promote optimal prescribing in animals

The VMD will:

- encourage professional education
- encourage the production and promulgation of guidelines/codes of practice for prescribing, including through BVA, NFU and NOAH.

- (ii) To reduce unnecessary and inappropriate use of antimicrobials for non-therapeutic use in animals

The VMD will:

- review appropriate usage, including as growth promoters, in light of advice from the Advisory Committee on the Microbiological Safety of Food (ACMSF) and the Veterinary Products Committee, and EU decisions.

- (iii) To use the regulatory framework to improve optimal antimicrobial prescribing (in the UK and Europe) where appropriate

The VMD will:

- critically assess existing products at the time of renewal of marketing authorisations and ensure that data sheets and product characteristics summaries are appropriate and consistent (with those for other products containing the antibacterial active ingredient);
- in the authorisation process for new antimicrobials, require the development of optimised dosing rates and strategies based on recent advances in pharmacokinetic and pharmacodynamic data and, where necessary, require new dose rates and strategies for currently authorised antimicrobials.

Action area 5: Prudent antimicrobial use in other spheres

- (i) While the use of antimicrobials in arable agriculture and horticulture is not currently an issue in the UK, the UK will maintain that position and support action to reduce inappropriate use in Europe and elsewhere.

Action area 6: Infection Control

- (i) To strengthen infection control practices and processes in hospitals and the community, and promote collaboration between the Member States of the EU and the WHO European Region to this end
 - DH will lead the development of performance standards and targets for HAI (including MRSA) for England and Wales;
 - DH commissioned guidelines on infection control practices are due to be completed by Summer 2000;
 - DH will lead on the production of national guidance and standards for community infection control management;
 - DH will act on recommendations in this area arising from the Chief Medical Officer's Project to Strengthen Public Health;
 - DH will seek improvements in infection control practices in the NHS through the clinical governance framework;
 - The NHS Executive/RO's will monitor implementation of the National Priorities Guidance in this area through performance management;
 - DH will review arrangements in hospitals in light of the Regional Epidemiologists and National Audit Office surveys of infection control in acute hospitals;
 - DH will take account of the needs of infection control should Parliamentary time be gained for a review of communicable disease legislation;
 - DH and PHLS will take the lead, in liaison with the other countries, to link with relevant EC actions concerned with the control of nosocomial infection.

Action area 7: Information technology

- (i) To ensure that developing information systems take account of the needs of antimicrobial resistance surveillance and prescribing monitoring and support, and that they allow effective international co-operation in this field
- in the implementation of the NHS IT strategy 'Information for health – 1998-2005', which will provide a range of compatible electronic-based clinical support systems, attention will be given, both nationally and locally, to a number of issues relevant to supporting work on antimicrobial resistance, ie:
 - information for patients and the public;
 - information for clinicians;
 - information for management;
 - surveillance and public health;
 - infrastructure issues;
 - implementation issues (including training);
 - DH will encourage hospitals to evaluate and introduce ward level computerised prescribing systems;
 - DH will continue the roll out of the PRODIGY computerised prescribing support system in primary care;
 - DH will commission research on the use of decision support systems.

Action area 8: Research

- (i) To promote a co-ordinated programme of research, responsive to policy needs, including basic and applied research.
- (ii) To encourage the development of relevant new technologies
- DH's Research and Development Division will take the lead in establishing and maintaining a liaison group (the Research subgroup) to ensure a co-ordinated approach between the major Government funding bodies in which the relevant clinical and public health issues related to antimicrobial resistance are appropriately addressed, including through the Departments' Policy Research Programme, the NHS Research and Development Programme and the MRC;
 - the MRC will develop potential areas for research identified at its brainstorming meeting;
 - DH will encourage use of European programmes such as the Orphan Drugs programme, Rare diseases programme and the 5th Framework research programme for relevant research in this field.

Specific areas of research mentioned in reports include:

- basic mechanisms of resistance and its spread;
- drivers of resistance and effects of interventions;
- research to support development of surveillance in this field and answer hypotheses raised by surveillance data;
- optimum dosing and duration of antimicrobials;
- clinical research into what was prescribed and why, to better inform clinical prescribing practice [a Copenhagen recommendation];
- impact of resistance on clinical outcome (and costs);
- rapid affordable diagnostic and susceptibility tests;
- use of delayed prescriptions;
- vaccine development;
- [continue malaria research];
- infection control: factors favouring cross infection and best practice for control;
- alternative means of animal husbandry to allow discontinuation of antibiotics as growth promoters;
- development of partnerships with the pharmaceutical industry for development of drugs for human and animal use;
- exploration of use of the Foresight programme to further research in this area;

This list will be reviewed, and priorities set, in the Research Subgroup referred to above.

8. Taking the Work Forward

It is expected that the key Government Departments and other organisations involved will develop action plans covering their own contributions to the overall strategy. These should include milestones by which progress will be monitored by the Interdepartmental Steering Group. Those for the Department of Health and the NHS have already been produced; others are in preparation.

Subgroups of the Interdepartmental Steering Group will take forward work in the following areas:

- Clinical prescribing
- Co-ordination of research
- Public information and education.

The current strategy does not include specific, measurable, targets for antimicrobial resistance or disease due to resistant organisms. Identification of suitable targets requires considerable further development work, but should, we believe, form part of future phases of this strategy.

Priorities for the Interdepartmental Steering Group are:

1. establishment of a national expert advisory committee;
2. establishment of a clinical prescribing subgroup and its work programme to oversee implementation of the SMAC recommendations for optimising prescribing (including a Campaign on Antibiotic Treatment, guidelines and prescribing and organisational support for prescribers);
3. the public information campaign;
4. establishment of arrangements to determine priorities, encourage suitable proposals and co-ordinate research;
5. ensure arrangements are set up to co-ordinate surveillance in animals/man;
6. ensure development work proceeds to establish appropriate standards, and thence targets, for HAI (including MRSA);
7. support action at EU and WHO level.

9. Resources

Individual departments and organisations will reflect the strategy in their work programmes, and the budgets to cover it in their business plans.

The strategy takes account of the arrangements and resources of Scotland, Wales and Northern Ireland.

10. References

- 1 Government Response to the House of Lords Select Committee on Science and Technology Report: Resistance to Antibiotics and other Antimicrobial Agents
- 2 House of Lords Select Committee on Science and Technology. Session 1997-8, 7th Report: Resistance to antibiotics and other antimicrobial agents. Chairman Lord Soulsby. London: The Stationery Office.
- 3 Standing Medical Advisory Committee Sub-group on Antimicrobial Resistance. The Path of Least Resistance. Department of Health, 1998.
- 4 World Health Organisation: Emerging and other Communicable Diseases: Antimicrobial Resistance. Resolution of the 51st World Health Assembly, May 1998.
- 5 European Union Conference 'The Microbial Threat': The Copenhagen Recommendations. Danish Ministry of Health and Ministry of Food Agriculture and Fisheries, September 1998.

Annex A

Members of the Interdepartmental Steering Group on Resistance to Antibiotics and other Antimicrobial Agents

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