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Antimicrobial Resistance

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應對耐藥性

正確使用抗生素

Combat Antimicrobial Resistance

Proper use of Antibiotics

只服用醫生
處方的抗生素
Only take antibiotics
prescribed by doctors

遵照醫生的
建議服用抗生素
Follow doctor's advice
when taking antibiotics

向醫生要求
抗生素
Demand antibiotics
from doctor

與他人
共用抗生素
Share antibiotics
with others

病情轉好便自行
停用抗生素
Stop taking antibiotics by
yourself when feeling better

服用剩餘的抗生素
Take leftover antibiotics

衛生防護中心
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衛生署
抗菌素耐藥性專頁

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Department of Health

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Disclaimer

The Cover Shot

This is one of the signature photos of the undersigned taken earlier in Iceland, constructed after merging seven photos of different exposures into one high dynamic resolution photo. This magical moment disappeared shortly after shooting due to melting of ice augmented by the high flowing water stream and above-zero ambient temperature in the era of global warming. Alike global warming, antimicrobial resistance is a global public health threat recognised by the World Health Organization nowadays, with effective antimicrobials for curing of infections (like the icebergs in this photo) running out as microorganisms evolve.

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Antimicrobial resistance (AMR) is a global public health concern that threatens the effective prevention and treatment of an ever-increasing range of infections caused by various micro-organisms. AMR has caused significant morbidity and mortality worldwide, and the situation would be even worse in the future if no effective strategies are put in place.

AMR can threaten everyone's health, as both healthy urban dwellers and the sickest patients in intensive-care units can contract infections caused by resistant micro-organisms. AMR can render the medications used to cure the infections ineffective, making the treatment difficult, costly or even impossible. In the era of modern medicine, it is hard for a lay person to imagine and accept the fact that even simple infections, such as urinary tract infections or post-operative wound infections, can turn into fatalities in young-fit population due to AMR. However, this actually happens around the world every day.

AMR is not solely a human health issue. In fact, resistant micro-organisms respect no border. The resistant micro-organisms, or the genes they carry that confer antimicrobial resistance, can spread readily among animal, food and human sectors and their surrounding environment. To tackle the problem of AMR, everyone is a stake holder, and multi-sectoral actions are called for. This is why an "One Health approach" is adopted by the World Health Organization and by various countries to combat AMR.

The Government of the Hong Kong SAR has all along recognised the problem of AMR and is committed to tackling it in a proactive way. AMR has been included as a policy agenda since 2016 along with the establishment of a High Level Steering Committee chaired by the Secretary for Food and Health to formulate strategies in collaboration with the relevant sectors to tackle the threat. The Hong Kong Strategy and Action Plan on Antimicrobial Resistance (2017-2022), launched in 2017 using a One Health approach, outlines the priority actions and activities under six key areas, namely (1) surveillance; (2) optimise the use of antimicrobials in humans and animals; (3) infection prevention and control; (4) improve awareness; (5) promote research and (6) strengthen partnerships.[1]

This special issue of the Hong Kong Medical Diary could serve as one of the means to improve awareness of readers on this important public health issue. We are delighted to have an array of colleagues from various disciplines to provide readers with a panoramic view of AMR from a multitude of perspectives.

From the human health side, my peer colleagues within the Infection Control Branch of the Department of Health's Centre for Health Protection took readers through a number of topics, covering global burden of AMR, some of our previous works to echo WHO's annual World Antibiotic Awareness Week, surveillance on antimicrobial use, results of a recent survey on medical practitioners, and optimising the use of antibiotics for treatment of urinary tract infection from the perspective of AMR.

The development of AMR is linked to the antimicrobial use as resistant micro-organisms that adapt to the presence of antimicrobials will be selected out to proliferate. It is important to note that even appropriate antimicrobial use may create such selective pressure, but inappropriate use or misuse can hasten the process of emergence of AMR. Hence, it is essential to continuously monitor the situation with surveillance mechanisms and to ensure proper use of available antimicrobials by empowering the prescribers, patients and carers.

Partnership under the umbrella of One Health is equally important. We are honoured in this special issue to have contributions from our partners working in the animal health and food safety sect. Dr Michelle Yeung of the Agriculture, Fisheries and Conservation Department used an angle from the veterinarian to illustrate the importance of AMR in the animal sector. Dr Jerry Mang, from the Centre for Food Safety, shared his insights from the food safety perspective.

The cover photo of this issue (the magical moment before melting of icebergs) acts a metaphor to our current situation in AMR control – we all need to act now to preserve our precious antimicrobials for the future. Besides hoping that our discerning readers will enjoy the reading of this issue, we would like to urge everyone to take an extra step in protecting the efficacy of antimicrobials, not just for now but also for our future generations. Readers who wish to play a role could take reference from key messages and resources highlighted by the advertorials in this special issue that we wish promulgating to healthcare colleagues and the public for combating AMR.

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Global Burden of Antimicrobial Resistance and How Hong Kong Responds to the Call from the WHO

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INTRODUCTION

The World Health Organization (WHO) put antimicrobial resistance (AMR) as one of the ten threats to global health in 2019.[1] With more microorganisms becoming resistant to the existing antimicrobial agents, and antimicrobial agents becoming ineffective towards their targeted pathogens nowadays, AMR has become a major concern facing global health. Resistant microorganisms are transmitted between humans and animals in exactly the same way as non-resistant ones in the community, residential care homes, and in hospitals. Infections could spread amongst people and impose huge threats to community and population health.

Among all antimicrobials, resistance to antibiotics for treatment of bacterial infection is the most serious problem. Resistance to antibiotics can be a natural evolutionary response of bacteria which offers survival advantages towards the presence of the drugs. Antibiotic-resistant bacteria can also share their ability to become resistant with other bacteria that have not been exposed to antibiotics.[2] Several factors can contribute to the emergence and spread of AMR, with misuse or overuse of antibiotics in health-care settings and in the community for non-therapeutic purposes being the most important ones. Globally, WHO estimates that only 50% of antibiotics are used appropriately.[3] Using antibiotics to treat non-bacterial infections such as common cold and influenza, failure to follow doctor's instructions, and use of antibiotics on food animals as growth promoters or disease prevention have greatly accelerated the problem.

IMPACT OF AMR

Antimicrobials, including antibiotics, are essential and valuable medical tools to fight against diseases in humans and animals, which play vital roles to safeguard human and animal health. Their widespread use in clinical care throughout the second half of the twentieth century markedly decreased the burden of infectious diseases and led to the success of complex medical procedures, such as organ transplantation, advanced surgeries and chemotherapy, by preventing infection-related complications.

With the development of AMR, it is not uncommon that the resistant microorganisms are capable of resisting more than one antimicrobials to make treatment difficult. Resistant infections can lead to serious and prolonged illnesses, disabilities, prolonged hospital stay, treatment failure and higher costs in patient management. Due to the problem of AMR, clinicians may need to use last-resort classes of medicine such as vancomycin and polymyxins, which may be less effective or carry more side effects.[4] The AMR problem hits vulnerable groups most. For instance, the probability of developing a resistant infection is significantly higher for children up to 12 months of age and among elderly persons aged 70 and above, and resistant bacteria such as vancomycin-resistant Enterococci cause serious infections mainly in hospitalised immunocompromised patients.[5,6]

According to the report of the Organisation for Economic Co-operation and Development (OECD) published in 2019,[5] if the problem of AMR does not improve, the use of second-line and last-line antibiotics would be 72% higher and more than doubled respectively in 2030 when compared with 2005, implying fewer effective treatment options would be available by 2030.

Moreover, the development of novel antibiotics is too far behind to keep pace with AMR development. While bacteria become more resistant to antibiotics, companies are pulling out of antibiotics research, and fewer new antibiotics are being approved.[7]

PUBLIC HEALTH IMPACT

In recent years, AMR has become a major and global public health issue and a critical challenge faced by health systems worldwide. The OECD 2019 report stated that AMR could result in over 569 million extra hospital days annually across countries in the European Union (EU) and European Economic Area (EEA) by 2050, and within the EU/EEA, more than 670,000 infections could occur due to AMR-related bacteria claiming some 33,000 deaths as a direct consequence.[8] The report also estimated up to 2.4 million deaths between 2015 and 2050 in those high-income countries without a sustained effort to contain AMR.[8] The impact would be even higher in developing countries with a higher burden of infectious diseases.[5,9] If no action is taken, drug-resistant diseases that have already caused at least 700,000 deaths per year globally could kill ten million people in the world annually by 2050 under the worst-case scenario.[10] Alarming levels of resistance have been reported in countries of all income levels; more and more common diseases are becoming untreatable, and lifesaving medical procedures riskier to perform.[11] According to the Centers for Disease Control (CDC) of the United States (US), the burden of antibiotic-resistance threats in the US was greater than expected, with more than 2.8 million-related infections occurring each year and more than 35 000 deaths.[2]

Based on the above, AMR is a rising and serious threat to the effectiveness of the future use of antimicrobial agents with significant public health implications.

SOCIAL AND ECONOMIC IMPACT

In addition to increasing morbidity and mortality, AMR also adds considerable costs to the economic system. The rising levels of AMR also pose a significant economic burden and huge adverse impact on healthcare cost throughout the world. Healthcare expenditures in 2050 could be as much as 25%, 15% and 6% higher than the baseline values respectively for low-income, middle-income and high-income countries.[12] In Europe, if no effective action is in place and AMR rates follow the projected trends, up to 1.1 billion Euros are expected to be spent yearly between 2015 and 2050, and AMR could result in over 569 million extra hospital days annually across countries in the EU/EEA by 2050.[8] Hospital costs of treatment for a resistant infection are estimated to be USD10,000 to 40,000 higher than for susceptible infections.[13] According to the CDC, AMR could add USD20 billion surplus in direct healthcare costs in the US, which is exclusive of about USD35 billion in loss of productivity annually.[14]

The adverse health effects of AMR can also pose a serious economic impact by reducing the size of the working population and affecting labour market participation and productivity. It has been estimated that by 2050 and assuming 100% resistance to *E. coli, Klebsiella pneumoniae, S. aureus*, human immunodeficiency virus, tuberculosis and malaria in OECD countries, there would be a loss of 10.2 million working-age people per year, in contrast with a loss of 2.1 million per year under the current levels of resistance.[13] Moreover, drug-resistant infections could cut global Gross Domestic Product (GDP) by 3.8 % by 2050, that would cost the world up to approximately over USD100 trillion.[15] The burden of AMR and its societal cost are expected to continue to rise unless significant progress is made in preventing infections, developing new diagnostics and drugs to treat.

"ONE HEALTH" APPROACH AND THE CALL FROM WHO

AMR is a complex problem that affects all and is driven by many interconnected factors. The health of people is connected to the health of animals and the environment. AMR has no respect for borders and direction and can be transmitted in a bi-directional manner from animals to humans and vice versa. The rising threat of AMR should be addressed by a comprehensive framework and in a multi-sectoral and collaborative approach. Different sectors, including human and veterinary medicine, agriculture, food, environment and pharmaceutical industry as well as the public being consumers, should take collective actions. "One Health" approach has already been distinguished as a major element of AMR control and prevention strategies by the international tripartite collaboration of WHO, the Food and Agriculture Organization of the United Nations and the World Organisation for Animal Health.

The WHO has all along recognised the need for a coordinated global effort to contain AMR. In 2015, the WHO launched the Global Action Plan on AMR calling for a dedicated global campaign to raise public awareness and understanding of AMR. Following this, the WHO organises annual World Antibiotic Awareness Week (WAAW) every November to promote global education on antibiotics, how they should be used, and the growing risks of AMR. WAAW is celebrated by governments, health facilities, schools and communities across the globe. The campaign highlights best practices among the general public, health workers and policymakers to help to stop the further emergence and spread of antibiotic resistance. WHO has announced the week 18 to 24 November 2020 as WAAW 2020.[16]

EXAMPLES OF HONG KONG'S RESPONSES TO ECHO THE CALL FROM WHO FROM THE HEALTH PROMOTION PERSPECTIVE

Hong Kong has also recognised the threats of AMR for years. Echoing the call from the WHO, the Hong Kong Strategy and Action Plan on Antimicrobial Resistance (2017 - 2022) launched in 2017 has outlined a number of priority actions and activities with improving awareness being one of the key action areas.[17]

In strengthening partnerships and foster engagement of relevant stakeholders, the Department of Health (DH), the Centre for Food Safety (CFS) of the Food and Environmental Hygiene Department and the Agriculture, Fisheries and Conservation Department (AFCD) jointly organised a two-day regional symposium on AMR under the theme "Fighting AMR – Partnerships in Action" in November 2018. More than 300 experts, including medical, veterinary, pharmacy, nursing and laboratory professionals as well as infection control personnel from public and private hospitals from Hong Kong and overseas joined the Symposium and took the opportunity to exchange their experience and gain knowledge of international strategies and actions in containing the AMR problem.[18]

In terms of health promotion, core health message to be promoted is of paramount importance. With reference from the findings of "General Public's Knowledge, Attitude and Practice Survey on Antimicrobial Resistance 2016/17" (survey) conducted by the Department of Health (DH) in 2016/17 reflecting (a) over half of all respondents mistakenly identified cold and flu were treatable with antibiotics; (b) around half considered not much they could do to stop AMR and (c) a large proportion of respondents rated considered videos, websites and social media were effective means for promoting the safe use for antibiotics, evidence-based awareness-raising activities with a core message to promote proper use of antibiotics were implemented targeting members of the public.[19]

For effective and timely dissemination of AMR related health messages, an AMR thematic website was first launched in 2017 and revamping was done in November 2019 with updated health messages. The webpage serves as a platform for effective delivery of health message on AMR and proper antibiotic use as well as arising public awareness on combating AMR together.

As the video was found to be an effective tool to educate patients and to both instigate and sustain behaviour change, two animated videos have been produced to promulgate proper use of antibiotics, with key messages including antibiotics are not effective for treating cold/flu, causes of AMR, route of transmission, impact on human health and what could be done by members of the public in combating AMR (i.e., proper use of antibiotics, personal hygiene and receive up-to-date vaccination).[20]

DH also launched publicity campaigns to echo WAAW since 2015 to raise awareness of public and stakeholders on the threat of AMR, and to promote proper use of antibiotics in combating the problem of AMR together effectively. For instance, the publicity campaign in 2019 involved broadcasting of the aforesaid videos in the clinics under the Hospital Authority and DH, over 200 private medical clinics and Home Affairs Enquiry Centres. The videos were also uploaded to the website of the Hong Kong Education City for access by primary school students and their parents in the territory. Mass social media publicity were also launched on YouTube, Facebook and other online channels.

Fig. 1: Screen capture of animated video "Act together now to combat AMR" produced in 2019 (Excerpted from CHP YouTube Channel, the Chinese and English version are accessible at https://www.youtube.com/watch?v=FGcuLUic_6g and https://www.youtube.com/watch?v=PJ9ABR1K7aE respectively)

Apart from a new set of poster and pamphlet, health promotion tools including hand hygiene static film stickers and medicine boxes with relevant health message were produced and distributed to promulgate the messages in the community. Moreover, under the One Health framework, DH collaborated with AFCD and CFS in launching the publicity with a related promotion during the week.

Fig. 2: CHP Facebook post in collaboration with AFCD and CFS during WAAW 2019 (Source: https://www.facebook.com/CentreforHealthProtection/posts/3074504672565429)

SUMMARY

AMR is not just a problem confined to bacteria but all microbes that have the potential to mutate and render our drugs ineffective. It is also a multi-sectoral global issue with a huge burden to the society requiring shared responsibility by all to combat. In response to the call from WHO and implementation of the AMR Action Plan in Hong Kong, DH has initiated a series of publicity works from the human health side, including but not limited to building partnership and launching publicity campaigns to echo WHO's annual WAAW. Adopting the One Health approach, there has been a collaboration with other Government departments and partners on related health promotion activities.

To preserve global precious antibiotic resources, responsible and prudent use of antimicrobials (including using the right antibiotic at the right time with right dose and duration) would be required to protect people and mitigate the progression of AMR. From the human health perspective, while doctors have the responsibility of prescribing antibiotics sensibly, it is the responsibility of patients to use antibiotics properly

according to doctor's prescription and medical advice, and everybody has a role to play.

In saving lives, we have no time to wait; let us act together to combat AMR now. For more information about AMR from the human perspective, please visit the AMR thematic webpage (screen capture on the page following this article) at https://www.chp.gov.hk/en/features/47850.html.

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Antimicrobial Resistance (AMR)

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Antimicrobial Resistance (AMR)

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香港抗菌素耐藥性策略及行動計劃
The Hong Kong Strategy and Action Plan on Antimicrobial Resistance

Homepage	About AMR	Strategic Framework
For General Public	For Healthcare Workers	Press Releases & Publications
Activities to Combat AMR	Health Education Materials	Related Links

What can I do to combat AMR?


Do not demand antibiotics from your doctor


Follow your doctor's advice when taking antibiotics


Do not stop taking antibiotics by yourselves even if you are feeling better


Practise frequent hand hygiene, especially before eating and taking medicine, and after going to the toilet


Ensure your vaccination is up-to-date


Maintain cough etiquette, wear a surgical mask if you have respiratory symptoms

Surveillance on Antimicrobial Use via Wholesale Supply from the Human Health Perspective

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INTRODUCTION

Organisms adapting to adverse environments is one of their inborn instincts for survival. As bacteria are among the oldest living organisms on earth, long before the appearance of many other organisms, it is not surprising that they have developed means to resist substances which threaten their survival. The ability of bacteria to render antibiotics ineffective to kill them was forewarned by Sir Alexander Fleming, the Nobel Prize winner, the prize having been awarded not long after his earth-breaking discovery of benzylpenicillin.[1]

Though antimicrobial resistance (AMR) is a natural process over time, it is believed that misuse or overuse of antimicrobials would aggravate the situation.[2] As such, in the year 2016, the World Health Organization (WHO) requested all member states to implement "stewardship programmes that monitor and promote optimisation of antimicrobial use (AMU) at national and local levels in accordance with international standards in order to ensure the correct choice of medicine at the right dose on the basis of evidence".[3,10] Internationally, monitoring of AMU is performed through various means.[3] Some countries monitor their AMU data by collecting: i) prescribing data through prescribers; ii) dispensing data for countries in which all prescriptions have to go through a central processing system for reimbursement; iii) insurance claim data if the majority of the residents are covered by health insurance policy; or iv) wholesale supply data if a comprehensive system for medicinal product registration and product distribution tracking is in place.

Surveillance including monitoring of AMU is one of the key action areas in the Hong Kong Strategy, and Action Plan on AMR ("HK Action Plan") published in 2017.[4] In Hong Kong, collecting wholesale supply data is considered to be the most suitable approach to monitor AMU, as it is mandatory for any medicinal products, including antimicrobials, to be registered with the Pharmacy and Poisons Board, and drug wholesalers need to be licensed before distributing antimicrobials to the eight designated sectors, namely: i) Community Pharmacies; ii) Department of Health (DH); iii) Farmers; iv) Hospital Authority (HA); v) Private Doctors; vi) Private Hospitals; vii) Registered Dentists; and viii) Registered Veterinary Surgeons. Besides, licensed drug wholesalers are legally required to keep comprehensive transaction records of all medicinal product distribution, and hence it is possible to monitor the movement of antimicrobials by collecting the wholesale supply data of antimicrobials through licensed drug wholesalers.[5,6]

STANDARDISED UNIT IN MEASURING AMU

Since different drugs carry different dosing quantities and dosing frequency, the WHO has promulgated a system to group and calculate the number of drugs being consumed according to their anatomical, therapeutic and chemical properties, namely, the Anatomical, Therapeutic and Chemical (ATC) classification system. Drugs grouped under the ATC classification system would be given a unique ATC code and a corresponding constant according to their route of administration. The constant is known as Defined Daily Dose (DDD), which is defined as the assumed average maintenance dose per day for a medicine used for its main indication in adults.[7]

DDD is a commonly used unit to standardise the quantities of various drugs used which may involve different dosing quantity through a different route of administration. By aggregating the quantities of the drug of various preparations used (in grams or International Units, wherever appropriate) and then divide the sum by the assigned DDD constant of that drug, usage of various drugs with different dosing quantity, frequency and dosage form can then be compared. More information on ATC code and DDD can be found at http://www.whocc.no/atc_ddd_index.

GROUPING OF ANTIMICROBIALS

Improving AMU through antibiotic stewardship is considered to be one of the key interventions necessary to curb further emergence and spread of AMR.[8] For this reason, apart from the ATC classification system used for grouping antimicrobials and other pharmaceutical products, the WHO in 2017 introduced the Access, Watch, Reserve ("AWaRe") classification system of antibiotics in its Essential Medicines List.[9] This system is a tool for supporting antibiotic stewardship at local, national and global levels with the aim of not only reducing antimicrobial resistance but also ensuring that appropriate treatment are readily available. In the AWaRe classification system, antimicrobials are grouped into three categories, namely: i) Key Access Antibiotics (the Access Group) for antimicrobials being available at all times as first-line treatments for a wide range of common infections; ii) Watch Group Antibiotics for antimicrobials recommended as first- or second-choice treatments for a limited number of infections; and iii) Reserve Group Antibiotics for antimicrobials that should be considered "last resort" options and used only in the highly specific circumstances when all other alternatives

have failed, such as life-threatening infections due to multidrug-resistant bacteria. A list of example antimicrobials grouped by AWaRe classification can be found in Table 1.

Table 1: Examples of antimicrobials grouped by AWaRe classification (Excerpted from the WHO, 2018[10])

AWaRe Classification			
Access	**Watch**	**Reserve**	**Others**
Amoxicillin/ Clavulanic Acid Amoxicillin Doxycycline Metronidazole Cefalexin	Azithromycin Levofloxacin Clarithromycin Ciprofloxacin Ofloxacin	Cefepime Linezolid Colistin Daptomycin Fosfomycin	Cefuroxime Combinations of Penicillins Lymecycline Cefaclor Tetracycline

METHODOLOGY

Data Scope

Annual retrospective collection of wholesale supply data of the previous year was commenced in 2017 (2014 to 2016 wholesale supply data were collected in 2017). Product certificate holders of registered antimicrobial products and licensed drug wholesalers were requested to return supply data if they ever handled the antimicrobial products belonging to the groups of antimicrobials as recommended by the WHO.[3] Information on dosage form, ingredient, strength per unit dose and quantity supplied to the eight designated sectors were collected for each of the registered antimicrobial products. Only wholesale supply data for antimicrobial products of systemic use, which included preparations administered through the systemic routes, such as oral, rectal, inhalation and parenteral routes, were included for analysis. Information for antimicrobials of external preparations such as cream, ointment and eye/ear drops were not collected.

Data Analysis

Collected data were processed, and the supply quantity for the eight designated sectors in DDD was calculated. The calculated DDD figures of each antimicrobial product were grouped according to the respective ATC group and route of administration. In order to adjust for the change in the Hong Kong population, DDD per 1,000 inhabitants per day (DID) was also calculated, based on the annual year-end Hong Kong population. Antimicrobials supplied to non-human sector (i.e. farmers and veterinarians) and antimicrobials for animal use were not included in the analysis as these antimicrobials are not intended for human use.

Antimicrobial wholesale supply quantity to various sectors in DDD was also grouped according to the WHO AWaRe classification for calculation.[10]

Antimicrobials with a broad spectrum of anti-bacterial coverage as listed in Table 2 are drugs for treating infections caused by resistant bacteria and seriously ill patients. Some of them are regarded as last resort antimicrobials for treating resistant bacterial infections. These antimicrobials were selected for further examination in supply quantity.

Table 2: List of locally-important broad spectrum antimicrobials (Excerpted from the CHP, 2020[12])

ATC Pharmacological Group	Some locally-important broad spectrum antimicrobials
Beta-Lactam Antibacterials, Penicillins (J01C)	Piperacillin/Tazobactam
Other Beta-Lactam Antibacterials (J01D)	Ceftazidime Cefoperazone/Sulbactam Cefepime Meropenem Ertapenem Imipenem/Cilastatin Ceftaroline Fosamil Ceftolozane/Tazobactam
Other Antibacterials (J01X)	Vancomycin Teicoplanin Colistin Linezolid Daptomycin

RESULTS

For simplicity of presentation, only the results of 2016 to 2018 are presented here.

In 2019, wholesale supply data for year 2018 was compiled from the returns of a total of 1,298 registered antimicrobials of which 737 products were reported as not being supplied in Hong Kong. A total of 59.2 million DDD was supplied to human sectors in Hong Kong, equivalent to 21.7 DID when adjusted for Hong Kong population. When compared with prior years of wholesale supply data, the overall supply of antimicrobials peaked in 2016 (23.6 DID) and declined in 2017 (21.5 DID), but then had a slight increase in 2018.

Stratified wholesale supply data by the eight designated sectors showed that the four sectors with the highest supply volume of antimicrobials in 2018 were private doctors (55.1%), HA (23.3%), community pharmacies (8.0%) and private hospitals (7.7%), followed by registered dentists (3.6%), registered veterinary surgeons (1.2%) and DH (1.1%). (Fig. 1)

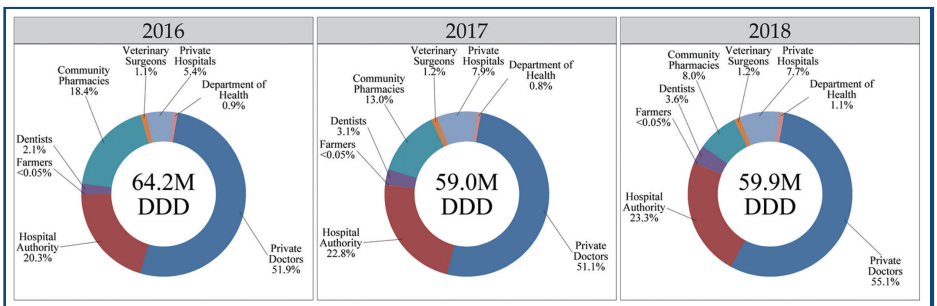

Fig. 1: Overall antimicrobial supplied in Hong Kong, stratified by eight designated sectors, 2016-2018 (Compiled by author)

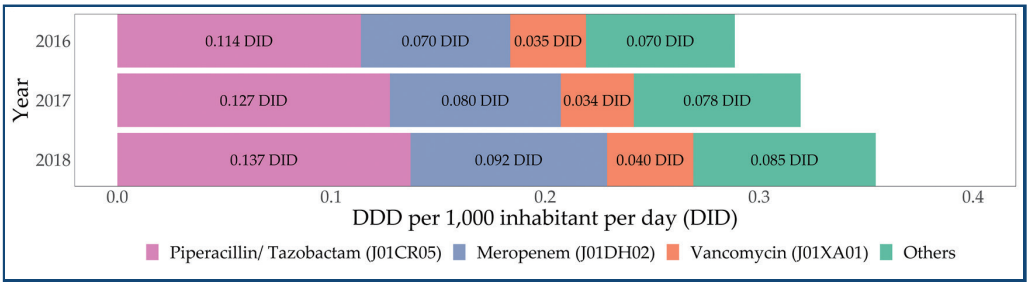

Fig. 2: Supply of broad-spectrum antimicrobials in Hong Kong, 2016-2018 (Compiled by author)

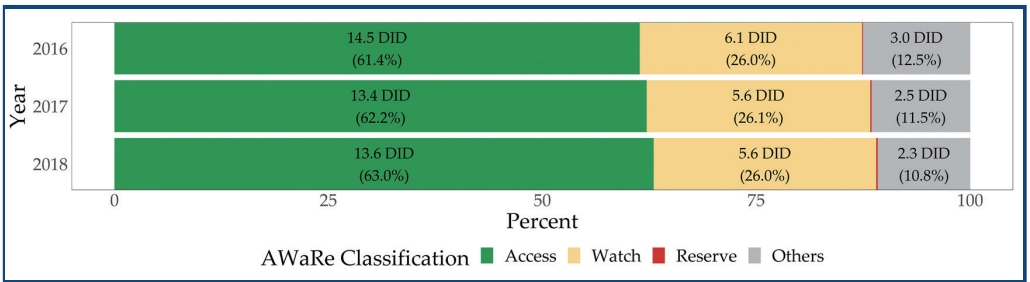

Fig. 3: Overall antimicrobials supplied to human sectors in Hong Kong, stratified by AWaRe classification, 2016 - 2018 (Compiled by author)

For locally-important broad spectrum antimicrobials, nearly all (99.5%) were supplied for use in hospital settings, i.e. supplied to HA and private hospitals. Wholesale supply of these antimicrobials in Hong Kong was on the increase from 2016 to 2018 in general, especially the top 3 most supplied ones, namely, piperacillin/tazobactam, meropenem and vancomycin. (Fig. 2)

Amount of antimicrobials supplied to human sectors stratified by AWaRe classification, the overall wholesale supply was consistent throughout the study period, with over 60% belonging to the Access Group from year 2016 to 2018. (Fig. 3)

DISCUSSION

The WHO suggests a number of possible use in monitoring data on antimicrobials consumption[3] which include: i) relating exposure to antimicrobials to the development of AMR; ii) identifying and providing early warning of problems relating to changes in exposure and utilisation and to develop interventions to address problems identified; iii) monitoring the outcomes of interventions aimed at changing exposure; iv) assessing the quality of prescribing practice against practice guidelines; and v) raising awareness in health professionals, consumers and policy makers of the issues of AMR and the contribution of inappropriate use of antimicrobials in humans.

Examination of wholesale supply data has enabled regulatory body in identifying area for improvement. For example, since the publication of the HK Action Plan in 2017, a significant reduction in antimicrobials supplied to community pharmacies was observed, as reflected by the reduction from 18.4% of total supply in 2016 to 8.0% in 2018. [11,12]

An increase in supply volume of locally-important broad-spectrum antimicrobials, in particular piperacillin/tazobactam, meropenem, and vancomycin, was observed in Hong Kong. While a majority of these antimicrobials were supplied to hospital settings, these drugs need to be closely monitored as they should be reserved for treatment of resistant bacterial infections only.

The WHO has targeted that at country-level, based on AWaRe classification, at least 60% of antimicrobial consumption should come from medicines in the Access Group.[13] Hong Kong has been consistently achieving the target, with over 60% of the overall antimicrobials supplied by means of wholesale fell into the Access group.

The strength of adopting the wholesale supply antimicrobial data as the national supply data is that it can capture the over-the-counter sale of antimicrobials which other methods of data collection may miss, such as capturing the dispensing data by prescriptions through medical practitioners and hospitals. In addition, the majority of the primary healthcare services in Hong Kong are provided by private medical practitioners, who are not obligated to report their prescription data, including the antimicrobial prescription data, to the authorities.[14] Despite the fact that alternative data source such as prescribing or dispensing data may reflect a more accurate picture in consumption volume, wholesale supply data of antimicrobials is still considered to be an appropriate measurement in estimating which and how many antimicrobials being supplied to various sectors, through which the drugs are assumed to be then supplied to their patients or customers eventually.

Finally, with continuous surveillance of antimicrobials by wholesale supply to various sectors using the ATC classification, trend comparison of the total supply in Hong Kong and the supply of various antimicrobials within the same sector can be made. Such trend observation can inform policy makers whether the measures imposed are effective or additional measures are required in response to the newly observed trend, if any.

LIMITATION

Nevertheless, limitations below should be taken into consideration when interpreting the findings.

Firstly, DDD is a technical unit and not necessarily representing the recommended or average prescribed dose for the disease indicated.[7] In addition, since it is an assumed average maintenance dose per day in adults, so caution must be exercised when applying it to analyse and interpret paediatric AMU data.

Secondly, wholesale supply data collected from licensed wholesalers and product certificate holders reveal that antimicrobials supplied to farmers were less than 0.05% of total antimicrobial supply in Hong Kong. Nevertheless, it should be noted that there are indications that food animal farmers may import antimicrobials that are not on the "List of Registered Pharmaceutical Products" through other channels as registered antimicrobial products suitable for food animal use are limited in Hong Kong. Therefore, the wholesale supply data may not capture the entire scope of veterinary antimicrobial products for food animal use.

Thirdly, given the different characteristics of AMU data sources and methodologies in AMU monitoring adopted by different countries, direct comparison on AMU figures among different countries and regions may not be appropriate.

ADVICE TO HEALTHCARE WORKERS

Antimicrobials are a precious resource. Healthcare workers play an essential role to preserve their effectiveness against infections by: i) prescribing appropriate antibiotics in accordance with guidelines; ii) discussing with patients about the importance of choosing the right antibiotic and the risks of AMR; iii) applying infection prevention and control principles; and iv) educating patients on infection prevention including personal hygiene, hand hygiene and vaccination.

Readers are encouraged to go to the AMR thematic webpage of the Centre for Health Protection of the DH for more details of the wholesale supply: https://www.chp.gov.hk/en/static/103276.html.

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Certificate Course for General Practitioners, Nurses and Health Care Providers who are interested in Cardiology

● Course No. C358 ● CME/CNE Course

Certificate Course in

Cardiology 2020

(Video Lectures)

Jointly organised by

The Federation of Medical Societies of Hong Kong

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Objectives:

This course is designed for General Practitioners, Nurses and Health Care Providers who are interested in Cardiology. A series of lectures covering up-to-date cardiology knowledge and skill in day-to-day clinical practice.

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To tie in with the new CME requirements for video lectures, DOCTORS are required to complete a quiz after the completion of the videos.

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10 Nov, 2020	Current Management of Common Cardiac Arrhythmia	Dr. KO Yiu Kwan, Cyril Specialist in Cardiology Private Practice
17 Nov, 2020	Heart Failure: the Past Present and Future	Dr. KWOK Chun Kit, Kevin Specialist in Cardiology Private Practice
24 Nov, 2020	Application of CT Coronary Angiogram	Dr. KO Kwok Chun, Jason Specialist in Cardiology Private Practice
1 Dec, 2020	Common Heart problems in Paediatric Patients	Dr. YUNG Tak Cheung Consultant Division of Paediatric Cardiology Department of Paediatrics and Adolescent Medicine Hong Kong Children's Hospital
8 Dec, 2020	"Acute Pulmonary Embolism" and "Acute Deep Vein Thrombosis"	Dr. TAN Guang Ming Associate Consultant, Division of Cardiology Department of Medicine and Therapeutics Prince of Wales Hospital
15 Dec, 2020	Management of Chest Pain and Acute Coronary Syndrome	Dr. CHENG Yue Hong, Victor Associate Consultant Internal Medicine - Division of Cardiology Pok Oi Hospital

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Knowledge, Attitude and Practice in Relation to Antimicrobial Resistance Amongst Medical Practitioners Practising in Hong Kong

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BACKGROUND

The Hong Kong Strategy and Action Plan on Antimicrobial Resistance (2017 - 2022) launched in 2017 recommended, among others, to monitor knowledge, attitude and practice (KAP) towards antimicrobial resistance (AMR) and antimicrobial use among the general public and target population identified by the survey.[1] Results of KAP surveys were useful in providing guidance for key messages to be developed and in providing means for promulgation targeting different target populations (e.g. general public, healthcare professionals) in order to raise awareness and enable them to use antimicrobials in an appropriate manner.

This article will give an account on the key findings of a KAP survey of medical practitioners ("The Survey") on AMR conducted by the Department of Health in 2019. Besides obtaining information on KAP related to AMR and antibiotic use, the Survey also provided an opportunity to evaluate the effectiveness of existing tools for optimising the use of antibiotics, namely Interhospital Multi-disciplinary Programme on Antimicrobial ChemoTherapy (IMPACT) guideline, antibiogram for public/private hospitals and Antibiotic Stewardship Programme (ASP) in Primary Care/ Hospital.[2,3]

METHODOLOGY OF THE SURVEY

The sampling frame of the Survey involved a random sample of medical practitioners fully registered with the Medical Council of Hong Kong under the Medical Registration Ordinance who were on the Resident List of the General Register as at 1 July 2018. While primary care was patients' first point of contact in the continuum of healthcare process, the Survey also explored this group of doctors in particular. The target sample size was 1,067 registered medical practitioners, among whom at least 350 should be primary care medical practitioners. The Survey was conducted by self-administrated paper-based or web-based questionnaire consisting of 24 questions in English. Paper-based questionnaires with unique QR code and password (for access to web-based questionnaire) were mailed to selected medical practitioners. The fieldwork was conducted from 11 September to 31 December 2019, achieving a sample size of 1,074 (including 364 primary care doctors) and a response rate of 12.3%.

KEY FINDINGS OF THE SURVEY

Demographics of Respondents

We analysed data collected from 1,043 medical practitioners (including 354 primary care doctors) who were practising in Hong Kong as of 30 June 2019. Among them, about two-thirds (66.9%) of respondents enumerated were males, and there were relatively more respondents of younger age: aged 36 to 45 years (25.7%); aged 46 to 55 years (23.4%); aged 35 years or below (21.0%); and aged 56 to 65 years (18.1%). Slightly over one in ten (11.8%) respondents were aged over 65 years.

About a quarter of respondents enumerated had been practising in the medical profession for 11 to 20 years (27.4%), over 30 years (26.9%) and 21 to 30 years (25.2%) respectively, whereas another 20.5% of the respondents had been in practice for ten years or less. Most of the respondents were either working with the Hospital Authority (47.0%) or in the private sector (45.3%). A very small proportion of them were working with the Government (4.9%), academic institutions (1.8%) or subvented organisations (1.0%). About two-thirds (66.7%) of them spent most of their working time in specialty practice, either as specialists, fellows or trainees, while around three in ten (31.8%) mainly spent their time on general practice.

Among those practising in specialties and working as specialists, fellows or trainees, the specialties included internal medicine (22.0%), family medicine (15.2%), surgery (10.3%), paediatrics (9.4%), emergency medicine (7.2%), obstetrics & gynaecology (7.1%) and anaesthesiology (5.2%).

Knowledge and Awareness

Majority of respondents considered AMR severe worldwide (70.1%) and in Hong Kong (65.1%), and over 97% of the respondents were aware that AMR could lead to reduced treatment options, increased treatment cost, increased mortality and increased length of hospital stay. Relatively more respondents considered that patients' self-medication with antibiotics (83.2%) and inappropriate choice of drug (83.0%) were important drivers of AMR. (Fig. 1)

The less experienced respondents were more likely to rate AMR in Hong Kong as "very severe" or "slightly severe". The proportion of respondents practised for ten years or less was the highest (79.0%) among all

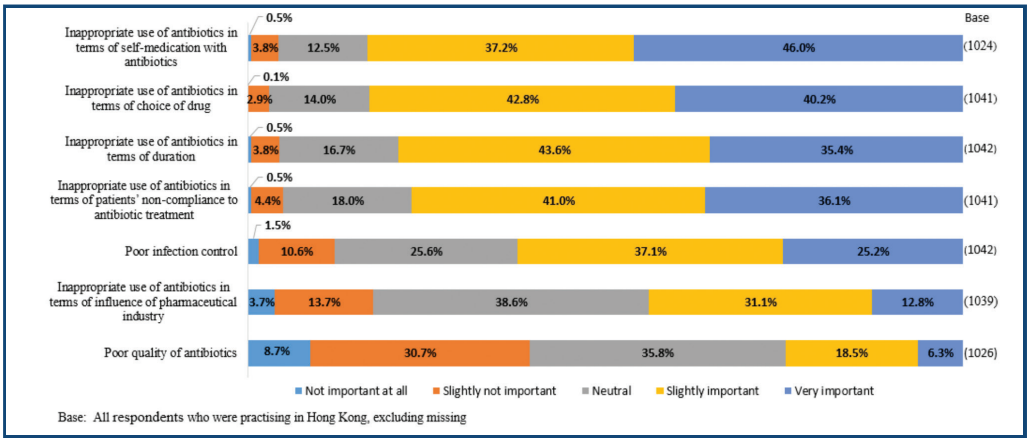

Fig. 1: Importance of various drivers of AMR (Data from the Survey, compiled by the authors)

groups who considered AMR in Hong Kong was "very severe" or "slightly severe". About one in ten (9.6%) respondents from the private sector considered AMR slightly or not severe in Hong Kong, a proportion being at least doubled compared with respondents working in other sectors.

Practice of Antibiotic Prescription

A majority (86.8%) of respondents enumerated expressed they "always" or "often" reminded their patients to complete course of the antibiotics as prescribed, while slightly more than half (58.1%) "always" or "often" explained to patients that improper use of antibiotics would increase AMR.

Nearly half (43.9%) of respondents prescribed antibiotics in less than 10% of all consultations. Around half (56.8%) prescribed antibiotics for cold, influenza, or upper respiratory tract infection (collectively abbreviated as "URTI" for ease of subsequent presentation) in a frequency of less than 5%. Univariate analysis revealed that being female, practising for 11 to 20 years, working in the Government, and practising surgery-related specialties (covering surgery, orthopaedics and traumatology as well as otorhinolaryngology) were associated with less frequent prescription of antibiotics for URTI.

More than half (59.4%) of the respondents reported "always", "often" or "sometimes" requested by patients for antibiotics for URTI, and higher frequency of such requests were associated with doctors who were male or in the general practice field. Despite this, a majority (83.0%) of all respondents "never" or "rarely" prescribed antibiotics whenever patients requested. On the other hand, the frequency of prescribing antibiotics for uncomplicated URTI whenever patients requested was significantly associated with the perceived importance of reasons for unindicated antibiotic prescription including patient/carer's expectation or request, being unable to ensure the return of patient for follow up, no time to explain why not indicated and fear of patient's litigation. Among those reported "always", "often" or "sometimes" prescribed antibiotics for uncomplicated URTI whenever patient requested, 30.9% and 26.9% respectively considered "Expectation/request of antibiotics by patients or carers" and "Fear of patient's litigation" as important reasons accounting for unindicated antibiotic prescription and these proportions were significantly lower among those reported "rarely" or "never" (less than 25% and 15% respectively). (Fig. 2)

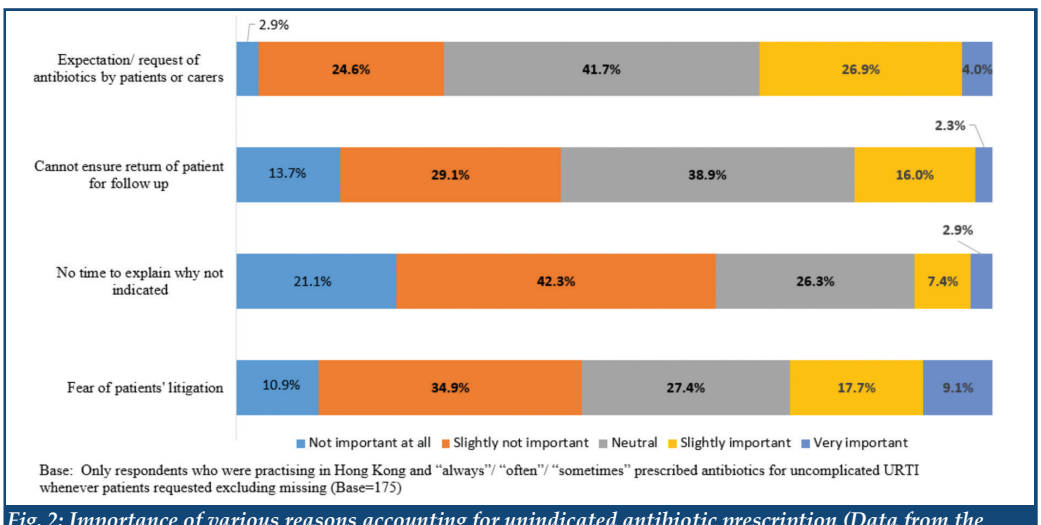

Fig. 2: Importance of various reasons accounting for unindicated antibiotic prescription (Data from the Survey, compiled by the authors)

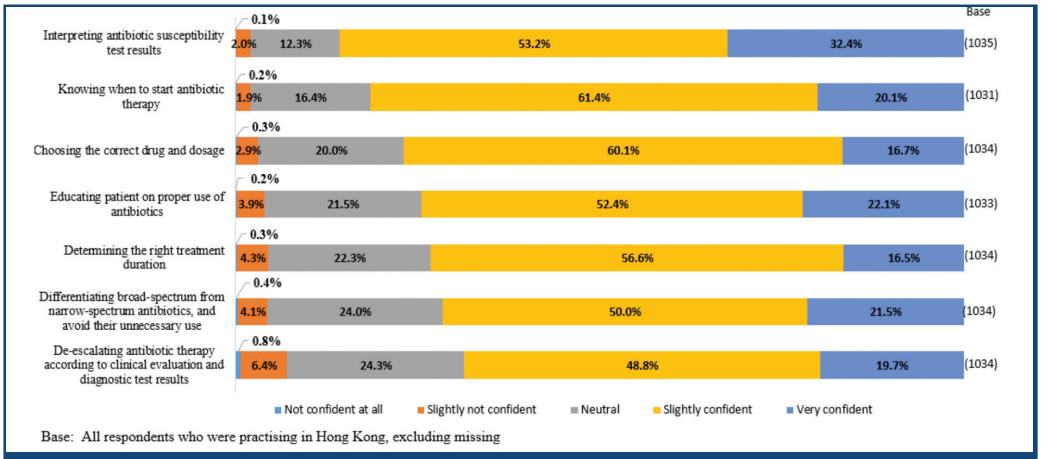

Fig. 3: Level of confidence in antibiotic prescription-related tasks (Data from the Survey, compiled by the authors)

Majority (71.9%) of respondents considered themselves adequately trained on antibiotic use. Male gender, longer duration of practice and working in academic institutions were found to be factors by univariate analysis associated with perceived adequately trained on antibiotic use. Findings in relation to the level of confidence in antibiotic prescription amongst respondents were graphically presented in Fig. 3. Over 80% of respondents were confident in interpreting antibiotic susceptibility test results (85.6%) and knowing when to start antibiotic therapy (81.4%). Around seven in ten respondents were confident in choosing the correct drug and dosage (76.8%), educating the patient on the proper use of antibiotics (74.5%), determining the right treatment duration (73.1%), differentiating broad-spectrum antibiotics from narrow-spectrum antibiotics and avoiding their unnecessary use (71.5%) and de-escalating antibiotic therapy according to clinical evaluation and diagnostic test results (68.6%).

Less than four in ten respondents (38.4%) reported "always" or "often" re-assessed patients' antibiotic regimen after 48 to 72 hours of initiating treatment. Univariate analysis showed that male doctors, those working in academic institutions, those practising in specialty (especially surgery-related) were more inclined to practise this more frequently.

Evaluation of Tools

Amongst the tools covered by the Survey, the IMPACT guideline was known to most (78.7%) respondents, followed by the antibiogram for public and private hospitals at 68.2% and the ASP in Primary Care or Hospital at 64.4%. Subgroup analysis revealed that those with fewer years of practice, working in the Hospital Authority, and practising in specialty were more aware of the IMPACT guideline. Enumerated medical practitioners working in academic institutions and in the administration/teaching field were more aware of antibiograms, while those working in academic institutions were more aware of ASP-related tool.

Among the respondents who were aware of the corresponding tools, between 70% to 80% expressed that they "always", "often" or "sometimes" used the IMPACT guideline (78.2%), antibiogram for public and private hospitals (72.2%), and ASP in Primary Care/ Hospital (71.2%). The frequency of using the tools by relevant respondents was not significantly associated with any of their demographics (gender, year of practice, type of institution, major field of practice, and specialty). Effectiveness of the tools perceived by relevant respondents was also not significantly associated with any of their demographics. Among those who had used the corresponding tools, around three quarters considered the tools useful in improving doctors' knowledge on the proper use of antibiotics: IMPACT guideline (78.5%), antibiograms (78.1%) and ASP-related tools (72.0%). (Fig. 4)

Primary Care Doctors

Primary care doctors (respondents who replied "general practice" as the major field of practice or "family medicine" as his/her specialty in the questionnaire) were more inclined to regard patients' non-compliance with antibiotic treatment, self-medication by patients and poor quality of antibiotics as important drivers to AMR.

In terms of practice, primary care doctors more frequently reported explaining to their patients about the indication of antibiotic prescription, the side effects of antibiotics, the need for complete course of antibiotics as prescribed, and the consequential relationship between improper use of antibiotics and increased AMR.

Compared with those not working in the primary care setting, fewer primary care doctors reported "always" or "often" acceding to request by patients for antibiotics to treat URTI, while more of them considered expectation or request by patients or carers an important reason for an unindicated antibiotic prescription. Of note is that primary care doctors prescribed antibiotics less frequently, and explained to their patients why antibiotics were not indicated more frequently. However, fewer primary care doctors reassessed their patients' antibiotic regimen frequently, and fewer primary care doctors made decisions on antibiotic prescription with reference to peers' suggestions, specialist consultation, and laboratory or Point-of-Care test.

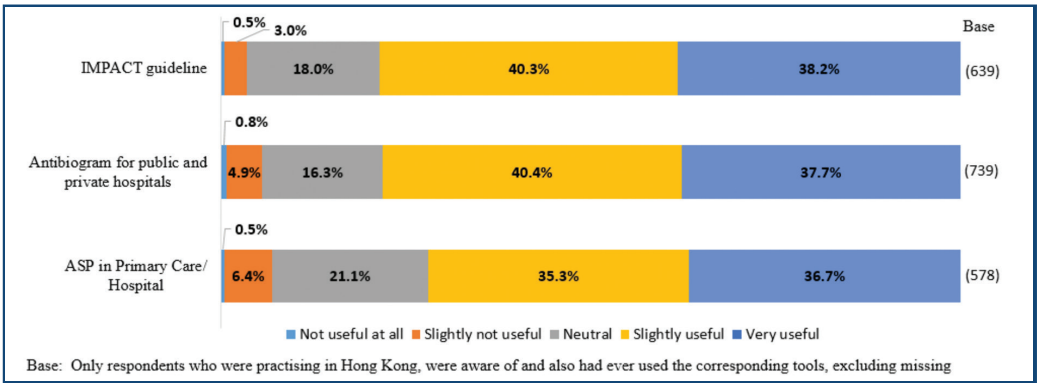

Fig. 4: Response on "How would you rate the effectiveness of the following on improving doctors' knowledge on proper use of antibiotics?" (Data from the Survey, compiled by the authors)

While more primary care doctors were confident in educating their patients on the proper use of antibiotics, they were relatively less confident in differentiating various broad-spectrum antibiotics, and in de-escalating antibiotic therapy. Moreover, fewer primary care doctors were aware of the availability of IMPACT guideline, antibiograms and ASP related tool. Nevertheless, more of them considered continuous medical education (CME)-accredited formal lectures, and web or computer-based resources useful to improve doctors' knowledge on the proper use of antibiotics.

RECOMMENDATIONS ARISING FROM THE KEY FINDINGS

As relatively fewer respondents from the private sector considered AMR a severe problem in Hong Kong, future AMR awareness-raising activities could be arranged to target medical practitioners working in the private sector.

Since patients' self-medication with antibiotics was considered by most respondents an important driver of AMR, members of the public should be educated more on the disastrous consequences of AMR instead of merely asking them to stop practising self-medication.

Patient education and expectation management should be enhanced in the public promotional campaigns for the following findings:

1. More than half of the respondents reported "always", "often" or "sometimes" requested by patients for antibiotics for URTI;
2. Respondents who "always", "often" or "sometimes" prescribed antibiotics for uncomplicated URTI upon patients' requests were more likely to consider "expectation/request of antibiotics by patients or carers" and "fear of patient's litigation" as important reasons for unindicated antibiotic prescription.

The Survey revealed comparatively fewer doctors were confident in de-escalating antibiotic therapy and differentiating broad-spectrum antibiotics. As such, these two areas should be strengthened in continuous professional training, guiding tools and reference materials.

Noting from the Survey results, the Department of Health should target at primary care doctors in future promotional campaigns focusing on promulgation of the use of IMPACT guideline, antibiograms and ASP. Efforts could be made to explore and remove hindrance to application of the tools, as well as to create a feedback mechanism for continuous improvement of these tools. Dissemination of relevant training could be done via CME-accredited formal lectures as well as web- or computer-based resources, which were considered useful by the majority of respondents.

For more details about the Survey, please visit the "Press Release & Publication" page of the Department of Health's AMR thematic website at https://www.chp.gov.hk/en/features/47850.html#10006.

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大部分上呼吸道感染由病毒引起
並不須使用抗生素

Most of the Upper Respiratory Tract Infections are caused by virus
Antibiotics are not needed

Antibiotic Stewardship Programme in Primary Care

Antibiotic Stewardship Programme in Primary Care

基層醫療
抗生素導向計劃

Antibiotic Stewardship Programme in Primary Care

Antimicrobial resistance (AMR) occurs when microorganisms such as bacteria, viruses, fungi and parasites change in ways that render the medications used to cure the infections they cause ineffective. AMR is a global public health concern. It is a problem related to you and me as AMR could affect anyone, of any age, in any country, resulted in reduced efficacy of antimicrobials, making the treatment of patients difficult, costly or even impossible. AMR can occur naturally, but misuse of antimicrobials in humans and animals is accelerating the process. Therefore, responsible use of antimicrobials is the key success factor for AMR containment.

Concerted efforts of the healthcare sector, general public and all stakeholders in the community and all over the world are required to combat AMR. Primary care is the first level of care in the whole healthcare system and family doctors are the main providers. They play a pivotal role in tackling AMR problem by reducing unnecessary antibiotic use. In connection to this, Centre of Health Protection of the Department of Health rolled out the “Antibiotic Stewardship Programme in Primary Care”, aiming to optimize the use of antibiotics by providing evidence-based antibiotic prescription guidance for common infections in community for doctors and healthcare professionals as reference. The guidance notes will be kept updating based on local epidemiology and international best practice.

As members of the public, your pledge to judicious use of antibiotics indeed is very important. Only use antibiotics when prescribed by a qualified health professional. Never share or use leftover antibiotics. Trust your family doctors and never demand antibiotics. Always follow their advice when using antibiotics. Besides, simple infection prevention and control measures like practicing good hand hygiene, maintain cough etiquette, ensure vaccinations up to date and prepare food hygienically, in fact are able to contribute in containment of AMR.

Antibiotics are a precious resource and should be preserved. Please get more information on AMR and the programme from your family doctors. We would also like to take this opportunity to thank our family doctors of their unfailing support to judicious use of antibiotics and to disseminate the health materials and messages to clients during clinical encounters for raising people’s awareness of appropriate antimicrobial use and infection control measures.

- Advisory Group on Antibiotic Stewardship in Primary Care
- Guidance Notes on Antibiotic Use
- Education Materials
- Antibiogram

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Antibiotic Stewardship Programme in Primary Care Thematic Webpage

Reducing bacterial resistance with IMPACT Fifth Edition

Interhospital Multi-disciplinary Programme on Antimicrobial ChemoTherapy

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Appropriate Use of Antibiotics for Acute Uncomplicated Cystitis in Women in Primary Care Setting

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This article has been selected by the Editorial Board of the Hong Kong Medical Diary for participants in the CME programme of the Medical Council of Hong Kong (MCHK) to complete the following self-assessment questions in order to be awarded 1 CME credit under the programme upon returning the completed answer sheet to the Federation Secretariat on or before 30 November 2020.

INTRODUCTION

Antibiotic Stewardship Programme (ASP) is defined as an organisational or system-wide healthcare strategy to promote the appropriate use of antimicrobials through the implementation of evidence-based interventions. ASP optimises the use of antimicrobials, improve patient outcomes, reduce antimicrobial resistance and healthcare-associated infections, and save healthcare costs amongst others.[1] Implementation of ASP, and related training is also one of the activities to combat antimicrobial resistance (AMR), as set out in the Hong Kong Strategy and Action Plan on Antimicrobial Resistance addressing the key target to "optimise the use of antimicrobials in humans and animals".[2]

Apart from the hospital setting, implementation of ASP supported by the provision of tools such as guidelines and antibiograms is also possible in the community setting for treatment of common infections. In the following sections, we attempt to illustrate, using the scenario of acute cystitis, how optimal use of antibiotics could be achieved in the primary care setting.

DIAGNOSTIC APPROACH OF ACUTE CYSTITIS

Acute cystitis is a form of uncomplicated lower urinary tract infection (UTI). It usually occurs in pre-menopausal, non-pregnant woman with no known urological abnormalities or comorbidities. Typical symptoms are those related to irritation of the lower urinary tract, such as dysuria, urinary frequency, urgency and occasionally haematuria. Physical findings are usually normal, but there may be mild suprapubic tenderness. According to a previous local study, *Escherichia coli (E. coli)* is the predominant organism account for 75% to 80% among women with cystitis.[3]

About one in two women who present with the symptoms of UTI have a genuine infection. Specific combinations of symptoms (e.g. dysuria and frequency without vaginal discharge or irritation) increase the probability of UTI to over 90%, effectively ruling in the diagnosis.[4,5] Additional testing with a urine dipstick for leukocyte esterase would not further improve the likelihood of true infection.[6] As such, the diagnosis is often based on symptomatology alone, especially in the primary care setting. Important points in history taking include any fever, flank pain, vaginal discharge, last menstrual period, sexual and past medical history (e.g. previous episodes of UTIs, diabetes mellitus, indwelling urinary catheters, immunocompromised conditions and underlying urological abnormalities).[4,6] The presence of chronic medical conditions or structural defect may suggest the possibility of a more complicated diagnosis e.g. acute pyelonephritis other than simple bacterial cystitis. We should also examine for any signs and symptoms related to upper tract infection e.g. loin pain, costovertebral angle tenderness, chills, rigour and systemic upset. Differential diagnoses of simple cystitis include pyelonephritis, vaginitis, urethritis, painful bladder syndrome (interstitial cystitis), pelvic inflammatory disease and nephrolithiasis.

Dipstick urinalysis is a simple, inexpensive test and could be helpful for the diagnosis of acute uncomplicated cystitis if the clinical presentation is atypical. In women with uncomplicated UTI, a positive urine dipstick result of either nitrite or leucocytes and blood carries a sensitivity of 77% and a specificity of 70%. If nitrite, leucocytes, and blood are all negative, the negative predictive value of UTI is 73%; while a positive nitrite and either blood or leucocytes has a positive predictive value of 92%.[7]

THE ROLE OF URINE CULTURE

Routine urine culture for the management of acute uncomplicated cystitis may not be necessary. Collection of urine culture is recommended when symptoms are atypical, do not resolve, or recur within two to four weeks after the completion of treatment, and for those with suspected upper urinary tract infection.[4] Midstream urine specimen should be used for testing to reduce contamination. A colony count greater than or equal to 10^3 colony-forming units per mL of an uropathogen is considered diagnostic of acute uncomplicated cystitis. It should be noted that antibiotic treatment is usually not required for asymptomatic bacteriuria, except in pregnancy or before urological procedures for which mucosal bleeding is anticipated.[8]

LOCAL ANTIBIOTIC SUSCEPTIBILITY

Upon identification of classic symptoms, empirical treatment should be considered even without urine culture or dipstick urinalysis. In making the

appropriate choice of antibiotics, local antibiotic susceptibility patterns of uropathogens should be taken into account. According to the results of the sentinel surveillance of private medical practitioners (PMP) conducted by the Centre for Health Protection (CHP) in 2019, 71 (44.4%) of 160 female patients (70% < 65 years) with mid-stream urine bacterial culture collected for urinary tract infection showed positive results, with 49 (69.0%) isolates being identified as *E. coli*.[9] None of the 49 *E. coli* isolates was non-susceptible to nitrofurantoin. Two (4.1%) of the *E. coli* isolates were resistant to amoxicillin-clavulanate, while 14 (28.6%) were resistant to levofloxacin and 22 (44.9%) were resistant to co-trimoxazole. Limitations of this set of sentinel surveillance data include only one-year duration and a relatively small sample size. Minor variations between years of collected data are expected.

OTHER CONSIDERATIONS FOR CHOICE OF ANTIBIOTICS

Besides the susceptibility profile, another important factor to be considered when deciding on empirical antibiotic choice is "collateral damage". The term refers to adverse ecological effects of antimicrobial therapy, such as the selection of drug-resistant organisms and colonisation or infection with these organisms. Such a phenomenon has been observed with broad spectrum cephalosporins and fluoroquinolones. Use of broad-spectrum cephalosporins has been associated with subsequent infection with vancomycin-resistant enterococci (VRE), extended spectrum beta-lactamase (ESBL) - producing *Klebsiella pneumoniae*, beta-lactam-resistant *Acinetobacter* species, and *Clostridioides difficile* (formerly known as *Clostridium difficile*) infection. Fluoroquinolones, on the other hand, have been linked to infection with methicillin-resistant *Staphylococcus aureus* (MRSA) and increased cross resistance to other gram-negative bacilli, e.g. *Pseudomonas aeruginosa*. Given that uncomplicated UTI is frequently encountered in general practice affecting many of the population, the choice of antibiotic to treat such condition can exert significant ecological pressure on other organisms and infections.[10]

RECOMMENDED MANAGEMENT IN THE LOCAL SETTING

Table 1 is extracted from the Guidance Note on Acute Uncomplicated Cystitis in Women of Primary Care Antibiotic Stewardship Programme by CHP, which indicates the preferred choices of antibiotics in the local setting.[11] As recommended, nitrofurantoin is an appropriate first choice for therapy with low local resistance rate (as indicated by the absence of detection in sentinel surveillance of PMP in 2019) and minor collateral damage as shown by the preserved in vitro susceptibility of *E. coli* to nitrofurantoin over many years of use.[10] Amoxicillin-clavulanate is another suitable choice, with a low resistance profile (again supported by the 4.1% in sentinel surveillance of PMP in 2019) and physiological concentration in urine, meaning that the drug remains to be efficacious even if the antibiotic susceptibility result is "intermediate" instead of "sensitive".[12] In fact, both beta-lactams (e.g. amoxicillin-clavulanate and cefuroxime) and fluoroquinolones exhibit such property in general. However, two reasons limit the routine use of fluoroquinolones. Firstly, the rate of resistance among *E. coli* is higher than 20%, the suggested threshold of resistance prevalence at which an antibiotic is no longer recommended for empirical treatment of acute cystitis.[10] Secondly, the side effect profile of fluoroquinolones is suboptimal, carrying a potential risk of serious side effects (e.g. joint or tendon pain, muscle weakness, tingling or pricking sensation, numbness in the arms or legs, confusion, and hallucinations) which generally outweighs the benefits for simple infections. In this regard, the Food and Drug Administration of the United States has released a boxed warning stating that fluoroquinolone use should not be routinely used for acute bacterial sinusitis, acute bacterial exacerbation of chronic bronchitis and uncomplicated urinary tract infections. They should be reserved for patients who have no other treatment options for these conditions.[13] Please note that sulfamethoxazole-trimethoprim (co-trimoxazole) is not recommended as the first-line agent in Hong Kong given the high local resistance rate, as supported by almost half of the isolates detected in sentinel surveillance of PMP in 2019.

Table 1: Recommended antibiotic treatment for acute uncomplicated cystitis in women(Excerpted from CHP, 2017 [11])*

Drug (Route)	Dosage and Frequency (Usual)	Duration (Usual)	Remarks
First line			
Nitrofurantoin (oral)	50 mg four times daily	5-7 days	Nitrofurantoin is an appropriate choice for therapy due to low local resistance rate and is less likely to select drug-resistant organisms. It is contraindicated in patients with eGFR of less than 45 ml/minute.
Amoxicillin-clavulanate (oral)	250 mg/125 mg three times daily or 875 mg/125 mg twice daily	5-7 days	Beta-lactam agents are appropriate choices for therapy even if there is intermediate susceptibility because they are physiologically concentrated in urine.
Second line			
Cefuroxime (oral)	500 mg twice daily	5-7 days	Beta-lactam agents are appropriate choices for therapy even if there is intermediate susceptibility because they are physiologically concentrated in urine.
Levofloxacin (oral)	250 mg once daily	3 days	Fluoroquinolones should be reserved for use in patients who have no other treatment options for acute uncomplicated cystitis because the risk of serious side effects (e.g. joint or tendon pain, muscle weakness, tingling or pricking sensation, numbness in the arms or legs, confusion, and hallucinations) generally outweighs the benefits.
Ciprofloxacin (oral)	250 mg twice daily	3 days	
Ofloxacin (oral)	200 mg twice daily	3 days	
Sulfamethoxazole-trimethoprim (oral)	960 mg twice daily	3 days	Sulfamethoxazole-trimethoprim is not recommended as the first line agent given the high local resistance. Beware of possible adverse reactions (e.g. skin rash).

**Clinicians should tailor make drug treatment based on clinical judgement. Definitive therapy should be based on microbiological and antibiotic sensitivity results if available.*

CONCLUSION

In summary, appropriate antibiotic use in the era of antimicrobial resistance is essential. Attending doctors can contribute their parts in this difficult battle to control AMR by judicious use of antibiotics when treating patients presenting with common infections such as acute uncomplicated cystitis. For more details about the proper use of antibiotics in the primary care setting, please refer to the website of the Antibiotic Stewardship Programme in Primary Care initiative, Centre for Health Protection, Department of Health at https://www.chp.gov.hk/en/features/49811.html.

REMARKS BY THE EDITOR

Under the ASP in Primary Care initiative, the Centre of Health Protection of the Department of Health publishes guidance notes for family doctors and healthcare professionals as a reference about treatments for different common infections and recommends treatment choices, doses and durations of antibiotics based on the best available clinical evidence and common local practice for each infection. The guidance notes were developed in consultation with key stakeholders in primary care settings such that recommendations can be tailored to their needs. Guidance notes and patient information sheets on seven common infections including acute pharyngitis, acute uncomplicated cystitis in women, simple (uncomplicated) skin and soft tissue infections, acute otitis media, acute rhinosinusitis, community acquired pneumonia and acute exacerbations of the chronic obstructive pulmonary disease have been issued in batches from 2017 onwards. Continuing Medical Education accredited training sessions were arranged jointly with the Hong Kong Medical Association and Hong Kong Doctors Union for promulgation between December 2017 and October 2019 with over 1,100 attendance recorded.

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MCHK CME Programme Self-assessment Questions

Please read the article entitled "Appropriate Use of Antibiotics for Acute Uncomplicated Cystitis in Women in Primary Care Setting" by Dr Leo LUI and complete the following self-assessment questions. Participants in the MCHK CME Programme will be awarded CME credit under the Programme for returning completed answer sheets via fax (2865 0345) or by mail to the Federation Secretariat on or before 30 November 2020. Answers to questions will be provided in the next issue of The Hong Kong Medical Diary.

Questions 1-10: Please answer T (true) or F (false)

1. **Acute uncomplicated cystitis usually occurs in pre-menopausal, non-pregnant women with no known urological abnormalities or comorbidities.**
2. **The predominant causative organism for acute uncomplicated cystitis in women is Proteus.**
3. **Specific combinations of symptoms, e.g. dysuria and urinary frequency without vaginal discharge raise the probability of UTI to above 90%, effectively ruling in the diagnosis.**
4. **Dipsticks urinalysis may not be necessary when presenting symptoms strongly suggestive of infection.**
5. **We should consider sending mid-stream urine culture when symptoms are atypical, do not resolve, or recur within 2-4 weeks after completion of treatment, or when upper urinary tract infection is suspected.**
6. **Asymptomatic bacteriuria does not require antimicrobial therapy except in pregnancy or before urological procedures in which mucosal bleeding is anticipated.**
7. **In selecting which antibiotics to be used empirically, we should consider both the local susceptibility profile as well as the collateral damage of the selected agent.**
8. **Fluoroquinolones are considered the treatment of choice for uncomplicated cystitis because of low resistance rate and favourable side effect profiles.**
9. **First-line agents for acute uncomplicated cystitis in the local setting are nitrofurantoin and amoxicillin-clavulanate.**
10. **Co-trimoxazole has a too high resistance rate to be used locally as first-line agent for uncomplicated cystitis.**

ANSWER SHEET FOR NOVEMBER 2020

Please return the completed answer sheet to the Federation Secretariat on or before 30 November 2020 for documentation. 1 CME point will be awarded for answering the MCHK CME programme (for non-specialists) self-assessment questions.

Appropriate Use of Antibiotics for Acute Uncomplicated Cystitis in Women in Primary Care Setting

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Answers to October 2020 Issue

Dual Pathway Inhibition Treatment Strategy in Coronary Artery Disease: Why, When & Who?

1. T 2. T 3. F 4. F 5. T 6. F 7. F 8. T 9. T 10. T

Antimicrobial Resistance in Animals and its Relationship with Human Health

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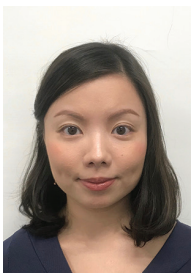


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INTRODUCTION

Antimicrobial resistance (AMR) has emerged as a threat to public health and animal health globally. The development and spread of AMR in human health, animal health and environmental sectors, is well-documented.[1,2] To mitigate the threat, a "One Health" approach addressing AMR across and between the three sectors is regarded as necessary.[3,4] This article provides a brief overview of AMR in animals and its relationship with human health. While a multitude of complex factors contributes to the emergence of AMR, antimicrobial use (AMU), especially inappropriate use is recognised as an important driver.[3] The growing demand for food of animal origin and the close relationship of companion animals with their owners allow the existence of various pathways through which AMR micro-organisms and genes may be transmitted between animals and humans.[2,5] Since the majority of antimicrobials used in humans and animals are analogues, the development of AMR in either sector can potentially jeopardise both sectors.[6] In addition to actions in the human health sector, actions that specifically target the animal health sector are being undertaken in many countries and regions to contain AMR.

AMR IN FOOD ANIMALS

AMR in food animals has become an increasingly important global issue. Growing demand for food of animal origin has led to the intensification of animal production. In most cases, intensified animal production takes place in farms without optimal biosecurity levels and adequate infectious disease prevention measures. This has, in turn, resulted in an increasing amount of AMU.[2,7] Antimicrobials are used in food animals mainly for safeguarding animal health. Animal health and public health are intricately linked due to the presence of zoonotic agents and commensal organisms in animals carrying resistance genes. Some of these genes are transferable. There is potential for transmission of these resistant organisms through direct and indirect contact.[2,6,7] Resistance in zoonotic and commensal organisms has been growing and recognised since large scale animal production occurred.[2,6,7] Frequently, instead of treating sick animals individually, disease treatment is done using a metaphylactic approach, in which an entire group of animals in close contact with diseased animals is treated with antimicrobials in feed or water.[2,6] Antimicrobials are sometimes used prophylactically, but current guidance strongly discourages this practice.[2,7] Disease prevention with antimicrobials is common in times of stress, such as cold weather and the post-weaning period in pigs.[6] Antimicrobials have been used at sub-therapeutic levels as growth promoters to enhance feed conversion and productivity. This practice has been banned in the European Union since 2006, and many other countries are following this lead.[2,6,7]

The increasing use of antimicrobials in food animals for disease treatment and prevention and in some countries as growth promoters resulted in the development of AMR in bacteria through the selection pressure from the use of antimicrobials.[6,7] When exposed to antimicrobials, especially at suboptimal levels, bacteria capable of resisting the effects of antimicrobials have a selective advantage. Resistance genes may subsequently be transferred to other bacteria, including normal flora, animal pathogens, zoonotic bacteria colonising opportunistic pathogens and human-adapted pathogens.[2,6,7] As resistance to commonly used antimicrobials occurred in animal pathogens, additional antimicrobials that are now regarded as critically important for use in humans such as fluoroquinolones and third and fourth generation cephalosproins were used in animals. As a result, levels of resistance to these classes increased. Concerns about AMR resulted in reductions in usage in animals in some places, and this was followed by a reduction in resistance. One of the best known examples is bans on the use of third generation cephalosporins in poultry hatcheries that resulted in a major reduction in levels of resistance. For other antimicrobials, levels of resistance have not changed dramatically even after they are no longer used in animals.[1,7]

Resistance to antimicrobials is not only selected by the use of antimicrobials. Some organisms are intrinsically resistant to certain antimicrobials. In addition, heavy metals and biocides may also play a role in the development of AMR in the food animal sector. Zinc and copper compounds serve as supplements for pig feed to prevent post-weaning diarrhoea and stimulate growth.[6] Metal resistance has developed in some animal-associated bacteria. A close association has been found between metal resistance and resistance to antimicrobials in some bacteria, for instance, methicillin in *Staphylococcus* spp., and macrolides in *Enterococcus* spp.[6,8]

As AMR worsens, treatment of infectious diseases would become difficult and ineffective with increased

disease severity, greatly compromising animal health and welfare. Furthermore, economic losses and reduced food security would be caused by the subsequent decrease in food animal production.[2,7]

RELATIONSHIP BETWEEN AMR IN FOOD ANIMALS AND HUMAN HEALTH

AMR arising from the food animal sector may impact human health via the transmission of resistant bacteria and resistance genes. There are three routes of transmission of resistant bacteria from animals to humans: i) Direct or indirect contact with animals carrying resistant bacteria; ii) Contact or consumption of food products such as meat, milk or eggs contaminated by resistant bacteria of food animal origin; and iii) Environmental routes.[6,7] Fig. 1 demonstrates the potential transmission routes of AMR, including between food animals and humans. Direct contact in large part concerns occupations that are involved in the food animal trading business, for example, farmers, slaughterhouse workers and veterinarians. Further spread among humans may occur via indirect contact with animals when exposed, and contaminated individuals come into contact with others.[6,7] Food products of animal origin harbour resistant bacteria from animals. Food products may also be contaminated by workers along the food supply chain. Contact or consumption of these products would expose consumers to resistant bacteria.[6,7] In the environmental aspect, animal manure used as soil fertilisers and waste discharged from food animal farms may contain resistant bacteria and provide pathways for transmission to humans through non-animal food products and polluted water.[6,7] Resistant bacteria from animals may be zoonotic or non-pathogenic to humans. However, resistance genes carried by those bacteria can potentially be transferred to and incorporated by human normal flora or human pathogens. This then creates the potential for AMR to spread from human normal flora to human pathogens when infection occurs, possibly rendering antimicrobial treatment ineffective.[6,7]

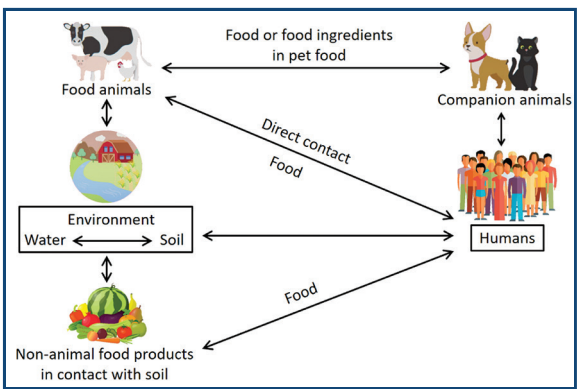

Fig. 1: AMR transmission under the One Health context (Adapted from Argudin et al, 2017)

The mechanisms for the transmission of resistant bacteria and genes amongst different sectors are complex and, in some cases, poorly understood.[9] Many studies have been conducted to understand the role played by AMR in bacteria in animals and disease caused by AMR organisms in humans. For zoonotic pathogens such as *Campylobacter jejuni*, *Campylobacter coli* and *Salmonella* spp., the relationship between animal and human isolates is relatively straightforward, given the direct or indirect transmission of organisms from animals. However, for some other organisms, such as colonising opportunistic pathogens, including *Escherichia coli*, the links between animal and human isolates and resistance genes is more complex. Studies have been conducted to assess whether these organisms might transmit via food but only in a few cases has a direct association been demonstrated.[10]

In addition to AMR in bacteria from animals, AMU in the food animal sector may contribute to the development of AMR through the excretion of antimicrobial residues. It has been estimated that 75% to 90% of antimicrobials used in livestock farms are excreted in their unmetabolised forms.[2,7] These residues may exert selective pressure on bacteria in the environment, which could subsequently exacerbate AMR in animal health and human health.[2,7]

AMR IN COMPANION ANIMALS

AMR in companion animals has received heightened awareness and attention recently as the incidence of resistant bacterial infections in this sector appears to be rising. The extent of the problem of AMR in companion animals is currently less well-characterised compared to food animals in view of the less extensive relevant research available.[5,11] Antimicrobials are essential medicine for combating infectious bacterial diseases in companion animals. They are used frequently in clinical practice for therapeutic purposes in cases of confirmed or suspected bacterial infections and for prophylactic purposes typically prior to surgical procedures.[11,12] As with AMU in human health and food animals, AMU in companion animals, places selective pressure on bacteria and suboptimal use can exacerbate the development of AMR. AMU in companion animals has been identified as a risk factor for colonisation or infection with AMR pathogens in companion animals.[5,11] The close relationship between companion animals and humans presents a number of possible pathways for transmission of AMR bacteria and AMR genes from companion animals to humans, and vice versa.[11,12,13]

RELATIONSHIP BETWEEN AMR IN COMPANION ANIMALS AND HUMAN HEALTH

AMR from companion animals can be transmitted to humans via direct contact and the environment as shown in the previous Fig. 1. The close bond between companion animals and their owners gives rise to affectionate behaviours and animal care routine which facilitate the transmission of AMR hazards through contact with the skin, mucosal surfaces and excreta. The dissemination of AMR hazards in the shared household environment also allows indirect transmission to occur.[11,12,13] AMR hazards transmitted from companion animals to their owners can be classified into direct and indirect ones.[5,11] Direct hazards are AMR bacteria that are zoonotic and can cause diseases in humans.

Examples of direct zoonotic hazards include methicillin-resistant *Staphylococcus aureus* and methicillin-resistant *Staphylococcus pseudintermedius* from dogs and cats.[5,11] Indirect hazards refer to AMR organisms or genes that may be transmitted from companion animal bacteria to human bacteria with potential for adverse impact on human health. Examples of indirect hazards include AMR genes from extended spectrum beta-lactamase-producing *Enterobacteriaceae*, carbapenem-resistant gram-negative bacteria and colistin-resistant *Escherichia coli* from dogs and cats.[5,11] An abundance of studies have demonstrated the presence of zoonotic as well as non-pathogenic AMR bacteria acquired from companion animals in people who have had close contact with colonised or infected companion animals.[5,11,13] Moreover, some studies have revealed the presence of AMR bacteria originating from companion animals in people with no apparent contact with companion animals. This shows the possibility of community spread of those bacteria.[5]

ROLE OF REVERSE ZOONOSIS IN AMR IN ANIMALS

The vast majority of available literature has focused on the zoonotic potential of AMR microorganisms from animals to humans. A literature review of the role of reverse zoonosis in AMR in animals has identified the potential for transmission of AMR microorganisms from humans to animals. For instance, a study by Magro et al. has revealed the infection of dairy cows with a human epidemic methicillin-resistant *Staphylococcus aureus*, UK-EMRSA-15 grouping in CC22, acquired from an infected milker.[14] Another study by Fenandes et al. has revealed via genomic investigation the infection of a dog by the human pathogenic bacterial strain of VIM-2 producing *Pseudomonas aeruginosa* in the human-animal-environment interface.[15] Hence, it is evident that AMR microorganisms in humans have the potential to contribute to AMR in animals through direct and indirect contact between humans and animals. Reverse zoonosis has to be taken into account when devising control measures in order to contain AMR in a holistic approach.[16,17]

ACTIONS BEING TAKEN TO COMBAT AMR IN ANIMALS IN HONG KONG

The Antimicrobial Resistance Surveillance Section (AMRSS) has been established under the Agriculture, Fisheries and Conservation Department (AFCD) since April 2017. It is responsible for conducting tasks relevant to local animal sectors contained in the Hong Kong Strategy and Action Plan on Antimicrobial Resistance (2017 - 2022). Actions that are currently being taken by the AMRSS to combat AMR in local animal sectors encompass the following aspects: i) Surveillance of AMR and AMU; ii) Optimising AMU; iii) Raising awareness of AMR in animals among relevant stakeholders.

Surveillance of AMR and AMU is crucial for understanding the extent of the AMR problem in animals and identifying necessary interventions. Despite the local food animal sector contributing to only around 2% of livestock and fresh meat consumed in Hong Kong, the AMRSS has commenced surveillance in the local food animal sector since mid-2019. Data from ongoing surveillance is being analysed to study the trends and patterns of AMR and AMU in the sector. Necessary interventions will be devised based on findings of the analysis. Nevertheless, the contribution of the local food animal sector to the overall AMR in animals in Hong Kong is anticipated to be very small. In the companion animal sector, the AMRSS has commissioned an 18-month relevant research study since November 2019 to provide recommendations for an appropriate surveillance system. It is anticipated that surveillance in the companion animal sector would commence following the implementation of the system.

Optimising AMU in both the livestock and companion animal sectors is a key action to the control of AMR in animals. Thus, the AFCD has approved funding through the Sustainable Agriculture Development Fund and Sustainable Fisheries Development Fund to the Jockey Club College of Veterinary Medicine and Life Sciences of the City University of Hong Kong (CityU) to provide veterinary services to local food animal farmers. These veterinary services include disease diagnosis and treatment, sourcing necessary veterinary medications and devising tailor-made disease management plans for each farm. A code of practice (CoP) on "Prudent and Responsible AMU" will also be developed for farmers jointly by the AFCD and CityU to educate them on the importance of this concept and necessity to seek veterinary consultation and prescription prior to using antimicrobials in food animals. In the companion animal sector, the aforementioned research study will also provide recommendations for an antimicrobial stewardship programme and devise a CoP on "Prudent and Responsible AMU" for private veterinarians.

Raising awareness of AMR in animals among all stakeholders is an integral part of all control measures by engaging their participation and action. Relevant stakeholders include veterinarians, farmers and companion animal owners. Since its establishment, the AMRSS has organised various publicity and educational activities for stakeholders such as roving exhibitions and seminars. With enhanced awareness, it is expected that stakeholders have a better understanding of the negative impact of the problem of AMR on both animal health and public health. This may then foster their engagement to take actions to control it, for instance, optimising the health and welfare of their animals to minimise the need for antimicrobials.

CONCLUSION

In the animal health sector, food animals and companion animals are currently considered the two groups of animals in which the development of AMR may have a negative impact on human health. Actions are being taken globally to combat AMR in animals. Nevertheless, it should be reiterated that AMR is a One Health issue. The problem of AMR in one sector is intricately linked to that in the others. In order to effectively control AMR, actions are required in the human health, animal health and environmental sectors.

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Dermatology Quiz

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Specialist in Dermatology and Venereology

Dr KWAN Chi-keung

Fig.1: Multiple itchy and erythematous papules on the trunk.

This 23-year-old Chinese gentleman complained of multiple itchy and red pimples on the trunk and the upper arms. There is no vesicle and they are not painful. He could not recall any precipitating factors or events. Further history revealed he returned from vacationing at Phuket, Thailand and enjoyed sunshine and beach. He put on sunscreen and noted that the pimples developed after he was back to Hong Kong after the vacation. Physical examination revealed multiple erythematous papules and pustules, each around 3 mm in diameter, over the upper back, chest wall and the extensor area of the upper arms. (Fig. 1)

Questions

1. What are the differential diagnoses of his skin lesion?
2. What investigation(s) are you going to order?
3. How would you treat this patient?

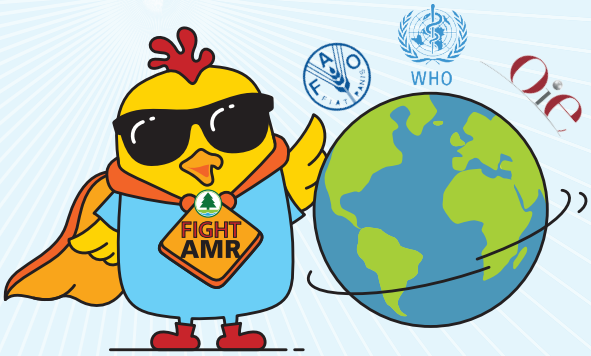
(See P.36 for answers)

Let's take action against Antimicrobial Resistance (AMR)

<FIGHT AMR> TEAM -
Captain Piggy

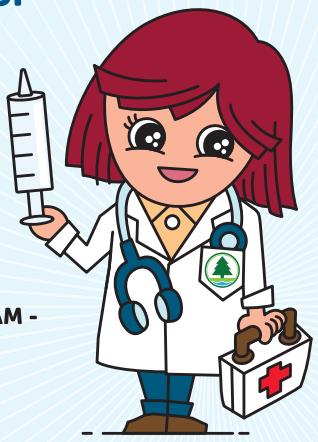
Hong Kong Strategy and Action Plan on Antimicrobial Resistance (2017-2022) was launched on 10 July 2017

Tackle the issues of AMR under the principles of "One Health"



<FIGHT AMR> TEAM - Chic-Ken

Promote "responsible and prudent use of antibiotics"



<FIGHT AMR> TEAM -
Dr. Amy

Local Livestock Farmer -
Rookie

Strengthen knowledge through education and training

漁農自然護理署
Agriculture, Fisheries and Conservation Department

You Can Help Address Antimicrobial Resistance by Eating Safe!

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MBChB(CUHK), FHKCCM, FHKAM (Community Medicine)
Senior Medical Officer (Risk Communication)
Risk Assessment and Communication Division, Centre for Food Safety, Food and Environmental Hygiene Department

Dr Chun-yu MANG

Antimicrobial resistance (AMR) is an emerging health threat worldwide. To combat AMR, the General Assembly of the United Nations launched in 2015 a global action plan on AMR developed by the World Health Organization (WHO).[1] One of the issues the plan aimed to address is the spread of AMR along the food chain since much antibiotic use is linked to food animal production and food is a potential vehicle through which AMR bacteria could spread from animals to humans. In Hong Kong, the Government launched in 2017 the "Hong Kong Strategy and Action Plan on Antimicrobial Resistance 2017-2022" which adopts a multi-sectoral approach to addressing the rising threat of AMR, including that from the food chain. This article provides some basics regarding AMR from food safety perspectives.

HOW DO AMR BACTERIA GET ONTO YOUR PLATE?

AMR occurs naturally over time, usually by means of genetic changes. However, this process can be accelerated by misuse and overuse of antimicrobials in humans and animals. Examples of misuse of antimicrobials include people taking antibiotics when they have viral infections and food producing animals being given antibiotics for growth promotion without professional oversight.[2] There are many possible routes for the transmission of AMR bacteria. Our concern here is the food routes. The foods we eat come from animals and plants, whereas foods of animal origin represent the major route of human exposure to foodborne pathogens with AMR.[3,4,5,6] Foods of animal origin can become contaminated during slaughter and carcass dressing, while foods of plant origin can be contaminated by the affected environment, water and manures.[7]

In addition, foods can also become contaminated at different points of post-harvest stage. They can be contaminated with AMR bacteria by infected food handlers, particularly those who do not observe good hygienic practices when handling foods, or through improper food processing or unhygienic food preparation environment.[2,3] Nevertheless, further research is needed to determine the extent of exposure to AMR bacteria via the food chain. On the other hand, it is believed that any further increase in the occurrence and spread of AMR bacteria in foods is likely to have an influence on human exposure.[8]

SUPERBUGS IN FOODS

From time to time, there are media reports on finding AMR bacteria in foods or food-producing animals. AMR bacteria are usually highlighted in media reports as "superbugs" which generally refer to microorganisms that have developed AMR. Different superbugs are reported usually because of their resistance to a wide range of antimicrobials or certain last-resort antimicrobials, which suggests the emerging threats of treatment failure.[9]

Superbugs are not necessarily pathogens. They can also be commensal organisms that have acquired resistance genes. Commensal organisms derive benefits from their association with humans generally without causing harm. Superbugs that are commensal organisms are not of no concern, because commensal organisms like *E. coli* and *Enterococcus* species serve as reservoirs of resistance genes that can be transferred to human pathogens transiting the intestinal tract. Sometimes, commensal organisms can also be human pathogens. For example, *E. coli* which is naturally present in our gut is also a common cause of urinary tract infection and blood stream infection.[10]

While infection with superbugs in patients indicates an imminent threat, the finding of superbugs in food-producing animals or animal products (e.g. poultry meat) suggests the spread of AMR.[11] Locally, it was reported that more extended-spectrum β-lactamase-producing *E. coli* was found in faecal samples from food-producing animals (i.e. cattle, pigs and chickens) than those from cats, dogs and wild rodents.[10,12] However, as there are limited data, it is difficult to compare between the extent of superbugs transmitted via food-producing animals to humans and that via humans to humans. That said, the increase in the occurrence of superbugs in food-producing animals is likely to pose a risk to human health.[9]

KNOCKING OFF SUPERBUGS WITH THE 5 KEYS TO FOOD SAFETY

Foodborne pathogenic bacteria, i.e. bad bugs, can make you sick while those that are superbugs are more dangerous as treatment options will be limited. Detecting superbugs in foods may raise concern on whether we are having unsafe foods, or these foods should be thrown away. In fact, cooking food until the core temperature reaches 75°C can kill most bacteria,

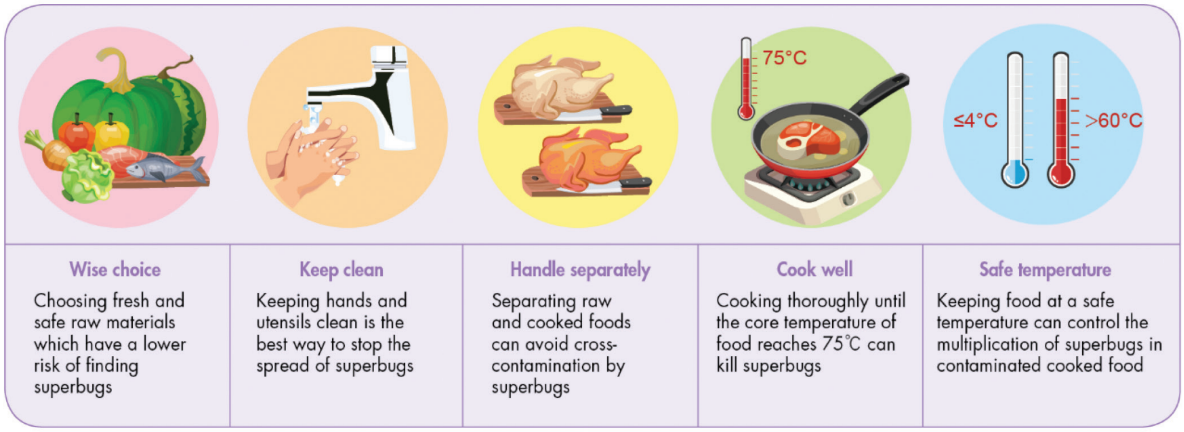

Fig . 1 : Combating superbugs and other bad bugs with the 5 Keys to Food Safety. (Excerpted from CFS, 2018[9])

including both bad bugs and superbugs.[10] That's why raw or undercooked foods are considered higher risk in terms of spreading these bacteria. Observance of good hygienic practices can minimise cross-contamination by both superbugs and bad bugs.[13] The "5 Keys to Food Safety" are five simple and effective steps for people to follow when handling foods: (1) "Choose" (choose safe raw materials); (2) "Clean" (keep hands and utensils clean); (3) "Separate" (separate raw and cooked foods); (4) "Cook" (cook thoroughly); and (5) "Safe temperature" (keep food at a safe temperature).

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要惡菌無處容身
做足食物安全五要點

Follow the 5 keys to food safety to prevent bugs

1 精明選擇 Choose wisely

選擇新鮮衞生的食物
Choose fresh and hygienic raw food

2 保持清潔 Keep clean

清潔雙手及食具
Wash hands and utensils

3 生熟分開 Separate raw and cooked food

分開生熟食物
Separate raw and cooked food

4 煮熟食物 Cook thoroughly

徹底煮熟食物
中心溫度達攝氏75度
Cook food thoroughly until its core temperature reaches 75°C

5 安全溫度 Keep food at safe temperature

存放食物於安全溫度
攝氏4度或以下或60度以上
Keep food at safe temperature of 4°C or below or above 60°C

食物環境衞生署
Food and Environmental Hygiene Department

食物安全中心
Centre for Food Safety

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Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	★ Facebook Live Biological Treatment on Atopic Dermatitis 3	★ Facebook Live Improving Dyslipidaemia Management: an Update on International Guideline and More ★ Short Course in Clinical Toxicology 2020 (Video Lectures) 4	★ Facebook Live The Role of Nutrition in Management of Sarcopenia 5	6	7
8	9	★ Facebook Live Current Rectal Cancer Management ★ Certificate Course in Cardiology 2020 (Video Lectures) 10	★ The Hong Kong Neurosurgical Society Monthly Academic Meeting –Different haemostatic mateirals used in Neurosurgery ★ Facebook Live Common Medical Problems in Elderly ★ Short Course in Clinical Toxicology 2020 (Video Lectures) 11	★ Facebook Live Update on Sarcopenia Management 12	★ Facebook Live Disease Which is Difficult to Voice Out? Hemorrhoidal Disease Management 13	14
15	16	★ Certificate Course in Cardiology 2020 (Video Lectures) 17	★ Short Course in Clinical Toxicology 2020 (Video Lectures) 18	19	20	21
22	23	★ Facebook Live Family Medicine In A Hospital-Based Centre ★ Certificate Course in Cardiology 2020 (Video Lectures) 24	★ Facebook Live Influenza and COVID-19 Management at Primary Care ★ Short Course in Clinical Toxicology 2020 (Video Lectures) 25	26	★ Facebook Live Managing Heart Failure 27	28
★ Hong Kong Association for the Study of Liver Diseases (HKASLD) 33rd Annual Scientific Meeting and International Symposium on Hepatology 2020 (Webinar) 29	30					

Date / Time	Function	Enquiry / Remarks
3 TUE 2:00 PM	**Facebook Live** **Biological Treatment on Atopic Dermatitis** Organiser: HKMA-Kowloon West Community Network; Speaker: Dr. HO Ka Keung	Miss Antonia Lee 3108 2514 1 CME Point
4 WED 2:00 PM	**Facebook Live** **Improving Dyslipidaemia Management: an Update on International Guideline and More** Organiser: Hong Kong Medical Association; Speaker: Dr LI Cho-shan	HKMA CME Dept. 3108 2516 1 CME Point
7:00 PM	**Short Course in Clinical Toxicology 2020 (Video Lectures)** Organiser: The Federation of Medical Societies of Hong Kong Speaker: Dr FUNG Hin-tat	Ms. Vienna LAM Tel: 2527 8898
5 THU 2:00 PM	**Facebook Live** **The Role of Nutrition in Management of Sarcopenia** Organiser: HKMA-Shatin Community Network; Speaker: Dr Charles Fei CHAN	Ms. Candice Tong 3108 2513 1 CME Point
10 TUE 2:00 PM	**Facebook Live** **Current Rectal Cancer Management** Organiser: The Hong Kong Medical Association & Hong Kong Sanatorium & Hospital; Speaker: Dr LAW Wai-lun	HKMA CME Dept. 3108 2516 1 CME Point
7:00 PM	**Certificate Course in Cardiology 2020 (Video Lectures)** Organiser: The Federation of Medical Societies of Hong Kong Speaker: Dr Cyril Yiu-kwan KO	Ms. Vienna LAM Tel: 2527 8898
11 WED 7:30 AM	**The Hong Kong Neurosurgical Society Monthly Academic Meeting –Different haemostatic mateirals used in Neurosurgery** Organiser: Hong Kong Neurosurgical Society; Speaker(s): Dr HE Zhexi; Chairman: Prof George Kwok-chu WONG; Venue: Conference Room, F2, Department of Neurosurgery, Queen Elizabeth Hospital; or via Zoom meeting	CME Accreditation College: 1.5 points College of Surgeons of Hong Kong Dr Calvin MAK Tel: 2595 6456 Fax. No.: 2965 4061
2:00 PM	**Facebook Live** **Common Medical Problems in Elderly** Organiser: HKMA-Central, Western & Southern Community Network; Speaker: Dr Kevin Wai-yin TSANG	Miss Antonia Lee 3108 2514 1 CME Point
7:00 PM	**Short Course in Clinical Toxicology 2020 (Video Lectures)** Organiser: The Federation of Medical Societies of Hong Kong Speaker: Dr Patrick Siu-chung LEUNG	Ms. Vienna LAM Tel: 2527 8898
12 THU 2:00 PM	**Facebook Live** **Update on Sarcopenia Management** Organiser: HKMA-New Territories West Community Network; Speaker: Dr Selina Kit-yan CHAN	Miss Antonia LEE 3108 2514 1 CME Point
13 FRI 2:00 PM	**Facebook Live** **Disease Which is Difficult to Voice Out? Hemorrhoidal Disease Management** Organiser: HKMA-Kowloon East Community Network; Speaker: Dr Kevin Wai-chung CHAN	Miss Antonia LEE 3108 2514 1 CME Point
17 TUE 7:00 PM	**Certificate Course in Cardiology 2020 (Video Lectures)** Organiser: The Federation of Medical Societies of Hong Kong Speaker: Dr Kevin Chun-kit KWOK	Ms. Vienna LAM Tel: 2527 8898
18 WED 7:00 PM	**Short Course in Clinical Toxicology 2020 (Video Lectures)** Organiser: The Federation of Medical Societies of Hong Kong Speaker: Dr CHAN Chi-keung	Ms. Vienna LAM Tel: 2527 8898
24 TUE 2:00 PM	**Facebook Live** **Family Medicine In A Hospital-Based Centre** Organiser: The Hong Kong Medical Association & the Gleneagles Hong Kong Hospital; Speaker: Dr Anthony HO	HKMA CME Dept. 3108 2516 1 CME Point
7:00 PM	**Certificate Course in Cardiology 2020 (Video Lectures)** Organiser: The Federation of Medical Societies of Hong Kong Speaker: Dr Jason Kwok-chun KO	Ms. Vienna LAM Tel: 2527 8898
25 WED 2:00 PM	**Facebook Live** **Influenza and COVID-19 Management at Primary Care** Organiser: HKMA-Central, Western & Southern Community Network; Speaker: Dr Andrew Tin Yau WONG	Miss Antonia Lee 3108 2514 1 CME Point
7:00 PM	**Short Course in Clinical Toxicology 2020 (Video Lectures)** Organiser: The Federation of Medical Societies of Hong Kong Speaker: Dr CHOW Tin-yat	Ms. Vienna LAM Tel: 2527 8898
27 FRI 2:00 PM	**Facebook Live** **Managing Heart Failure** Organiser: HKMA-Shatin Community Network; Speaker: Dr CHUNG Yat-kiu	Ms. Candice TONG 3108 2513 1 CME Point
29 SUN 8:45 AM	**Hong Kong Association for the Study of Liver Diseases (HKASLD)** **33rd Annual Scientific Meeting and International Symposium on Hepatology 2020 (Webinar)** Organizer: Hong Kong Association for the Study of Liver Diseases (HKASLD)	Meeting Secretariat: Ms. Gloria CHEUNG Tel: 2527 8898 CME Point TBC

Answers to Dermatology Quiz

Answers:

1. Malassezia folliculitis, acne vulgaris, eosinophilic folliculitis, drug eruption, especially AGEP (acute generalized exanthematous pustulosis), miliaria, lymphomatoid papulosis and so forth are the possible differential diagnoses.

   Malassezia folliculitis, also known as pityrosporum folliculitis, is the diagnosis and is a fungal infection of the hair follicles by a lipophilic fungus, Malassezia spp. Occlusive and greasy sunscreen used by this young gentleman may be the precipitating factor. Others include high sebum production, hyperhidrosis and immunosuppression such as using systemic steroids and immunosuppressants.

2. Clinically the rash is typical of Malassezia folliculitis. Skin scraping for microscopy (prepared with potassium hydroxide) and fungal culture may help to identify the causative yeast.

   Since Malassezia is lipophilic, olive oil is added to the culture medium for facilitating the culture process. Skin biopsy is needed to differentiate from other possible diagnoses. It shows folliculitis, and Malassezia yeasts may commonly be found in the ostium and pilary canal.

3. Both topical and oral anti-fungals agents are effective for treating Malassezia folliculitis; though systemic oral treatment is more effective than topical treatment. However, topical treatment such as ketoconazole shampoo applying on the affected area after successful treatment of systemic treatment may reduce the relapse. Moreover, avoidance of precipitating factors is important. Retinoid and tetracycline, in general, is not recommended for Malassezia folliculitis.

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抗生素要處方
問醫生最妥當

Never take antibiotics without a prescription
Consult your doctor first

抗生素只能治療細菌感染，
對病毒感染（如傷風感冒）完全無效。

Antibiotics are effective against bacterial infections but not viral infections such as colds and flu.

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Department of Health

互相提醒要潔手
惡菌至會無路走!

Let's Remind Each Other Keep Hands Clean Together!

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Centre for Health Protection

衛生署
Department of Health

齊潔手
Clean your hands
對付超級細菌
Keep superbugs away

1 手掌 Palms

2 手背 Back of hands

3 指隙 Between fingers

4 指背 Back of fingers

5 拇指 Thumbs

6 指尖 Finger tips

7 手腕 Wrists

搓手20秒
Rub hands for 20 seconds

衛生防護中心
Centre for Health Protection

衛生署
Department of Health