

Pathogens In Rio Grande River Water

Dr. George D. Di Giovanni, Texas A&M AgriLife Research

Support provided by: USDA-NIFA, Texas Water Resources Institute and Texas A&M AgriLife Research

BACKGROUND

Few studies have evaluated the microbial quality of the Rio Grande River despite its critical role in agriculture and potable water supply for the region. Furthermore, no prior studies exist on the occurrence of the parasites *Cryptosporidium* and *Giardia* in Rio Grande River irrigation water. *Cryptosporidium* and *Giardia* cause diarrheal illness and have been responsible for numerous waterborne and foodborne disease outbreaks. The disease caused by *Cryptosporidium* is called cryptosporidiosis and there is currently no cure for the disease which normally lasts about two weeks in healthy individuals. However, cryptosporidiosis may be fatal in people with weakened immune systems, such as chemotherapy patients, the young and elderly and organ transplant patients. Under the Clean Water Act the US Environmental Protection Agency mandated 2 years of *Cryptosporidium* monitoring of potable supply surface waters, including the Rio Grande River, beginning in 2006. If high levels of *Cryptosporidium* are found, costly upgrades to drinking water treatment plants may be required. Until recently, the risk from waterborne *Giardia* was considered lessened. However, concern is growing over the risk it poses as it has recently been found in high densities in wastewater treatment plant effluents using more reliable detection methods.



Franklin Canal delivering Rio Grande water for agricultural and urban water use, El Paso, Texas

OBJECTIVES

- Protect our food supply, water supply, and public health by providing timely and useful information on the occurrence, infectivity and potential human health risk of the pathogens *Cryptosporidium* and *Giardia* in Rio Grande River water in the El Paso, Texas region.
- The infectivity and characterization of *Cryptosporidium* and *Giardia* strains present in Rio Grande River water will be determined using state-of-the-art cell culture and molecular methods to better assess the risks posed to human health by these pathogens.
- Levels of *Cryptosporidium* and *Giardia* in Rio Grande River water are also being quantified using the conventional EPA Method 1623 (the current regulatory standard) to develop a baseline occurrence of these organisms and estimate the potential impact of future regulations on drinking water treatment costs.

RESULTS AND BENEFITS

- Large seasonal differences in levels of *Cryptosporidium* and *Giardia* in the Rio Grande water have been identified. Pathogen levels are much higher during the non-irrigation season than during the irrigation season, mostly due to the contribution of wastewater treatment plant effluents. Fortunately, drinking water plants use groundwater instead of Rio Grande water due to the low river flow and salinity during the non-irrigation season. During the irrigation season, releases from Elephant Butte reservoir and return flows increase the volume of river water and lead to a 20-fold or greater decrease in levels of *Cryptosporidium* and *Giardia*.
- Genetic typing (genotyping) is underway to determine the human or animal origin of the detected *Cryptosporidium* and *Giardia*, and the potential risks to human health.
- The results of this research will provide fundamental information on the occurrence of *Cryptosporidium* and *Giardia* in Rio Grande River water and gauge the potential human health risks posed by these pathogens.



Cryptosporidium oocyst (left) and *Giardia* cyst (right) under epifluorescent microscopy