THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

A hybrid Culture-Dependent and Multiplex PCR Assays for Detection of *Salmonella* in Dairy and Meat Products

Achenef Melaku Beyene, Ahmed Abdelhamid, Wondwossen Gebreyes,, Barbara Kowalcyk, Ahmed Yousef
Department of Food Science and Technology, Ohio State University

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

INTRODUCTION

Salmonellosis is a foodborne illness, caused by the rigorous pathogen, *Salmonella enterica* and transmitted by ingestion of contaminated food or water. Dairy and meat products are the main source of the pathogen (Alberto *et al.*, 2014).
Salmonella is the cause of one of the four main diarrheal diseases in the world (WHO, 2020). Center of Disease Control and Prevention (CDC) estimates *Salmonella* cause about 1.35 million infections, 26,500 hospitalizations and 450 deaths in United States every year (CDC, 2020). Detection and identification of the potential sources are very crucial for designing of appropriate approaches for control and prevention of the pathogens. This study aimed to detect *Salmonella* in dairy and meat products using the standard culture-dependent method combined with multiplex polymerase chain reaction (PCR).

METHODOLOGY

A total of 34 samples of milk, meat and their product were collected from local and international groceries. Detection of *Salmonella* in the food samples was conducted using standard operating procedure which was created based on the U.S. Food and Drug Administration and ISO 6579-1:2017 protocols (Fig 1).

QUALITY ASSURANCE

SOP was verified by inoculating lab strain on apparently *Salmonella* free food samples prior to the actual procedure. Negative and positive control colonies were plated separately in addition to the food samples during each analysis.

RESULTS

Three out of 34 samples (8.82%) were positive for *Salmonella*. Biochemical and multiplex PCR result suggested that all the three isolated belongs to *Salmonella enterica subspecies enterica*.

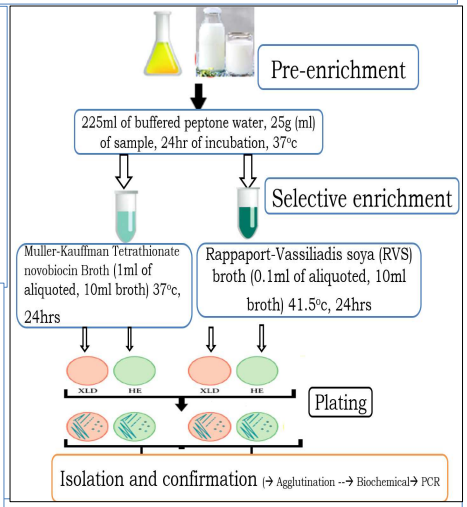
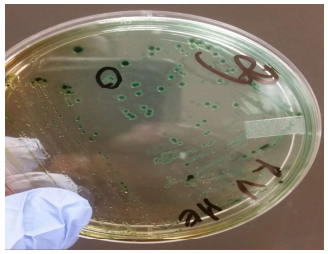


Fig 1. the procedure used for detection

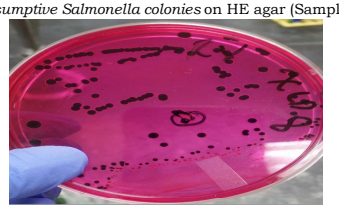
All positive samples were from poultry meat particularly from hearts, liver and gizzards. All dairy and beef samples were negative (Table 1). We also checked the presence of some virulent genes in the isolates. All isolates were positive for *invA, hilC, sipA* and ssrA genes whereas isolate two was negative for *invF* gene.

Table 1. Type of samples examined and their Salmonella Contamination status

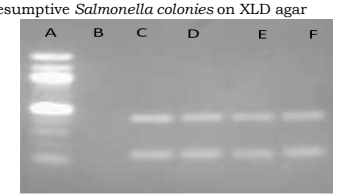
S	Sample type	# examined	# Positive	%
1	Yogurt	9	0	0
2	Milk	1	0	0
3	Cheese	4	0	0
4	Beef	5	0	0
5	Chicken liver	9	1	11.1
6	Chicken heart	3	1	33.3
7	Chicken Gizzard	1	1	100.0
8	Minced chicken meat	2	0	0
	Total	34	3	8.82



Presumptive Salmonella colonies on HE agar (Sample)



Presumptive *Salmonella colonies* on XLD agar



Multiplex PCR result STM3098 and STM4057 genes of the isolates, *A = ladder, B = negative control , C, D and E are isolates, F= positive control*

CONCLUSION AND RECOMMENDATION

The study revealed that *Salmonella* contamination were not detected in samples from dairy and beef products. However, *Salmonella* was detected in samples poultry products. Therefore, appropriate cooking and hygienic handling of these products are mandatory to prevent exposure of individuals. Further phenotypic and genotypic characterization of the isolates are suggested.

References
Alberto, C. *et al.* (2014) 'The Role of Foods in Salmonella Infections', *inTech*, (June 2014). doi: 10.5772/28316
CDC, 2020. Center for Disease Control and Prevention, Salmonella https://www.cdc.gov/salmonella/index.html.
WHO, 2020. World Health Organization, https://www.who.int/news-room/fact-sheets/detail/salmonella-(non-typhoidal)

Acknowledgement: Authors would like to acknowledge NIH fogarty international center, one health east Africa research training (OHEART) program, laboratory staff in food science and technology, global one health initiative (GOHI) East Africa regional office.