

**World Antimicrobial Awareness Week
WAAW Special Webinar Series**

**AMR in Latin America and the Caribbean:
innovations and challenges**

Report

Day 2: Thursday, Nov. 19th

**Understanding and Changing Behavior to Combat AMR in the
Community**

Time	Topic
09:30 am 09:45 am	Opening remarks » Dr. Gerry Eijkemans, Social Determinants of Health and Health Promotion, PAHO » Dr. Carlos Espinal, Global Health Consortium, Florida International University (FIU) » Dr. Leopoldo Del Barrio, Food and Agriculture Organization (FAO)
Session 2 Moderator: Dr. Gerry Eijkemans, Social Determinants of Health and Health Promotion, PAHO	
09:45 am 10:00 am	Progress and challenges in fighting AMR in Latin America and the Caribbean » Dr. Pilar Ramon-Pardo, PAHO
10:00 am 10:20 am	Behavioral insights and new approaches to public health intervention design » Dr. Saad Omer, Yale Institute for Global Health
10:20 am 10:40 am	Community wisdom in the use of antibiotics and preservation of the health of Mother Earth » Dr. Arturo Quizhpe, ReAct Latin America
10:40 am 11:30 am	Discussion Moderator: Dr. Gerry Eijkemans, Social Determinants of Health and Health Promotion, PAHO
Session 3 Moderator: Dr Carlos Espinal, Global Health Consortium, Florida International University (FIU)	
11:30 am 11:45 am	Identifying community level risk factors and their impact on AMR in low income communities in Guatemala » Dr. Brooke M. Ramay, Universidad del Valle de Guatemala/Washington State University
11:45 am 12:00 pm	Antibiotic Use in Small-Scale Food Animal Production in Ecuador: A Mixed-Methods Study » Dr. Jay Graham, UC Berkeley, Ecuador
12:00 pm 12:15 pm	Antimicrobials use in small-scale food production » Dr. Hernán Rojas, FAO/CERES BCA consultant, Chile
12:15 pm 13:10 pm	Discussion Moderator: Dr Carlos Espinal, Global Health Consortium, Florida International University, FIU
13:10 pm 13:15 pm	Closing remarks » Dr. Pilar Ramon-Pardo, PAHO » Dr. Carlos Espinal, Global Health Consortium, Florida International University (FIU)

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Introduction

This second day of the webinar series focused on behavior and behavior changes in the community, key component of the strategies to control and prevent AMR. There were also presentations on regional and country experiences on the use of antibiotics in food production, and its impact on AMR.

Panelists and Moderators

Dr. Gerry Eijkemans

Dr. Eijkemans is the Unit Chief of Social Determinants of Health and Promotion at the Pan American Health Organization, in WDC. She has served in PAHO since 1993, in a prolific career starting in 1998 as Occupational Health and Service Advisor in Perú, then WDC and afterwards Geneva. In 2009 she was appointed PAHO representative in Surinam, Bahamas in 2011, Mexico in 2016, until she was promoted to her current position in 2018. Dr. Eijkemans was born in the Netherlands, she obtained her medical degree in the University of Michigan, and a master's in public health from John Hopkins University.

Dr. Pilar Ramón Pardo

After graduating as Medical Doctor with a specialty in Internal Medicine, Dr. Ramón-Pardo obtained her PhD from the Universidad Complutense de Madrid, Spain and from her thesis she made antimicrobials the core of her professional career. During the last 20 years Dr. Ramón-Pardo has worked in Prevention and Control of Infectious Diseases in various countries of Africa Asia and the Americas and

she is currently the coordinator and responsible for planning, programming, and implementation of regional strategies to support the countries of the Americas to carry out and expand their national responses to AMR.

Saad B. Omer, MBBS, MPH, PhD, FIDSA

Dr. Omer has conducted studies in the United States, Guatemala, Kenya, Uganda, Ethiopia, India, Pakistan, Bangladesh, South Africa, and Australia. His research portfolio includes epidemiology of respiratory viruses such as influenza, RSV, and - more recently - COVID-19; clinical trials to estimate the efficacy of maternal and/or infant influenza, pertussis, polio, measles, and pneumococcal vaccines; and trials to evaluate drug regimens to reduce mother-to-child transmission of HIV. Moreover, he has conducted several studies on interventions to increase immunization coverage and acceptance. Dr. Omer's work has been cited in global and country-specific policy recommendations and has informed clinical practice and health legislation in several countries. He has directly mentored over 100

junior faculty, clinical and research post-doctoral fellows, and PhD and other graduate students. Dr. Omer has published widely in peer reviewed journals including the New England Journal of Medicine, JAMA, Lancet, British Medical Journal, Pediatrics, American Journal of Public Health, Science, and Nature and is the author of op-eds for publications such as the New York Times, Politico, and the Washington Post.

Dr. Omer has received multiple awards – including the Maurice Hilleman Award by the National Foundation of Infectious Diseases for his work on the impact of maternal influenza immunization on respiratory illness in infants younger than 6 months-for whom there is no vaccine. He has served on several advisory panels including the U.S. National Vaccine Advisory Committee, Presidential Advisory Council on Combating Antibiotic-Resistant Bacteria -Vaccine Innovation Working Group, and WHO Expert Advisory Group for Healthcare Worker Vaccination. He has also served as an academic affiliate of the Office of Evaluation Sciences –formerly known as the White House Social and Behavioral Sciences Team.

Dr. Arturo Quizhpe Peralta

Arturo Quizhpe Peralta is Director of ReAct Latin America, and he was one of the persons starting ReAct in this part of the world. Arturo has been dean of the Faculty of Medical Sciences of the University of Cuenca, Ecuador. Here he also served as

the chair of pediatrics. Currently, he is an external PhD researcher at the International Centre for Research and Education on Health Systems Radboud University in the Netherlands. Earlier he was the general coordinator of the Second World Health Assembly of Peoples (Cuenca, 2005), member of the Executive Committee of the Movement for People's Health, founder of the International University for People's Health teacher and founding member of Child to Child center in Ecuador. He has also authored more than 50 books, scientific articles, and stories, translated into several languages, and published in many countries.

Dr. Leopoldo del Barrio

Dr. del Barrio has over 18 years of experience in Veterinary Medicine. He is Coordinator of the RAM Network in the FAO Regional Office for Latin America and the Caribbean. Dr. del Barrio is Chilean, he graduated from the School of Veterinary Medicine in Colegio Mayor in Chile and obtained a master's degree and other specializations in other Universities in the region.

Dr. Jay Graham

Dr. Jay Graham's research combines qualitative and epidemiologic methods and next-generation DNA sequencing to refine our understanding of the drivers for transmission of antimicrobial resistance (AMR) and zoonotic infectious diseases. He has worked in a variety of countries in Latin America, Asia, and Africa, and he has

extensive experience working on the US-México border where he conducted research on the primary prevention of diarrheal diseases and pneumonia within informal settlements of Ciudad Juárez, MX. Much of his work has focused on developing more efficient and cost-effective approaches to scale-up public health initiatives for the prevention and control of infectious diseases. Dr. Graham holds an M.P.H. and an M.B.A., and he received his PhD from the Johns Hopkins Bloomberg School of Public Health. Prior to joining the faculty in EHS, he served as an AAAS Science & Technology Policy Fellow, and served as a lead technical advisor on water, sanitation and hygiene and household air pollution in the Bureau for Global Health at the United States Agency for International Development (USAID).

Dr. Brooke Ramay

Dr. Brooke Ramay's main research activities are based in Guatemala and focus on the paradigms of antibiotic use at the community level as a potential driver of antimicrobial resistance. Antibiotic consumption drives resistance, yet factors related to hygiene and sanitation may contribute more significantly to this global health problem. In a country where both antibiotic use and poor hygiene are a challenge, Dr. Ramay and collaborating partners in Guatemala are working to establish under what circumstances these factors play a role in their contribution to AMR. Through continual collaborative efforts with the Ministry of Health, findings from these studies may be

used to develop health policy in Guatemala. Dr. Ramay has a dual appointment as a clinical pharmacy professor and researcher at Universidad del Valle in Guatemala (UVG), and a researcher at Washington State University (WSU). She is also part of the clinical volunteer faculty at the University of California San Francisco.

Dr. Hernán Rojas

Specialist in design and management of animal health programs for terrestrial and aquaculture animals. Dr. Rojas is a Veterinarian from the University of Chile, a master's in animal health Program Development and Production Systems and a PhD in Veterinary Epidemiology and Economics from the University of Reading, England. For six years, he served as Chief of the Chilean Veterinary Service, leading the internationalization processes, prevention and control of animal diseases, health negotiation and modernization of the Service. Likewise, he designed and implemented prevention programs for exotic diseases such as Foot-and-Mouth Disease, Bovine Spongiform Encephalopathy and Classical Swine Fever. During this period, he was responsible for controlling the entry of highly pathogenic avian influenza to Chile in 2002. He was National Director of the Institute of Agricultural Development of the Ministry of Agriculture for four years, in which he implemented a new policy of productive development and excellence management for family farming. He has been a consultant for IICA, FAO, OIE, IDB and OECD in

matters of animal health and food safety. He is visiting professor of the Master and Doctorate Program at the University of Chile in Animal Health Management and Applied Veterinary Epidemiology. Dr. Rojas is currently Director of CERES BCA, a company specialized in biosafety and food quality services for terrestrial and aquaculture species, which maintains a portfolio of clients from the private and public

sphere, both nationally and internationally. Services include: Design and implementation of health emergency management systems, strategic health management and compartmentalization of intensive production systems, import risk analysis, review and improvement of health legislation, technical-economic evaluation of animal health programs, specialized training in applied epidemiology.

Session 2

Moderator: *Dr. Gerry Eijkemans*

Progress and challenges in fighting AMR in Latin America and the Caribbean

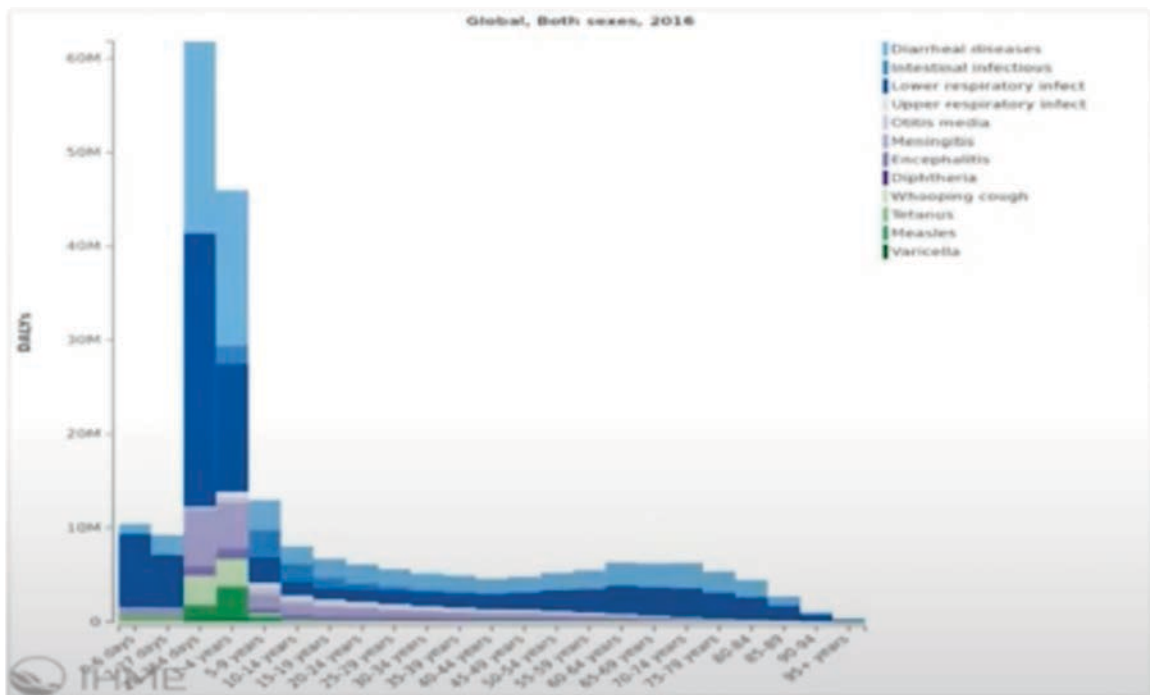
Dr. Pilar Ramon-Pardo

**Team Lead, Antimicrobial Resistance Special Program
Communicable Diseases and Environmental Determinants of Health PAHO/WHO**

AMR is a highly relevant global and multisectoral problem, and is of concern to everyone, reason why the community is also involved. We cannot start any discussion about health today without at least mentioning the importance of the COVID-19 pandemic and how it is affecting the use of antimicrobials and AMR. Antimicrobials are being widely used in this context, particularly in severe patients in ICU, while at the same time the incidence of bacterial infections is

between 10 and 15 % in these patients. Another additional factor that favors transmission of health care associated infections is the systems' overload.

But beyond COVID-19, the burden of infectious diseases remains important, particularly in countries with limited resources, and especially in children under 5 years of age.

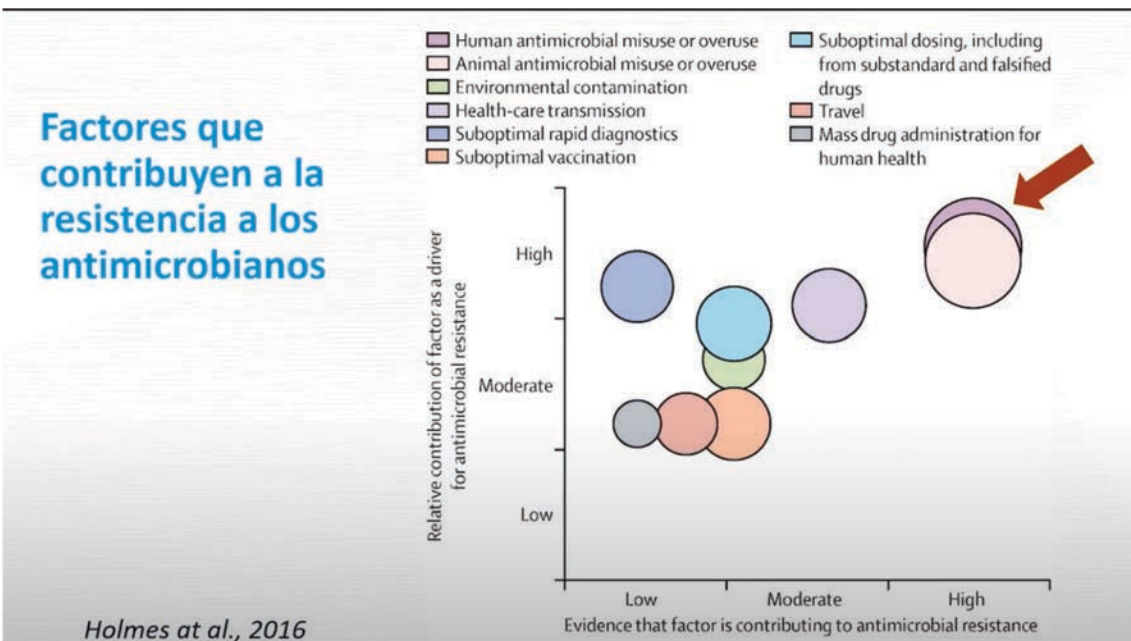




AMR does not equally affect all countries, and there are also differences between age groups.

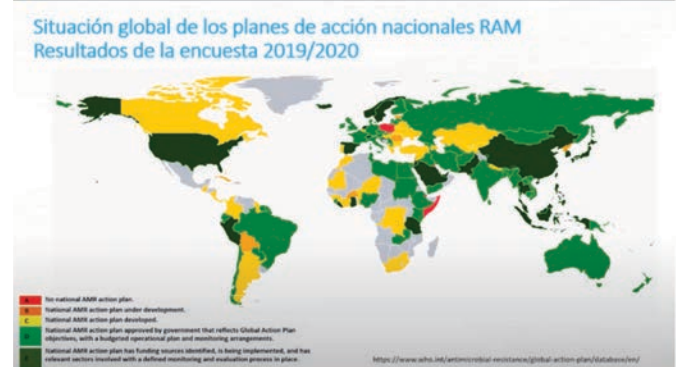
As this graphic shows, the burden of AMR is not only important in children under one year of age, but also in adults and older adults.

The factors that mainly contribute to developing resistance are the use or overuse of antibiotics, both in human health as well as in environment and in farming.



We know that the global consumption of antimicrobials in human health has increased by 30% in the decade of 2000. Another big problem is the transmission of resistant pathogens in the context of health care. We must always emphasize the importance of hygiene in infection control programs

There are some resistance mechanisms of special concern such as carbapenems-resistant *Klebsiella pneumoniae*, which has had an exponential increase in the region. We know that AMR requires a global, multisectoral and coordinated response. WHO launched its global action plan, which was endorsed by PAHO in October 2015, and to a certain extent fostering the development of national plans in all member countries, as shown in the next graphics.



Behavioral insights and new approaches to public health intervention design

Dr. Saad Omer

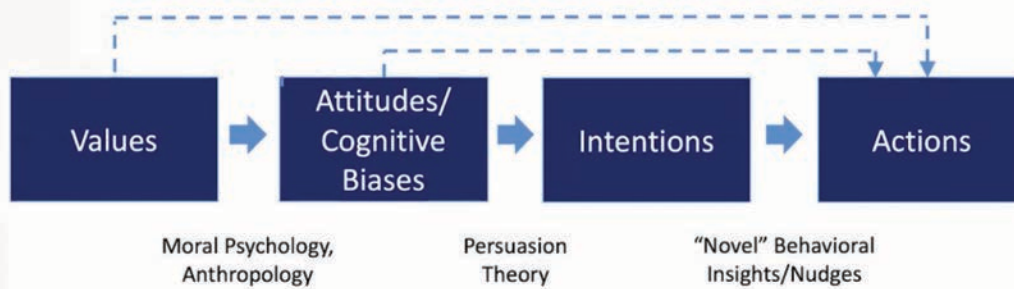
Director, Yale Institute for Global Health

Behavioral insights are a multidisciplinary approach that puts human behavior at the center and draws from psychology, behavioral science, economics, and

neuroscience to design evidence-based policies.

This graphic shows a working model used for acceptance and demand interventions.

A Working Model for Acceptance & Demand Interventions



Omer, 2017

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Cognitive biases are important to be considered when discussing how to change human behavior:

- Present bias: It is intuitive to give stronger weight to more immediate payoffs than long-term payoffs
- Sunk cost fallacy: Individuals who continue to work towards a goal because they have previously invested resources: time, money.
- Risk aversion: The pain of a loss is more powerful than the joy from gain
- Conjunction fallacy: Individuals think a specific condition is more likely than a general condition
- Base rate neglect: Individuals focus more on specific information and ignore general information about events
- Information avoidance: individuals choose not to obtain knowledge that is freely available.

The next graphic shows the relationship between policy tools, nudges, and behavioral insights, and would apply to AMR.

Figure 2: The relationship between policy tools, nudges and behavioral insights

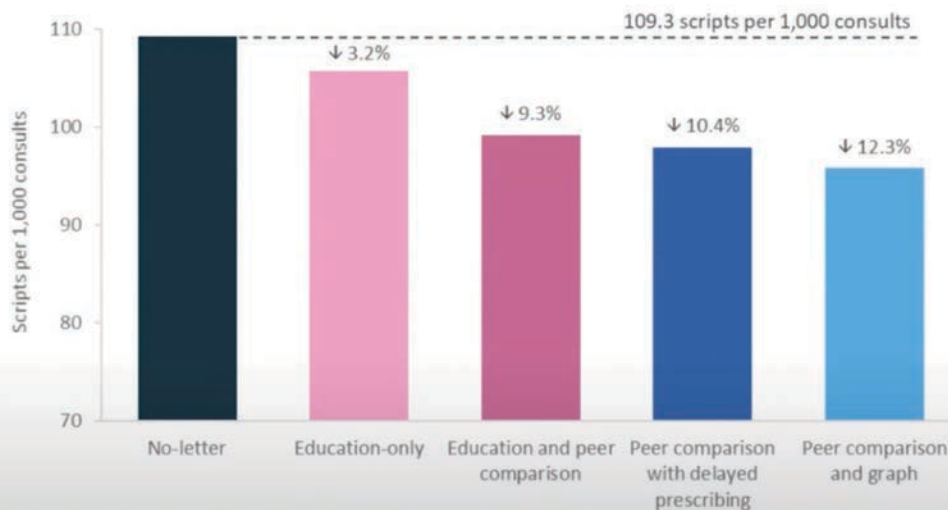


Several studies in the UK and Australia used different interventions with physicians to influence their antibiotic prescription pattern. These were based on a peer comparison strategy and included comparison of antibiotic prescription rates by letter or

graphics. This graphic shows the result of each intervention on the reduction of antibiotic prescription.

Incorporating values into messaging is also important in terms of prescription behavior.

Main findings for six months combined (prescription rates)



Community wisdom in the use of antibiotics and preservation of the health of Mother Earth

Dr. Arturo Quizhpe
ReAct Latin America

Community involvement in life issues has been the ground of ReAct Latin America for the last 10 years.

Particularly during the first years, we focused on understanding the wisdom of the native original civilizations of Latin America and the Andes about the preservation of health, of the earth, animals, and plants, all of which is not only a narrative or rhetorical description, but a life experience.

The school of medical sciences, in its community-oriented program organized a massive workshop for children to teach them to take care of the health of land and of the sources of water, to talk about food and nutrition, and climate change, among other topics. ReAct also produced a series of booklets promoting health care, healthy food production and consumption, and adequate use of antibiotics.

ReAct understands that the global plans to combat AMR not only should be adapted to a national level but should involve the communities, understanding that the problem is not only medical but also social, ecological, environmental, and economic and that the response to AMR requires a behavior change, a conceptual revolution in the way we use antibiotics and in our relationship with the world of microbes.

The global and national response to AMR must also be local. We need to walk towards an action plan with consensus, involving agricultural producers, peasants, academia, life sciences, human health, animals' health, and environmental health and promoting the construction of community plans.

The pandemic has not shown us that the community is the heart of the healthcare system. If the community is not sensitized, if the community does not want to do something, there is no force that will compel people to act. If the community and the people do not accept that social distance prevents the transmission of COVID, there is no way to make people change.

Awareness programs undoubtedly play a vital role at school, to develop knowledge and skills of children and their families to efficiently address prevalent infectious diseases and prevent the inadequate use of antibiotics under the "" approach.

To recover balance, understanding that caring for health and that of other forms of life, communities must respect, observe, and learn from the vital processes of soil, air, water and know the ecosystem to which they belong.

Diversity is essential for life and survival.

Discussion

Moderator: Dr. Gerry Eijkemans,

Pilar, which is the commitment of our region to fight against AMR?

We have seen a growing political commitment particularly since the G20 meeting in Argentina in 2008. The other great achievement in the region is multisectoral committees. We have seen in recent years how the agriculture, human and animal health have joined to combat AMR. However, community commitment is still a challenge.

Dr. Quizhpe, could you share with us an experience about community engagement to combat AMR that could be useful for other countries in the region?

The publications that I have presented are the result of a process developed in Latin America, particularly in Argentina, Bolivia, Peru, Ecuador, and Guatemala, through seminars and workshops, with intensive intercultural exchange. I can also comment on our experience in Ecuador, where a small population of peasants who work on fruits and poultry was instructed about the use and impact on antibiotics in their land and environment, in human and animal health, they started to look for

alternatives, regardless of any local or national regulation, looking to protect their health, their land, and their work.

Dr. Saad, how can the knowledge be applied to the realities of our countries in Latin America and in general, if you could give three pieces of advice to a Minister of Health about changing behaviors, which would they be?

1. On-going intervention: feedback to providers
2. Add a layer of behavioral science to communities, speaking to people values, align messages around them.
3. Constantly monitor what is or not working

Self-prescription seems to be a severe problem in the region. What do you think should be done to modify this pattern?

Dr. Ramón-Pardo: PAHO is concerned about this problem, in our case particularly regarding antimicrobials, which of course are not the only drugs which are self-prescribed. Almost all efforts have been directed to countries' regulations. We know that we need to work on community behavior

involvement and change, as was explained both by Dr. Quizhpe and Dr. Omer.

Dr. Quizhpe: Community awareness is key to sustaining any regulation. People need to understand the risks and consequences to change their behavior. To carry out a campaign to teach about the role that microorganisms play in human life, we are working with physicians, actors, artists. We need to look for different strategies, as Dr. Omer pointed out earlier in his presentation.

Dr. Saad, is age relevant regarding awareness development and

involvement in health issues, particularly AMR?

In most countries social studies are taught as observational disciplines, and the world is moving towards a more engaged citizenship. Our students should integrate science, sociology, anthropology, and all other disciplines that they are learning, into policy solutions; otherwise, we end up having populations which are passive thinkers, not active problem solvers. AMR requires a multidisciplinary solution and needs that generation of problem-solvers.

Conclusion

Behavior change is a key field to be included in any action plan to combat AMR. There is much more to do beyond promoting hand hygiene, immunization, and the adequate use of antimicrobials. Behavior change involves all actors in AMR, as contemplated by the one-health approach.

Session 3

Moderator: *Dr. Leopoldo Del Barrio*

Behavior change is one of the great challenges of the current global and national strategies to mitigate the risks of AMR. This change of behavior in the community finally translates into the reinforcement of those practices which are favorable to human health and to animal health, as well as in modifying adverse patterns, both at

individual and collective level. From FAO, as the organization in charge of food and agriculture including animal health, in conjunction with numerous countries in the region, we have raised valuable experiences advancing health education processes to generate new knowledge, abilities and skills among rural producers and in family

livestock producers, through participatory educational methodologies specifically designed for that sector. Communication is the first big step to generate adequate levels of awareness in the community or in the civil

society to adopt greater knowledge and an attitude to combat AMR, but we must go further through strategies that foster practices which are also favorable to human health.

Identifying community level risk factors and their impact on AMR in low-income communities in Guatemala

Dr. Brooke M. Ramay

Universidad del Valle de Guatemala / Washington State University

Which type of interventions would be more effective at a community level to reduce AMR?

Self-medication with antibiotics is a homogeneous trend among some socio-economic sectors (80% of the patients self-

medicated with antibiotics). Broad spectrum antibiotics are among the highest priced medications.

Self-medication and etiologies of individuals presenting at pharmacies with influenza-like illness: Guatemala City, 2018 influenza season

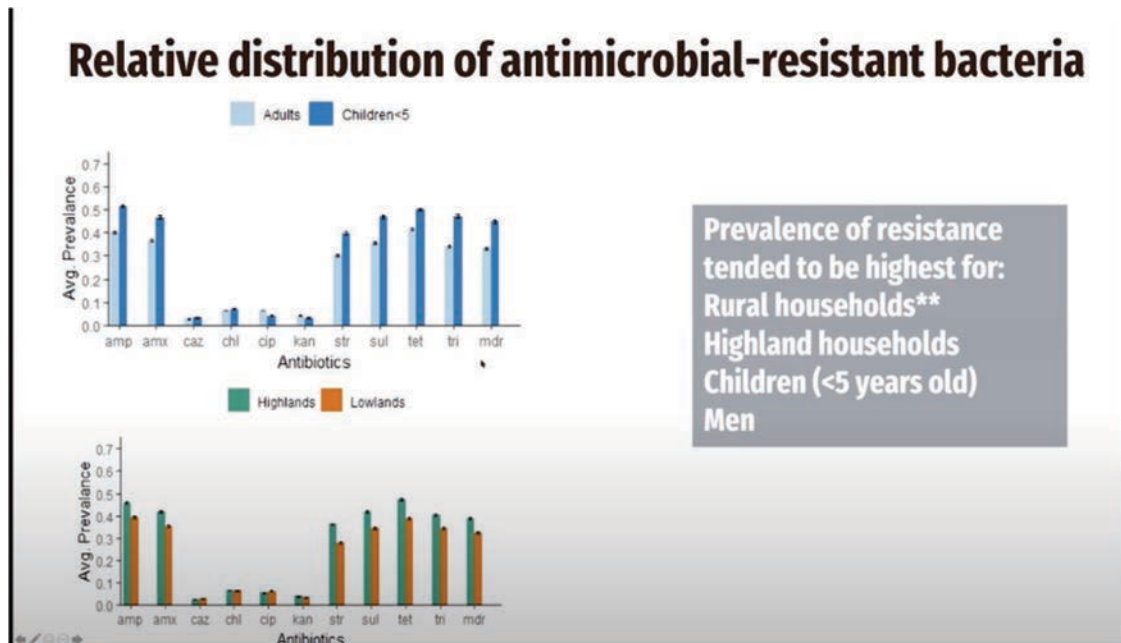
Total number of participants self-medicating with antibiotics	16/130
Positive viral result (n=9)	Amoxicillin/clavulanic acid (n = 3) Tetracycline (n = 1) Chloramphenicol (n = 1) Ceftriaxone (n = 2) Azithromycin (n = 2)
Negative viral result (n=7)	Amoxicillin (n = 2) Dicloxacillin (n = 1) Azithromycin (n = 2) Ceftriaxone (n = 2)

The Centers for Disease Control and Prevention (CDC) works with local and national health departments throughout the world to respond to public health threats and

prevent the spread of disease regionally and globally. One of the places CDC works is Guatemala, where roughly half of the people live in rural areas. CDC works through local

partners, reaching people in areas like the Department of Quetzaltenango. Among the many health challenges these communities face is AMR. To examine the effects of poor sanitation and hygiene on the prevalence of antimicrobial-resistant bacteria, households

in two rural and two urban communities in Guatemala were surveyed (N = 196 randomly selected households). One adult (≥ 18 -years old) and, when available, one child (≤ 5 years-old) provided a stool sample.



Antibiotic use was associated with a higher likelihood of harboring detectable antimicrobial-resistant bacteria, but almost exclusively in households classified as Level 2 in the antibiotic use scale which reported

consuming the most antimicrobials frequently. This group comprised 11% of the sampled population.

Associations of Antimicrobial resistance Mixed effects logistic regression

Higher odds of AMR:

- Level 2 AB use
- Children
- Urban communities

Lower odds of AMR

- Increasing household hygiene
- Household consumed boiled milk
- Level 1 AB use



Ramay, B.M. et al. 2020, Sci Rep

For household hygiene, every unit increase in the hygiene scale (i.e., better hygiene) was associated with a $\approx 30\text{--}50\%$ decrease in odds of detecting resistance to all antibiotics. Improved antibiotic stewardship is critical to reducing the prevalence of antimicrobial-

resistant bacteria. The impact of stewardship is questionable when hygiene is compromised. Interventions and policy practices need to be informed to justify the relevance of the investments.

Antibiotic Use in Small-Scale Food Animal Production in Ecuador: A Mixed-Methods Study

Dr. Jay Graham
UC Berkeley, Ecuador

Four years ago, we conducted a pilot study of antibiotic resistance in children and animals, with in-depth interviews with small-scale food-animal producers ($n = 25$). Nearly half of producers interviewed considered antibiotics important for growth promotion. Multiple respondents claimed that their animals rarely get sick and credited antibiotics with animal health. Producers had

a limited understanding of antibiotic resistance

A new study is being carried out in the same area (2018-2022), with three groups of 120 children each, from different type of neighborhoods (1. No animals, not proximity to commercial poultry; 2. Small-scale animals, not proximity to commercial poultry and 3. Small-scale animals, live near commercial poultry). Fecal samples were

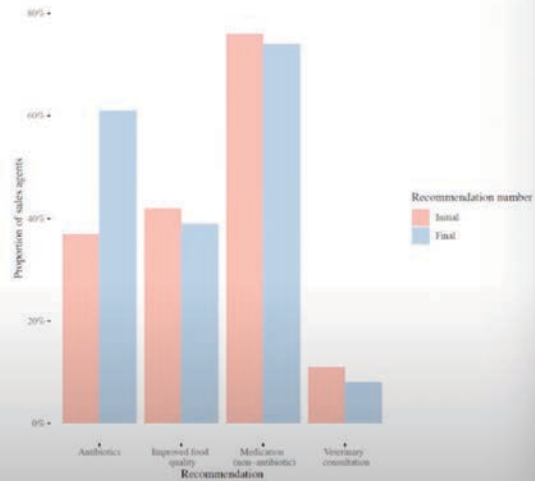
taken in six events to the same household, looking at clinically relevant drug resistant *Escherichia coli*. A survey on food animal management was conducted to find out about the knowledge and attitudes towards antibiotics and the use of antibiotics for animals, to understand antibiotic use practices among small-scale animal

producers. To characterize true sales behavior with realistic client interactions, a secret shopper study was carried out with 40 veterinary shops which were visited on two occasions.

These graphics summarize our results to date:

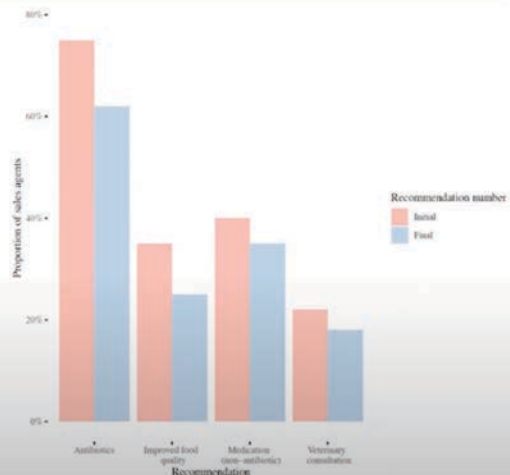
Agricultural shop recommendations (growth promotion scenario, n = 38)

- 82% of agriculture shops carried antibiotics
- 8% of shops had a veterinarian present
- 37% of sales agents immediately recommended antibiotics to increase growth
- 61% of sales agents recommended antibiotics when asked if antibiotics would be effective for growth promotion



Agricultural shop recommendations (disease treatment scenario, n = 40)

- 75% recommended antibiotics as their first recommendation
- Few sales agents recommended the use of colistin (1 out of 40)
- About one-fifth recommended a veterinary consultation

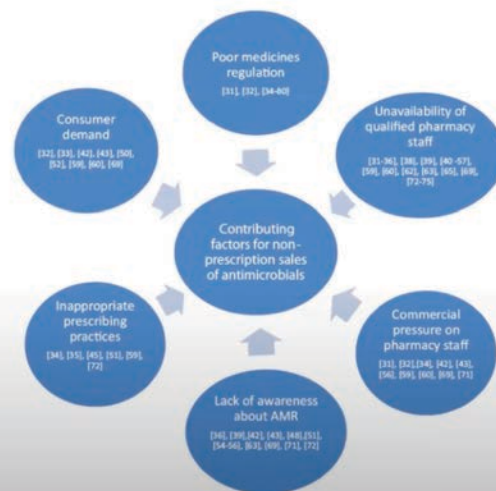


Antibiotics are commonly used in small-scale food animal production; more than one-third of sales agents immediately recommend antibiotics for chicken that are growing slowly; 75% of sales agents

immediately recommend antibiotics when household's chicken appear to be sick (about 25% recommend high caution antibiotics in this scenario).

Policy implications

- Look for lower risk substitutions
- Change incentive structures for antibiotics
- Improve stewardship surveillance and improve enforcement of existing regulations
- Consumer and practitioner awareness campaigns



Antimicrobials use in small-scale food production

Dr. Hernán Rojas
Director of CERES BCA

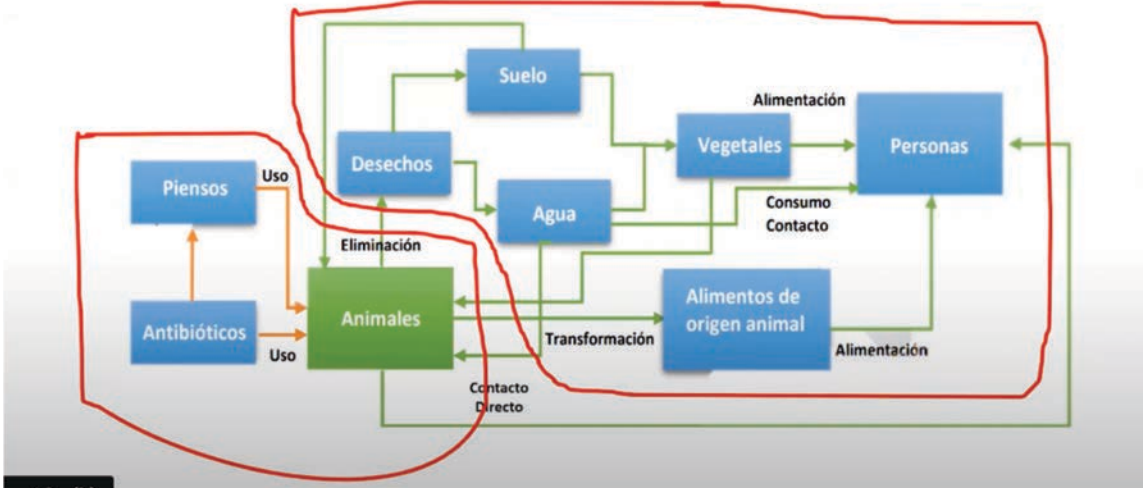
Family livestock production systems exist in all countries of the region, in some they represent over 80 %, they generate between 20 and 50% of the food that is consumed, and they grow over 50% of the animals. It is a very heterogeneous sector, for varied factors. They generally live in poor regions.

FAO evaluated the risks on this sector of family agriculture regarding the generation and dissemination of AMR.

One of the studies included a very comprehensive survey which also help to identify the gaps and design a roadmap to mitigate the risks of AMR.



Rutas de Generación y Diseminación de RAM



The study also evaluated which were the agents most frequently used in family agriculture, categorized by animal species.



Especies	Agente	Denuncia obligatoria	Frecuencia	Principios activos	Via de administración
Pollos de engorde y Gallinas ponedoras	<i>Salmonella spp.</i>	No	Media	Enrofloxacina, Tilosina, Cefalosporinas	Oral
	Cólera aviar (<i>Pasteurella multocida</i>)	Sí	Alta	Enrofloxacina	Oral
	Coriza infecciosa aviar (<i>Avibacterium paragallinarum</i>)	Sí	Media	Tilosina	Inyectable
	Viruela aviar (Poxivirus)	No	Baja	Tilosina	Inyectable
Cerdos	<i>Mycoplasma hypopneumoniae</i>	No	Media	Tilosina, Tulatromicina, Enrofloxacina	Inyectable
	Colibacilosis (<i>E. coli</i>)	No	Alta	Enrofloxacina	Inyectable
	Disentería (<i>Brachyspira hyodysenteriae</i>)	No	Media	Tilosina	Inyectable
	Estafilococosis	No	Baja	Amoxicilina	Inyectable
Bovinos de Carne	Neumonías (<i>Pasteurella y/o Haemophilus</i>)	No	Alta	Penicilina, Estreptomina	Inyectable
	Anapiroplasmosis (<i>Anaplasma marginale, Babesia bovis, Babesia bigemina</i>)	Sí	Media	Oxitetraciclina	Inyectable
Bovinos de Leche	Clostridiosis	No	Baja	Penicilina G Sódica	Inyectable
	Mastitis	No	Alta	Ceftiofur	Intramamaria
	Metritis	No	Media	Oxitetraciclina/Gentamicina	Topica
	Anapiroplasmosis (<i>Anaplasma marginale, Babesia bovis, Babesia bigemina</i>)	Sí	Baja	Oxitetraciclina	Inyectable
Acuáticas	<i>Staphylococcus aureus, Streptococcus agalactie</i>	No	Media	Cefalosporinas, Betalactámicos, Aminoglucósidos.	Inyectable e Intramamario
	Bacterial	No	Media	Oxitetraciclina	Oral
	Hongo	No	Media	Oxitetraciclina	Oral
	<i>Aeromonas hydrofila</i>	No	Media	Florfenicol	Oral



Especies	Agente	Denuncia obligatoria	Frecuencia	Principios activos	Vía de administración
Pollos de engorde y Gallinas ponedoras	<i>Salmonella spp.</i>	No	Media	Enrofloxacina, Tilosina, Cefalosporinas	Oral
	Cólera aviar (<i>Pasteurella multocida</i>)	Sí	Alta	Enrofloxacina	Oral
	Coriza infecciosa aviar (<i>Avibacterium paragallinarum</i>)	Sí	Media	Tilosina	Inyectable
Cerdos	Viruela aviar (Poxivirus)	No	Baja	Tilosina	Inyectable
	<i>Mycoplasma hypneumoniae</i>	No	Media	Tilosina, Tulatromicina, Enrofloxacina	Inyectable
	Colibacilosis (<i>E. coli</i>)	No	Alta	Enrofloxacina	Inyectable
	Disentería (<i>Brachyspira hyodysenteriae</i>)	No	Media	Tilosina	Inyectable
Bovinos de Carne	Estafilococosis	No	Baja	Amoxicilina	Inyectable
	Neumonías (<i>Pasteurella</i> y/o <i>Haemophilus</i>)	No	Alta	Penicilina, Estreptomina	Inyectable
	Anapiroplasmosis (<i>Anaplasma marginale</i> , <i>Babesia bovis</i> , <i>Babesia bigemina</i>)	Sí	Media	Oxitetraciclina	Inyectable
Bovinos de Leche	Clostridiosis	No	Baja	Penicilina G Sódica	Inyectable
	Mastitis	No	Alta	Ceftiofur	Intramamaria
	Metritis	No	Media	Oxitetraciclina/Gentamicina	Topica
	Anapiroplasmosis (<i>Anaplasma marginale</i> , <i>Babesia bovis</i> , <i>Babesia bigemina</i>)	Sí	Baja	Oxitetraciclina	Inyectable
Acuáticas	<i>Staphylococcus aureus</i> , <i>Streptococcus agalactiae</i>	No	Media	Cefalosporinas, Betalactámicos, Aminoglucósidos.	Inyectable e Intramamario
	Bacterial	No	Media	Oxitetraciclina	Oral
	Hongo	No	Media	Oxitetraciclina	Oral
	<i>Aeromonas hydrophila</i>	No	Media	Florfenicol	Oral

The study showed that family agriculture poses potential risks to develop and disseminate AMR. There is a low level of sanitary management, an inadequate management of residues, insufficient microbiological control of the food that they

eat or sell. Diverse species share food, water, live together, and they are in direct contact with people. There is low technical or veterinary support. This sector demands a comprehensive approach, from animal and human health.

Conclusions

In these two sessions, participants learned about the importance of human behavior interventions and how a better understanding of the factors that increase the risk of AMR generation and dissemination can be achieved from different perspectives, and provide insights for new strategies and community interventions.

Most of the experiences presented in this seminar are the result of many years of study which serve as a basis for public policies. The academy and the institutions carrying out the research, are key actors in the field.