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**Antimicrobial Resistance Monitoring: Update of Activities
1997/1998**

World Health Organization
Emerging and other Communicable Diseases,
Surveillance and Control

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The Threat of Antimicrobial Resistance

The control of infectious diseases is increasingly threatened by the emergence and spread of resistant microbes, and the response to this threat is imposing a growing burden on limited health care resources. Public health strategies to control resistance must reconcile the need to provide effective care to ill patients today while preserving the efficacy of antimicrobials for future generations.

REVIEW OF ACTIVITIES

The aim of this leaflet is to summarize the activities of the WHO Antimicrobial Resistance Monitoring programme in 1997/1998. We hope that it may also stimulate you to suggest other collaborations that would help to strengthen our programme.

The activities of the Antimicrobial Resistance Monitoring programme are divided between two main channels:

- C **strengthening national capacity** to develop and implement strategies for the containment of antimicrobial resistance, including the establishment of antimicrobial resistance surveillance and;
- C **establishing international linkages** to share information on resistance and its surveillance and to promote the development of containment strategies.

Strengthening National Capacity

Increasing the pool of skilled professionals

In 1997/1998, WHO Laboratory Training Courses on Antimicrobial Susceptibility Testing and Resistance Monitoring were conducted in countries in five WHO Regions (African Region [Kenya]; Eastern Mediterranean Region [Sudan]; European Region [an inter-country course for Croatia/Estonia/Latvia in collaboration with the American International Health Alliance]; South East Asia Region [India, Myanmar, Sri Lanka, Thailand]; Western Pacific Region [China (five courses), Mongolia, Viet Nam]). In addition, two specialized courses in the detection and monitoring of methicillin-resistant *Staphylococcus aureus* were organized in the Eastern Mediterranean Region [Bahrain, Kuwait]; and training in the use of the WHONET software was conducted in Japan. Tentatively scheduled for the last quarter of 1998 are laboratory training courses in China (two courses) and Viet Nam and inter-country courses for Algeria/Djibouti/Morocco/Tunisia and Iraq/Jordan/Lebanon/Syria. To build on the training activities of 1997, a follow-up session was organized in Thailand, and further follow-up activities and situation analyses are currently being planned.

A team of 18 experts from 11 countries has been brought together to run the microbiology section of the training courses. A further eight individuals from six countries teach resistance data analysis and use of the WHONET software. Three trainer 'debriefing' sessions (for trainers based in Europe, the United States, and Asia) have helped us to strengthen our training activities through feedback provided and lessons learned.

Training trainers is an increasing focus of our work. Twelve individuals from eight countries in Asia attended a workshop in Hong Kong on resistance data analysis and use of the WHONET software, and eight microbiologists in China were trained in the conduct of the microbiology aspects of the training courses.

We acknowledge the contribution and commitment of all those who work so hard to make the training courses successful. In 1997/1998, some 200 laboratory personnel have been trained to improve susceptibility testing techniques, to communicate results to clinicians, and to manage resistance data using the WHONET software. Such an extensive programme would not have been possible without the support of the WHO Regional Offices, the WHO Representatives in the countries, and the local organizers, and we look forward to strengthening these collaborations in 1999.

Strengthening national strategies for the containment of antimicrobial resistance

In 1998, the World Health Assembly adopted a resolution which recognizes the public health importance of antimicrobial resistance and urges WHO and its Member States to undertake a number of actions in surveillance, education, and policy development and implementation.

A programme of National Policy Workshops has been developed in collaboration with the WHO Action Programme for Essential Drugs and the WHO Division of Drug Management and Policies to bring together policy-makers, physicians, pharmacists, microbiologists, industry partners, and other health care specialists to review local problems in resistance and antimicrobial usage and to establish a national strategy and plan of action for the containment of resistance. Four such Workshops were held in 1997/1998 [China, Kenya, Myanmar, Sri Lanka].

Software development

Initial evaluation of WHONET 5.0 for Windows was undertaken in the summer of 1998. As with previous versions, the aims of the software are to enhance local analytical capabilities and to facilitate the exchange of data between collaborating laboratories. New features which facilitate these aims include:

- C a Windows interface integrated with other Windows softwares and facilitating future programme enhancements;
- C a new data structure (dBase) compatible with major database, spreadsheet, statistical and word processing softwares;
- C modular configuration, permitting the customization of the software for clinical, epidemiological, veterinary, molecular, pharmacological, and infection control applications.

The BACLINK software facilitates the transfer of microbiology data from existing laboratory information systems, commercial softwares, and automated susceptibility test instruments into WHONET.

Quality Control and Proficiency Testing

An essential component of national resistance containment strategies is the initiation or strengthening of quality assurance programmes and surveillance activities. A WHO quality assurance scheme in antimicrobial susceptibility testing is coordinated by the WHO Collaborating Centre for International Monitoring of Bacterial Resistance to Antimicrobial Agents at the Centers for Disease Control and Prevention, Atlanta. Two distributions of proficiency test strains were made in 1998. In the first round, strains were sent to a total of 46 laboratories in 40 countries throughout all WHO Regions. The strains were further distributed within these countries to a total of 317 additional laboratories. Results from participating laboratories emphasize the need for continuous quality improvement in susceptibility test performance and result interpretation, but illustrate that laboratories throughout the world, using different methodologies and sources of reagents, are able to achieve accurate and comparable results.

Non-human medical use of antimicrobials

Addressing the concerns of many scientists and public authorities about the public health consequences of the use of antimicrobials outside human health, the WHO programme has initiated activities in the following areas: identification and assessment of emerging human health problems from non-human medical use of antimicrobials; improved availability of data on resistance trends and prevalence in priority bacteria; and development of strategies for more prudent use of antimicrobials in relevant sectors. In 1997/1998, two meetings were organized to review the current knowledge of the links between antimicrobial use in agriculture and resistance in human populations: "The medical impact of the use of antimicrobials in food animals" (Berlin) and "Use of quinolones in food animals and potential impact on human health" (WHO, Geneva). Priority areas of concern were identified and recommendations made on the monitoring of antimicrobial resistance in food animals and food of animal origin, and the use of antimicrobials for growth promotion in animal husbandry. The meeting reports also outline priority areas for further applied research and data gathering (meeting reports available).

To strengthen current surveillance activities, the Danish Veterinary Laboratory, Copenhagen, is establishing in collaboration with WHO a quality assurance programme in bacterial identification and susceptibility testing for national reference laboratories for foodborne diseases. In addition, a Regional Centre for Antimicrobial Resistance Monitoring in Food Animals and Food of Animal Origin will be inaugurated in Bangkok by the end of 1998.

WHO, the Food and Agricultural Organization (FAO), the Codex Alimentarius Commission, and other international organizations are working jointly to elaborate policy and guidelines on the containment of resistance in foodborne pathogens and to investigate the health implications of antimicrobial use in food production and other industries (e.g. aquaculture, horticulture).

Establishing International Linkages

Information gathering

No global surveillance system of antimicrobial resistance exists today. Several countries operate national systems and many local and multicentre surveillance systems have been initiated, but at present there is no repository for information about the systems that do exist nor coordination between them.

An activity initiated in 1997/1998 is the gathering of information on existing surveillance activities. This is being undertaken region by region and was launched in the WHO European Region in conjunction with a meeting on "The Status of Antimicrobial Resistance Surveillance in Europe" organized jointly with the Associazione Culturale Microbiologia Medica in Verona, Italy in December 1997. A similar meeting, "The Pan American Meeting on Antibiotic Resistance Monitoring: Current Situation and Development of an Action Plan for Regional Surveillance", is being coordinated by the Pan American Health Organization in collaboration with the Pan American Infectious Disease Society, and will take place in Caracas in November 1998. To address the lack of information on activities investigating resistance associated with non-human uses of antimicrobials, questionnaires were sent to 60 national reference laboratories for foodborne diseases. Information gathered through these activities will become available through the WHO Antimicrobial Resistance Information Bank (see below).

Information sharing

The WHO programme is building the WHO Antimicrobial Resistance Information Bank which will make relevant information available to policy-makers and health care professionals. This information resource will include information about resistance in key bacterial pathogens from human and animal specimens, about drug usage patterns, and about contact points, activities, and programmes which address resistance surveillance and containment. In 1998, we have advanced in defining the structure of the bank and its linkages to sources of information on antimicrobials and resistance. An internet site permitting access to this resource will be opened in the last quarter of 1998.

As well as collecting data from published sources, preliminary discussions are underway with national and international networks, academic societies, and the pharmaceutical and diagnostic industries on the possibilities of sharing data from surveillance projects. We are currently developing guidelines for terms of data sharing which address the issues of data quality, confidentiality, ownership, recognition, access, and presentation.

Meetings organized

WHO has organized a number of meetings which have stimulated the international community to further discussions and actions in the surveillance of antimicrobial resistance and in the rational use of antimicrobial agents in humans and in food animals. Meeting reports are available (see *References*).

Partnership building

With a multitude of players in the international arena involved in the many aspects of antimicrobial resistance, building partnerships is an important part of our activities:

C Industry

We continue to build important links with industry. In the "Second Joint WHO/IFPMA Meeting on Antimicrobial Resistance Monitoring: Information Exchange and Opportunities for Collaboration", representatives from pharmaceutical and diagnostic companies addressed data sharing, research priorities, non-medical uses of antimicrobials, and strengthening national capabilities.

C Professional Institutions and Societies

An active partnership has been initiated with the International Society for Infectious Diseases (ISID) in supporting programme activities in Africa. Discussions on partnership are also ongoing with the American Society for Microbiology (ASM), the American International Health Alliance (AIHA), the National Committee for Clinical Laboratory Standards (NCCLS), and the Alliance for the Prudent Use of Antibiotics (APUA), among others.

C Governmental and inter-governmental organizations

The WHO programme has participated in meetings of various governmental agencies in the United States and in the member states of the European Union, in the European Union-United States Task Force, the Economic and Social Committee of the European Union, and Directorate General XXIV.

Presentations at meetings

Our programme activities have been presented at a number of meetings including:

- Meeting of the United States-Japan Common Scientific Agenda, Thailand (March 1997);
- Wellcome Trust Frontier Meeting on Antibiotic Resistance, United Kingdom (April 1997);
- International Symposium on Hospital Acquired Infections, Saudi Arabia (April 1997);
- Institute of Medicine Forum on Emerging Diseases, United States (July 1997);
- Meeting of the United Kingdom Government Select Committee on Science and Technology, Sub-Committee on Resistance to Antimicrobial Agents, United Kingdom (October 1997);
- 11th Session of the Codex Alimentarius Committee on Residues of Veterinary Drugs in Food, United States (September 1998);
- 18th Conference of the Regional Commission of the OIE for Europe, Czech Republic (September 1998);
- First international workshop of the Gonococcal Antimicrobial Susceptibility Programme, Peru (December 1997);
- Second Latin American workshop on antibiotic resistance of *Salmonella*, *Shigella* and *Vibrio cholerae*, Mexico (January 1998);
- First Enter-net Workshop, Ireland (February 1998);
- Meeting of the European Antimicrobial Resistance Surveillance System (EARSS), Bilthoven, The Netherlands (April 1998);
- FEDESA-European Commission Info-day "Veterinary antibiotics in the European Union", Belgium (May 1998);
- Committee on Agriculture and Rural Development of the Council of Europe, "The use of antibiotics in food production", United Kingdom (June 1998);
- Invitational European Union Conference "The microbial threat", Copenhagen (September 1998).

LOOKING FORWARD

The WHO Antimicrobial Resistance Monitoring programme intends to participate fully in the development of a global strategy for the containment of antimicrobial resistance, and we look forward to closer collaboration with other Divisions and Programmes in WHO, with WHO Regional Offices, with national initiatives in resistance surveillance, and with other partners in the global antimicrobial resistance arena.

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