

*Clinical study***Effectiveness of cranberry juice in preventing urinary tract infections in Long-Term Care Facility patients**

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ABSTRACT

ELDERLY PATIENTS in Long-Term Care Facilities (LTCF) such as Retirement Homes, Residential Care Facilities, Intermediate Care Facilities and Skilled Nursing Care Facilities frequently have urinary tract infections. This study was performed to determine if drinking a small amount of cranberry juice daily for 7 weeks would prevent urinary tract infections in a high risk elderly LTCF population.

Drinking 4 to 6 ounces of cranberry juice almost daily for 7 weeks appeared to prevent urinary tract infections in 19 of 28 nursing home patients. The remaining nine patients had trace or greater leukocytes and/or nitrites in all their urine (confirmed by urine microscopy) and significant colony counts of Gram negative bacilli even though they drank 4 to 6 ounces of cranberry juice. This suggests that the action of cranberry juice may be preventative rather than curative.

INTRODUCTION

The cranberry (*Vaccinium macrocarpus*) is a native American fruit that has been given credit for preventing urinary tract infections. It may act by increasing urinary acidity(1) and hippuric acid(2) content in some patients, however this mode of action is refuted by other authors in favor of the plant possessing "anti-adherence" factors preventing bacterial attachment to the urinary tract lining.(3,6) Twenty-eight elderly nursing home patients who were a high risk population for urinary tract infections were the subjects of this study.

The amount of cranberry juice which has been used to prevent urinary tract infections varies from 5 to 20 ounces.(3)

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Fairly good compliance can be obtained if 4 to 6 ounces of cranberry juice are used. It has been shown that LTCF personnel such as Registered Nurses, Licensed Practical Nurses, Certified Nursing Assistants and Nurses Aides can be taught to use dry chemistry dipsticks and multimedia culture plates to monitor urinary tract infection of patients in LTCF.(3)

MATERIALS AND METHODS*Patients*

Twenty eight patients in the Robison Jewish Home were used for this study. Eleven patients live in the Residential Care Facility and were able to dress and generally help themselves. Nineteen patients were in the Intermediate Care Facility and were assigned a Certified Nursing Assistant to assist them in their daily routine. Informed consent forms were signed by each patient and permission was obtained from their physicians to be included in the study. All patients were generally cooperative, able to drink the cranberry juice (*Cranberry Juice Cocktail*®, Ocean Spray) and provide clean catch, mid-stream urine specimens biweekly for 7 weeks without difficulty.

At the conclusion of the study it was necessary to disqualify one patient who had consistently refused to drink the cranberry juice. Two patients died during the study. One patient died shortly after the study began and was not included in the study. The second patient (number 10) died at four weeks and was included.

Urine specimens

Five mid-stream clean catch urines or catheterized (3 patients) urines were obtained from each of the 28 patients biweekly for 7 weeks. The patients were cleaned with a *Povidone-iodine* swabstick (Professional Disposables, Mt. Vernon NY) and asked to begin urination. After the flow of urine was begun a sterile urine cup was used to catch some of the urine during the middle of voiding.

Chemstrip LN, Chemstrip 9 and Multistix 10 SG

Chemstrip LN and *Chemstrip 9* (Boehringer Mannheim Diagnostics, Indianapolis, IN) and *Multistix 10 SG* (Ames Division, Miles Laboratories, Elkhart IN) were dipped in the urine and read by Robison Jewish Home personnel. The urine samples were then held at room temperature until all were collected and then transported to Consulting Clinical and Microbiological Laboratories (CCML) where a routine urinalysis was performed by CCML personnel.

WITHOUT URINARY INFECTION

Pt. #	JUICE oz.	JUICE Type	# CFU	GRAM	TYPE	MICRO wbc/bac	L/N Chem LN	L/N Chem 9	L/N Multistix
1	4	reg	21	positive negative	cocci rods	1/n	n/n	n/n	n/n
2	6	reg	31	positive	cocci	1/n	n/n	n/n	n/n
3	6	reg	145	positive negative	cocci rods	4/n	n/n	n/n	n/n
4	4	reg	30	positive	cocci	8/n	n/n	n/n	n/n
5	6	reg	27	positive positive	cocci rods	2/n	n/n	n/n	n/n
6	4	low	93	positive negative	cocci rods	1/n	n/n	n/n	n/n
7	4	reg	69	positive	cocci	1/n	n/n	n/n	n/n
8	6	low	42	positive	cocci	1/n	n/n	n/n	n/n
9	6	low	100	positive	cocci	3/n	n/n	n/n	n/n
10*	6	low	109	positive	cocci	1/n	n/n	n/n	n/n

TABLE 1. Clinical data for patients without urinary tract infections. * Patient died during study.

URINARY INFECTION

Pt. #	JUICE oz.	JUICE Type	# CFU	GRAM	TYPE	MICRO wbc/bac	L/N Chem LN	L/N Chem 9	L/N Multistix
11	6	reg	89	positive negative	cocci rods	+/md	+/n	+/n	2+/n
12	6	reg	200	positive	cocci	+/s	+/n	+/n	2+/n
13	4	reg	168	positive positive	cocci rods	+/s	tr/n	tr/n	+/n
14	6	reg	132	positive negative	cocci rods	10/s	+/n	+/n	+/n
15	6	reg	210	positive positive	cocci cocci	12/s	tr/n	+/n	+/n
16	6	low	87	positive	rods	9/var	tr/n	+/n	+/n
17	6	reg	200+	positive	cocci	2+/md	2+/n	2+/n	3+/n
18	4	reg	92	positive negative	cocci rods	6/n	tr/n	tr/n	tr/n
19	4	reg	122	positive negative	rods rods	25/s	tr/n	tr/n	+/n

TABLE 2a. Clinical data for patients without Gram negative bacilli urinary tract infections.

Pt. #	JUICE oz.	JUICE Type	# CFU	GRAM	TYPE	MICRO wbc/bac	L/N Chem LN	L/N Chem 9	L/N Multistix
20	4	low	200+	positive negative	cocci rods	+/my	tr/+	tr/+	+/+
21	6	reg	200+	negative	cocci	+/md	+/n	+/n	2+/n
22	4	reg	200+	negative	cocci	6/my	tr/+	n/+	tr/+
23	4	reg	200+	negative positive	rods cocci	2+/my	2+/n	2+/n	3+/n
24	6	reg	200+	negative positive	rods cocci	17/my	tr/+	tr/+	+/+
25	4	reg	200+	negative	rods	4+/my	2+/+	2+/+	3+/+
26	6	low	200+	negative	rods	5/my	tr/n	tr/n	tr/n
27	4	reg	200+	positive negative	cocci rods	3/my	2+/+	2+/+	3+/+
28	4	low	122	positive negative	cocci rods	+/md	2+/n	2+/n	2+/n

TABLE 2b. Clinical data for patients with Gram negative bacilli urinary tract infections.

Unibac culture plates

Within 5 minutes of collection of the mid-stream clean catch urine, a *Unibac* (Boehringer Mannheim Diagnostics, Indianapolis IN) was inoculated using a sterile 10 ul disposable inoculating loop. These plates were held until all the urines were collected, inoculated and then transported to CCML for overnight incubation at 35° C. The number of colony forming units were counted on each of the five media and recorded. If the colonies were too close together for an accurate count, an estimate was made of greater than 200 colony forming units (200+). The colonies on the Unibac inoculated with the final urine specimen were Gram stained and observed as to Gram reaction (+ or -) and bacterial type (cocci or bacilli). The data in Tables 1 and 2 is an average number of colony forming units on all the media and from the cultured urine specimens.

RESULTS

Ten patients had no leukocytes or nitrites in their urine as shown by a negative test reaction on the three dipsticks used. This was confirmed by microscopic examination showing less than 10 leukocytes per high power field. In addition the colony forming units on the Unibac culture plates were less than 200 in number. (Table 1)

Nine patients had trace to 2+ leukocytes but negative nitrites on the three dipstick tests used. These results were confirmed by having an average of 6 or more leukocytes per high power field and small to moderate numbers of bacteria seen on high power microscopic examination. The colony forming units on the Unibac plates were less than 200 in number except for patient number seven who also had an

increased number of leukocytes. This patient's colony forming units were Gram positive cocci rather than Gram negative bacilli. (Table 2)

Nine patients had a trace or greater leukocytes and in most cases were also positive for nitrites on the three dipsticks employed. The positive tests were confirmed by urine microscopic examination which yielded numerous leukocytes and moderate to many bacteria. In addition, all but one set of Unibac plates averaged greater than 200 colony forming units. (Table 3)

DISCUSSION

The popular press has long praised the effectiveness of cranberry juice in preventing urinary tract infections. The amount of cranberry juice which has been used to prevent urinary tract infections varies from 5 to 20 ounces.⁽³⁾ One difficulty with having people drink large quantities of cranberry juice is that many object to the bitter taste of the cranberry juice without added sweeteners. However many natural product manufacturers now produce encapsulated cranberry preparations. One such preparation of cranberry juice concentrate in a concentration of 800mg/capsule (Pharmacaps® Inc., Elizabeth NJ) was studied on 21 subjects who took 12 of these capsules daily for varying lengths of time. Twenty reported no incidence of urinary tract infection. Six patients were given 12 capsules daily though they had a pre-existing urinary tract infection. None of the patients were cured while taking the cranberry juice capsules.⁽⁵⁾

In conclusion, evidence is presented here that drinking 4 to 6 ounces of cranberry juice cocktail or taking an encapsulated concentrate may prevent urinary tract infection in the high risk population found in LTCF's.

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OPPOSITE: (Tables 1, 2a, 2b) Results from routine urinalysis, microscopy and culture from 28 LTCF patients taking cranberry juice as a preventative therapy for urinary tract infection. Key: Urinary tract infection [trace or greater leukocytes and/or nitrites on the 3 dipstick tests, confirmed by microscopic and significant colony count on Unibac plate]; Juice oz. [number of ounces daily of regular or low calorie cranberry juice]; #CFU [number of colony forming units counted on all five chambers of the Unibac plate and for all five urines collected during the time patient was taking cranberry juice: an average]; Gram type [Gram stain reaction and colony type of microorganism culture on Unibac plate inoculated with last urine collected while patients were taking cranberry juice]; L [leukocytes as demonstrated by the presence of leukocyte esterase reaction with indoxylcarbonic acid]; N [nitrite present as demonstrated by its reaction with an aromatic amine]; Micro. [Microscopic examination of centrifuged urine sediment after 5 minutes centrifugation of a maximum 15 ml of urine]; WBC [average number of leukocytes per 10 to 20 high power fields]; Bac [approximate number of bacteria present: n= none seen, s=small number, md=moderate number, my=many, var=variable number- not the same on all urine samples.]

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