



Designing, Implementing, and Evaluating Risk Communication and Community Engagement (RCCE) Strategies for Antimicrobial Resistance (AMR) Prevention in the Mekong River Delta Using a One Health Approach

This case study examines the design, implementation, and evaluation of Risk Communication and Community Engagement (RCCE) strategies for antimicrobial resistance (AMR) prevention in the Mekong River Delta. Through training, strategy development, and grassroots communication campaigns, the initiative enhances awareness, knowledge, and community action to combat AMR.

Authors: Pham Duc Phuc^{1,2}, Dinh XuanTung¹

Affiliations:

¹ Institute of Environmental Health and Sustainable Development (IEHSD)

² Center for Public Health and Ecosystem Research (CENPHER), Hanoi University of Public Health (HUPH)

Table of Contents

Abstract	3
What is the incremental value that makes this a One Health case?	3
Learning outcomes	4
Background and context	4
Interdisciplinary Process	6
Project Impact	8
Project Outlook	12
Conclusions	14
Group Discussion Questions	15
Acknowledgements	15
Further reading	16
References	16

Summary

This case study explores the design, implementation, and assessment of risk communication and community engagement (RCCE) strategies on antimicrobial resistance (AMR) for human, animal, and environmental health workers in Vietnam's Mekong River Delta. Through training, strategy development, and grassroots communication campaigns, the initiative enhances awareness, knowledge, and community action to combat AMR.

Abstract

AMR poses a significant threat to public health, particularly in Vietnam, where antibiotic misuse is prevalent in healthcare, aquaculture, and livestock industries. The Mekong River Delta Region, known for extensive antimicrobial use in pig, chicken, and duck farming, presents a critical area for intervention. This case study details the design, implementation, and assessment of RCCE on AMR for human health, animal health, and environmental workers in three provinces: An Giang, Can Tho, and Tra Vinh.

The primary objective of this activity was to develop and implement RCCE strategies to educate and empower local communities to mitigate AMR risks. The project followed a structured approach, beginning with a technical review of AMR status and RCCE efforts, followed by the development of collaborative RCCE strategies at the provincial level. Guidelines for implementing RCCE at the grassroots level were created and introduced through a training-of-trainers (ToT) program, equipping 26 participants with the skills necessary to conduct AMR-focused communication initiatives.

The trained personnel subsequently executed pilot communication campaigns, reaching 266 individuals across three provinces. These campaigns utilized interactive presentations, video clips, and educational materials to raise awareness about responsible antibiotic use. The engagement of local authorities and communities played a vital role in the program's success. Lessons learned from the activity emphasize the importance of integrating RCCE into local events, selecting appropriate communication methods, and adapting to contextual challenges such as weather conditions. This initiative serves as a model for future RCCE interventions addressing AMR and other public health concerns.

What is the incremental value that makes this a One Health case?

This case adds significant value to existing knowledge by integrating RCCE into AMR prevention. While AMR control efforts in Vietnam have largely focused on technical and policy interventions, this initiative uniquely incorporates RCCE, an underutilized yet crucial strategy for influencing behavior change at the local level.

Unlike most top-down AMR strategies, this activity develops a province-specific RCCE framework that is adaptable and responsive to the needs of human, animal, and environmental health sectors. By grounding its approach in local realities, the initiative ensures that AMR prevention strategies are both relevant and effective.

Furthermore, this case study builds upon existing literature reviews but goes a step further by operationalizing RCCE frameworks through hands-on training, guideline development, and community-led implementation. Beyond theoretical contributions, the case study also

emphasizes practical application by testing RCCE strategies in real-world settings, assessing their impact through post-intervention evaluations, and refining best practices for future AMR-focused RCCE efforts.

Besides contributing to existing knowledge, this case study adds incremental value as a One Health case through cross-sectoral collaboration, engaging human, animal, and environmental health professionals to ensure a holistic AMR response.

It fosters a sustainable, community-driven RCCE model by training local professionals and implementing community-led AMR campaigns, strengthening long-term capacity and behavior change.

Beyond AMR, its RCCE strategies and guidelines offer a transferable model for tackling other public health challenges like zoonotic disease outbreaks and food safety risks.

By addressing a critical gap in AMR control, this initiative enhances risk communication, community engagement, and policy integration, demonstrating the practical application of One Health principles in public health.

Learning outcomes

1. Describe the current AMR status in the three target provinces and summarize key RCCE efforts undertaken to address AMR.
2. Develop collaborative RCCE strategies tailored to provincial needs to prevent and control AMR.
3. Design effective communication materials and messages to raise awareness about AMR risk factors and prevention.
4. Demonstrate the ability to implement RCCE campaigns at the community level using evidence-based approaches.
5. Evaluate the effectiveness of RCCE interventions by applying predefined indicators and assessment frameworks.

Background and context

Importance of Antibiotics

Antibiotics are among the most revolutionary medical discoveries in history, significantly contributing to both human and animal health. They are defined as antibacterial substances produced by microorganisms, such as bacteria and fungi, that inhibit the growth of other microorganisms (Huong Dan Su Dung Khang Sinh, 2015).

The use of antibiotics can be traced back to ancient times, with evidence of tetracycline residues found in Nubian skeletal remains from 350–550 BC. However, the modern antibiotic era began in the early 20th century with notable contributions from scientists such as Paul Ehrlich, who developed an antibacterial agent against *Treponema pallidum*, and Alexander Fleming, who discovered penicillin in 1928. Subsequent advancements by Howard Florey and Ernest Chain enabled the mass production of penicillin, marking the beginning of widespread antibiotic use after World War II (Rustam et al., 2020).

Antibiotics play a crucial role in treating bacterial infections in both humans and animals. Depending on their mechanism of action, antibiotics can either inhibit bacterial growth (bacteriostatic) or kill bacteria (bactericidal). Their applications extend beyond medicine to

agriculture, where they are used to enhance plant and livestock productivity (Huong Dan Su Dung Khang Sinh, 2015). Some antibiotics, such as bambarmycin and bacitracin, serve as growth stimulants in animal husbandry, improving livestock growth rates by 4–8% (Patrick et al., 2003).

Antibiotic Use in Vietnam

Vietnam, a Southeast Asian country with a population density of 297 people/km², has a tropical monsoon climate that fosters the spread of infectious diseases. As a major producer of meat and animal products, Vietnam heavily relies on antibiotics in its livestock industry. Despite regulatory frameworks such as the Veterinary Law and the 2018 Livestock Law, economic pressures often lead to non-compliance and excessive antibiotic use.

A 2020 study estimated that approximately 2,751 tons of antibiotics were used in Vietnam's livestock and poultry farming (Juan et al., 2020). The highest misuse rates were found in pig and poultry farming, with 98.1% of pig farmers and 87.9% of poultry farmers using antibiotics (Khanh et al., 2021). A 2021 study in Tien Giang province found that 73.3% of chickens and 66.7% of pigs received antibiotics without a confirmed diagnosis (Nhungs et al., 2021). Additionally, a survey conducted between March and June 2015 revealed that 43.7% of livestock feed products contained antibiotics, with 21.5% of pig feed and 5.4% of poultry feed containing multiple antibiotics (Nguyen et al., 2016).

Antibiotic residues in food products further highlight the issue. A 2019 study found antibiotic residues in 3.6% of chicken samples, 8.1% of pork samples, and 27.5% of other tested samples (Luu et al., 2020). In aquaculture, a 2017 study in An Giang province reported that 56% of shrimp and fish farms used antibiotics for disease treatment, with tilapia and basa fish farms showing particularly high antibiotic use (Gunilla et al., 2019).

Beyond livestock, antibiotic misuse is rampant in human healthcare. Estimates suggest that 69–80% of outpatient visits in Vietnam result in antibiotic prescriptions (Wenhui et al., 2015). Another report found that a third of hospital prescriptions were deemed unnecessary (Shannon et al., 2021). Over-the-counter antibiotic sales are common, with a 2018 study reporting that 57.6% of antibiotics in rural Vietnam were purchased without a prescription (Nam et al., 2020). In urban areas, antibiotics account for 24% of total pharmacy sales, while in rural areas, they make up 18% (Do et al., 2024).

Antibiotic Resistance: Concept, Situation in Vietnam, and Causes

The World Health Organization (WHO) defines antibiotic resistance as "the ability of microorganisms such as bacteria, viruses, fungi, or parasites to grow in the presence of a drug that would normally kill them or inhibit their growth" (WHO). This phenomenon renders conventional treatments ineffective and poses a growing global health challenge.

In Vietnam, multiple studies have demonstrated alarmingly high antibiotic resistance rates. A study in the Mekong Delta found that *E. coli* strains isolated from livestock showed resistance rates of 84.7% to tetracycline, 78.9% to ampicillin, and 52.1% to trimethoprim-sulfamethoxazole. Multidrug-resistant (MDR) *E. coli* was prevalent in 86.7% of pigs and 66.9–72.7% of poultry (Nhungs et al., 2025). Another study analyzing 202 *Campylobacter* spp. strains found 100% resistance to erythromycin and 99% to sulfamethoxazole/trimethoprim (Carrique-Mas et al., 2014).

Antibiotic-resistant bacteria in food products further endanger public health. A study in Ho Chi Minh City reported that 60.8% of meat samples and 18% of bivalve mollusk samples contained *Salmonella* spp., with over 90% testing positive for *E. coli* (Thi et al., 2007). In Northern Vietnam, an analysis of *Salmonella* from pork and chicken samples showed resistance rates of 58.5% to tetracycline, 58.1% to sulfonamides, and 47.3% to streptomycin (Truong et al., 2021).

Hospital-acquired infections also exhibit high antibiotic resistance. The Ministry of Health's 2023 surveillance report from 16 hospitals showed resistance rates of 78% in *Staphylococcus aureus* (methicillin-resistant *S. aureus*, MRSA), 67.9% in *E. coli* (ceftriaxone-resistant), 87.8% in *Acinetobacter* (carbapenem-resistant), and 91.5% in *Streptococcus pneumoniae* (penicillin-resistant) (BYT, 2023).

One of the main causes of high antibiotic resistance is the overuse of antibiotics in the livestock industry. Research on the knowledge, attitudes, and practices of aquaculture farmers in Vietnam shows that reasons such as “animals showing abnormal signs or behaviors” (55%), “weather is about to change” (25%), and “neighboring farms with sick animals” (27%) also lead farmers to use antibiotics (Phuc et al., 2014).

Additionally, antibiotic resistance increases treatment costs by prolonging hospital stays and raising economic burdens. A review of antibiotic resistance in China found that patients infected with multidrug-resistant bacteria, such as *S. aureus*, *E. faecalis*, *E. coli*, *K. pneumoniae*, *P. aeruginosa*, and *A. baumannii*, had higher treatment costs (average US\$3,391), longer hospital stays (average 5.48 days), and increased hospital mortality rates (1.5%) (Xuemei et al., 2021).

The Need for This Case Study

Antibiotic resistance is a critical global public health concern, and Vietnam exemplifies the challenges posed by excessive and inappropriate antibiotic use. This issue extends beyond human health, affecting food security, economic sustainability, and environmental well-being. With a high burden of infectious diseases and widespread antibiotic use in both agriculture and healthcare, Vietnam provides a valuable setting for examining the drivers and consequences of antibiotic resistance.

Understanding antibiotic use and resistance patterns in Vietnam is essential for developing targeted interventions and policies. This case study aims to support professionals working in human, animal, and environmental health in the Mekong River Delta Region by guiding the development, implementation, and evaluation of RCCE strategies on AMR. These efforts will help protect and educate individuals, communities, and the general public.

By providing insights into RCCE strategies, evidence-based guidelines, training methodologies, communication practices, and monitoring and evaluation frameworks, this case study serves as a benchmark for measuring progress. It equipped stakeholders with practical approaches for antibiotic stewardship, regulatory enforcement, and community education - contributing to the fight against antibiotic resistance in Vietnam and beyond.

Interdisciplinary Process

Integration of Different Approaches and Disciplines

The design, implementation, and assessment of RCCE on AMR in the Mekong River Delta Region involved a interdisciplinary approach. This process required integrating expertise from human health, animal health, and environmental sciences to address AMR comprehensively. The collaborative effort combined scientific research, policy recommendations, communication strategies, and grassroots engagement to develop effective risk communication interventions.

Multi-Sectoral Collaboration

The project was designed to ensure a One Health approach by engaging professionals from multiple sectors. Experts in human health, including medical doctors, public health professionals, and epidemiologists from the Vietnam One Health University Network (VOHUN) and Hanoi University of Public Health (HUPH), contributed insights on AMR trends, its impacts on human health, and effective communication strategies for healthcare providers. In the animal health sector, veterinarians, livestock professionals, and agricultural experts from provincial animal husbandry and veterinary departments provided knowledge on antibiotic use in farming, zoonotic transmission risks, and strategies to communicate responsible antimicrobial use among farmers and industry stakeholders. Additionally, environmental health specialists, including environmental scientists and public health professionals, examined the spread of AMR in water sources, soil, and ecosystems due to antibiotic runoff from farms and improper waste disposal.

Evidence-Based Strategy Development

To ensure interventions were grounded in research, the project incorporated data and findings from multiple sources. Prior to conducting this case study, a comprehensive review of antibiotics, antibiotic resistance, and their consequences was undertaken to establish a strong scientific foundation. Additionally, the project aligned risk communication efforts with national policies, laws, and decrees on AMR control to ensure consistency with regulatory frameworks. Furthermore, a review of the AMR status in An Giang, Can Tho, and Tra Vinh facilitated the development of RCCE strategies tailored to the specific challenges and needs of local communities.

Participatory Approach to Training and Communication

To enhance engagement and local adoption, the RCCE approach emphasized participatory learning. Workshops and technical meetings were held, where experts and local stakeholders jointly reviewed and refined AMR communication strategies to ensure local relevance. The development of RCCE guidelines involved input from public health, veterinary, and environmental experts, ensuring that the guidelines were practical and applicable at the grassroots level. Additionally, a ToT model was implemented, equipping local professionals with the necessary knowledge and skills to cascade training and lead community-level initiatives.

Cross-Disciplinary Implementation and Assessment

The project followed an iterative process where interdisciplinary contributions were made at various stages. Experts from different fields collaborated to develop tailored communication strategies for various target audiences, including farmers, healthcare workers, policymakers, and the public. Pilot RCCE campaigns were then conducted in An Giang, Can Tho, and Tra

Vinh, engaging 266 community members. To ensure continuous improvement, an evaluation and feedback was established, allowing ToT trainees and campaign participants to assess the effectiveness of training and communication materials, leading to necessary refinements.

Community Engagement and Local Adaptation

Sustained engagement with local communities was a cornerstone of the project. Local stakeholders, including community health workers, farmers, and members of the Women's Union, played an active role in awareness campaigns, ensuring that messages were effectively disseminated at the grassroots level. Communication strategies were also adapted to align with local cultural and social norms, making them more relevant and impactful. Moreover, engagement with local authorities facilitated institutional support, ensuring the sustainability of RCCE efforts beyond the project's duration.

Project Impact

(i) Reviewing the Current AMR Status and RCCE Efforts

The technical meeting on February 29, 2024, at HUPH served as a crucial platform for evaluating AMR and RCCE efforts in An Giang, Can Tho, and Tra Vinh provinces. The discussions highlighted significant challenges in addressing AMR, particularly high levels of antibiotic misuse in both human healthcare and agriculture, inconsistent enforcement of regulations governing antibiotic use, and gaps in RCCE initiatives, which limit public awareness and adherence to AMR mitigation strategies.

The expert dialogue played a key role in shaping an evidence-based RCCE strategy tailored to regional needs. By incorporating expert recommendations, the meeting established a strong foundation for future policy development and intervention programs aimed at enhancing antibiotic stewardship and improving compliance with AMR control measures.

Antibiotic Use in Vietnam

Vietnam's climate and economic structure create an environment conducive to both infectious disease outbreaks and extensive antibiotic use. Findings on antibiotic usage patterns highlight widespread, unchecked use in livestock, aquaculture, and human healthcare. A significant proportion of antibiotics used in animal husbandry are for growth promotion or disease prevention, often administered without proper diagnosis. Over-the-counter antibiotic sales remain prevalent, leading to self-medication and improper dosage use. Additionally, antibiotic residues in animal-derived products pose a direct risk to consumers and contribute to resistance development.

These findings underscore the urgent need for stricter enforcement of antibiotic regulations and improved public health education. They provide compelling evidence for policy changes aimed at reducing antibiotic overuse. Key recommendations include strengthening surveillance and monitoring systems for antibiotic sales and usage, implementing targeted educational campaigns for farmers and healthcare professionals, and encouraging alternative disease prevention methods, such as improved biosecurity in farming practices.

Antibiotic Resistance: Concept, Situation in Vietnam, and Causes

Studies on antibiotic resistance in Vietnam reveal alarming statistics, particularly among bacterial strains found in livestock, aquaculture, and human healthcare settings. High levels

of resistance have been observed in *E. coli* and *Salmonella* isolated from livestock and food products. In hospital settings, extensive antibiotic resistance in hospital-acquired infections complicates treatment options. Additionally, the presence of multidrug-resistant bacteria in hospital wastewater highlights environmental contamination as a potential transmission pathway.

These findings illustrate how antibiotic misuse directly contributes to resistance, impacting food safety, healthcare efficacy, and environmental health. Addressing this issue requires a multi-sectoral response that integrates stricter hospital infection control measures, improved wastewater treatment protocols to prevent environmental spread, and public-private collaborations to promote the responsible use of antibiotics.

Consequences of Antibiotic Resistance

AMR poses severe health and economic risks, leading to increased mortality and morbidity due to ineffective treatments. Patients with resistant infections often experience prolonged hospital stays and require more expensive medical interventions, driving up healthcare costs. In addition, AMR negatively impacts the agricultural sector, as untreatable infections in livestock and aquaculture result in significant productivity losses.

By quantifying the economic and health burdens of AMR, this research highlights the urgency of policy interventions. Economic analyses of AMR-related costs can help inform government strategies and donor funding allocations for mitigation efforts, ensuring a more effective and coordinated response.

Global and Vietnam Efforts to Combat AMR

Vietnam has actively engaged in global initiatives to combat AMR and has developed national strategies to address the issue. Key efforts include the implementation of the National Action Plan on AMR (2013-2020), which has been updated for 2021-2030, as well as collaborations with international organizations like the WHO and the Food and Agriculture Organization (FAO). Additionally, Vietnam has fostered research partnerships, such as those with the Oxford University Clinical Research Unit (OUCRU), to advance scientific understanding and interventions against AMR.

Evaluating these initiatives provides valuable insights into best practices and areas needing improvement. Future strategies should prioritize stronger enforcement of AMR policies at local levels, enhanced intersectoral coordination between healthcare, agriculture, and environmental sectors, and expanding RCCE initiatives to improve public compliance with antibiotic stewardship efforts.

(ii) Developing Collaborative RCCE Strategies for AMR Prevention

A technical meeting on March 25, 2024, brought together experts from provincial Centers for Disease Control (CDC) and veterinary sub-departments to develop a collaborative RCCE strategy for AMR prevention.

During the session, participants were introduced to key concepts, including strategy development, RCCE and community mobilization, legal frameworks, the RCCE framework, and key messages on AMR. The discussion also covered communication channels, proposed activities for different target groups, and methods for organization and evaluation. Following

the presentation, experts provided feedback, shared valuable insights, and helped refine the strategy to better meet the specific needs of each province.

The participants agreed on the strategy's core content, which covered risk communication principles, RCCE functions, essential elements, benefits, and challenges. Experts emphasized that communication activities should be integrated into local events to enhance engagement and effectiveness. The meeting also introduced the RCCE framework, legal foundations, and key messaging strategies, facilitating discussions on how to align strategies with local needs and embed RCCE efforts into existing provincial public health initiatives.

This collaborative approach ensured provincial ownership of RCCE strategies, fostering commitment from local authorities and health professionals. By integrating AMR-related communication activities into local events, the strategy aimed to achieve greater public outreach and awareness, strengthening efforts to combat AMR at the community level.

(iii) Developing RCCE Guidelines for Human, Animal, and Environmental Health Workers

The guidelines were developed to provide standardized approaches for implementing RCCE strategies at the grassroots level. These guidelines were introduced during the ToT workshop, where they received valuable feedback from experts and practitioners to ensure their relevance and effectiveness. By establishing a structured framework, the guidelines aim to improve communication consistency, enhance public understanding of AMR risks, and strengthen community engagement efforts.

Designed with an open-structured approach, the guidelines provide flexibility while maintaining a clear direction for grassroots-level staff in preparing and conducting community communication sessions. Additionally, they offer basic skill-building recommendations to enhance the capacity of communication officers, ensuring they are well-equipped to engage with diverse audiences effectively.

The document is divided into three main sections:

Section I: Theoretical Foundations of Risk Communication and Community Engagement

This section consists of two chapters. Chapter 1 introduces the fundamental concepts of communication and community engagement, covering broad communication theories and the specific definition of risk communication in community settings. It also outlines community engagement principles, steps for implementing engagement activities, and criteria for identifying target communities, key audience groups, and participants. Chapter 2 focuses on the roles and essential skills of communication officers, emphasizing active listening and interactive presentation techniques. Additionally, it introduces communication strategies for social media platforms to enhance outreach efforts and maximize engagement.

Section II: Practical Guidelines for Risk Communication and Community Engagement on AMR

This section includes three chapters (Chapters 3, 4, and 5), which provide step-by-step guidance on preparing, executing, and evaluating risk communication sessions in community settings. These practical instructions ensure that communication officers can effectively plan and implement AMR-related awareness campaigns, making them more structured, impactful, and goal-oriented.

Section III: Supporting Tools for Risk Communication on AMR

This section provides appendices with practical tools, including Draft communication plans and work programs to assist in structured planning. Presentation examples to support knowledge dissemination. Monitoring and evaluation tools to measure the effectiveness of risk communication sessions.

Regarding the impact, these resources serve as comprehensive references for communication officers, enabling them to design and execute community-based communication activities effectively while ensuring their messaging remains clear, consistent, and evidence-based. By providing structured guidelines and practical tools, this document enhances the capacity of frontline health workers to communicate AMR risks effectively, contributing to greater awareness, informed decision-making, and improved public health outcomes.

(iv) Conducting Training of Trainers (ToT) on AMR-Focused RCCE

From March 28–29, 2024, VOHUN NCO conducted a ToT workshop in Can Tho, training 26 district and commune-level health and veterinary staff on RCCE for AMR. The workshop targeted human, animal health, and environmental professionals from three selected provinces, An Giang, Can Tho, and Tra Vinh with the following objectives:

- Equip participants with RCCE knowledge and skills for effective implementation at the grassroots level.
- Strengthen the capacity of local healthcare personnel in designing and delivering AMR-related communication campaigns.
- Guide participants in developing communication materials to raise awareness of antibiotic use.
- Assist local staff in creating targeted communication plans for their communities.

During the training, participants gained practical knowledge and hands-on experience in implementing RCCE strategies. The workshop provided clear guidelines for human, animal health, and environmental professionals to apply in real-world settings.

Following the theoretical sessions, trainees were divided into three interdisciplinary groups, combining human and animal health professionals. Each group developed a detailed communication plan tailored to their province's target audience. Through collaborative discussions, participants exchanged insights and best practices. The training concluded with role-playing exercises, where participants practiced communication techniques based on their group presentations.

The impact of this training directly strengthens community-level RCCE capacities, aligning with Joint External Evaluation (JEE) Indicator D3.3. By equipping district- and commune-level health and veterinary staff with essential knowledge and skills, the training enhanced their ability to communicate AMR-related risks, engage communities, and promote responsible antibiotic use.

Participants, now trained as trainers, can cascade their knowledge to colleagues and community members, creating a multiplier effect that extends beyond the initial group. This ensures the widespread dissemination of RCCE principles and AMR awareness at the grassroots level.

The training also fostered interdisciplinary collaboration by bringing together human, animal health, and environmental professionals. Through joint discussions and group exercises, participants developed integrated communication strategies that reflect a One Health approach to AMR.

Hands-on activities, including communication plan development and role-playing exercises, strengthened participants' confidence and preparedness to address AMR concerns in real-world settings. The training also resulted in locally adapted communication materials that can be immediately implemented to support AMR prevention and responsible antibiotic use.

By building RCCE capacities, this initiative supports Vietnam's national AMR action plan and aligns with global efforts such as the WHO's Global Action Plan on AMR. Ultimately, it empowers frontline professionals to serve as long-term advocates for AMR mitigation, ensuring sustainable and impactful community engagement.

(v) Executing Community-Based AMR Risk Communication Campaigns

Between April 15–17, 2024, ToT course participants led pilot risk communication campaigns in An Giang, Can Tho, and Tra Vinh, engaging 266 community members. These locally driven RCCE activities aimed to:

- Support ToT-trained communal-level human, animal health, and environmental staff in executing pilot AMR communication campaigns at the grassroots level.
- Educate participants on antibiotic use in livestock and healthcare, as well as the consequences of inappropriate antibiotic use on human, animal, and environmental health.

Participants were introduced to the current situation of antibiotic use in Vietnam, particularly in their local areas. They received key information on antibiotics, AMR, and the risks associated with antibiotic misuse. Presenters emphasized responsible antibiotic use, advising against self-medication, stressing the importance of completing prescribed treatments, and demonstrating proper antibiotic stewardship. Educational video clips reinforced these messages, illustrating the consequences of antibiotic misuse.

A major factor contributing to the success of the campaign was the enthusiastic support and active participation of local authorities and community members. The well-planned logistics ensured smooth execution, and interactive discussions encouraged participant engagement. Presenters facilitated Q&A sessions to address concerns, and informative leaflets were distributed to reinforce key messages.

These campaigns effectively raised AMR awareness, strengthened community engagement, and provided ToT graduates with valuable hands-on experience in leading AMR-focused communication activities. The strong support from local authorities further reinforced the importance of collaborative efforts in combating AMR at the community level.

Project Outlook

Project Reception

The project was well-received by stakeholders, including local health authorities, veterinary services, and environmental professionals. Experts and participants recognized the initiative's

importance in addressing AMR at the grassroots level. The inclusion of interdisciplinary collaboration between human and animal health sectors strengthened the approach, leading to meaningful discussions and practical recommendations.

Key Achievements

Review of AMR Status and RCCE Efforts

The AMR status in An Giang, Can Tho, and Tra Vinh provinces was successfully reviewed, culminating in a technical meeting at HUPH where experts provided feedback on AMR policies, antibiotic usage, and RCCE initiatives. The insights from this meeting were incorporated into a comprehensive overview report, which included expert recommendations for future improvements.

Development of RCCE Strategies

A technical meeting with three provincial experts led to the development of a standardized RCCE strategy, which outlined key messages, communication channels, and legal frameworks. Experts also recommended integrating RCCE activities into local events to enhance outreach and community engagement.

Creation of RCCE Guidelines

Comprehensive RCCE guidelines were developed for human, animal health, and environmental workers, ensuring a structured approach to risk communication. These guidelines were introduced during a ToT workshop, where participants provided valuable feedback for further refinement and practical application.

Training of Trainers (ToT) Workshops

A ToT workshop was conducted in Can Tho from March 28-29, 2024, with 26 trainees gaining essential RCCE knowledge and skills. The workshop focused on equipping participants with the capacity to design and implement AMR-related communication strategies through hands-on exercises, group work, and role-playing activities.

Execution of RCCE Campaigns

Three locally-led RCCE campaigns were successfully executed in An Giang, Can Tho, and Tra Vinh from April 15-17, 2024, engaging 266 attendees through presentations, video clips, and interactive discussions. These campaigns emphasized responsible antibiotic use and provided practical guidelines, with strong support from local authorities and communities contributing to their success.

Evaluation and Refinement

The effectiveness of RCCE activities was assessed through participant feedback and expert reviews, identifying areas for improvement, such as optimizing scheduling to avoid extreme weather conditions. Participants expressed confidence in applying RCCE strategies in their localities, ensuring the sustainability of these initiatives.

Challenges, Limitations and Lessons Learned

The implementation of RCCE activities revealed several challenges and limitations that offer valuable insights for improving future programming.

Key Challenges and Limitations:

- **Limited Cross-Sectoral Engagement:** While the human and animal health sectors participated, involvement from the environmental and education sectors was limited, constraining the full implementation of a One Health approach.
- **Inconsistent RCCE Capacity:** Variations in participants' professional backgrounds led to uneven understanding and application of RCCE principles. Some required additional support to apply key concepts effectively.
- **Logistical and Environmental Barriers:** Extreme heat and the lack of appropriate indoor venues affected the effectiveness of community outreach, highlighting the need for improved logistical planning and contingency arrangements.
- **Resource Constraints:** Inadequate funding and infrastructure at the local level hampered follow-up, monitoring, and scaling efforts, threatening the sustainability of RCCE outcomes.
- **Diverse Communication Needs:** Differences in disease patterns and local cultures call for adaptable communication materials. While standardization is important, flexibility is needed to tailor content to local contexts.

A key lesson learned is the importance of sustained engagement. For long-term impact, RCCE efforts must be continuously supported and embedded within local government programs. While standardized communication tools help ensure clarity and credibility, materials should also be adaptable to meet the specific needs of each province.

Sustainability and Next Steps

To ensure the sustainability of RCCE initiatives, efforts should focus on integrating these strategies into existing AMR control programs led by local authorities. Strengthening capacity-building efforts through expanded ToT programs will equip more local facilitators, increasing community outreach and knowledge dissemination. Establishing a structured monitoring and evaluation framework is also crucial for assessing the long-term impact and effectiveness of RCCE activities. Additionally, securing additional funding will be key to replicating and scaling up successful RCCE initiatives in other regions, further strengthening AMR control efforts.

Conclusions

The implementation of RCCE activities on AMR for human health, animal health, and environmental workers in the Mekong River Delta Region has been a significant step towards addressing the growing challenge of AMR in Vietnam. The multi-sectoral approach involving professionals from different disciplines ensured a comprehensive understanding and application of RCCE principles.

Through the six sub-activities, including technical reviews, strategic development, guideline creation, ToT, risk communication campaigns, and evaluation, the project has successfully raised awareness and built capacity among local health personnel. The engagement of experts and local stakeholders helped tailor the communication strategies to the specific needs of the target provinces (An Giang, Can Tho, and Tra Vinh).

The overall success of the activity was reflected in the positive feedback from experts and participants, the active participation in pilot campaigns, and the willingness of trained personnel to continue applying RCCE strategies in their respective localities. Despite some logistical and environmental challenges, the initiative demonstrated a strong potential for sustainability and scalability.

Group Discussion Questions

1. What are the key drivers of AMR in the Mekong River Delta?
2. How does the One Health approach help address AMR in this region?
3. What are the essential components of an effective RCCE strategy for AMR prevention?
4. How can RCCE strategies be adapted for different audiences (e.g., farmers, local authorities, general public)?
5. What are the potential barriers to implementing RCCE on AMR in the target provinces (An Giang, Can Tho, Tra Vinh)?
6. How do resource limitations (e.g., funding, staffing, technology) affect the success of RCCE programs?
7. What methods can be used to measure the effectiveness of RCCE activities?
8. How can we assess whether RCCE strategies have led to behavioral change in antibiotic use?
9. How can RCCE efforts be sustained beyond short-term training and workshops?
10. How can RCCE programs be integrated into existing national policies on AMR control?

Acknowledgements

We would like to express our gratitude to all individuals and organizations that contributed to the successful implementation of this case study.

We extend our sincere appreciation to the United States Agency for International Development (USAID) for funding this initiative through the One Health Workforce-Next Generation (OHWN-NG) project. Their financial support and commitment to addressing AMR have been instrumental in enabling this work.

We would also like to thank to VOHUN and HUPH for their leadership and coordination in organizing technical meetings, training workshops, and community engagement activities. Their dedication and expertise have been invaluable in shaping the project's outcomes.

Special thanks go to our collaborating institutions, including the provincial Centers for Disease Control (CDC) and sub-Departments of Livestock and Animal Health in An Giang, Can Tho, and Tra Vinh provinces. Their insights and contributions have played a crucial role in tailoring RCCE strategies in the local context.

We acknowledge the expert contributions of trainers, facilitators, and participants who attended the technical meetings and ToT workshops. Their knowledge, experience, and active engagement have greatly enriched the development of RCCE strategies and guidelines for AMR prevention.

Finally, we sincerely appreciate the efforts of all stakeholders who participated in the Community-Based AMR Risk Communication Campaigns. Their collaboration and dedication have been essential in raising awareness and strengthening community responses to AMR challenges.

Further reading

Risk communication and community engagement approaches during the monkeypox outbreak in Europe, 2022. Available at:

<https://www.ecdc.europa.eu/sites/default/files/documents/ECDC-WHO-Risk-communication-community-engagement-monkeypox-outbreak-Europe.pdf>

References

Huong dan su dụng kháng sinh (2015). Available at:

<https://kcb.vn/upload/2005611/20210723//H%C6%B0%E1%BB%9Bng-d%E1%BA%ABn-s%E1%BB%AD-d%E1%BB%A5ng-kh%C3%A1ng-sinh-C%E1%BA%ADp-nh%E1%BA%ADt-l%E1%BA%A7n-cu%E1%BB%91i-khi-in-09.01.2015.pdf> (accessed January 15, 2024).

Rustam I. Aminov, (2010) A Brief History of the Antibiotic Era: Lessons Learned and Challenges for the Future. *Frontiers in Microbiology* 1, December 8, 2010: 134. DOI: 10.3389/fmicb.2010.00134.

Patrick Butaye, Luc A. Devriese, and Freddy Haesebrouck, (2003) Antimicrobial Growth Promoters Used in Animal Feed: Effects of Less Well-Known Antibiotics on Gram-Positive Bacteria. *Clinical Microbiology Reviews* 16, no. 2: 175–88. DOI:10.1128/CMR.16.2.175-188.2003.

Juan J. Carrique-Mas et al., (2020) An Estimation of Total Antimicrobial Usage in Humans and Animals in Vietnam. *Antimicrobial Resistance & Infection Control* 9, no. 1 (January 14, 2020): 16. DOI:10.1186/s13756-019-0671-7.

Khanh Nguyen Di et al., (2021) Antibiotic Usage and Resistance in Animal Production in Vietnam: A Review of Existing Literature. *Tropical Animal Health and Production* 53, no. 3 (June 5, 2021): 340. DOI: 10.1007/s11250-021-02780-6.

Nhung T. Nguyen et al., (2016) Use of Colistin and Other Critical Antimicrobials on Pig and Chicken Farms in Southern Vietnam and Its Association with Resistance in Commensal *Escherichia Coli* Bacteria. *Applied and Environmental Microbiology* 82, no. 13 (July 1, 2016): 3727–35. DOI: 10.1128/AEM.00337-16.

Nguyen Van Cuong et al., (2016) Antimicrobial Consumption in Medicated Feeds in Vietnamese Pig and Poultry Production. *EcoHealth* 13, no. 3 (September 2016): 490–98. DOI: 10.1007/s10393-016-1130-z.

Luu Quynh Huong et al., (2020) Pilot Monitoring of Antimicrobial Residues in Chicken and Pork in Vietnam. *Journal of Food Protection* 83, no. 10 (October 1, 2020): 1701–6. DOI: 10.4315/JFP-20-111.

Gunilla Hallenberg Ström et al., (2019) Antibiotic Use by Small-Scale Farmers for Freshwater Aquaculture in the Upper Mekong Delta, Vietnam. *Journal of Aquatic Animal Health* 31, no. 3 (September 2019): 290–98. DOI:10.1002/aah.10084.

Wenhui Mao et al., (2015) Systematic Review on Irrational Use of Medicines in China and Vietnam,” ed. John E Mendelson, *PLOS ONE* 10, no. 3 (March 20, 2015): e0117710. DOI: 10.1371/journal.pone.0117710.

Shannon McKinn et al., (2021) Drivers of Antibiotic Use in Vietnam: Implications for Designing Community Interventions. *BMJ Global Health* 6, no. 7 (July 2021): e005875. DOI: 10.1136/bmjgh-2021-005875.

Nam Vinh Nguyen et al., (2020) Community-Level Consumption of Antibiotics According to the AWaRe (Access, Watch, Reserve) Classification in Rural Vietnam. *JAC-Antimicrobial Resistance* 2, no. 3 (September 1, 2020): DOI: 10.1093/jacamr/dlaa048.

Do Thi Thuy Nga et al., (2014). Antibiotic Sales in Rural and Urban Pharmacies in Northern Vietnam: An Observational Study. *BMC Pharmacology & Toxicology* 15 (February 20, 2014): 6. DOI: 10.1186/2050-6511-15-6.

World Health Organization (WHO) (2020). <https://www.who.int/vietnam/vi/health-topics/antimicrobial-resistance>.

Nhung N. T. et al., (2015) High Levels of Antimicrobial Resistance among Escherichia Coli Isolates from Livestock Farms and Synanthropic Rats and Shrews in the Mekong Delta of Vietnam. *Applied and Environmental Microbiology* 81, no. 3 (February 2015): 812–20. DOI: 10.1128/AEM.03366-14.

Carrique-Mas, J. J. et al., (2014) An Epidemiological Investigation of Campylobacter in Pig and Poultry Farms in the Mekong Delta of Vietnam. *Epidemiology and Infection* 142, no. 7 (July 2014): 1425–36. DOI: 10.1017/S0950268813002410.

Thi Thu Hao Van et al., (2007) Antibiotic Resistance in Food-Borne Bacterial Contaminants in Vietnam. *Applied and Environmental Microbiology* 73, no. 24 (December 2007): 7906–11. DOI: 10.1128/AEM.00973-07.

Truong Ha Thai et al., (2012) Antibiotic Resistance Profiles of Salmonella Serovars Isolated from Retail Pork and Chicken Meat in North Vietnam. *International Journal of Food Microbiology* 156, no. 2 (May 15, 2012): 147–51. DOI: 10.1016/j.ijfoodmicro.2012.03.016.

Bo Y Te (BYT) (2023) Báo Cáo Giám Sát Kháng Kháng Sinh Tại Việt Nam Năm 2020 Của Bộ Y Tế, Công Bố Tháng 11/2023. Available at: <http://soyte.namdinh.gov.vn/giao-duc-suc-khoe/bao-cau-giam-sat-khang-khang-sinh-tai-viet-nam-nam-2020-cua-bo-y-te-cong-bo-thang-11-2023-331004>. accessed January 18, 2024.

Phuc Pham-Duc et al., (2019) Knowledge, Attitudes and Practices of Livestock and Aquaculture Producers Regarding Antimicrobial Use and Resistance in Vietnam,” ed. Italo Francesco Angelillo, *PLOS ONE* 14, no. 9 (September 25, 2019): e0223115. DOI: 10.1371/journal.pone.0223115.

Xuemei Zhen et al., (2021) Economic Burden of Antibiotic Resistance in China: A National Level Estimate for Inpatients,” *Antimicrobial Resistance & Infection Control* 10, no. 1 (December 2021): 5. DOI: 10.1186/s13756-020-00872-w.