Technical consultation: Strategies for global surveillance of antimicrobial resistance

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Meeting report

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CONTENTS

ABBREVIATIONS AND ACRONYMS

AGISAR	Advisory Group on Integrated Surveillance of Antimicrobial Resistance
AMR	antimicrobial resistance
ANSORP	Asian Network for Surveillance of Resistant Pathogens
CIA	critically important antimicrobials
CLSI	Clinical and Laboratory Standards Institute
EARS Net	European Antimicrobial Resistance Surveillance Network
EQA	external quality assessment
ESBL	extended-spectrum beta lactamase
FAO	Food and Agriculture Organization of the United Nations
GARP	Global Antibiotic Resistance Partnership
GFN	Global Foodborne Infections Network
HIV	human immunodeficiency virus
HQ	Headquarters (WHO)
HSE	Health Security and Environment (WHO Department)
ICT	information and communications technology
ICU	intensive care unit
IHR	International Health Regulations
INDEPTH	International Network for the Demographic Evaluation of Populations and Their Health
IPC	infection prevention and control
LMIC	low- and middle-income countries
MDR	multidrug resistance
MRSA	methicillin-resistant *Staphylococcus aureus*
NGO	nongovernmental organization
OIE	World Organisation for Animal Health
PED	Pandemic and Epidemic Diseases (WHO Department)
QA	quality assurance
ReACT	Action on Antibiotic Resistance (an NGO)
ReLAVRA	Red Latinoamericana de Vigilancia de la Resistencia a los Antimicrobianos
RIS	resistant, intermediate or sensitive
TB	tuberculosis
UK	United Kingdom of Great Britain and Northern Ireland
UN	United Nations
USA	United States of America
WHA	World Health Assembly
WHO	World Health Organization
WHONET	WHO software for management and analysis of antimicrobial susceptibility tests

1   WELCOME AND INTRODUCTION

Dr Fukuda – Assistant Director-General, Health Security and Environment (HSE), World Health Organization Headquarters (WHO HQ) – welcomed participants. He introduced antimicrobial resistance (AMR) as a well-known but complex subject that requires a broader scope of action than has previously been the case, if there is to be real change. The issue is global in reach and goes well beyond medical and technical issues. The broad scope and complexity of AMR can make the problem seem daunting, and it needs to be broken down into more manageable parts; for example, surveillance, the need for therapeutic tools, and how to engage with industry to research and prime the drug pipeline. Other issues that require action are the elaboration and enforcement of guidelines; development of national AMR plans; engagement with a broader group of stakeholders; coordination on planning, social and cultural aspects of AMR; and determination of how to convey that we all have a common stake in tackling AMR. Answers are required, for example, on how to better reach mothers, families and communities with educational messages about the correct use of antibiotics; how to better reach farmers and the agricultural sector, so that they better understand the effects of antibiotics; and how to better understand the economic aspects that drive inappropriate use of antibiotics. There is wide variation between communities on access to drugs of assured quality, and across Member States in enforcement of regulations and guidelines. Clearly, there is a need to elevate AMR to the political level, because it constitutes an economic and social issue, not just a health issue. Although political engagement varies across the regions, global consensus is required because action needs to be taken worldwide.

There is a great need for innovation; not just technical innovation (e.g. better prevention, and diagnostic and therapeutic tools), but also innovation to change the current business model in the industry. Ideally, we need to return to a scenario where there are a number of new drugs in the pipeline and, simultaneously, rational use of medicines. For this to happen, it is vital to engage business schools, economists and other experts not usually involved in the discussion.

The intrinsic complexity and the cross-sectoral nature of AMR mean that it does not fit completely into the remit of any organization, making it even more important to find leadership. The messages conveyed need to be clear and accessible, while transmitting the belief that we can move forward and tackle all aspects of the problem. One of the first areas to be addressed is raising awareness in order to increase political engagement. Such engagement will ensure that important sectors are brought together; it will also provide the authority for various national agencies to work on the issue. The second area to address is that of technical activities. These are encapsulated in the WHO policy package launched on World Health Day 2011,[1] but their implementation is a continuing challenge. In areas for which we have no solutions, we need to reach out, through partnerships and collaborations, to new partners.

The current meeting concerns surveillance of AMR. This is a good place to start because surveillance provides important baseline information for public health action. Although many countries already have good surveillance, many gaps remain. Surveillance is an area of AMR where success is possible, and where the global community can demonstrate its commitment to moving forward and tackling a

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[1] See http://www.who.int/world-health-day/2011/policybriefs/en/index.html

key part of this global issue. For countries, better surveillance will translate into information that can be acted upon; it will also provide information that will increase understanding of the issue.

2   MEETING SCOPE, BACKGROUND, OBJECTIVE AND OUTPUTS

2.1   SCOPE

The scope of the meeting was to review and identify the objectives, needs, gaps, priorities and next steps for improving global surveillance of antibacterial resistance, and to explore opportunities for collaboration.

2.2   BACKGROUND

The development and implementation of effective policies and strategies to combat AMR requires a comprehensive understanding of the prevalence of such resistance, and the factors that drive its development and spread.

Current data are limited due to factors such as:

• surveillance networks being limited in their coverage of pathogens or geographical area (or both);

• surveillance often being based on clinical samples, and resistance data thus being biased towards hospital populations.

Strengthening surveillance and laboratory capacity is one of the six points in the WHO policy package launched on World Health Day 2011. Key challenges identified in that package included poor infrastructure and data management, low coverage of surveillance, lack of intersectoral cooperation and inadequate international collaboration.[1]

There is a need for AMR surveillance that:

• increases our understanding of the extent and distribution of AMR, the scale of the human disease and economic burden, and the relatedness between AMR in humans and animals;

• operates to agreed standards, provides timely global reporting on the current state of AMR, and permits monitoring of the effectiveness of interventions to combat or limit AMR.

> **Vision**
>
> The proposed vision is to achieve a monitoring capacity that will capture the global situation of antimicrobial resistance, and inform decision-making.

2.3   OBJECTIVE

The focus for this meeting was surveillance of antibacterial resistance, because there is an acknowledged lack in this area compared to other pathogens such as viruses and parasites.

The objective of this initial meeting was to:

• review the scope of existing international networks for surveillance of antibacterial resistance around the globe;

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[1] See http://who.int/entity/world-health-day/2011/presskit/whd2011_fs2_labcapa.pdf

- identify the capabilities, methods and data that are needed to develop appropriate surveillance;

- identify current gaps, needs and possible solutions related to such surveillance.

The meeting drew on experts from WHO collaborating centres, WHO regional offices and relevant WHO programmes, and from international initiatives.

2.4 EXPECTED OUTPUTS

The expected outputs of the meeting were:

1. Objectives and outcomes for global antibacterial surveillance.

2. Overview of existing international surveillance networks for AMR.

3. Identification of coverage and capacity gaps.

4. Identification of needs for sharing comparable data and communicating results.

5. Priorities and key elements for developing global surveillance of AMR.

6. Principles of, and opportunities for, international collaboration on surveillance of AMR.

3   MEETING OFFICIALS

The meeting was opened by Dr Keiji Fukuda (Assistant Director General, Health Security and Environment, WHO HQ), Dr Hiroki Nakatani (Assistant Director General, Human immunodeficiency virus [HIV], Tuberculosis [TB] and Malaria, WHO HQ) and Dr Kees De Joncheere (Director, Essential Medicines and Pharmaceutical Policy, WHO HQ).

The sessions on Day 1 were chaired by Professor Jae-Hoon Song (President and CEO, Samsung Medical Centre, Republic of Korea) and those on Day 2 were chaired by Dr Thomas O'Brien (WHO Collaborating Centre for Surveillance of Antimicrobial Resistance, Brigham and Women's Hospital, Boston, United States of America)

Professor Song noted that the Asian Network for Surveillance of Resistant Pathogens (ANSORP) has been working on this issue since the early 1990s, and that initial approaches to WHO in the late 1990s met with no response. Consequently, he welcomed this meeting as an important follow-up to the 2001 WHO Global AMR Strategy and the 2011 World Health Day on AMR.

Dr Carmem Pessoa (AMR Team Leader, Pandemic and Epidemic Diseases, WHO HQ) reiterated the objectives of the meeting and its expected outputs. She also proposed the following vision for AMR surveillance:

"The achievement of a monitoring capacity of key information, to capture the global situation of antimicrobial resistance and inform decision-making."

4   PROCEEDINGS

4.1   OVERVIEW OF EXISTING NETWORKS FOR SURVEILLANCE OF ANTIBACTERIAL RESISTANCE

4.1.1 RESULTS OF THE WHO SURVEY

A survey was conducted to determine the scope of some existing AMR surveillance networks. Responses were received from 5 international and 22 national networks. About 50% of respondents reported that surveillance was part of a broader programme to contain AMR; in about 60% of these cases, the network was coordinated by a national body, but only about half had a specific governmental mandate. There was some overlap with data collected on other pathogens (e.g. HIV, malaria, TB, influenza and gonorrhoea) by disease-specific networks, and a strong overlap with data collected on foodborne pathogens.

The main priority of the networks was the surveillance of trends in pathogen resistance, followed by the identification of public health threats, and the provision of information for clinical treatment guidelines and infection control. Networks reported that they take on a broad range of responsibilities, with most providing services for data analysis, technical feedback, report preparation and dissemination, technical support and training. Data from epidemiological sources, including antibiotic use, are generally not used in analysis. In terms of laboratory work and data handling, manual test methods tended to dominate in these networks, with less than 70% of respondents reporting that they are able to separate first from repeat isolates, and less than 50% reporting that they are able to distinguish between hospital and community-based isolates. Data are generally submitted using manual methods, usually on a yearly basis. Most networks reported that they met minimal requirements for quality assurance (QA), but less than 40% had formal QA requirements.

In terms of perceived impact, most networks reported that their surveillance has an impact in terms of improved laboratory capacity and methods, and improved infection prevention and control (IPC). About 40% of respondents believed that the outputs of surveillance had an impact on decision-making at health-care establishment and national levels. The greatest spin-off benefits from surveillance were identified as a greater awareness of AMR issues, improved networking and improved laboratory QA. Multiple factors were required for supporting further growth and achieving network sustainability; they included government support, sustainable funding, utility and quality of service, and the worsening AMR situation. The main organizational lessons learnt included lack of supporting government policies and an over-reliance on core staff. The main technical challenge was assuring quality of testing.

4.1.2   INTERNATIONAL SURVEILLANCE NETWORK EXAMPLE – LATIN AMERICA RESISTANCE SURVEILLANCE NETWORK

The Latin America Resistance Surveillance Network (Red Latinoamericana de Vigilancia de la Resistencia a los Antimicrobianos, ReLAVRA) was initiated to strengthen laboratory capacity for antibiotic susceptibility testing. It has a supporting QA programme (both internal and external), and uses WHONET (WHO software for management and analysis of antimicrobial susceptibility tests) as a tool for data collection. The network was small initially, but has slowly increased in size, with the

Caribbean countries being the latest group of countries to join. There are three supranational laboratories, and the Pan American Health Organization provides overall coordination of the network. The list of pathogens under surveillance has been determined by the network; it includes 7 nosocomial and 11 community pathogens.

The network defines the roles and responsibilities of its members and participating laboratories. There are 21 national reference laboratories, receiving data from 720 sentinel sites (mostly located in hospitals). To improve harmonization, standards from the Clinical and Laboratory Standards Institute (CLSI) were translated into Spanish and adopted across the network. An external QA programme is in place, and quality levels are generally found to be high. The number of samples tested across the region is also steadily increasing, and is currently about 175 000. The network has a technical advisory group that meets annually. Technical feedback is provided to participants, together with treatment guidelines and epidemiological alerts. Annual reports containing aggregated data are produced.

The rate of methicillin-resistant *Staphylococcus aureus* (MRSA) in hospital settings is gradually rising across the region. A manual for promotion of the rational use of antimicrobials is currently in its fifth edition. In cases of emerging resistance, an epidemiological alert is distributed. Furthermore, a special issue on AMR has been published in the *Pan American Journal of Public Health*. Factors for sustainability identified in the journal were continuous technical improvement, the biannual meetings for exchange of information and team building, and production of the annual report. Challenges included covering the cost of maintaining the external QA programme. Most activities within the ReLAVRA remit are currently supported by national governments.

4.1.3 NATIONAL SURVEILLANCE NETWORK EXAMPLE – RUSSIAN FEDERATION

AMR surveillance data were presented, based on samples collected from a number of sentinel sites across the Russian Federation and three neighbouring countries (Belarus, Kazakhstan and Ukraine), and analysed in a central laboratory. Major resistance problems related to human bacterial pathogens were reported in Gram-negative bacteria, especially Enterobacteriaceae, *Pseudomonas aeruginosa* and Acinetobacter. An increase in the prevalence of nosocomial MRSA was also reported. Rates are particularly high in intensive care unit (ICU) wards, but also in those for general surgery, burns and plastic surgery. It was reported that the Russian Federation does not have a problem with community-acquired MRSA, in contrast to the experience in the USA and South American countries. Rather, as molecular typing has shown, most community-acquired MRSA is derived from hospital-acquired MRSA, which is presenting a new and large problem.

Concerning *P. aeruginosa*, a rapid and substantial rise in resistance to carbapenems from 1998 was reported, and was identified as a major problem for the Russian Federation. In this and surrounding countries, the number of cities reporting resistant *P. aeruginosa* is starting to increase, and this was cited as a good example of why surveillance is important and actions are required immediately. No new antibiotics to tackle *P. aeruginosa* are in the drug-development pipeline.

It was further suggested that international collaboration is urgently required to address such resistance, because data show that most resistant *P. aeruginosa* are the same clone (multidrug resistant [MDR] *P. aeruginosa* CC235), which circulates in many countries of Europe, but also in Asia

and South America. For the study of resistance patterns, data from molecular epidemiology was proposed as a way to obtain important information to supplement susceptibility testing.

A rapidly increasing number of carbapenemase-producing Acinetobacter were reported in the Russian Federation and Belarus. A particular clone of carbapenemase-producing *Acinetobacter baumannii* has also been shown to be circulating internationally. The cross-border circulation of such clones emphasizes the need for a coordinated response across borders.

For Enterobacteriaceae, no actions have been implemented, and resistance is virtually out of control. Currently, more than 70% of Enterobacteriaceae isolates are producers of extended-spectrum beta lactamase (ESBL). In hospitals, resistance used to be confined to ICU wards, but is now widespread and, if not controlled, will lead to increased resistance in the community. Data presented showed that, in community-acquired urinary tract infections, the prevalence of ESBLs in *Escherichia coli* was 10% and in Klebsiella 40%, with an average rate of 13% for all Enterobacteriaceae.

One of the biggest challenges to surveillance, apart from generating more data, is that few of the many surveillance networks also undertake prospective surveillance. However, it was reported that a number of research projects are in progress to address this and other deficiencies such as delayed feedback to the centres, sub-optimal choice of combinations of microorganisms and drugs, and poor QA systems. Cloud technology may make it easier to use data to improve local decision-making, and to identify new and emerging resistant pathogens and respond quickly.

4.1.4   REVIEW OF WHONET

The goals of surveillance at local, national and global levels were outlined, as was the role of WHONET as a tool for managing, interpreting and using the results of quantitative isolate susceptibility testing in such surveillance. Some of the core features of WHONET were shown, including isolate listing and summaries; determination of the percentage of data characterized as resistant, intermediate or sensitive (RIS); and associated histograms. WHONET is not a surveillance project, it is a tool to facilitate data collection and analysis.

A recent survey showed that WHONET is being used in about 100 countries across all six WHO regions. It is predominantly used in hospitals, but also in public health and research laboratories, and in a small number of animal, food and environmental laboratories. The use of WHONET for outbreak detection was also introduced.

4.1.5   REVIEW OF WHO INTEGRATED SURVEILLANCE OF ANTIMICROBIAL RESISTANCE IN FOOD ANIMALS

Most antibiotic use occurs outside the human health sector in animal husbandry, aquaculture and even plant husbandry. Antibiotic resistance has occurred throughout the food-chain. There are multiple and complex routes for the possible spread of AMR between food, animals, humans and the environment, and these have resulted in AMR being considered under the "One Health" initiative. The importance of cross-sectoral collaboration is thus clear, and WHO, the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE) have begun formally working together.

Some classes of antimicrobials are used in humans and animals. WHO has therefore established a list of critically important antimicrobials (CIA) to inform risk-management strategies for antimicrobial

use in animal husbandry. The issue of AMR in foodborne pathogens has been covered in a World Health Assembly (WHA) resolution, and a strategy was formulated through consultation in 2001. The key issue now is implementation. WHO promotes integrated surveillance to tackle foodborne AMR through its Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR), which currently includes 31 members and representatives from FAO and OIE. AGISAR has a subcommittee for AMR, has supported pilot projects in developing countries, and provides data to support monitoring and inform policy-making. The Global Foodborne Infections Network (GFN) is a network of professionals in public health, food and veterinary sectors that seeks to strengthen integrated surveillance of foodborne and other enteric infections by various capacity-building activities.

A collaborative study from FAO, OIE and WHO of AMR (including Salmonella, Campylobacter and *E. coli*) was presented. The study investigated in vitro transmissibility in the beef, pork and poultry value chains in Kenya. Similar projects in other countries are planned. The project made it possible to engage with regional actors and different sectors within the regions, and to establish and generate baseline surveillance data that will hopefully function as a precursor for an AMR surveillance system in the country. The selection of sites for the project was based on population and livestock concentration in both rural and urban settings. Poultry production was of most concern, pork less so, and cattle least. Most farmers did not understand the public health risks of AMR associated with inappropriate use of antibiotics, and often used them prophylactically. Standards of hygiene were also found to be poor. A meeting with stakeholders was held to develop guidance; this led to the creation of a national task force on AMR, and the development of a national plan on AMR surveillance. Also highlighted was the use of television, with messages on antimicrobial use and resistance included in two episodes of a high-rating television programme.

4.1.6   POTENTIAL USE OF LONGITUDINAL HEALTH AND DEMOGRAPHIC STUDIES IN DEFINED POPULATIONS IN THE SURVEILLANCE OF ANTIBIOTIC RESISTANCE

The International Network for the Demographic Evaluation of Populations and Their Health (INDEPTH) aims to improve the collection and use of reliable population-based data on health. It does this through prospective monitoring of health events in defined populations. Importantly, such studies reach down to the level of families and mothers. Currently, INDEPTH is carrying out 47 studies in 21 countries across Africa and Asia, covering a population of more than 3 million people. Many of these studies are multisite and cover a wide range of health events. With access to microbiology infrastructure, they will now be extended to AMR, in cooperation with Action on Antibiotic Resistance (ReACT, a nongovernmental organization [NGO] for action on antibiotic resistance). Using a demographic-based approach it has been possible to map the prevalence of different pathogens and AMR in defined populations. This approach also enables responses and interventions to be directed at communities and families. Studies to date in developing countries with similar patterns of high infectious disease burden, erratic access to antibiotics and lack of local guidelines to direct rational use of antibiotics have found that there is often a lack of knowledge and resources at local level to enable an adequate response to AMR. Further studies are planned in seven countries across Asia and Africa on antibiotic consumption, surveillance of antibiotic use in the community and hospital settings, burden of disease, economic impact and mapping of molecular determinants of resistance. Some cooperation with the Global Antibiotic Resistance Partnership (GARP) network is also planned.

The presentations stressed the complexities of AMR, including the challenge of making better use of surveillance data in decision-making. There is a need to find better and more intuitive ways to disseminate and communicate data to stakeholders and decision-makers, as has been done, for example, with the maps used successfully by the European Antimicrobial Resistance Surveillance Network (EARS Net). WHO was encouraged to work more effectively with partners – including its collaborating centres and existing surveillance networks (many of which were started by national centres and use WHONET) – and to use these partners as potential pathways for communication of messages to host governments. It was also noted that, in many poorer parts of the world, where basic microbiological facilities are lacking and access to antibiotics is restricted, some form of sentinel surveillance is necessary to enable data to be collected quickly.

Many AMR information gaps remain; for example, the lack of sufficient data on the burden of AMR in terms of morbidity and mortality, the economic cost of AMR, and the association between the emergence of resistance in humans and in animals. The limited use of surveillance for collecting burden-of-disease data was acknowledged. The lack of new drugs in the pipeline was also raised as a challenge. WHO was encouraged to play a central role in the systematic compilation and dissemination of such information to a range of stakeholders and decision-makers, to help convince policy-makers to prioritize action on AMR .

4.2 WORKING GROUP REPORTS

The participants were divided into five working groups to discuss different topics, as shown below:

- Session I: Defining the issues
  - Needs
  - Gaps
  - Challenges

- Session II: Recommendations
  - Objectives and outcomes by 2017
  - Priorities and key elements
  - Principles of and opportunities for collaboration

4.2.1 EPIDEMIOLOGICAL ASPECTS

The working group identified the following gaps, needs and challenges:

- Provide better data to policy-makers, clinical decision-makers and other stakeholders (e.g. patients, consumers, industry and farmers); the main gap is a lack of linkages between the data available and its use by decision-makers. The challenge is to extract useful data for the different target audiences.

- Generate data on the clinical impact and burden of AMR (in particular, patient-based rather than laboratory-based surveillance); sentinel studies could provide some useful data on clinical impacts. One challenge is the large differences in data quality and type.

- Collect and compare data from around the world, based on existing surveillance (although there are significant gaps in coverage).

- Develop early warning systems for emerging resistance, and improve connections between surveillance systems for humans and those for animals in the food-chain .

Outputs by 2017, priorities and opportunities for collaboration were proposed as follows:

- WHO to take leadership, and to dedicate staff at WHO HQ, and at regional and country office levels. Also, Member States to appoint national AMR focal points, and to create linkages from global to national AMR action plans, via regional plans. An opportunity for collaboration is to dedicate one staff member to preparing the report, supported by an advisory group.

- Use available data to start the process of producing a first global AMR report on core combinations of drugs and microorganisms of primary clinical relevance. The report will:

  – be used mainly for advocacy and mobilization of resources;

  – link available data sources through WHO regional offices, list priority pathogens and include data on burden of disease.

- To improve infection control and encourage prudent use of antibiotics, establish sentinel surveillance systems.

  – In the short term, define the processes and outcomes for sentinel surveillance through a network of representative sites that connect laboratories, hospitals and communities.

  – In the mid-term, have at least one pilot site in every region, with particular focus on low- and middle-income countries (LMIC), and establish QA and educational programmes.

  – In the long term, aim for all countries to have surveillance that informs interventions; have focal points for technological development and innovation; and improve diagnostic capabilities.

- An opportunity for collaboration In the short-to-medium term is to establish a permanent working group to lead the process.

- Generate data on burden of resistance. This requires a heavy research commitment. The priority is to summarize what is currently known, and identify the further studies required. An opportunity for collaboration is to use the sentinel sites as the basis for collecting burden data.

DISCUSSION POINTS
- Participants discussed how sentinel sites could be selected to ensure that data collected are representative of the situation in the Member State. It was noted that existing modelling tools could be used for this purpose.

- Concerning the difficulties of defining appropriate denominators, it was suggested that the best existing examples be used, rather than trying to develop an ideal denominator.

- Although pushing for sentinel surveillance is important, bacterial isolate data (as a primary tool for physicians and to populate hospital databases) are also necessary and useful.

4.2.2 MICROBIOLOGICAL ASPECTS

The working group identified the following gaps, needs and challenges:

- Those at administrative and policy-making levels lack awareness of the need for surveillance.

- The major needs are for competent and sufficiently resourced laboratories that are part of a network and can provide quality-assured laboratory testing. There are many gaps in the provision of laboratory services, and antimicrobials are often used without laboratory testing. Even when

testing is available, there is often a lack of QA, quality-assured reagents, reference strains and trained staff. The challenges are to improve regulation of the health laboratory sector as a whole, and of supply-chain management; introduce standardised, automated and quality-assured methods; and improve linkages with competent private laboratories.

- There is a need to link laboratory, epidemiological and clinical data, but transferring information between the different databases is difficult because of issues with IT system incompatibility. Access to laboratory testing is often lacking for community-based patients, and local laboratories may fail to recognize important new patterns of resistance.

- There is a major need for resources for laboratory testing; the challenge is convincing governments that health laboratories deserve regular funding.

- There is a need to improve networking of laboratories because many remain isolated, although it is also often difficult to get laboratories to participate in networks.

- There is an urgent need to improve laboratory QA systems, although the challenge is the widespread lack of appropriate accreditation systems.

Outputs by 2017, priorities and opportunities for collaboration were proposed as follows:

- Have one or more key laboratories in each country that participates in external quality assessment (EQA), and can act as a reference laboratory for phenotypic and genotypic analysis. A priority is to identify key EQA providers, which can then collaborate with and provide support for participating laboratories.

- Provide web-based training resources in all official United Nations (UN) languages.

- Improve coordination of data collection on AMR across different sectors. Priorities are:

  – to strengthen links between the human and animal sectors within the "One Health" framework;

  – for WHO to advocate for significant funding, and to show leadership at global and regional level in promoting improved surveillance;

  – to collect at least a snap shot of local data (owing to the lack of AMR data in many countries);

  – for WHO country offices to advocate to the Ministry of Health for improved laboratory capacity for AMR testing, and participation in regional EQA programmes.

  The main opportunity for collaboration in this area is to increase linkages between the laboratory sectors for human and animal health.

- Build on existing surveillance networks to achieve functional AMR surveillance at country level in hospital and community settings. The priority is for WHO to provide regional guidance on establishing AMR surveillance at country level, including a strong laboratory component. Opportunities for collaboration are to link disease surveillance programmes.

- Standardize data collection in the medium to long term, using internationally validated methods. Priorities were identified as collecting raw surveillance data (e.g. zone diameter and disc potencies) rather than interpretive data (e.g. RIS classification). Confidentiality of results should be preserved; however, it is difficult to balance reporting of emerging profiles against the needs of notification of individual cases.

There was discussion of how sentinel sites could be selected to ensure that data collected are representative of the situation in the Member State. It was noted that existing modelling tools could be used for this purpose. Pushing for sentinel surveillance is important, however:

- bacterial isolate data (as a primary tool for physicians and to populate hospital databases) are also necessary and useful;

- it is to also important to undertake a quick study to gather initial data, to start capacity building;

- an alternative to sentinel surveillance is a large, sectional study.

The main need is for improved interaction between laboratories in the human and animal health sectors; for example, opportunities for collaboration with the private and not-for-profit sectors should be encouraged.

Once EQA has been established, participating laboratories at national level could become champions for AMR within their own Member State.

4.2.3 KEY SURVEILLANCE METRICS, DATA SHARING AND INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) SYSTEMS

The working group identified the following gaps, needs and challenges:

- There is a need:

  - to establish and issue guidance on standard metrics to enable data from different sources to be compared, but the challenge is to find standards that are applicable to the differing data requirements at local and central level, and also across differing situations and disease types

  - for a two-level approach for local data and global data (although agreement is lacking on exactly what kind of data are required at higher levels), but the challenges are how to combine the data requirements at local hospital level with those required at the international level, and how to secure quality-assured data;

  - to establish a network of centres of excellence and sentinel surveillance systems, but there are challenges in selecting appropriate sites;

  - to define suitable numerators and denominators for monitoring resistance;

  - to improve linkages between laboratory data and associated epidemiological data;

  - for further definition of metrics (e.g. composite index of drug resistance and antibiotic usage), to describe the burden of disease;

  - for further training on ICT infrastructure and data management, with the challenge of achieving interoperability of databases;

  - for improved QA of data, but a challenge is identifying local centres of excellence to support such improvements.

- There are gaps in information on antibiotic use data; such data are necessary for appropriate action. The challenge in collecting these data surrounds the differing needs of each region, and issues of confidentiality for data sharing.

Outputs by 2017, priorities and opportunities for collaboration were proposed as follows:

- During 2013, produce an inventory that includes information on national focal points, reference laboratories, national surveillance bodies and networks, WHONET users, other programmes used for data collection and management, and centres of excellence. Collection of such data could facilitate linkages between people and institutions. The deliverable would be a report on the current situation and limitations.

- Establish:

  – a working group to define standardized laboratory and epidemiological data and metrics;

  – a capacity-building programme to evaluate and quality check microbiological and epidemiological results, and establish an alert system in surveillance systems.

- Establish regional programmes or networks by 2014–15, and a data-collection model or system at different levels (from hospitals to national to regional) in all regions.

DISCUSSION POINTS

It was suggested that it would be useful to compile data on antibiotic use by bacterial species (in addition to antibiotic resistance data by bacterial species); a pilot study in Nairobi is currently trying this approach. There was support for using existing data to start producing maps of resistance, even if data are not easily comparable in the first instance. In each region, key individuals could be identified who could take the lead in strengthening regional networks.

4.2.4 COMPONENTS OF AND COLLABORATION FOR EFFECTIVE SURVEILLANCE SYSTEMS

The working group identified the following gaps, needs and challenges:

- There is a need to:

  – increase surveillance coverage at regional or global level, particularly in LMIC;

  – increase laboratory capacity and associated QA systems, particularly in LMIC; one challenge is the current low capacity for provision of training;

  – improve effectiveness of communication within networks; the gaps and challenges are to overcome limited resources and differences in technology, and to encourage a "reporting" form of surveillance;

  – improve effectiveness of communication, particularly of risk, among networks at regional and global levels; the challenge is to address issues relating to governance and to ownership of data, and to determine roles and responsibilities in terms of coordination;

  – make more effective use of data; and close the gaps between the laboratory data and data required for expressing burden of disease, economic impact and treatment guidelines; gaps include a lack of relevant incidence and prevalence data, and a lack of the standardized reporting that is required for data comparability;

  – improve coordination between the human, animal and environmental sectors, to counter the lack of appropriate coordination mechanisms and political will;

  – have consensus on data sharing; this requires political support and functional national systems;

– convince policy-makers to prioritize the problem and to allocate resources.

- The lack of leadership and of coordination mechanisms have led to poor awareness of the benefits and motivations for surveillance.

Outputs by 2017, priorities and opportunities for collaboration were proposed as follows:

- Organize a task force to:

  – first, define the ultimate goal and develop a strategy for a global surveillance system;

  – second, develop indicators for monitoring.

- Increase awareness of AMR, especially in LMIC, with the following priorities:

  – publish a WHO position report that includes all available data from all existing surveillance networks;

  – develop risk communication and advocacy strategies for AMR;

  – implement awareness campaign programmes, especially in LMIC;

  – establish a WHO web repository to collate available data from existing programmes.

  For all these activities, there is a need to consider opportunities for collaboration with other sectors.

- Achieve a measure of collaboration between existing surveillance networks by:

  – defining a core group of pathogens, diseases and population to be monitored;

  – mapping and characterizing existing surveillance networks, including other existing programmes (e.g. maternal and child health) and the private sector;

  – identifying an initial model of collaboration with existing networks.

- Identify and prioritize the multisectoral impact of AMR by:

  – establishing the multisectoral dimension and reach of AMR (human, animal, environment and trade);

  – increasing the priorities of AMR issues in existing public health policies and other sectors;

  – identifying the clinical and economic burden of AMR, especially in LMIC (opportunities for collaboration would flow from the development of a global burden of disease study).

- Engage with existing initiatives in areas of laboratory capacity building and other areas by defining and establishing collaboration with existing programmes for laboratory capacity building and development, including QA, especially in LMIC.

- Develop structure and processes of a global surveillance network system by:

  – evaluating the experiences and usefulness of data;

  – defining the framework for a system to capture identified objectives by regions and sectors;

  – developing a functional framework for reporting;

  – developing an understanding of comparability and validity of data;

  – evaluating opportunities for collaboration with existing surveillance networks.

- Initiate and coordinate regional or global surveillance systems by:

  – defining the types of surveillance requirements at national, regional and global level;

  – establishing support for national and regional surveillance networks;

  – mobilizing resources to implement and sustain the surveillance systems.

- Launch effective communication systems by considering the implementation of innovative technology methods (e.g. smart mobile phones). Opportunities for collaboration include consideration of surveillance needs at different levels.

- Develop monitoring and evaluation of surveillance programmes that measure:

  – changing trends of resistance;

  – the impact of change of practices, policies and awareness level in cross sectors (e.g. regulatory outcomes of antibiotic use in the animal sector, and economic or social studies).

- Promote the existing WHO AMR six-point policy package to other programmes.

- Expand AMR surveillance following the building of laboratory capacity, through sentinel sites where appropriate.

DISCUSSION POINTS

The ultimate goal of global surveillance could be to contain AMR through establishment of a unified and functional surveillance system. However, it was not clear that there was consensus on this definition, and further elaboration may be needed.

4.2.5 IMPROVING USE OF SURVEILLANCE DATA IN DECISION-MAKING

The working group identified the following gaps, needs and challenges for the use of surveillance data in decision-making:

- greater understanding of surveillance and of why data are being gathered;

- political will and resources for surveillance;

- the ability to detect and contain new or emerging issues;

- information and approaches that can be used for changing behaviour;

- data on treatment outcomes, to better inform prescription practice and guidelines;

- dedicated units to analyse the data and share the information with relevant stakeholders;

- ICT tools to generate real-time data and information;

- better use of existing data to demonstrate the burden of AMR;

- translation of knowledge into messages for policy-makers.

Outputs by 2017, priorities and opportunities for collaboration were proposed as follows:

- Provide meaningful and timely information for decision-makers at all relevant levels and in all sectors to identify appropriate interventions. Priorities are to:

  – translate available and new data into information;

–   define minimum requirements for surveillance (core capacities and data);

–   estimate the AMR burden in terms of medical, financial and social aspects (with WHO taking the lead, in collaboration with other agencies and partners);

–   understand the cross-sectoral risk factors (e.g. animal – food – human – environment).

Proposed next steps were to develop a global AMR surveillance report by 2014, define essential AMR surveillance requirements (e.g. in a formal WHO recommendation report) by 2013, and develop a global AMR burden report for decision-makers (including health economics aspects) by 2014–15.

Opportunities for collaboration were identified as WHO working with WHO collaborating centres, surveillance networks and other partners with competence in health economics.

• Strengthen information sharing on emerging issues, and make better use of early warning or alert systems to trigger instigation of appropriate intervention within a risk-management framework. Priorities are to establish an early warning system and recognize AMR surveillance core capacity as a requirement under the International Health Regulations (IHR) framework.

Next steps proposed were the definition of notification requirements for early warning, and a proposal to the WHO Executive Board for annual reporting on AMR under the IHR.

Opportunities for collaboration were for the WHO Secretariat to work with the IHR group, WHO collaborating centres and surveillance networks.

• Develop evidence-based guidance on effective interventions at clinical, health systems and policy levels. Priorities are to:

–   review compliance with the WHO list of CIA;

–   review treatment guidelines and essential medicines lists;

–   measure the need to access essential medicines.

Proposed next steps are to:

–   measure animal husbandry compliance with CIA by 2014;

–   review the use of AMR surveillance data to inform development or revision of treatment guidelines by 2013–14;

–   explore the usefulness or applicability of the use of a single "use/resistance index" by 2013.

Opportunities for collaboration included the WHO Secretariat working with AGISAR, WHO collaborating centres and AMR surveillance networks.

• Determine which Member States have a mechanism to inform integrated and cross-sectoral decision-making and policy development on AMR in accordance with the 2005 WHA resolution WHA58.27.[1] Priorities were identified as assigning national centres recognized by WHO to coordinate data management for integrated AMR surveillance at national and international level, and ensuring that national advisory bodies oversee application of defined minimum requirements for AMR surveillance data, and interpret the data in the context of the national and international AMR trends. The next step is to review compliance with resolution WHA58.27.

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[1] See http://apps.who.int/gb/ebwha/pdf_files/WHA60/A60_28-en.pdf

- Provide sufficient timely information to allow analysis and management of global data on antimicrobial susceptibility and appropriate drug use, to help Member States to evaluate the effectiveness and impact of their interventions.

- Suggested principles for collaboration were transparency, declarations of conflicts of interest, agreements on data confidentiality, and clarity on the channels and mechanisms of communication.

DISCUSSION POINTS

Participants noted that, in relation to sampling bias, decisions are made by people at many levels within surveillance (e.g. microbiologists in laboratories; and infection prevention and control experts, clinicians and managers in hospitals), and each requires different types of information. Public health is important in connecting data across health-care settings, and WHO has an important role in raising issues at the level of health ministers and at WHA, and should promote the issue beyond the health sector.

The WHO Secretariat was encouraged to collect and present data on the follow-up action of Member States in compliance with resolutions such as WHA58.27.

Also noted was the need for representation of a broad range of stakeholders on any advisory groups that will be formed, and the suggestion that existing studies on burden of AMR be incorporated into any further planned studies (ReACT has compiled such an inventory).

4.3   DISCUSSION

At the end of Day 1, Professor Song summarized as follows:

- The morning presentations and the discussion that followed demonstrated the different approaches to surveillance in different sectors, and the wide range of situations in different countries.

- The working group identification of needs, gaps and challenges was very productive, and provided a solid basis for the next working group session to start to delineate possible solutions that can feed into the development of a global plan for surveillance.

At the beginning of discussion following the final reports from the working groups, Dr O'Brien (Chair of Day 2) used the example of sepsis to note that the focus should be on helping to establish basic microbiology in countries that have no access to it.

Dr Pessoa summarized the main messages from the final reports from the working groups as follows:

- Use existing data so that work can begin immediately to summarize the available information on AMR rates, and to strengthen and foster existing and new surveillance networks and systems.

- Develop information on the burden of disease, possibly based on a sentinel surveillance strategy, but also using existing information.

- Within the next 1–2 years, complete a global AMR report based on existing data, which can be used to raise awareness and inform policy-makers.

- Target at least one laboratory per Member State that has the capacity to conduct surveillance, and to participate in wider surveillance networks and EQA.

- Assess the compliance of Member States with the WHA resolution of 2005, which includes the recommendation that Member States establish mechanisms for AMR surveillance.

- The WHO Secretariat has noted suggestions by the working groups, and will endeavour to use the momentum created by the meeting to encourage further collaboration.

The following points were then made during the wider discussion:

- Using sentinel surveillance to collect data from previously inaccessible areas is a potential first step of a strategy to build more comprehensive surveillance systems. Despite large gaps, the quality of data has generally been improving over recent years.

- The malaria programme may be able to offer some lessons (e.g. through partnering) on how to collect data from regions where there are no microbiological facilities.

- The rise in information on AMR resulting from activities of the African network for IPC shows that there are opportunities to tap into other programmes.

- It is important to define standards for data collection.

4.3.1 FINAL PLENARY DISCUSSION

The challenges in persuading countries and networks to share data were discussed briefly. Participants suggested that WHO will need to clearly explain to data providers the benefits of contributing to a wider WHO data-collection exercise. Also, WHO might need to incentivize the sharing of data by offering something in return (e.g. assistance with the use of WHONET). The ANSORP experience was also noted, where the benefits for data sharers can be scientific (e.g. co-authorship of a paper), financial (for certain projects) or professional (e.g. ability to use data for their own purposes, slides and lectures). WHO was advised to coordinate strategic planning, in conjunction with existing regional and national networks, government systems and donor organizations.

Generally, there is a willingness to share data, but establishing a clearly defined and open relationship between the data managers and the data providers is critical for the development of any global system.

There have been previous failed attempts to tackle AMR and we cannot afford another failure; thus, future strategies for action should build on knowledge gained from both the successes and failures of past attempts to tackle AMR. Consequently, it was suggested that WHO dedicate at least one staff member to AMR surveillance at HQ level, and one to AMR in each regional office. In addition, each region should identify an influential figure to be a "champion" for AMR. Finally, WHO should develop a "road map" that fixes deliverables and timelines.

4.4 CONCLUSIONS AND NEXT STEPS

The WHO Secretariat welcomed the many inputs from participants, and the productive exchange of ideas, both leading up to and during the meeting. The Secretariat will endeavour, through the use of existing tools and mechanisms, to continue the momentum by strengthening and extending collaboration with existing and new partners. Specific collaborations will be further developed with stakeholders (e.g. existing networks, funders and Member States), to improve and integrate surveillance, and to follow up on the advice generated from the meeting.

The WHO Secretariat will develop a roadmap that reflects and consolidate inputs from the meeting, and defines strategies, priority targets, deliverables and a timeline.

The following next steps were agreed:

1. Collect existing data from surveillance systems and networks to produce a global report on the status of AMR (capturing data and trends, and highlighting the urgency of the situation). This work should start as soon as possible, to generate a snapshot of the current situation, and should be published in the next 1–2 years. The report will be used to raise awareness and provide information to policy-makers, and will include an appropriate strategy for communicating its messages.
2. Create a platform to facilitate further communication (including the clear messages needed to bring about change in the mindset of many stakeholders) and cooperation. In the first instance, this will be to share information with and obtain feedback from participants on proposed activities.
3. Carry out sentinel surveillance studies to build information in areas where there are currently gaps, such as burden of disease and effective surveillance strategies.
4. Aim to have at least one laboratory per Member State with the capacity to conduct surveillance and participate in a surveillance network and an accompanying EQA programme.
5. Define surveillance standards.
6. Review compliance of Member States with the recommendations of WHA58.27, especially with respect to establishing a mechanism for AMR surveillance and use of the data generated for decision-making.
7. Strengthen and foster capacity building of existing and new surveillance systems, and assist in identification of gaps.
8. Continue and expand collaboration that is still in progress, both internally and externally, in the broader field of AMR.
9. Improve access to data for decision-makers.

4.5 CLOSING STATEMENT

Dr Fukuda thanked Professor Song and Dr O'Brien for chairing the 2 days of the meeting. He noted that the issue of combating AMR must compete with the many priorities currently on the global public health agenda. However, as has happened for noncommunicable diseases, the key ingredients are now coming together to make AMR a health priority. WHO is trying to capitalize on this situation. Although scientific and technical work are core, the discussion needs to be elevated to social, political and economic levels.

Dr Fukuda thanked all participants and the meeting organizers.

ANNEX A: LIST OF PARTICIPANTS

All participants completed the WHO form for declaration of interests. None of the participants declared interests that were considered by the WHO secretariat to affect their participation in the meeting.

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