Aug 6th, 9:30 AM - 12:00 PM

Survival of Shigella flexneri in swimming pool water

Monique Gomez  
*University of Nevada, Las Vegas*

Helen J. Wing  
*University of Nevada, Las Vegas*

Repository Citation  
Monique Gomez and Helen J. Wing, "Survival of Shigella flexneri in swimming pool water" (August 6, 2009). *Undergraduate Research Opportunities Program (UROP)*. Paper 15.  

This Event is brought to you for free and open access by the Undergraduate Research at Digital Scholarship@UNLV. It has been accepted for inclusion in Undergraduate Research Opportunities Program (UROP) by an authorized administrator of Digital Scholarship@UNLV. For more information, please contact digitalscholarship@unlv.edu.
Shigellosis is a disease caused by the pathogenic bacterium *Shigella flexneri*. The bacterium causes bloody diarrheaa, fever and abdominal pain. Infections can be and may cause fatal. The disease may also cause bloody diarrhea and intense intestinal crampings. In the United States, there have been many outbreaks of shigellosis have been traced back to associated with inadequately disinfectedchlorinated public swimming pools and wading pools. These outbreaks of sShigellosis are most commonly seen among small children who play in these pools. My goal is to determine how well *Shigella* survives in freshly chlorinated pool water and in pool water that has been stored outside in Las Vegas weather for fixed periods. It is well documented that water dechlorinates and loses its bacterial killing power with exposure to high temperatures and UV. In my experiment, pool water will be distributed into flasks and inoculated with two different strains of Shigella, 2457T (wild type) and BS103 (cured of its virulence plasmid). The pool water will not be chlorinated once the experiment has begun. Chlorine levels will be monitored over time and samples of water will be removed to determine the number of viable *Shigella* cells. I hypothesize that both strains of *Shigella* will not survive in pool water that is treated properly. However, once the levels of chlorine have dropped, the survival rate of wild type *Shigella* will increase.
Survival of *Shigella flexneri* in Swimming Pool Water

Monique Gomez and Helen J. Wing

School of Life Sciences, University of Nevada, Las Vegas

### Introduction

*Shigella flexneri* is a gram-negative bacterium that causes dysentery resulting in bloody diarrhea, fever, and abdominal pain. Complications caused by this infection can be fatal. A common source of *Shigella* infection is from the consumption of contaminated water. In the United States, outbreaks of dysentery have been traced back, as recent as 2006, to inadequately chlorinated swimming pools. These outbreaks are most commonly seen among small children who play in these pools (2, 3). It is well documented that water decholorinates and loses its bactericidal capacity with exposure to high temperatures and UV (2, 4). My hypothesis is that *Shigella flexneri* will not survive in pool water that is properly chlorinated. In addition, the virulence plasmid carried by *S. flexneri* contains genes with potential to confer resistance to environmental stresses. Therefore, my second hypothesis is that the survival of wild-type versus virulence plasmid cured *S. flexneri* will be greater once the levels of chlorine have dropped below adequate levels.

### Objective

Determine how well *S. flexneri* survives in pool water that has been allowed to naturally dechlorinate after exposure to heat and UV in Las Vegas weather for fixed periods.

### Materials and Methods

- Inoculum for pool microcosms was made by growing cultures of 2457T (W/T Type) and BS103 (cured of its virulence plasmid) in Tryptic Soy Broth (TSB) overnight. The cultures were washed by three repetitions of centrifuging and resuspension with filter-sterilized pool water and normalized to cell density.
- 500 mL of pool water was dispensed into acid washed 2 L flasks and inoculated to a final cell concentration of a million cells/mL of washed cells.
- Samples were collected and spread onto TCS plates and incubated at 37°C overnight.
- Chlorine levels were monitored using Pool Time 6-way test strips.

### Results

#### First Inoculation
- *S. flexneri* strains did not survive after washing in inadequately chlorinated pool water (Fig. 2a).

#### Second Inoculation
- *S. flexneri* strains were washed with and inoculated into inadequately chlorinated pool water (Fig. 2b).
- Only the wild type *S. flexneri* persisted after two days exposure (10 cells/mL, Table 1).

#### Third Inoculation
- *S. flexneri* strains were washed with and inoculated into inadequately chlorinated pool water (Fig. 2c).
- Samples were retrieved and plated every 30 mins for 7 hours.
- Cell density was quantifiable due to the plates containing colonies that were too numerous to count.

### References


### Acknowledgements

Funding for this project was provided by the National Science Foundation REU Scholarship (NSF 0860367). I would like to thank Stephanie Lasbahn for all of her amazing su support, help and guidance throughout this project. I would also like to thank Kurt Legner for supplying me with pool water.