

## ANTIBIOTIC RESISTANCE, WITH SPECIAL REFERENCE TO POULTRY PRODUCTION

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**Summary:** *The inclusion of the topic 'Antibiotic resistance, with special reference to poultry production' in the agenda for the 14th Conference of the OIE Regional Commission for Africa, emphasises the relevance and importance of the subject of bacterial resistance to antimicrobial drugs as it is currently perceived globally.*

*Antibiotic resistance and the possible transmission to human bacteria through animal food-borne pathogens has led to increased public concern and scientific interest regarding the administration of therapeutic and subtherapeutic antimicrobials to animals. Numerous international meetings have been organised, especially during the 1990s, to address the problem of the emergence of antimicrobial resistance among bacterial pathogens. In the same vein, several scientific reports have been published dealing with this topic. Some of the significant meetings and publications are referred to in this report.*

*A questionnaire was compiled for consideration by all the OIE Member Countries in Africa. The objective was to obtain information relating to current perceptions and approaches to antibiotic resistance in food animal production, especially in poultry, in Africa. Eighteen countries completed the questionnaire.*

*All Member Countries have significant small-scale poultry farming sectors. The use of antimicrobial drugs for therapy in this sector is minimal and the concomitant selection of resistant bacteria therefore of a low magnitude. In countries with developed, commercial poultry farming sectors, however, the same concerns relating to the possible spread of resistant bacteria or resistant genes to human bacteria would apply as it does in the Northern Hemisphere.*

*Monitoring of the quantities of antimicrobials used in animal production is limited to only a few countries. Most countries have administrative procedures for marketing authorisation, but the extent to which it is applied varies markedly between countries. Awareness within countries on the possible adverse effects of the use of antimicrobial drugs in animal husbandry varies from good to negligible.*

*All countries have identified various combinations of constraints such as lack of legislation, lack of knowledge, lack of resources and lack of veterinary services as obstacles to the prudent use of antimicrobial drugs.*

### 1. INTRODUCTION

Bacterial resistance to antimicrobial drugs has become an issue of increased public concern and scientific interest during the last decade. This resulted from a growing concern that the use of antimicrobial drugs in veterinary medicine and animal husbandry may compromise human health if resistant bacteria develop in animals and are transferred to humans via the food chain or the environment. While there is still no consensus on the degree to which usage of antibiotics in animals contributes to the development and dissemination of antimicrobial resistance in human bacteria, experiential evidence and epidemiological and molecular studies point to a relationship between antimicrobial use and the emergence of resistant bacterial strains in animals, and their spread to humans, especially via the food chain.

## 2. OVERVIEW OF CURRENT PERCEPTIONS AND APPROACHES TO ANTIMICROBIAL RESISTANCE

### 2.1. International meetings

The public health significance of the transmission of resistant bacteria from animals to humans has resulted in the organisation over the last few years, of several international meetings to address this issue. In October 1997, a World Health Organization (WHO)-sponsored meeting on 'The medical impact of the use of antimicrobials in food animals', took place in Berlin, Germany. At this meeting it was recommended *inter alia* that the use of growth promoters in production animals with human health implications should be terminated if the same antimicrobial or class of antimicrobials are used for human therapeutics or known to select for cross-resistance to antimicrobials used in human medicine (18).

Another WHO-sponsored meeting on 'The use of quinolones in food animals and potential impact on human health', was held in Geneva, Switzerland in June 1998. The meeting agreed that there was an urgent need to develop prudent use guidelines for antibiotic use in food-producing animals and that the indiscriminate use of fluoroquinolones must be diminished (19).

A European Union conference on 'The microbial threat' took place in Copenhagen, Denmark, in September 1998. This conference dealt with the implications for human health of increased resistance of bacteria to antimicrobial drugs. One of the recommendations made at the conclusion of the conference was that Member States in the European Union need to collect data on the supply and use of antimicrobial drugs.

A European Scientific Conference entitled 'The use of antibiotics in animals - ensuring the protection of public Health' was held at the headquarters of the Office International des Epizooties (OIE) in Paris, France, in March 1999. It focused on implementing strategies and actions to control and reduce the potential for antibiotic resistance to occur from the use of antibiotics in animals (12).

### 2.2. Scientific reports and discussion documents

Several significant scientific reports have been tabled that addressed the issue of the emergence of antimicrobial resistance in pathogenic bacteria and the concomitant risk for human health. The Swann Committee of the United Kingdom Joint Houses of Parliament presented a report in 1969 that dealt especially with the question of whether the use of antibiotics in animals serves to compromise the treatment of bacterial disease in humans. This committee was the first to recommend that antibiotics used for the treatment of infections in humans and animals should not be used as growth promoters (2).

At the 65th General Session of the OIE International Committee in May 1997, the European Member Countries decided to launch an investigation into 'The role of international trade of animals, animal products and animal feed in the spread of antimicrobial resistance, and the means to control the spread of resistance factors of infective agents'. The report on that investigation by the OIE's Collaborating Centre for Veterinary Medicinal Products, Agence nationale du médicament vétérinaire (ANMV), Fougères, France, was presented at the Conference of the OIE Regional Commission for Europe in Prague, Czech Republic, in September 1998.

In Australia, the Joint Expert Technical Advisory Committee on Antibiotic Resistance (JETACAR) was established in April 1998. The terms of reference for the committee were broadly to review the scientific evidence on the link between the use of antibiotics in food-producing animals, the emergence and selection of antibiotic-resistant bacteria and their spread to humans; and to develop evidence-based recommendations for the appropriate future management of antibiotic use in food-producing animals. The report of this committee was tabled in October 1999 (7). In its overall conclusion following meticulous groundwork, the committee agreed that antibiotic use in animal production can affect human health, but that decisions relating to antimicrobial drugs should be based on sound science and risk analysis. They recommended the development of an antibiotic-resistance management programme that will focus simultaneously on human and animal use of antibiotics. The Australian government responded favourably to the report in October 2000 and decided to establish an inter-departmental JETACAR implementation group to oversee and coordinate the antibiotics strategy.

In December 1998, the United States Food and Drug Administration's Center for Veterinary Medicine issued a discussion document entitled 'A Proposed Framework for Evaluating and Assuring the Human Safety of the Microbial Effects of Antimicrobial New Animal Drugs Intended for Use in Food-Producing Animals'. The document discussed the need to consider both the importance of an antimicrobial drug to human medicine and the potential

human exposure to resistant bacteria acquired from food-producing animals that are human pathogens or that can transfer their resistance to human pathogens.

A report produced by the Working Group of the Advisory Committee on the Microbiological Safety of Food (ACMSF) was published in the United Kingdom in 1999. It represented an in-depth review of the role of food in transferring microbial antibiotic resistance. The report emphasised the fact that the question whether the administration of antibiotics to animals results in the selection of resistant bacteria that may be transferred to humans in food and cause infections, which are difficult to treat, has been the subject of debate for more than forty years. Similar to the recognition in the JETACAR report, this report accepts that the major contributing factor to development of antibiotic resistance is most likely the use of antibiotics in human medicine. However, the growing evidence that the administration of antibiotics to animals results in the emergence of some resistant bacteria that infect humans requires consideration and remedial action.

The DANMAP publications from Denmark deal in an ongoing manner with the issue of the development of bacterial resistance to antimicrobials. These reports are produced annually and link animal, food and human data on antibiotic resistance with information on antibiotic use in animals and humans.

Finally, the International Committee of the Office International des Epizooties (OIE) decided in May 1999 to create an international expert group to address, in a comprehensive and interdisciplinary approach, the public health risks related to antimicrobial resistance originating from the use of antimicrobial drugs in veterinary medicine. This decision was significantly influenced by the findings and recommendations contained in the OIE Collaborating Centre report to the OIE Regional Commission for Europe in September 1998, as well as inputs from the OIE Standards Commission. The OIE Expert Group was mandated to develop guideline documents for all OIE Member Countries relating to:

- Risk analysis methodology for managing the potential impact on public health of antimicrobial resistant bacteria of animal origin
- The responsible and prudent use of antimicrobial agents in veterinary medicine
- Monitoring the quantity of antimicrobials used in animal husbandry
- Harmonisation of national antimicrobial resistance monitoring programmes in animals and animal-derived foods
- Standardisation and harmonisation of antimicrobial susceptibility testing methodologies

The objective of these guidelines is not to be prescriptive, but to recommend methods that Member Countries can use to generate more information, which can be utilised for scientific decision-making. The final report on the deliberations relating to the five guideline documents will be presented to the OIE International Committee in May 2001, and will be preceded by the 2nd International OIE Conference on Antimicrobial Resistance in Paris, France from 20-23 March 2001.

### **2.3. Actions**

Decisive actions and proposed actions by certain OIE Member Countries also featured prominently over the last few years. In 1998, the Precautionary Principle was invoked by the European Union banning virginiamycin, spiramycin, bacitracin and tylosin as feed additives.

On 26 October 2000 the Center for Veterinary Medicine (CVM) of the US Food and Drug Administration (FDA) issued a notice of opportunity for a hearing on its proposal, based on new evidence, to withdraw approval for use of the fluoroquinolone antimicrobial enrofloxacin in poultry. The action was based on the Center's determinations that:

- The use of fluoroquinolones in poultry causes the development of fluoroquinolone-resistant *Campylobacter*, a pathogen to humans, in poultry
- The latter organisms are transferred to humans and are a significant cause of the development of fluoroquinolone-resistant *Campylobacter* infections in humans
- Fluoroquinolone-resistant *Campylobacter* infections are a hazard to human health

### 3. ANTIMICROBIAL RESISTANCE IN BACTERIA FROM ANIMALS AND HUMANS

Although it is known that some bacteria are intrinsically insensitive to antibiotics, and were so even before the advent of antibiotics, most resistant bacteria have emerged as a result of genetic changes, acquired through mutation or transfer of genetic material from a resistant bacterium to a sensitive one. It is generally accepted that bacteria will develop resistance to practically any antibiotic in response to antibiotic use. Exposure to antimicrobial drugs leads to selective amplification of resistant bacteria. These bacteria can persist and replace the sensitive bacteria (6).

Resistance genes are encoded either chromosomally, or extrachromosomally by means of plasmids, transposons and integrons. The ease of transfer of genetic material plays an important role in the spread of antimicrobial resistance from one bacterial strain to another. Resistance genes therefore have the potential for wide distribution among bacteria. The implication of this is that antimicrobial drugs may be responsible for an increase in resistant bacteria between both virulent strains and normal bacterial flora.

Descriptions of human infections caused by bacteria of animal origin date back to the mid-1960s in the United Kingdom. Resistance can transfer from animals to humans by transfer of antibiotic resistant zoonotic or commensalistic bacteria, or by transfer of resistance genes in the human gastro-intestinal tract following ingestion of contaminated animal products. The routes of transmission of, for example, *Campylobacter jejuni* and other related thermophilic campylobacters from animals to humans have been described (17).

During the past decade, multiresistant *Salmonella typhimurium* definitive phage type (DT) 104 were responsible for numerous infections in humans in the United Kingdom, and to a lesser extent in Europe, the United States of America and Canada. The infections in the United Kingdom were regarded as zoonotic in origin as DT 104 is the most common salmonella strain in cattle, sheep and pigs and second most common in poultry in the United Kingdom (16).

Vancomycin resistance was not reported for nearly 20 years since its introduction in the 1960s. In the late 1980s reports of vancomycin resistance in commensal bacteria naturally resistant to the antibiotic started appearing. More disturbing, however, was a report from France in 1988 stating that vancomycin-resistant *Enterococcus faecium* isolates were found that expressed a gene (*vanA*) carried on a transmissible plasmid. Molecular evidence indicated that in Europe, food-producing animals are the likely reservoir for these particular strains and that the use of avoparcin (a glycopeptide antibiotic related to vancomycin) is responsible for their selection (20).

The detection of fluoroquinolone-resistant *Campylobacter* species, following the licensing in 1995 of fluoroquinolones for therapeutic use in poultry in the USA, added to the concerns about the possible role of the use of antimicrobials in livestock production in the development of resistance in human pathogenic bacteria.

### 4. ANTIMICROBIAL RESISTANCE IN BACTERIA FROM POULTRY

The intestinal flora of animals can provide a reservoir of antibiotic-resistant bacteria that can infect or colonise humans via the food chain. Such strains are frequently found in food animals, including poultry. Chickens can be reservoirs for several food-borne pathogens including *Campylobacter* and *Salmonella* (8). Bacterial contamination of chicken carcasses usually takes place during slaughter and processing, and these organisms can survive on the retail product. In a study by Bok *et al* on the incidence of food-borne pathogens on retail broilers in South Africa, isolation of *Salmonella*, *Aeromonas*, *Shigella*, *Campylobacter* and *Yersinia* were reported. They also found that several chicken carcasses were infected with more than one type of pathogen (4). The ACMSF report mentioned earlier also emphasised the fact that poultry meat is an important reservoir for *Campylobacter jejuni* and *Campylobacter coli*.

Antimicrobial resistance in bacteria isolated from slaughtered and retail chickens, as well as free-ranging chickens, has been reported in several publications, including publications emanating from the African continent (1, 3, 9, 10, 13, 14).

There is significant usage of the quinolone enrofloxacin in poultry production in some countries and there is a belief (and accumulating evidence) that the emergence of quinolone-resistant *Campylobacter* spp. reflects the use of these drugs in veterinary medicine. Both *Campylobacter* and salmonella DT 104 (that also occurs in poultry) show a propensity to develop quinolone resistance, although as far as *Salmonella* species is concerned, it has thus far only been characterised as a slight loss in susceptibility rather than resistance.

## 5. QUESTIONNAIRE PROVIDED TO AFRICAN MEMBER COUNTRIES OF THE OIE

The inclusion of the topic 'Antibiotic resistance, especially in poultry production' on the agenda for the 14th Conference of the OIE Regional Commission for Africa is a further extension of the large amount of work done in the international arena on antibiotic resistance. It also reflects an ongoing effort by the OIE towards a world-wide consensus on the approach to deal with the problem and remedial actions that can be taken.

A questionnaire was compiled for consideration by all OIE Member Countries in Africa. The objective of the questionnaire was to obtain information relating to current perceptions and approaches to antibiotic resistance in food animal production, especially poultry, in Africa. To achieve this objective, the questionnaire was divided into six areas of interest, namely:

- The nature and extent of poultry production in Member Countries
- The use (consumption) of antimicrobial drugs
- Registration (marketing authorisation) of antimicrobial drugs
- Awareness of the global concerns regarding antimicrobial resistance
- Prudent use of antimicrobial drugs
- Surveillance and monitoring of bacterial resistance to antimicrobial drugs

The questions were formulated to generate information covering the broad field of antimicrobial resistance, but at the same time to focus on the importance of the poultry industry in Africa and its potential role in the development of antimicrobial resistance and dissemination of resistance factors.

## 6. RESULTS OF THE SURVEY

The questionnaire was sent to the 44 Member Countries of the OIE Regional Commission for Africa. Eighteen countries complied with the request to participate in the survey. The names of the countries in alphabetical order are: Algeria, Benin, Botswana, Burundi, Eritrea, Gabon, Ghana, Kenya, Malawi, Mali, Morocco, Namibia, Nigeria, South Africa, Sudan, Swaziland, Tanzania and Zimbabwe.

The complete questionnaire with a summary of the answers is given in this section and is followed by the discussion and conclusions in the last section of the document.

### A. The nature and extent of poultry production

1. *Please provide the following information relating to the developed, commercial section of the poultry industry in your country.*

a) *What is the approximate number of commercial broiler placements per week?*

Fifteen countries attempted to answer this question and 3 did not know the answer. The number of commercial broiler placements per week provided by the respondents varied from insignificant to 12 million per week. The average for the 13 countries that provided fixed figures was 1.33 million with a range of 5 000 to 12 million.

b) *What is the approximate number of commercial layer hen placements per annum?*

The annual layer hen placements varied from 115 000 to 16.5 million. Fourteen countries provided fixed figures, but some were unrealistic for the size of the commercial poultry industries in those countries, with the result that an average figure could not be calculated.

c) *How much processed poultry meat is produced in kilogram per week?*

The production of poultry meat was a difficult parameter for countries to respond to, and only 8 countries provided information. The reasons for the uncertainty surrounding this parameter included the fact that poultry meat is not consumed in some countries to any meaningful extent, and the high level of unofficial slaughtering of poultry that takes place. The average figure for the 8 countries was 1.7 million kg/week with a range of 15 000 to 12.151 million kg/week.

*d) How many table eggs are produced per month?*

Fifteen countries provided fixed figures and 3 countries did not answer. The average number of table eggs was 96.6 million per month with a range of 20 000 to 580 million.

2. *Is subsistence or small-scale poultry farming practised in your country?*

*If yes, what proportion/percentage of the industry does subsistence poultry farming represent?*

Each of the 18 respondents confirmed that small-scale poultry farming is practised and 17 of those countries emphasised that it represents a significant proportion of poultry production in their countries. Of the 16 countries that provided an estimate, the average proportion was 58% with a range of 0.05% to 97%.

B. Use of antimicrobial drugs

1. *For which of the following purposes are antimicrobial drugs used in poultry production in your country?*

*Growth promotion (digestive enhancing antibiotics)*

*Prophylaxis*

*Therapeutics*

Ten of the 18 countries confirmed that antimicrobial drugs are used for both therapeutics and prophylaxis in poultry production, whereas 7 countries additionally reported the use of antimicrobial drugs as growth promoters. One country did not answer.

2. *Are antimicrobial drugs used for prophylaxis and therapy in poultry production controlled/regulated in your country?*

Antimicrobial drugs for therapy and prophylaxis are controlled in 10 of the 17 user countries that answered the question.

3. *Are growth promoters (digestive enhancing antibiotics) used in poultry production controlled/regulated in your country?*

The 7 countries in which growth promoters are used indicated that these products are controlled.

4. *Has legislation been passed that regulates the sale or purchase of antimicrobial drugs used in poultry production in your country?*

*If yes, please indicate to whom the legislative power has been delegated.*

Fourteen countries do have legislation in place to regulate the sale of antimicrobial drugs used for poultry production. In most cases the legislative power was delegated to the Directorate of Veterinary Services, and for some countries the Department of Agriculture and/or the Department of Health.

5. *Is the amount of antimicrobial drugs used in your country for food-animal production monitored?*

*If yes,*

*a) Can the data for the poultry industry be separated from that generated by other industries?*

*b) Who would be the main source of the information?*

*c) How is the information obtained?*

The consumption of antimicrobial drugs is monitored in only 5 of the 18 countries, and of these 5, 4 countries claimed that they can separate data for poultry from that of other farming enterprises.

The sources of the information are pharmaceutical companies and data obtained from imports and sales kept by the Customs Departments.

6. *Are only veterinarians authorised to use antimicrobial drugs in food-producing animals in your country?*

*If no, who else is authorised?*

Only 6 countries reported that veterinarians only are authorised to use antimicrobial drugs in production animals. Some of the latter respondents added that in spite of this authorisation, farmers and paravets have easy access and use antimicrobial drugs freely. In countries in which authorisation is not limited to veterinarians, antibiotics are also used by farmers, paravets and community animal health workers, mostly with restrictions associated with its use. Three countries mentioned that as a result of the lack of control, anyone who wishes to use antibiotics will be able to obtain them and use them freely.

7. *Are there any restrictions on the range of antimicrobial drugs allowed for use in animals in your country?*

Twelve of the 17 countries that provided an answer have restrictions. Although details were scanty, one could conclude that it essentially means that certain products registered for use as stock remedies have been exempted by the establishments empowered to do so from prescription use.

8. *To what extent are antimicrobial drugs used extra-labelly in your country?*

The extra-label use of antimicrobial drugs is another parameter that is impossible to quantify. Extra-label use as defined in the American Veterinary Medical Association's document on Judicious Therapeutic Use of Antimicrobials, includes use in species not listed in the labelling, use for medications (disease or other conditions) not listed in the labelling, use at dosage levels, frequencies, or routes of administration other than those stated in the labelling, and deviation from the labelled withdrawal time based on these different uses. The response from the sixteen countries that replied, varied from negligible to extensive, and included answers such as seldom, limited, moderate or extensive.

9. *Is there a problem in your country with the fraudulent use of drugs (illegal or counterfeit products) in poultry production?*

Eleven respondents did not think that counterfeit products enter their countries successfully. Five countries did feel that the problem exists, and two countries did not know.

10. *How are residue limits and withdrawal periods determined in your country, and what monitoring is performed?*

Most countries make decisions on Acceptable Daily Intake (ADIs) and Maximum Residue Limits (MRLs) during the registration process of antimicrobial drugs. Decisions are based on withdrawal times set by the Codex Alimentarius, or international guidelines and information provided by the manufacturing companies. Tissue residue monitoring is only done by countries exporting red meat to the countries requiring this level of control.

11. *Are antimicrobial drugs for veterinary use readily available and distributed in the remote areas of your country?*

Only 3 countries reported that antimicrobial drugs are not readily available in remote areas and 2 countries did not answer. The role of NGOs in the distribution of drugs in remote areas was mentioned by some countries.

### C. Registration of antimicrobial drugs

Seventeen countries provided complete answers to all four questions in this section, and one country gave no information.

1. *Who is responsible for the evaluation of antimicrobial drugs imported into your country?*

The responsibility for the evaluation of imported antimicrobial drugs has been delegated in all 17 responding countries to either Government Departments or Directorates or to Government-subsidised Councils, Boards or Authorities or National Reference Centres/Laboratories.

2. *What criteria are used in the determination of the source of antimicrobial drugs?*

All 17 countries answered that antimicrobials are only permitted from approved manufacturers that can prove that the manufacturing process is according to internationally accepted GMPs (Good Manufacturing Practices). Other important criteria include certificates of registration in the country of origin and other countries, and the scientific dossiers provided by the importer/manufacturer.

3. *What measures are in place to control the importation of unlicensed products?*

All countries reported that the importation of unregistered products is not permitted. In some countries full Inspectorate Divisions of Government Departments or Boards are available. Most countries, however, mentioned that the issuing of import permits by Customs Departments is the most important measure to control the importation of products.

4. *After registration, who monitors the distribution and use of antimicrobial drugs?*

The monitoring of the distribution and use of antimicrobials in the various countries is performed by bodies variously referred to as Inspectorate Division/Services, National Agency or Federal Council, but in the majority of countries the Directorate of Veterinary Services fulfils this function. One country mentioned that no monitoring is currently done. Three countries added that although these measures are formally available, they are not necessarily efficiently implemented.

D. Awareness

1. *How is information regarding the use and availability of antimicrobial drugs for poultry production distributed to producers?*

In 8 countries the information is provided by poultry publications, advertisements and company representatives. Five countries said both representatives and advertisements provide the information, while in 4 countries, company representatives are the only source of this information. One country stated that this information is only available from poultry publications and one country did not answer.

2. *Is there an awareness in your country about the emerging threat of antimicrobial resistance?*

Fifteen of 18 respondents mentioned that there is recognition in their countries that antimicrobial resistance is an emerging threat. In 3 countries the awareness is still absent.

3. *Is there a concern in your country about the possible adverse effects on animal and human health as a result of the use of antimicrobial drugs in poultry production?*

*If yes, from which interest groups or role players do these concerns emanate?*

All 18 respondents said yes to this question, in spite of the fact that 3 countries answered in the previous question that bacterial resistance to antimicrobial drugs was not yet recognised as an emerging threat. Some countries did add, however, that such awareness, if present, would be of a very limited nature.

Although all 18 countries were of the opinion that veterinarians are aware that antimicrobial use in poultry may lead to adverse effects on animal and human health, 3 countries were of the opinion that the awareness was limited to veterinarians only, whereas 4 other countries named veterinarians and medical doctors as the concerned parties. The remaining 11 countries listed various combinations of veterinarians, medical doctors, farmers, government agencies, non-governmental organisations and consumers as the informed groups.

4. *Is there an awareness among users in your country of recommended withdrawal periods for meat and egg-laying poultry? If yes, how is this information communicated to users?*

According to the response to this question, there are users of antibiotics in 11 of the 18 countries that are familiar with withdrawal periods. They went on to list veterinarians, extension officers and product package inserts as the sources of information relating to withdrawal times. The remaining 7 countries answered no to the question.

## E. Prudent/responsible use of antimicrobial drugs

1. *What control measures are used in your country to ensure the responsible use of antimicrobial drugs in food-animal production?*

The general consensus of opinion was that no specific control measures are in place other than restrictions for over-the-counter sales or use by veterinarians only in those countries that do have these measures.

2. *Are there any measures that control the availability and provision of antimicrobial drugs in your country?*

The answers to this question essentially drew the same replies as those for question no. 22.

3. *What is the major constraint in your country to the responsible/prudent use of antimicrobial drugs in poultry production?*

Seventeen countries listed various combinations of a lack of legislation (7 countries), lack of veterinary services (3 countries), lack of knowledge (7 countries) and lack of resources (13 countries) as major constraints.

4. *Has a guideline document relating to the prudent use of antimicrobial drugs been compiled in your country by any representative organisation for the benefit of prescribers, manufacturers, distributors and users?*

Six of seventeen countries replied that such a document had been compiled. One country did not reply. The questionnaire, unfortunately, did not make provision for more information dealing with the specifics of the documents.

## F. Surveillance and monitoring of antimicrobial resistance

1. *Do you have a laboratory or laboratories in your country with the competence to:*

*Provide a diagnostic service to the poultry industry in terms of the isolation and identification of bacterial pathogens from poultry specimens?*

Seventeen countries answered yes and one country answered no.

*Perform antibiotic sensitivity testing for antimicrobial drugs relevant to production animals?*

Seventeen countries answered yes and one country answered no.

*Act as a national reference laboratory for surveillance and monitoring of antimicrobial resistance in bacteria from food-producing animals?*

Eleven countries answered yes and seven countries answered no.

2. *Does your country have programmes for monitoring resistance to antimicrobial drugs by means of antibiotic sensitivity testing?*

*If yes, do these programmes involve:*

*Sick animals presented for diagnosis and treatment?*

*Healthy animals?*

Two countries reported that they have monitoring programmes using specimens from both sick and healthy animals. Five countries are involved in testing specimens from sick animals only, and the remaining 11 countries do not have monitoring programmes.

3. *Finally, does your country have a microbiology laboratory or laboratories that provide a dedicated service to the poultry industry?*

Twelve of 18 countries do have dedicated poultry diagnostic laboratories.

## 7. DISCUSSION AND CONCLUSIONS

The purpose of the first section of the questionnaire was to obtain information on the importance of poultry for Member Countries and the size of the populations of chickens that may potentially be exposed to antibiotics. The most striking aspect of the information that was provided was the size of the small-scale chicken farming activities in the various countries in relation to the commercial farming sectors. Some examples may highlight this aspect. In a country such as Nigeria with a human population of 114 million and a commercial poultry industry that can supply 580 million eggs per month, it is estimated that there are more than 70 million village chickens. Similarly, in a country such as Botswana with a human population of 1.5 million, it has been reported that there are more than 3 million indigenous chickens, and Kenya with a population of 28 million, has 17 million indigenous chickens. According to Sonaiya (15), the average flock size of village chickens in Africa ranges from 5-10 birds per homestead. However, it would seem that the extent to which these chickens are exposed to antimicrobial drugs is comparatively small. Only 13% of small-scale chicken farmers in Botswana reported the use of veterinary drugs (including paraciticides) to control disease (11). It entails almost exclusively the use of tetracyclines for therapeutic purposes (5). It is unlikely that this state of affairs will differ significantly in other Member Countries with large numbers of small-scale chicken farmers. The use of antimicrobial drugs in small-scale chicken farming in Africa can therefore be regarded as limited and would currently contribute little to the selection of resistant bacteria. In those countries with well-developed commercial poultry industries, the same concerns relating to the possible spread of resistant bacteria or resistant genes to human bacteria would apply as it does in the Northern Hemisphere.

The quantity of antimicrobials used is monitored by 5 countries only, but it is not known if this takes place as part of an official directive. Data on the quantity of antimicrobials used is difficult to obtain in any country, including those in which full registration procedures for drugs are in place. Once marketing authorisation is achieved in the latter countries, the data on the importation and distribution is essentially in the hands of the importing companies, and partially with the Customs Departments.

The scheduling of all antimicrobials for disease control in animals as prescription only medicines is an ideal that all international agencies involved in animal health strive for. Six countries reported that veterinarians only are authorised to use antimicrobials, but this can more than likely be ascribed to the fact that in some countries only state veterinarians have access to these drugs and distribute them.

Legislation that regulates the sale or purchase of antimicrobials used in production animals in Member Countries has been delegated in most cases to the Directorates of Veterinary Services, and in a few cases to the Department of Agriculture and/or the Department of Health. The difference is based on the type of registration system that is employed. Countries may perform full registration or limit registration to a listing system. The former approach entails submission of a scientific dossier for complete evaluation in terms of quality, safety and efficacy of the product, and quality control in terms of the production facilities. It includes a registration secretariate and/or control body. For the listing system or approach, a register is kept for approval of drugs that are to be imported into the country allowing listing of the drugs. There is no formal requirement for a registration number or changing of labels and/or package inserts. The product is used as received. The listing approach also does not require a control body.

The fact that five of 18 countries can provide data on the amount of antibiotics used and can separate poultry data from data on other production systems can be attributed to the listing system. Listing countries as opposed to registering countries know what products come into the country as an import permit is required for each batch to be imported. In this way they also know what products are earmarked for the poultry industry.

Two factors are likely to be responsible for the fact that 12 countries reported restrictions on the range of antimicrobials allowed for use in animals. The one is the listing system that allows a country to limit the range by means of import permits. Secondly, the scheduling system in use in some countries makes provision for the scheduling of certain antimicrobials as over-the-counter products for use by farmers and others as prescription only drugs.

Awareness with regard to the possible adverse effects on animal and human health as a result of the use of antimicrobial drugs was reported from all 18 countries participating in the survey. The degree of awareness, however, varied and in some countries was described as minimal. It should be mentioned, however, that there are initiatives towards education and training of users of antibiotics in all spheres of animal husbandry. The second Southern and Eastern African Veterinary Drug Registration Application Conference (SEAVDRAC) that took place in Nairobi, Kenya, in July 2000, bears testimony to this. During this conference particular attention was paid to risk analysis and antibiotic resistance.

All countries (with the exception of one that did not answer) identified one or more constraints to the prudent use of antimicrobials in poultry (and by implication in other animals). This implies that the prudent use of antibiotics in Member Countries can only be optimally applied once the constraints have been diminished to acceptable levels.

The laboratory surveillance and monitoring of antimicrobial resistance is limited to 7 countries, 2 of which test bacteria isolated from both sick and healthy animals. Five other countries only test specimens from sick animals and poultry. This state of affairs represents a significant constraint to the provision of data that is indispensable for the development of national policies for the containment of antimicrobial resistance.

It is clear from the vast amount of available international literature that resistance to antimicrobial drugs in humans and animals is an emerging problem and that the misuse of antibiotics in human and veterinary medicine contributes to the problem. Areas of concern that need to be addressed in Africa include *inter alia* the:

- Lack of appropriate legislation to support the responsible and prudent use of antimicrobial agents in veterinary medicine.
- Lack of veterinary services, and by implication the unavailability of veterinarians who can identify recurrent disease problems and develop alternative strategies to prevent or control disease and thereby minimise the need for antimicrobial use in livestock.
- Lack of knowledge and/or training that can provide stakeholders with information on the benefits of prudent antimicrobial use and the risks associated with inappropriate use.
- Lack of resources that impact negatively on efforts to develop surveillance and monitoring programmes, education strategies, evaluation and licensing of antimicrobials and efforts to combat the distribution and use of illegal and counterfeit products.

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