CRAINBERRY JUICE: A PREVENTIVE MEASURE FOR URINARY TRACT INFECTION IN CHILDREN

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ABSTRACT

Cranberries have long been the focus of interest for their beneficial effects in preventing urinary tract infections (UTIs). Cranberries contain 2 compounds with anti-adherence properties that prevent fimbriated \textit{Escherichia coli} from adhering to uro-epithelial cells in the urinary tract. Systematic reviews have concluded that no reliable evidence supports the use of cranberry in the treatment or prophylaxis of urinary tract infections; however, more recent randomized controlled trials demonstrate evidence of cranberry's utility in urinary tract infection prophylaxis. Most importantly, the trials have used a wide variety of cranberry products, such as cranberry juice concentrate, cranberry juice cocktail, and cranberry capsules, and they have used different dosing regimens.

KEYWORDS: \textit{Escherichia coli}.

INTRODUCTION

Urinary tract infection (UTI) is one of the most common medical conditions requiring outpatient treatment, affecting millions of children every year. Despite advanced immunization for many bacterial infections, the urinary tract is currently the most frequent site of occult and serious bacterial infections in children.\textsuperscript{[1]} A study of 3581 infants found 3.7% of boys and 2% of girls to have urine cultures positive for bacteria in the first year of life.\textsuperscript{[2]} During the preschool and school years (1 to 11 years of age), the incidence of
screening for bacteriuria is 9 to 10 times higher in girls because they have short urethras.[3] The cumulative incidence of symptomatic UTI in children younger than 6 years of age is 6.6% for girls and 1.8% for boys.[4]

**Cranberry in UTI:** Antibiotics are recommended for all children with proven UTI, and recent guidelines from the American Academy of Pediatrics have been more conservative than in the past when it comes to imaging procedures in children. Additional measures to prevent or treat UTI include drinking juice of the American cranberry (*Vaccinium macrocarpon*), which has a long folk tradition of use in UTI. Preliminary reports have demonstrated cranberry juice to be effective in patients with UTI caused by antibiotic-resistant bacteria.[5] Furthermore, the use of cranberry products substantially decreased antibiotic use in some reports[6] Traditionally, cranberry has been supplied as fresh berry, drinks, concentrate, and sauce. A cocktail containing 33% cranberry juice was introduced because the pure juice was very acidic (pH level < 2.5) and unpalatable. Today, multiple types of capsules and tablets are available.[7,8]

**Mechanism of Action:** Cranberry contains flavonoids, anthocyanins, catechin, terpenoids, and organic acids (citric, malic, quinic, benzoic, and glucuronic).[7] Benzoic acid is excreted in the urine as hippuric acid, and the therapeutic effect of cranberry juice has long been attributed to hippuric acid inhibiting the growth of bacteria[8] However, an acid medium is required for bacteriostatic activity of hippuric acid, and it has been shown that, owing to the low level of benzoic acid in cranberry (< 0.1%), ingestion of more than 4 L of cranberry juice a day is required to acidify the urine and increase hippuric acid excretion.[9] Another mechanism of action is the inhibition of adhesion of type I and P-fimbriated uropathogens (such as *Escherichia coli*) to the uroepithelium, prohibiting colonization and infection[10,11] The *E coli* fimbriae produce 2 adhesins, one of which is mannose sensitive and the other of which is mannose resistant.[12] Cranberry juice contains proanthocyanidin, which has been found to block the attachment of bacterial fimbriae to the urothelial mucosa owing to strong inhibitory activity against mannose-resistant adhesins of urinary *E coli*.[13] Cranberry is considered safe when taken orally, but ingesting large amounts might result in diarrhea. A study by RAN.D suggested that caution in the use of cranberry in patients at risk of nephrolithiasis.[14] One of the most considerable barriers to treating children with cranberry juice is its palatability. Most studies report a large number of dropouts or withdrawals over time owing to the bitter taste of cranberry juice.[15,16]
Canberry Juice for Prevention of Uti: A Cochrane review of 10 trials with more than 1000 patients showed that good-quality randomized controlled trials in women found that cranberry juice decreased the number of symptomatic UTIs over a 12-month period, especially among women with recurrent UTIs.\[^{17}\] No such evidence was provided for the effectiveness of cranberry juice or cranberry-lingonberry juice in children. In an earlier randomized controlled trial from Finland, respiratory tract bacterial composition and fecal fatty acid composition (as a measure for colonic bacterial flora) did not change significantly using cranberry juice in 342 children in day-care centers over a 3-month period.\[^{18}\] Unlike in other studies, the cranberry juice was well accepted by the children, which might suggest that its concentration might have been too low to affect them. It is also possible that colonic flora do not correlate well with the incidence of UTI. Two randomized studies on prophylaxis against bacterial UTI in a pediatric neuropathic bladder.

Populations were conducted in 40 patients, drinking 15 mL/kg of cranberry cocktail daily for 6 months did not have any effect compared with water on preventing UTI.\[^{19}\] In another study, 3-month consumption of cranberry concentrate in 15 children had no effect on bacteriuria in this population.\[^{20}\] In a study from Italy, 84 girls divided into 3 groups were randomized to receive 50 mL of cranberry juice, Lactobacillus GG drink, or placebo; there were 5 of 27 (18.5%), 11 of 26 (42.3%), and 18 of 27 (48.1%) episodes of symptomatic UTI, respectively ($P < .05$). Withdrawal was minimal in all groups. In a recent double-blind randomized placebo controlled trial in 7 Finnish hospitals, 255 children treated for UTI were given cranberry juice or placebo for 6 months. The investigators found no differences in timing between first recurrences of UTI ($P = .32$), but UTI incidence per person-year at risk was 0.16 episodes lower in the cranberry group ($P = .035$). The number of days on antibiotic therapy was much lower in children receiving cranberry (-6 days per patient-year; $P < .001$). This suggests a potential for cranberry juice to reduce recurrent UTIs in children.\[^{16}\]

Canberry for Treatment of Uti: Randomized trials of cranberry products for the treatment of UTI have not been performed yet. However, in one uncontrolled study, more than 50% of patients had a positive clinical response after drinking 450 mL of cranberry juice daily for 3 weeks.\[^{21}\] Another study found that 2 to 3 glasses of cranberry juice a day reduced white cell counts to 500 per mm$^3$ or less in children with neuropathic bladders, although urine cultures continued to be positive for E coli.\[^{22}\]
CONCLUSION

Some evidence suggests that cranberry juice might be beneficial to prevent recurrence of UTI in children. Further studies with robust methodology are needed. However, palatability of cranberry juice is a challenge in children, and the optimal dose has yet to be determined.

REFERENCES

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