

Investigating the Gut Dysbiosis during Uropathogenic *Escherichia coli*-Induced Urinary Tract Infection and Microbiome Diversity during Treatment with *Manihot esculenta*

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Published November 28, 2023

ABSTRACT

Uropathogenic *Escherichia coli* (UPEC) Urinary Tract Infection (UTI), is a common and often painful bacterial infection of the urinary system. The aim of this study was to evaluate the effect UPEC-induced UTI on the gut dysbiosis and microbiome diversity during treatment with the medicinal plant, *Manihot esculenta* for its known antimicrobial and anti-inflammatory properties. For this study, a group of 32 Sprague Dawley female rats were acquired from the University of KwaZulu-Natal Westville campus Biomedical Research Unit. They were divided into groups of 6 rats. Five of the groups were infected with UPEC and then treated with Saline, Ciprofloxacin, *M. esculenta*, and a combination of Ciprofloxacin and *M. esculenta* respectively, the 6th group is the control group with no infection. The rats were euthanized and the fecal matter in the large intestine was collected. Total DNA extraction was performed on the fecal matter using ZymoBIOMICS DNA Miniprep Kit and the samples were sent off for metagenomics sequencing. Sequencing adapters were removed from raw sequencing reads using Trimmomatic while microbiome diversity was interrogated using the Kbase platform. The Metagenomics analysis revealed elevated levels of Clostridiales, and a decrease in Bacteroidales and Lachnospiraceae in the UPEC-infected groups compared to the uninfected group. Some Clostridiales strains are thought to modulate the host's immune response and maintain immune homeostasis in the gut. Gut dysbiosis may lead to an altered immune response, contributing to inflammation and disease. However, the antagonistic action of Lachnospiraceae inhibits intestinal inflammation to maintain the intestinal barrier and modulate gut motility. Bacteroidales are amongst the most common anaerobes in the human colon, as they provide the body with energy by converting carbohydrates into fatty acids. Low levels of Bacteroidales can be associated with gastrointestinal disorders such as inflammatory bowel syndrome that could be a result of elevated levels of Clostridiales. The consumption of Ciprofloxacin restores the Bacteroidales relative abundance to near normal levels, however, Clostridiales still remain relatively high compared to the uninfected group. The consumption of *M. esculenta* reduces Clostridiales levels to relatively low levels and increases Bacteroidales compared to the Ciprofloxacin treated group. Thus, the current study reveals that consumption of *M. esculenta* restores normal gut microbiota compared to the Ciprofloxacin and Saline treatments.

Keywords: Uropathogenic *Escherichia coli*, *Manihot esculenta*, Urinary tract infection, Bacteroidales, Clostridiales

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Citation: Matenzhe S, Mvubu N & Ndlazi Z. (2023) Investigating the Gut Dysbiosis during Uropathogenic *Escherichia coli* Induced Urinary Tract Infection and Microbiome Diversity during Treatment with *Manihot esculenta*. J Infect Dis Res, 6(S4): 22.

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