

# The One Health approach and public education and awareness-raising activities in Japan

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The AMR Clinical Reference Center (AMRCRC) was established in 2017 to implement the National Action Plan on Antimicrobial Resistance (AMR) and consists of three divisions that together lead the fight against AMR in Japan. Since the One Health approach is an essential part of the National Action Plan, the AMRCRC has launched a One Health website based on the AMR One Health Report with integrated information on human, animal and environmental surveillance. In addition, the AMRCRC is deeply committed to public education and awareness-raising activities, which are critical for implementing measures against AMR.

The Japanese government published a National Action Plan on Antimicrobial Resistance (AMR) in 2016 in response to the publication of the Global Action Plan on Antimicrobial Resistance by the World Health Organization (WHO) in 2015 (1). The plan encompassed all the fields included in the WHO action plan along with the additional field of International Cooperation (Table 1). It also set outcome indices for drug resistance and antimicrobial use (Table 2).

The Japanese government is implementing several policies based on this action plan. In April 2017, the AMR Clinical Reference Center (AMRCRC) was established at the National Center for Global Health and Medicine Hospital and the Antimicrobial Resistance Research Center was established at the National Institute of Infectious Diseases to further advance measures against AMR.

The AMRCRC consists of three divisions: Clinical Epidemiology, Pharmacoepidemiology, and Information and Education. The Clinical Epidemiology Division sets up surveillance systems and conducts analysis to implement measures against AMR at sites such as healthcare facilities and geriatric facilities, and also implements the One Health approach. The Pharmacoepidemiology Division sets up national antimicrobial use surveillance systems and analyzes that data. The Information and Education Division supplies healthcare professionals with manuals and guidelines and conducts education and awareness-raising activities aimed

at the public and healthcare providers. This article reviews the implementation of the One Health approach and public education and awareness-raising activities in Japan, and describes the contributions of the AMRCRC to these efforts.

## The One Health approach in Japan

In November 2013, the Japan Medical Association and Japan Veterinary Medical Association signed an agreement to communicate and collaborate with regard to academic information on advances in human and veterinary medicine to ensure a healthy and safe society. This agreement, which resulted in professional organizations for providers of human and animal healthcare collaborating in One Health efforts, even spread to regional medical and veterinary associations across Japan. Then, in 2016, the Action Plan established an understanding of trends in AMR and antimicrobial use in humans, animals, agriculture, food products and the environment as a critical strategy that would contribute to the evaluation of policies to date and to the design of future policies (1). This is how the One Health approach came to be implemented in Japan.

In November 2016, the World Veterinary Association (WVA), World Medical Association (WMA), the Japan Medical Association, and the Japan Veterinary Medical Association joined efforts to hold the second WVA/WMA Global Conference on One Health in Japan. Participants

Table 1: Six Areas and Goals for Countermeasures on AMR

Fields	Goals
<b>1. Public Awareness and Education</b>	Improve Public Awareness and Understanding, and Promote Education and Training of Professionals
<b>2. Surveillance and Monitoring</b>	Continuously Monitor Antimicrobial Resistance and Use of Antimicrobials, and Appropriately Understand the Signs of Change and Spread of Antimicrobial Resistance
<b>3. Infection Prevention and Control</b>	Prevent the Spread of Antimicrobial-resistant Organisms by Implementing Appropriate Infection Prevention and Control
<b>4. Appropriate Use of Antimicrobials</b>	Promote Appropriate Use of Antimicrobials in the Fields of Healthcare, Livestock Production and Aquaculture
<b>5. Research and Development</b>	Promote Research on Antimicrobial Resistance and Foster Research and Development to Secure the Means to Prevent, Diagnose and Treat the Antimicrobial-resistant Infections
<b>6. International Cooperation</b>	Enhance Global Multidisciplinary Countermeasures against Antimicrobial Resistance

Table 2: Outcome Indices for the Action Plan

**Human-Related Indices**

- ➔ Lower the penicillin resistance of *Streptococcus pneumoniae* to 15% or less in 2020
- ➔ Lower the methicillin resistance of *Staphylococcus aureus* to 20% or less in 2020
- ➔ Lower the fluoroquinolone resistance of *Escherichia coli* to 25% or less in 2020
- ➔ Lower the carbapenem (imipenem) resistance of *Pseudomonas aeruginosa* to 10% or less in 2020
- ➔ Maintain the carbapenem resistance of *Escherichia coli* and *Klebsiella pneumoniae* at 0.2% or less in 2020
- ➔ Reduce the antimicrobial use per day per 1,000 inhabitants in 2020 to two-thirds of the level in 2013
- ➔ Reduce the use of oral cephalosporins, quinolones, and macrolides per day per 1,000 inhabitants in 2020 by 50% from the level in 2013
- ➔ Reduce the use of intravenous antimicrobials per day per 1,000 inhabitants in 2020 by 20% from the level in 2013

**Animal-Related Indices**

- ➔ Lower the tetracycline resistance of *Escherichia coli* to 33% or less
- ➔ Maintain the third-generation cephalosporin resistance of *Escherichia coli* at the same level as in the other G7 countries as of 2020
- ➔ Maintain the fluoroquinolone resistance of *Escherichia coli* at the same level as in the other G7 countries as of 2020

unanimously approved the “Fukuoka Declaration” expressing their determination to act based on the One Health concept and move to the implementation stage. As this movement progressed, these organizations began collaborating with government agencies, and the Nippon AMR One Health Surveillance Committee meeting was held in 2017. Understanding the current situation and trends in Japan and disseminating this information both within and outside Japan

is critical to advancing AMR-related policies in the international community. Thus, the AMR One Health Report with integrated information on human, animal and environmental surveillance was published (2,3).

**One Health surveillance in Japan**

The Japanese Veterinary Antimicrobial Resistance Monitoring System established by the Ministry of Agriculture, Forestry and Fisheries has conducted surveillance of veterinary antimicrobial use since 1999 and surveillance of the volume of antimicrobial use since 2000 (4). The field of human medicine is supervised by the Japan Nosocomial Infections Surveillance project organized by the Ministry of Health, Labour and Welfare, which has conducted surveillance of AMR rates in major pathogenic bacteria since 2000. The Ministry has also conducted surveillance of antimicrobial use since 2015. As illustrated above, microbial testing and antimicrobial surveillance first began in the field of veterinary medicine. Information on the distribution of antimicrobial feed additives and domestic production of antimicrobials as agrochemicals is also being collected.

The AMRCRC has launched a One Health website ([amr-onehealth.ncgm.go.jp/en](http://amr-onehealth.ncgm.go.jp/en)) to widely share updates about these efforts with the general public, government officials, healthcare providers, livestock farmers and researchers.

**Trends in human and animal data in Japan**

Human data on AMR in Japan from 2014 to 2017 show various trends. For instance, the rates of resistance to carbapenem in *Escherichia coli* and *Klebsiella pneumoniae* and vancomycin resistance in enterococci have been less than 1%. Penicillin resistance in *Streptococcus pneumoniae* decreased from 47% to 29%, and carbapenem resistance in *Pseudomonas aeruginosa* decreased from 20% to 17%. In contrast, the rate of fluoroquinolone resistance in *E. coli* increased from 36% to 40%. Although the percentage of methicillin-resistant *Staphylococcus aureus* infections among all cases of *S. aureus* infection has been decreasing, it was still at a high level of 48% in 2017. Further research will be necessary to determine the reasons for these trends.

In the field of livestock farming, studies of resistant bacteria in cows, pigs and chickens have shown a high rate of *E. coli* resistance to tetracyclines, in the range of 30%. However, resistance to third-generation cephalosporins and fluoroquinolones has remained at less than 10%. The rate of third-generation cephalosporin resistance in strains from humans and strains from chickens raised for meat were both increasing in 2011, but the rate in chickens began decreasing dramatically in 2012. This is believed to be because the industry had spontaneously stopped using third-generation

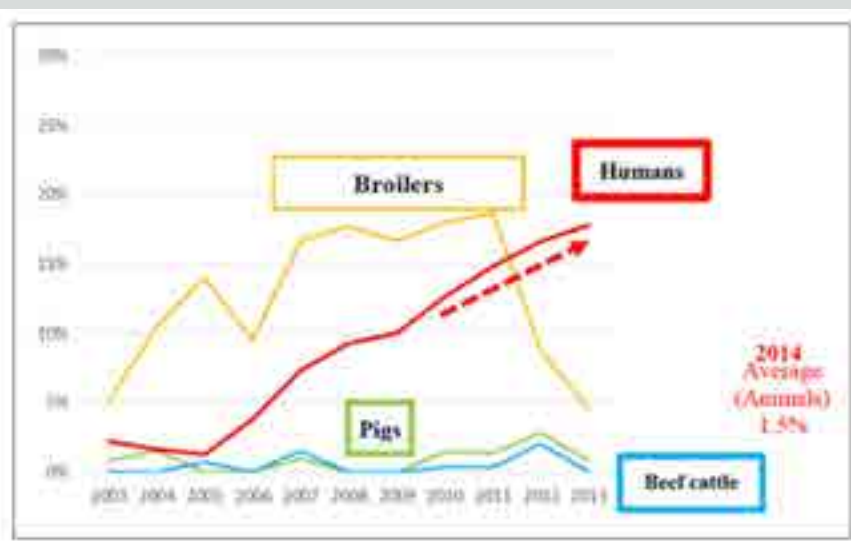
cephalosporins off-label at some hatcheries (Figure 1) (5). Surveillance in pets only began in 2017. Although the rates of tetracycline and aminoglycoside resistance are lower than in livestock, rates of fluoroquinolone and cephalosporin resistance have been trending high.

In Japan, food sanitation is strictly controlled under the hazard analysis critical control point (HACCP) approach to food safety. Reports from the Ministry of Agriculture, Forestry and Fisheries, revealed low resistance rates of bacteria samples collected from the production site to the slaughterhouse. In contrast, patterns of resistance to different drugs in various serotypes of *Salmonella* from food products and humans showed a clear resemblance, which strongly suggests relatedness between resistant strains in food products and humans. A study on commercially available chicken detected a high rate of resistant bacteria. This may be attributable to the possibility of horizontal transmission in the processing stage and differences in testing methods (selective medium or general medium). The latter is being addressed by plans to standardize current bacteriological testing procedures. A case in point is the eating of chicken sashimi, raw chicken, a part of traditional Japanese cuisine that many Japanese people enjoy eating, which poses some risk of bacterial transmission. It is thus necessary to raise awareness that adequate heating is required to ensure better safety of food products.

The next part of this section covers the surveillance of antimicrobial sales volumes. The volume of antimicrobial sales used in human medicine was 13.8 DID (defined daily dose/1,000 inhabitants per day) in 2017. This was 7.3% lower than in 2013. Oral medications account for 90% of this number, and rates of oral cephalosporin, oral macrolide, and oral fluoroquinolone use were high. The sales volume of antimicrobials for animals was 780.88 tons in 2013, but this increased to 832.56 tons in 2016. This increase was largely from the use of macrolides and penicillin in livestock. The largest portion of sales volume was for tetracyclines at about 40%. However, resistance to third-generation cephalosporins and fluoroquinolones was less than 1% each.

The sales volume of antimicrobials for humans and animals was compared from the One Health perspective (Figure 2). Use levels in 2016 were 591.0 tons in humans, 669.7 tons in livestock, 155.1 tons in aquatic animals, 6.7 tons in pets,

Figure 1: Comparison of the proportion of third-generation cephalosporin-resistant *Escherichia coli* derived from humans and those derived from food-producing animal



228.2 tons in antimicrobial feed additives, and 153.6 tons in agrochemicals, which gave an overall total of 1804.3 tons. More antimicrobials were used in animals than in humans. However, the most commonly used antimicrobials vary between humans and animals.

In 2019, the agency plans to launch a One Health platform with aggregated information from humans and animals by year for each region (47 prefectures). The AMRCRC will continue to update the data going forward making comprehensive efforts to implement measures against AMR as part of the One Health approach.

### Public education and awareness-raising activities

Public education and awareness-raising activities that reach all citizens are critical for implementation of measures against AMR. In Japan, the Cabinet Secretariat presides over all public education and awareness-raising activities. The AMRCRC is in charge of such activities related to medicine. This article will discuss the public education and awareness-raising activities being conducted by the AMRCRC.

#### Current public knowledge and awareness of AMR

The AMRCRC regularly conducts surveys to evaluate knowledge and awareness of AMR among the Japanese public, and references the results of these surveys when designing their outreach activities.

An AMRCRC online survey of 3,390 people conducted in March 2017 (6) showed that 46.8% of respondents believed that antibiotics are effective against viruses, and 40.6% thought them effective against the common cold and influenza. Also, 11.7% of respondents kept antibiotics at home, as of the time of the survey, which they or their relatives would use at

Figure 2: Antimicrobial consumption in human, animal and agrochemicals

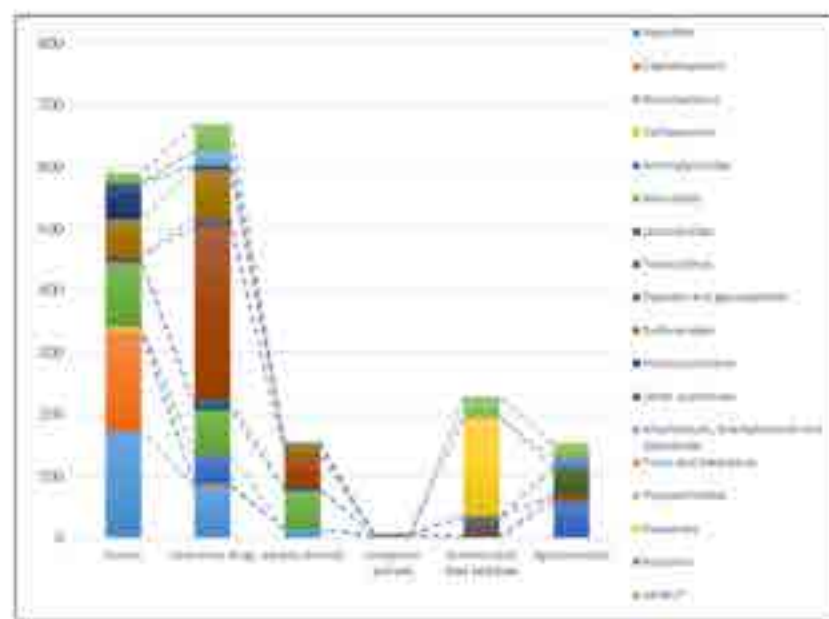


Figure 3: Educational events for antibiotic awareness



some point. A survey in February 2018 showed very similar results.

Another online survey with 721 respondents conducted in September 2018 (7) found that 94.2% of respondents were familiar with the word “antibiotics.” However, on further questioning using drug names, many respondents misidentified anti-influenza drugs, non-steroidal anti-inflammatory drugs, and anti-allergy drugs as antibiotics.

The results of this survey demonstrate that many Japanese people have misconceptions about the effects and importance of antibiotics. It is hoped that increased public knowledge and awareness will promote the proper use of antibiotics and lead to appropriate provision of medical care.

**Principles of public education and awareness-raising activities**

The AMRCRC began its public education and awareness-raising activities with parents of young children as its primary target audience. This is because children between the ages of 0 and 9 years are the age group most frequently prescribed

antibiotics (8). Current efforts are underway to reach all Japanese citizens with a focus on this age group.

The basic principles for these public education and awareness-raising activities by the AMRCRC are as follows:

- ➔ To raise awareness and increase basic knowledge of measures against AMR and the proper use of antibiotics.
- ➔ To utilize various outreach media such as websites, events and medical facilities.
- ➔ To support efforts raising awareness on AMR across Japan.

The AMRCRC also conducts education and awareness-raising activities throughout the year, but particularly in November, which has since been named National Antibiotic Awareness Month in Japan.

**Websites**

An information website on measures against AMR (<http://amr.ncgm.go.jp/>) was set up in September 2017. This website provides easy-to-understand explanations of

measures against AMR for the general public and healthcare providers. It has various outreach materials and posts about events.

The page views have been gradually increasing, reaching 200,000 views in November 2018. Smartphone access to the site by the general public has also been increasing particularly rapidly. This suggests that public interest in this topic is growing.

- ➔ The AMRCRC also conducts education and awareness-raising campaigns via social media such as Facebook and Twitter. Their Facebook page (<https://www.facebook.com/NCGMAMR>) in particular targets parents of young children, and provides information not only about AMR but also infectious diseases in general.

**Creation of outreach materials**

Various outreach materials are being created to raise awareness of measures against AMR. Many kinds of materials are being created to allow for various uses depending on purpose or preference. As of January 2019, there were nine

videos, seven posters, four leaflets, three booklets, and ten infographics available on the information site (<http://amr.ncgm.go.jp/materials/>). All these materials can be freely downloaded. Some can also be distributed as printed materials on request. The materials are designed so that the general public can easily understand the importance of their content. For example, a poster featuring the popular anime series *Mobile Suit Gundam* was created in 2017.

#### *Senryu poetry contests*

Many Japanese people write and read short poems called *senryu*, which has the same format as a *haiku* (three lines of 5, 7, and 5 syllables), but allows writers to freely express their ideas in more colloquial speech.

The AMRCRC has hosted an annual *senryu* poetry contest since 2017. Poems on antibiotics and resistant bacteria are submitted and many participants are recruited. The winning poems were as follows:

2017: “*We say ‘just in case’ / Resistant bacteria / Increase with these words*”.

2018: “*Time to make a change / To make sure that we are safe / For the future’s sake*”.

#### *Activities in schools*

Implementing measures against AMR requires long-ranging effort, which is why integrating activities into school education is considered effective. The AMRCRC holds special classes in elementary schools and high schools in Tokyo to provide students accurate information about infectious diseases and antibiotics. Based on such experience, we have developed and released educational materials (presentations, leaflets and videos) that experts can use for educational activities at schools (<http://amr.ncgm.go.jp/materials/#sec6>).

#### *Events*

Ensuring that people with limited or no access to information are still widely informed about measures to tackle AMR is vital. Thus, the AMRCRC not only organizes its own events but also supports events organized by other agencies across Japan. Each message is communicated in easy-to-understand formats such as poster presentations and quizzes, with the aim of strengthening understanding (Figure 3).

➔ One approach to reaching those with limited opportunities to access health information involved a public service announcement (PSA) made at a cinema from late 2017 until the 2018 New Year’s holidays. This 30-second PSA was aired over three weeks at a cinema in Shinjuku, a famous shopping district in Japan, and reached 160,000 people. There are plans to air PSAs at cinemas across Japan in the future.

### **Media approach**

Delivery of information through the media is an effective means of strengthening public understanding. The AMRCRC holds media seminars and issues press releases to disseminate information to the media. The increased coverage of measures against AMR via television, radio, and newspapers can be attributed to these efforts. For Antibiotic Awareness Month in November 2018, advertisements were placed in a major newspaper with information about the importance of measures against AMR and the role of individuals.

#### *Future activities*

Public education and awareness-raising activities in Japan have only just begun. To strengthen understanding of measures against AMR and infectious diseases in general, the AMRCRC plans to conduct public awareness surveys to evaluate the effects of its measures and to continue to implement these activities using various approaches. ■

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