Awards issued prior to January 20, 2025, were funded under previous Administrations and may not reflect the priorities and policies of the current Administration.

United States Department of Agriculture
Project Initiation

Project Data for Accession Number 1034602

Project Title

Integrating Genomics and Farmer Training to Address Antimicrobial Resistance on Puerto Rico Dairy Farms

Project Details

Sponsoring Institution National Institute of Food and Agriculture	**Project Status** ACTIVE
Funding Source NIFA Non Formula	**Grant Year** 2026
Grant No. 2026-67011-46242	**Cumulative Award Amt.** $180,000.00
Proposal No. 2024-13167	**Multistate No.** (N/A)
Project Start Date May 01, 2026	**Project End Date** Apr 30, 2029
Program Code [A7101] AFRI Predoctoral Fellowships	

Project Director

Acosta, A.

Recipient Organization

THE PENNSYLVANIA STATE UNIVERSITY

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Performing Department

(N/A)

Non Technical Summary

Antimicrobial resistance (AMR) is a threat to animal health, milk quality, and farm livelihoods on dairy farms, particularly inPuerto Rico with many small dairy operations. This project will combine DNA sequencing of common bacteria that can cause intramammary infections that lead to mastitis with surveys of farm practices to discover which resistance genes and mobile elements are spreading on farms and how management choices influence that spread. We will translate those scientific findings to inform four short, bilingual training videos and simple quizzes that provide resources for farmers about detecting mastitis early, using antibiotics responsibly, the importance of working closely with a veterinarian when an animal is sick, and adopting strong antimicrobial stewardship practices. By linking genomic evidence to clear, culturally appropriate education, this project aims to reduce AMR risks, improve milk quality, and support the economic flow of dairy producers. The results of this project will be accessible to dairy producers in the mainland U.S. along with Puerto Rico due to the bilingual outputs of the educational materials.

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Animal Health Component

Animal Health Component: 10%

Research Effort Categories

Basic	0%
Applied	100%
Developmental	0%

Classification

Knowledge Area (KA)	Subject of Investigation (SOI)	Field of Science (FOS)	Percent
311	3410	1170	33%
903	6210	3020	34%
722	4099	1170	33%

Knowledge Area

[311] Animal Diseases

[903] Communication, Education, and Information Delivery

[722] Zoonotic Diseases and Parasites Affecting Humans

Subject Of Investigation

[3410] Dairy cattle, live animal

[6210] Farmer cooperatives

[4099] Microorganisms, general/other

Field Of Science

[1170] Epidemiology

[3020] Education

Keywords

Antimicrobial Resistance, E. coli, Puerto Rico, S. aureus, dairy farms, mobile encoded elements

Goals / Objectives

?The major goal of this project is to reduce the antimicrobial resistance (AMR) risks on Puerto Rican dairy farms by combining genomic characterization of AMR mechanisms with targeted, farmer-focused education resources. This project will produce genomic maps of resistance and mobile genetic elements, identifying important plasmids, and translate those findings into concise, bilingual educational tools that improve antibiotic stewardship, mastitis prevention, and sustainable management practices on their respective farms. This integrated approach combines genomic research with education to reduce AMR on dairy farms while empowering farmers with sustainable practices.

Aim 1 focuses on the genomic characterization. The first objective is to identify and localize AMR genes in E. coli and S. aureus isolates from dairy farms using Whole Genome Sequencing (WGS) and descriptive bioinformatic analyses. The second objective is to classify and analyze the mobility potential of AMR genes in these isolates. This involves quantifying mobility potential by calculating the proportion of AMR genes on mobile genetic elements versus chromosomal AMR genes. Then, plasmids will be classified by incompatibility groups and mobility potential. The third objective will focus on a survey that aims to correlate genomic findings with farm practices. This will integrate data on antibiotic use, housing, management, and will build a statistical model to identify significant associations.Aim 2 focuses on farmer education and outreach. The first objective in this aim is to develop a series of short videos addressing early mastitis detection, responsible antibiotic use, the role of veterinarians, and sustainable practices. The second objective is to disseminate the modules, which will be done through the Puerto Rican Dairy Industry Resources, Penn State Extension, and University of Puerto Rico Mayagüez Extension websites, and available for download from those sites. Lastly, the third objective is to assess the comprehension and engagement by asking follow up questions after the program and evaluating the engagement metrics.

Project Methods

This study will use a variety of methods to achieve the set goals. For the genomic characterization, the isolates used in this study have been collected through sampling dairy cows from an existing USDA-NIFA collaboration. Whole genome sequencing is performed on those isolates. The bioinformatic analysis aims at identifying antimicrobial resistance (AMR) genes with the tool ABRicate and AMRFinder as the reference database. Mobile genetic elements will be identified using MobileElementFinder, and plasmids will be classified using MobSuite. Epidemiological methods will be accomplished by administering a farm survey capturing antibiotic use, housing, milking practices, and general AMR awareness. This data will undergo comprehensive statistical methods, such as linear regression and multivariate modeling, to identify significant variables that may play a role in mastitis onset. The educational material involved working with extension educators and video editors to design the four bilingual educational videos, along with measuring comprehension with three focused questions per video. Long-term follow up surveys will be distributed after 3-6 months to assess participants' knowledge retention.