

An investigation into the perception and care of antibiotic resistance in Florencia, Costa Rica relating to the dairy cow industry and human health.

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INTRODUCTION AND BACKGROUND

Antibiotics have arguably been the most important contribution to medicine in our collective history. Over 30 years starting in the 1930s, the boom of new antibiotic development maintained pace with emerging pathogens, but once the development of novel antibiotics slowed, antimicrobial resistance (AMR) gained the lead and resistant organisms continued to emerge as a growing threat to human, animal and environmental health (1). Fast forward 50 years, and the trend of antibiotic use in animal farming represented approximately 80% of the United States' antimicrobial use (2). The trend of increased antimicrobial use, with the growth of economies and population size, poses a serious threat to communities undergoing globalization as they shift to larger scale practices to meet the growing demands of their developing country and economy (3).

The Region: Florencia, district number 2 of the Canton of San Carlos, belongs to the province of Alajuela in Costa Rica; population as of 2011 was 15,149. From 1975 to 2015, the population has increased by 226%. Currently, there are no monitoring systems integrated into the effects or spread of antimicrobial resistance in Costa Rica. The lack of a central reporting agency leaves major gaps in knowledge with respect to general understanding through the lens of prevalence of disease due to AMR in the private AMR and public health sector.

One Health Costa Rica 2019 trip: In 2019, a OneHealth interdisciplinary team conducted research in the region during the summer months. Through informal interviews, field sampling and land use surveys, they began to characterize the presence and perception of antimicrobial resistance (AMR) and vector borne disease.

OBJECTIVE

Develop internet-based surveys to establish an understanding of the prevalence of AMR disease and to understand the perspectives of veterinarians, human healthcare providers, and farm workers.

STUDY DESIGN

We plan to deploy once permissions with healthcare entities are granted. Online Survey consisting of questions addressing the following concerns:

Veterinarian and Human Health Provider Focused

- Major perceptions of AMR and underlying factors contributing to multi drug resistant species.
- Antimicrobial practices and administration of treatment.

Farmer Focused

- Major uses of antimicrobials
- Source of antimicrobial supplies and treatment
- Perception of AMR and the effects on animals, humans, environment.

ABSTRACT

Antimicrobial resistance is a global health crisis. To address the rising threat of antibiotic resistance, an interprofessional research team using a OneHealth approach had been assembled and had completed a pilot study into the actions contributing to, and preventing the spread of, antibiotic resistance and to investigate various perceptions of antibiotic resistance through the lens of human and animal healthcare professionals as well as feed store and farm workers around Florencia, San Carlos, Alajuela province, Costa Rica. In the past 8 months, however, several issues that complicate the goal of developing interdisciplinary strategies to understand and impact this issue built on the pilot data have occurred. These factors include, but are not limited to, the current pandemic of COVID-19 with the associated travel restrictions, environmental impacts of a changing climate, as well as political, socioeconomic and land use changes. Now more than ever, a focused approach to proceed with research as a global and interdisciplinary team is necessary to continue qualitative data collection that can inform ongoing research efforts involving infectious diseases, including antimicrobial resistance. Given the current pandemic and travel restrictions, our objective was to develop and deploy an online survey to healthcare workers, veterinarians and farmers once permission is granted through the Costa Rican government. The survey, developed in conjunction with Costa Rican researchers, is designed to better understand the concerns of Costa Rican health care providers and veterinarians regarding the increased incidence of antimicrobial resistance and to understand what they believe to be the most significant contributing factors. In addition, a parallel online survey has been developed and will be deployed to farmers to better understand current practices around antibiotic use in dairy cows and how this may be influenced by farmer demographics.



DISCUSSION

There are numerous areas in which we can describe the evidence linking human health risks to AMR due to antimicrobial use in food animals including, but not limited to: epidemiologic studies, temporal evidence with emergence of AMR in animals prior to emergence of AMR in humans, evidence linking resistant foodborne pathogens to direct infection of humans but not between individuals, trends of AMR in focused species (*Salmonella* spp., *Campylobacter jejuni* and *E. coli* O157:H7 isolates) and studies describing a higher incidence of farmers and their family members acquiring AMR pathogens over the general population (4). In the greater metropolitan area of Costa Rica, researchers have identified serovars of *Salmonella* species resistant to several antibiotics which further highlights the trend of increased development with further AMR risk (6). Due to the broad nature of AMR and the broad areas this threat affects, a OneHealth approach meets the demand for research and intervention across the disciplines of human medicine, animal medicine and environmental health. The information collected from focused surveys will inform ongoing research as well as provide new avenues of research to address these growing issues in this region. Our goal is to collect qualitative data which will guide research and foster relationships within Costa Rica, so that we may provide resources and collaborate with global communities to better understand AMR. This information will guide efforts to better address interventions at every stage of the cycle of antimicrobial resistance not only in individual communities, but as a global community dependent on one another to address the health of our environment, our animals and one another.

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6. Images credit: Pint2 Realestate (Cow and Landscape of Costa Rica, Florencia)
7. Image credit family: <https://aushcostarica.wordpress.com/2015/02/10/families-kinship-and-marriage-in-costa-rica/>

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