

# CRITICAL FACTORS IN THE SPREAD OF SALMONELLOSIS

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The objectives of this research project were: to evaluate the origin of a recent rise in salmonellosis cases in Laredo by reviewing behavior, demographics; to discover factors that have caused this increase in Laredo. We are hopeful that, once these factors are identified, an attempt can be made to discover why certain age groups are more susceptible to infection than others. This study was designed to determine if salmonellosis cases were associated with people traveling to Mexico and eating food from street vendors and/or restaurants or if people were eating from local Laredo street vendors and/or restaurants and getting infected. It also evaluated if daily living habits played a major role in avoiding or contracting infection. Eighty people were surveyed to help better understand the behavior and daily living of Laredo residents. Forty records were selected from the salmonellosis cases reported to the City of Laredo Health Department (CLHD). An additional 40 people were randomly selected from La Familia program located in the CLHD. The results of the survey were examined to find patterns and associations between behavioral, demographics, and medical knowledge.

## INTRODUCTION

Salmonellae are motile, gram negative, rod shaped bacteria of the Enterobacteriaceae family.<sup>1</sup> Salmonellae transmission to susceptible hosts occurs by the consumption of contaminated foods. Common sources of salmonellae are poultry, beef, eggs, unpasteurized dairy products, and animals, especially reptiles such as turtles, snakes, and lizards. Modes of transmission are human-to-human and animal-to-human contact. Pathogenic salmonellae ingested in food survive passage through the gastric acid barrier and invade the mucosa of the small and large intestine and produce toxins, which stimulate proinflammatory cytokines that induce inflammation of the mucosa and may cause ulcerations.<sup>2</sup> If this occurs, the bacteria can disseminate from the intestines to cause systemic disease that may affect the gastrointestinal, cardiovascular, pulmonary, genitourinary, neurological, skeletal, and integument system. Common symptoms caused are diarrhea, nausea, vomiting, headache, fever, and chills. In some cases dehydration occurs due to vomiting and diarrhea, but ignored symptoms may worsen and arise to complications that may be life threatening.

Laredo is a Texas-Mexico border city with more than 200,000 inhabitants that fluctuates by 100,000 people daily due to travel, business, and trade.<sup>3</sup> It is one of the ten fastest growing communities in Texas. Latinos, primarily Mexican Americans, comprise 97% of the population and 50% of the population is underinsured or uninsured. Growth has helped the insurance problem, but has also created environmental as well as health issues that have become a great concern. Some health and environmental issues are: untreated

wastewater from Mexico flowing into drinking water sources; two railways divide the city and county into sectors, restricting access for the most vulnerable populations to emergency and health care services; illegal dumping of household and commercial contaminants; and lack of potable water in underdeveloped, semi-rural areas called Colonias. Even though the community population has grown, the number of health professionals has decreased.

One concern for health officials in Laredo is food-borne illnesses. For five years, food-borne illnesses have been ranked as one of the top five notifiable illnesses and salmonellosis represents half of the food-borne illnesses that are reported. Factors that have contributed to the rise of salmonellosis are that Laredo is a border city and is mainly populated by Hispanics who are at higher risk of being infected because of eating and living habits. The project goal was to elucidate why the number of salmonellosis cases has recently risen in Laredo, by questioning patients who have already been infected as well as those who have not in an attempt to find the most vulnerable age groups and other factors that can be addressed.

## METHODS

Fifty research papers were reviewed to identify the most important mode of transmission of salmonellosis within Laredo, Texas. As a retrospective approach to research, the City of Laredo Health Department (CLHD) Epidemiology Division provided 40 case records from the past three years. A survey tool was developed, which included the most relevant indicators from the Salmonellosis Department of State Health Ser-

vice Patient Questionnaire Form and the research papers reviewed. The 40 records provided by the CLHD were the study population and an additional 40 patients were randomly selected from La Familia program to serve as the control group.

A randomized, stratified sample survey was developed to identify diverse variables, which may affect, influence, and predict the salmonellosis communicability factors in the community. The one survey tool developed was used with both groups. For statistical purposes, a series of cross tabulations was developed, in which a breakdown of identifiable variables by demographics and subgroups was included. The main focus of this survey was on behaviors, common demographics, and exposure.

## RESULTS

This study showed that out of the 80 who were questioned only 42 were infected and half were females. Children (age >1 month and <10 years) were the individuals most prone to infection (67% of those infected). The adults and the elderly were also infected at rates of 10% and 8% respectively. Many of the participants lived along the border area and southern area; there was not a significant difference between these two areas. In total, 57% of the 80 surveyed were insured. While infected, 70% of the patients had contact with food and/or prepared food for others. All participants washed their hands before preparing or cooking any food.

Of the CLHD group (those who had had salmonellosis infections), 43%

of the patients' infections resulted in hospitalization and 48% of the total received antibiotics whether in the hospital or not. Food items were purchased from unapproved sources by 38% of the group. For cooking, 20% preferred their meat to be medium rare. Within these cases, 15% had eaten raw foods like sushi or raw egg products. Results showed that 62% of the group traveled to Mexico and 50% of the group ate food from street vendors either in Laredo or Mexico. Food was left out of the refrigerator for more than three hours by 20% of patients. From these cases, 3% said they knew of someone who was infected and had prepared them something to eat.

Within the control group, 13% preferred eating meats medium rare and 28% had eaten raw food products. Travel to Mexico was done by 75% with 33% of those having eaten food from Laredo or Mexico street vendors. Food was left out for over three hours by 23% of the group. Results showed that 8% knew of someone who was infected and had prepared them something to eat.

## DISCUSSION

After close examination we found that eating from street vendors has an association with getting infected, but traveling to Mexico does not. Street vendors lack basic infrastructure and potable water supplies and may lack knowledge about microbiological status of street vended foods.<sup>4</sup> Personal hygiene like hand washing was the biggest threat. Infants may have been infected

because caregivers may not keep up with personal hygiene before handling the child. Elderly were also more likely to be affected, especially if preexisting conditions were present. Vulnerability increased if the person had any type of stomach surgery or illness which led to greater sensitivity and vulnerability.

Since Salmonellae are ubiquitous, eradication is unlikely, so public education is the only mainstream method for prevention. People should become informed about the dangers of not washing their hands after using the bathroom and then handling food. Since transmission primarily occurs through the ingestion of contaminated foods, people should be informed on the importance of sanitary food handling, proper food preparation, and personal hygiene. Notably, the emergence of drug-resistant salmonellae illustrates the importance of responsible antibiotic use in medicine and animal husbandry.

To prevent salmonellae infection, we recommend the Laredo Health Department work together with the WIC program as they offer life skills classes that include cooking instruction. The classes could stress the importance of proper food handling and hand washing before food preparation. We also recommend public instruction and awareness, targeting all age groups, be implemented for all food-borne illnesses.

## RESOURCES

1. Zapor M. Salmonellosis. Department of Medicine. 2005.
2. Giannella RA. Salmonella.
3. Lopez W. Laredo Environmental Action on the Texas-Mexico Border, CLHD. 2007.
4. WHO. Essential safety requirements for street-vended foods. 1996.