Urinary Tract Infection

ABSTRACTS

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Antimicrobial activity of intraurethrally administered probiotic Lactobacillus casei in a murine model of Escherichia coli urinary tract infection.

Asahara T, Nomoto K, Watanuki M, Yokokura T. Yakult Central Institute for Microbiological Research, Kunitachi, Tokyo 186-8650, Japan.

Antimicrob Agents Chemother 2001 Jun;45(6):1751-60

The antimicrobial activity of the intraurethrally administered probiotic Lactobacillus casei strain Shirota against Escherichia coli in a murine urinary tract infection (UTI) model was examined. UTI was induced by intraurethral administration of Escherichia coli strain HU-1 (a clinical isolate from a UTI patient, positive for type 1 and P fimbriae), at a dose of 1 x 10(6) to 2 x 10(6) CFU in 20 microl of saline, into a C3H/HeN mouse bladder which had been traumatized with 0.1 N HCl followed immediately by neutralization with 0.1 N NaOH 24 h before the challenge infection. Chronic infection with the pathogen at 10(6) CFU in the urinary tract (bladder and kidneys) was maintained for more than 3 weeks after the challenge, and the number of polymorphonuclear leukocytes and yeloperoxidase activity in the urine were markedly elevated during the infection period. A single administration of L. casei Shirota at a dose of 10(8) CFU 24 h before the challenge infection dramatically inhibited E. coli growth and inflammatory responses in the urinary tract. Multiple daily treatments with L. casei Shirota during the postinfection period also showed antimicrobial activity in this UTI model. A heat-killed preparation of L. casei Shirota exerted significant antimicrobial effects not only with a single pretreatment (100 microg/mouse) but also with multiple daily treatments during the postinfection period. The other Lactobacillus strains tested, i.e., L. fermentum ATCC 14931(T), L. jensenii ATCC 25258(T), L. plantarum ATCC 14917(T), and L. reuteri JCM 1112(T), had no significant antimicrobial activity. Taken together, these results suggest that the probiotic L. casei strain Shirota is a potent therapeutic agent for UTI.

[Can acupuncture prevent cystitis in women?]

Aune A; Alraek T; Huo L; Baerheim A Bryggen Medisinske Senter, Bergen.

Tidsskr Nor Laegeforen (NORWAY) Mar 30 1998, 118 (9) p1370 2

67 adult women with a history of recurrent lower urinary tract infection (UTI) were randomized for acupuncture treatment, sham acupuncture, or no treatment. The incidence rate of UTI over the following six months was noted. In the acupuncture group a total of 85% was free of cystitis during the six month observational period, as compared to 58% in the sham group ($p < 0.05$), and 36% in the control group ($p < 0.01$). Compared to the acupuncture group, twice as many incidents of cytitis occurred in the sham group, and three times as many in the control group ($p < 0.05$). Acupuncture seems a worthwhile alternative in the prevention of frequently recurring cystitis in women.

Reduction of bacteriuria and pyuria after ingestion of cranberry juice.

Avorn J, Monane M, Gurwitz JH, Glynn RJ, Choodnovskiy I, Lipsitz LA. Program for the Analysis of Clinical Strategies, Brigham and Women's Hospital, Boston, MA 02115.

AMA. 1994 Mar 9;271(10):751-4.

OBJECTIVE--To determine the effect of regular intake of cranberry juice beverage on bacteriuria and pyuria in elderly women.

DESIGN--Randomized, double-blind, placebo-controlled trial.

SUBJECTS--Volunteer sample of 153 elderly women (mean age, 78.5 years).

INTERVENTION--Subjects were randomly assigned to consume 300 mL per day of a commercially available standard cranberry beverage or a specially prepared synthetic placebo drink that was indistinguishable in taste, appearance, and vitamin C content but lacked cranberry content.

OUTCOME MEASURES--A baseline urine sample and six clean-voided study urine samples were collected at approximately 1-month intervals and tested quantitatively for bacteriuria and the presence of white blood cells.

RESULTS--Subjects randomized to the cranberry beverage had odds of bacteriuria (defined as organisms numbering > or = 10 (5)/mL) with pyuria that were only 42% of the odds in the control group (P = .004). Their odds of remaining bacteriuric-pyuric, given that they were bacteriuric-pyuric in the previous month, were only 27% of the odds in the control group (P = .006).

CONCLUSIONS--These findings suggest that use of a cranberry beverage reduces the frequency of bacteriuria with pyuria in older women. Prevalent beliefs about the effects of cranberry juice on the urinary tract may have microbiologic justification.

New support for a folk remedy: cranberry juice reduces bacteriuria and pyuria in elderly women.

Fleet JC Human Nutrition Research Center on Aging, Tufts University, Boston, MA 02111.

Nutr Rev (United States) May 1994, 52 (5) p168-70

Cranberry juice has developed a following as a simple, nonpharmacologic means to reduce or treat urinary tract infections, yet the scientific basis for such a claim has been lacking. A new study suggests that bacterial infections (bacteriuria) and associated influx of white blood cells into the urine (pyuria) can be reduced by nearly 50% in elderly women who drink 300 mL of cranberry juice cocktail each day over the course of a 6-month study. The results of this study suggest that consumption of cranberry juice is more effective in treating than preventing bacteriuria and pyuria. Along with earlier reports on the ability of cranberry juice to inhibit bacterial adherence to urinary epithelial cells in cell culture, this new work suggests that drinking cranberry juice each day may be clinically useful. Additional work must be conducted, however, to more completely define the efficacy of cranberry juice.

Incidence of acute urinary tract infection in young women and use of male condoms with and without nonoxynol-9 spermicides.

Handley MA, Reingold AL, Shiboski S, Padian NS. Division of Public Health Biology and Epidemiology, School of Public Health, University of California-Berkeley, Berkeley, CA, USA. handley@itsa.ucsf.edu

Epidemiology 2002 Jul;13(4):431-6

BACKGROUND: Acute urinary tract infection is one of the most common infections seen in primary care.

METHODS: We conducted a nested case-control study among a cohort of 519 women, ages 15-29 years, enrolled in a contraceptive acceptability study to examine whether recent use of male condoms increases urinary tract infection risk.

RESULTS: One hundred sixty-five incident urinary tract infections were identified during 12-month follow-up periods in a cohort study that was conducted between 1996 and 1999. After exclusions for urinary tract infection recurrences, pregnancy, antibiotic use, diabetes, diaphragm/cervical cap use, or urinary tract abnormalities, there were 100 cases and 200 controls. Compared with women not using barrier methods (and after adjustment for age, urinary tract infection history, hormonal method use, and frequency of sex) the odds ratio (OR) for any reported use of condoms coated with spermicide (Nonoxynol-9) in the previous 30 days was 2.8 (95% [confidence interval] CI = 1.2-6.5). The OR was 11.5 (95% CI = 2.5-53) for exclusive Nonoxynol-9-coated condom use. The OR for exclusive use of non-Nonoxynol-9-coated condoms was 7.4 (95% CI = 1.6-35).

CONCLUSIONS: In this study, use of male condoms was associated with increased urinary tract infection risk; the largest risk was associated with exclusive condom use and use of Nonoxynol-9-coated condoms.

Cranberry juice and adhesion of antibiotic-resistant uropathogens.

Howell, A.B., Foxman, B.

JAMA 2002 Jun 19; 287(23): 3082-3.

No abstract available.

Bacterial urinary tract infections in diabetes.

Patterson JE, Andriole VT. Department of Medicine (Infectious Diseases), University of Texas Health Science Center at San Antonio, USA.

Infect Dis Clin North Am 1997 Sep;11(3):735-50

Diabetes mellitus has a number of long-term effects on the genitourinary system. These effects predispose to bacterial urinary tract infections in the patient with diabetes mellitus. Bacteriuria is more common in diabetic women than in nondiabetic women because of a combination of host and local risk factors. Upper tract infection complications are also more common in this group. Diabetic patients are at higher risk for intrarenal abscess, with a spectrum of disease ranging from acute focal bacterial pyelonephritis to renal corticomedullary abscess, to the renal carbuncle. A number of uncommon complicated urinary tract infection complications occur more frequently in diabetics, such as emphysematous pyelonephritis and emphysematous pyelitis. Because of the frequency and severity of urinary tract infection in diabetic patients, prompt diagnosis and early therapy is warranted. A plain abdominal radiograph is recommended as a minimum radiographic screening tool in the patient with diabetes presenting with systemic signs of urinary tract infection. Ultrasonography or further radiographic studies such as CT scanning may also be warranted, depending on the clinical picture, to identify upper urinary tract complications early for appropriate intervention.

Probiotic agents to protect the urogenital tract against infection.

Reid G. Lawson Research Institute and the Department of Microbiology and Immunology, the University of Western Ontario, Canada. gregor@julian.uwo.ca

Am J Clin Nutr 2001 Feb;73(2 Suppl):437S-443S

The urogenital microflora of a healthy woman comprises approximately 50 species of organisms, which differ in composition according to reproductive stages and exposure to several factors, including antibiotics and spermicides. Infections are very common with > 300 million cases of urinary tract infections, bacterial vaginosis, and yeast vaginitis worldwide per annum. At the time of infection in the bladder and vagina, the urogenital flora is often dominated by the infecting pathogens, in contrast with healthy phases when indigenous organisms dominate. Premenopausal women have a flora of mostly lactobacilli, and certain properties of these strains, including adhesive ability and production of acids, bacteriocins, hydrogen peroxide, and biosurfactants, appear important in conferring protection to the host. Efforts to artificially restore an unbalanced flora with the use of probiotics have met with mixed results but research aimed at selecting scientifically based strains could well provide a reliable alternative treatment and preventive regimen to antibiotics in the future.

The role of cranberry and probiotics in intestinal and urogenital tract health.

Reid G. Lawson Research Institute, University of Western Ontario, London, Canada. gregor@uwo.ca

Crit Rev Food Sci Nutr 2002;42(3 Suppl):293-300

Several forces are driving an expanded use of nutraceuticals, particularly functional foods and probiotics, as instruments of the restoration and maintenance of well-being. These include consumer desire to use natural rather than pharmaceutical products, the mounting scientific evidence that shows efficacy of certain nutraceutical products, and the increasing cost and continued failure of drugs to cure or prevent disease. There is now a strong scientific basis for use of cranberries to reduce the risk of E. coli adhesion to bladder cells and the onset of urinary tract infection. There is also a mechanistic basis and clinical support for use of Lactobacillus strains such as L. rhamnosus GR-1 and L. fermentum RC-14 to colonize the intestine and vagina and reduce the risk of intestinal and urogenital infections. For such alternative approaches to be successful, scientific rigor must be backed by public education and physician acceptance. Given the emergence of virulent and multidrug-resistant pathogens, time is not on our side.

Oral probiotics can resolve urogenital infections.

Reid G, Bruce AW, Fraser N, Heinemann C, Owen J, Henning B. Lawson Research Institute, London, Ont., Canada. gregor@julian.uwo.ca

FEMS Immunol Med Microbiol 2001 Feb;30(1):49-52

We report the first clinical evidence that probiotic lactobacilli can be delivered to the vagina following oral intake. In 10 women with a history of recurrent yeast vaginitis, bacterial vaginosis (BV) and urinary tract infections, strains Lactobacillus rhamnosus GR-1 and Lactobacillus fermentum RC-14 suspended in skim milk and given twice daily for 14 days, were recovered from the vagina and identified by morphology and molecular typing within 1 week of commencement of therapy. In six cases of asymptomatic BV or intermediate BV (based upon Nugent scoring) was resolved within 1 week of therapy.

Use of Lactobacillus to prevent infection by pathogenic bacteria.

Reid G, Burton J. Canadian Research and Development Centre for Probiotics, Lawson Health Research Institute, and Department of Microbiology and Immunology at the University of Western Ontario, 268 Grosvenor Street, London, Ontario, N6A 4V2, Canada. gregor@uwo.ca

Microbes Infect 2002 Mar;4(3):319-24

This review focuses on the use and potential of Lactobacillus to prevent infections of the urogenital and intestinal tracts. The presence and dominance of Lactobacillus in the vagina is associated with a reduced risk of bacterial vaginosis and urinary tract infections. The mechanisms appear to involve anti-adhesion factors, by-products such as hydrogen peroxide and bacteriocins lethal to pathogens, and perhaps immune modulation or signaling effects. The instillation of Lactobacillus GR-1 and B-54 or RC-14 strains into the vagina has been shown to reduce the risk of urinary tract infections, and improve the maintenance of a normal flora. Ingestion of these strains into the gut has also been shown to modify the vaginal flora to a more healthy state. In addition, these strains inhibit the growth of intestinal, as well as urogenital pathogens, colonize the gut and protect against infections as shown in mice. Other probiotic strains, such as Lactobacillus GG, have been shown to prevent and treat gastroenteritis caused by rotavirus and bacteria. Given that lactobacilli are not the dominant commensals in a gut which comprises around 10(10) organisms, much work is still needed to define the mechanisms whereby GR-1, RC-14, GG and other strains contribute to health restoration and maintenance. Such critically important studies will require the medical science community to show a willingness to turn away from pharmaceutical remedies as the only solution to health and disease.

An examination of the anti-adherence activity of cranberry juice on urinary and nonurinary bacterial isolates.

Schmidt DR; Sobota AE Alliance City Hospital, Ohio.

Microbios (England) 1988, 55 (224-225) p173-81

In a previous investigation it was demonstrated that cranberry juice cocktail was able to inhibit adherence in 77 clinical isolates of Escherichia coli obtained from patients with diagnosed urinary tract infections. This work has been extended to include clinical isolates of E. coli, Proteus, Klebsiella, Enterobacter and Pseudomonas isolated from urine, sputum, wound and stool. Bacterial strains isolated from urine adhere in greater numbers to urinary tract epithelial cells than organisms isolated from sputu and wound sources. E. coli, isolated from urine, adheres to urinary epithelial cells, in numbers three times greater than E. coli isolated from other clinical sources, and thus appears to represent a unique population of cells in terms of adherence. Cranberry juice cocktail and urine and urinary epithelial cells obtained after drinking the cocktail all demonstrate antiadherence activity against Gram-negative rods isolated from urine and other clinical sources. Drinking the cocktail may be useful in managing urinary tract infections in certain patients.

In vitro antagonistic effect of Lactobacillus on organisms associated with bacterial vaginosis.

Strus M, Malinowska M, Heczko PB. Department of Bacteriology, Medical College of Jagiellonian University, Department of Obstetrics and Gynecology, Health Care Trust of the Ministry of Internal Affairs and Administration, Krakow, Poland.

J Reprod Med 2002 Jan;47(1):41-6

OBJECTIVE: To assess antagonistic properties of Lactobacillus strains isolated from the vaginas of healthy women as compared to the most common bacterial agents related to vaginosis.

STUDY DESIGN: Antagonistic activity of different Lactobacillus strains isolated from the vaginas of healthy women not treated for infections with an antibiotic for the previous three months was screened using an agar slab method. The activity was tested against test organisms associated with bacterial vaginosis and/or urinary tract infections: Staphylococcus aureus, Enterococcus faecalis, Streptococcus agalactiae, Escherichia coli, Gardnerella vaginalis, Peptostreptococcus anaerobius and Prevotella bivia.

RESULTS: Many of the 146 Lactobacillus strains tested exerted apparent antagonistic activities against gram-positive aerobic cocci and gram-negative rods, such as S aureus and E coli, and a marked number of Lactobacillus strains inhibited facultative bacteria, such as Gardnerella vaginalis and the anaerobes P anaerobius and P bivia. Only a few lactobacilli were able to inhibit growth of E faecalis and S agalactiae. Indicator bacteria growth inhibition probably relies upon several different complementary mechanisms. The specific indicator bacteria species determines which mechanism predominates.

CONCLUSION: Lactobacillus strains taken from normal vaginal flora demonstrated antagonistic activity against a variety of bacteria related to vaginal and urinary tract infections. The specific occurrence rates of active Lactobacillus strains are different, and this difference is dependent on the indicator bacteria species.

Cranberry juice and its impact on peri-stomal skin conditions for urostomy patients.

Tsukada K; Tokunaga K; Iwama T; Mishima Y; Tazawa K; Fujimaki M

Ostomy Wound Manage (United States) Nov-Dec 1994, 40 (9) p60-2, 64, 66-8

In urostomy patients, peristomal skin problems are common and may stem from alkaline urine. Cranberry juice appears to acidify urine and has bacteriostatic properties, and is widely recommended for the reduction of urinary tract infections. Therefore, it is hypothesized that drinking cranberry juice might also prevent and/or improve skin complications for urostomy patients. To test this hypothesis, pH measurements of the skin around the stoma and of the urine of 13 urostomy patients were taken before and after instituting a regimen of drinking 160 to 320 g of cranberry juice each day for an average period of six months. Results showed an improvement in skin condition from 6 patients with erythema, maceration or pseudoepithelial hyperplasia at the beginning of the study to 2 patients with maceration or PEH. The average pH of the urine taken from the patients' pouches decreased a statistically significant amount from 8.0 to 7.3 (p = 0.0277), yet unexpectantly, the average pH of the fresh urine increased a statistically significant amount from 5.8 to 6.2 (p = 0.0178). Other results were not statistically significant. The authors conclude that while drinking cranpected, improvements were still seen in the skin conditions of the study participants, suggesting that drinking cranberry juice does positively impact the incidence of skin complications for these patients.

Urinary tract infections in women.

Valiquette L. Department of Surgery (Urology), CHUM-Hopital St-Luc, Montreal, Quebec, Canada.

Can J Urol 2001 Jun;8 Suppl 1:6-12

Urinary tract infections (UTIs) are the most common infections seen in the hospital setting, and the second most common infections seen in the general population. Due to women's anatomy, UTIs are especially problematic for them, and up to one-third of all women will experience a UTI at some point during their lifetimes. Appropriate treatment of a UTI requires accurate classification that includes infection site, complexity of the infection, and the likelihood of recurrence. The predominant pathogen in both complicated and uncomplicated UTI remains pathogenic Escherichia coli, although Klebsiella sp. and Proteus appear with increased frequency in complicated UTI. Most often, bacteria cause UTIs by ascending means through the urethra into the bladder. Bacteria must possess virulence factors to cause UTI. Host defense factors that predispose patients to UTI include urinary stasis, abnormal urinary tract anatomy, diabetes mellitus, debility, and aging. Estrogen-related issues and short urethras predispose women to UTI. Although urine culture, with >105 colony-forming units/mL (CFU/mL) in symptomatic patients, remains the diagnostic "gold standard," correlation of the patient's history and physical examination with urinalysis (including nitrite dipstick and leukocyte esterase test) results usually suffices to diagnose UTI. Three-day of antimicrobial treatment is recommended for simple cystitis. Acute pyelonephritis, an infection of the kidney parenchyma tissue, is treated with antibiotics for 7 to 14 days depending on the antimicrobial agent used and the severity of infection. In addition, patient classification determines the need for hospitalization or for urological imaging studies. Women with recurrent UTIs merit consideration for antimicrobial prophylaxis. Self-administered topical vaginal estradiol cream is an important adjunct in UTI prevention for postmenopausal women. Asymptomatic bacteruria only merits antimicrobial therapy in high-risk patients or those colonized with Proteus species.

SUGGESTED READING

Widespread distribution of urinary tract infections caused by a multidrug-resistant Escherichia coli clonal group.

Manges AR, Johnson JR, Foxman B, O'Bryan TT, Fullerton KE, Riley LW. Division of Epidemiology and Public Health Biology, School of Public Health, University of California at Berkeley, 94720, USA.

N Engl J Med 2001 Oct 4;345(14):1007-13

BACKGROUND: The management of urinary tract infections is complicated by the increasing prevalence of antibiotic-resistant strains of Escherichia coli. We studied the clonal composition of E. coli isolates that were resistant to trimethoprim-sulfamethoxazole from women with community-acquired urinary tract infections.

METHODS: Prospectively collected E. coli isolates from women with urinary tract infections in a university community in California were evaluated for antibiotic susceptibility, O:H serotype, DNA fingerprinting, pulsed-field gel electrophoretic pattern, and virulence factors. The prevalence and characteristics of an antibiotic-resistant clone were evaluated in this group of isolates and in those from comparison cohorts in Michigan and Minnesota.

RESULTS: Fifty-five of the 255 E. coli isolates (22 percent) from the California cohort were resistant to trimethoprim-sulfamethoxazole as well as other antibiotics. There was a common pattern of DNA fingerprinting, suggesting that the isolates belonged to the same clonal group (clonal group A), in 28 of 55 isolates with trimethoprim-sulfamethoxazole resistance (51 percent) and in 2 of 50 randomly selected isolates that were susceptible to trimethoprim-sulfamethoxazole (4 percent, P<0.001). In addition,

11 of 29 resistant isolates (38 percent) from the Michigan cohort and 7 of 18 (39 percent) from the Minnesota cohort belonged to clonal group A. Most of the clonal group A isolates were serotype O11:H(nt) or O77:H(nt), with similar patterns of virulence factors, antibiotic susceptibility, and electrophoretic features.

CONCLUSIONS: In three geographically diverse communities, a single clonal group accounted for nearly half of community-acquired urinary tract infections in women that were caused by E. coli strains with resistance to trimethoprim-sulfamethoxazole. The widespread distribution and high prevalence of E. coli clonal group A has major public health implications.

Sat, the Secreted Autotransporter Toxin of Uropathogenic Escherichia coli, Is a Vacuolating Cytotoxin for Bladder and Kidney Epithelial Cells.

Guyer DM, Radulovic S, Jones FE, Mobley HL. Department of Microbiology and Immunology, University of Maryland School of Medicine, Baltimore, Maryland 21201.

Infect Immun 2002 Aug;70(8):4539-46

The secreted autotransporter toxin (Sat) of uropathogenic Escherichia coli exhibits cytopathic activity upon incubation with HEp-2 cells. We further investigated the effects of Sat on cell lines more relevant to the urinary tract, namely, those derived from bladder and kidney epithelium. Sat elicited elongation of cells and apparent loosening of cellular junctions upon incubation with Vero kidney cells. Additionally, incubation with Sat triggered significant vacuolation within the cytoplasm of both human bladder (CRL-1749) and kidney (CRL-1573) cell lines. This activity has been associated with only a few other known toxins. Following transurethral infection of CBA mice with a sat mutant, no reduction of CFU in urine, bladder, or kidney tissue was seen compared to that in mice infected with wild-type E. coli CFT073. However, significant histological changes were observed within the kidneys of mice infected with wild-type E. coli CFT073, including dissolution of the glomerular membrane and vacuolation of proximal tubule cells. Such damage was not observed in kidney sections of mice infected with a Sat-deficient mutant. These results indicate that Sat, a vacuolating cytotoxin expressed by uropathogenic E. coli CFT073, elicits defined damage to kidney epithelium during upper urinary tract infection and thus contributes to pathogenesis of urinary tract infection.

Structural basis of tropism of Escherichia coli to the bladder during urinary tract infection.

Hung CS, Bouckaert J, Hung D, Pinkner J, Widberg C, DeFusco A, Auguste CG, Strouse R, Langermann S, Waksman G, Hultgren SJ. Department of Molecular Microbiology, Washington University School of Medicine, St. Louis, MO 63110, USA.

Mol Microbiol 2002 May;44(4):903-15

The first step in the colonization of the human urinary tract by pathogenic Escherichia coli is the mannose-sensitive binding of FimH, the adhesin present at the tip of type 1 pili, to the bladder epithelium. We elucidated crystallographically the interactions of FimH with D-mannose. The unique site binding pocket occupied by D-mannose was probed using site-directed mutagenesis. All but one of the mutants examined had greatly diminished mannose-binding activity and had also lost the ability to bind human bladder cells. The binding activity of the mono-saccharide D-mannose was delineated from this of mannotriose (Man(alpha1-3)[Man(alpha1-6)]Man) by gener-ating mutants that abolished D-mannose binding but retained mannotriose binding activity. Our structure/function analysis demonstrated that the binding of the monosaccharide alpha-D-mannose is the primary bladder cell receptor for uropathogenic E. coli and that this event requires a highly conserved FimH binding pocket. The residues in the FimH mannose-binding pocket were sequenced and found to be invariant in over 200 uropathogenic strains of E. coli. Only enterohaemorrhagic E. coli (EHEC) possess a sequence variation within the mannose-binding pocket of FimH, suggesting a naturally occurring mechanism of attenuation in EHEC bacteria that would prevent them from being targeted to the urinary tract.

Trends in antifungal use and epidemiology of nosocomial yeast infections in a university hospital.

Berrouane YF, Herwaldt LA, Pfaller MA. Departments of Internal Medicine, University of Iowa College of Medicine, Iowa City, Iowa, USA.

J Clin Microbiol 1999 Mar;37(3):531-7

This report describes both the trends in antifungal use and the epidemiology of nosocomial yeast infections at the University of Iowa Hospitals and Clinics between fiscal year (FY) 1987-1988 and FY 1993-1994. Data were gathered retrospectively from patients' medical records and from computerized databases maintained by the Pharmacy, the Program of Hospital Epidemiology, and the Medical Records Department. After fluconazole was introduced, use of ketoconazole decreased dramatically but adjusted use of amphotericin B decreased only moderately. However, the proportion of patients receiving antifungal therapy who were treated with amphotericin B declined markedly. In FY 1993-1994, 26 patients of the gastrointestinal surgery service received fluconazole. Among these patients, fluconazole use was prophylactic in 16 (61%), empiric in 3 (12%), and directed to a documented fungal infection in 7

(27%). Rates of nosocomial yeast infection in the adult bone marrow transplant unit increased from 6.77/1,000 patient days in FY 1987-1988 to 10.18 in FY 1989-1990 and then decreased to 0 in FY 1992-1993. Rates of yeast infections increased threefold in the medical and surgical intensive care units, reaching rates in FY 1993-1994 of 6.95 and 5.25/1,000 patient days, respectively. The rate of bloodstream infections increased from 0.044/1,000 patient days to 0.098, and the incidence of catheter-related urinary tract infections increased from 0.23/1,000 patient days to 0.68. Although the proportion of infections caused by yeast species other than Candida albicans did not increase consistently, C. glabrata became an important nosocomial pathogen.

Light-microscopic morphology, ultrastructure, culture, and relationship to disease of the nutritional and cell-wall-deficient alpha-hemolytic streptococci.

Zierdt CH. Clinical Pathology Department, Warren G. Magnuson Clinical Center, National Institutes of Health, Bethesda, Maryland 20892.

Diagn Microbiol Infect Dis 1992 Mar-Apr;15(3):185-94

alpha-Hemolytic streptococci, variously described as cell-wall deficient (C), L form (L), thiol dependent (O), satelliting (S), pyridoxal dependent (PY), and nutritionally deficient (N), or CLOSPYN, were isolated from patients with endocarditis, brain abscess, subauricular abscess, septicemia, acute and chronic urethritis, recurrent aphthous stomatitis, and fever of undetermined origin. With the aid of satelliting, most of the strains were adapted to grow on a human Mycoplasma growth agar consisting of brain-heart infusion agar fortified with 20% human blood, yeast extract, and arginine. Selected CLOSPYN strains required extensive subculture for only partial reversion to parentallike characteristics. Four of six strains biochemically tested were judged Streptococcus morbillorum. Two were unidentifiable. The CLOSPYN form was relatively inert biochemically, but glucose was converted mainly to lactic acid, with acetic acid also present. Guanine-cytosine values were 39%-43%. Cell wall material was present by transmission electron microscopy (TEM), but its synthesis was uneven on single cells and abnormally thickened on other cells. Closely spaced, incompleted septa occurred in cell chains, which resulted in unusually long chains of flattened cells resembling on TEM a stack of checkers. Mesosomes were frequent, greatly enlarged, convoluted, and elongated. They were often sectioned as circular and laminated, with 2-5 layers. Mesosomes were in close contact with nucleoid bodies, which, in turn, were closely apposed or integral with the cytoplasmic membranes in areas of cross-wall development. Chaotic morphology typifies the group. The inclusion of urinary tract infections is new in the gamut of diseases caused by CLOSPYN streptococci.

The use of amphotericin B in nosocomial fungal infection.

Perfect JR, Pickard WW, Hunt DL, Palmer B, Schell WA. Department of Medicine, Hospital Epidemiology, Durham, North Carolina.

Rev Infect Dis 1991 May-Jun;13(3):474-9

The use of potent broad-spectrum antibacterial agents, the increasing number of immunocompromised hosts, and the use of invasive treatment modalities have exacerbated the problems involved in the management of nosocomial fungal infection. The hospital records at a tertiary-care medical center were retrospectively reviewed in an effort to determine the magnitude of these problems. A plethora of fungal species were isolated from patients. Hospital infection surveillance revealed between 30 and 40 nosocomial yeast infections per month, with 20% of nosocomial urinary tract infections caused by yeasts rather than by bacterial pathogens and one or two cases of fungemia per week. Although these figures represent a large number of nosocomial fungal infections, a significant increase in the number of such infections over the last several years could not be documented. The use of amphotericin B was found to have increased each year. The patterns of use of amphotericin B changed little between 1983 and 1987, but the number of patients treated with this agent increased dramatically.

Relationship between pinworm and urinary tract infections in young girls.

Ok UZ, Ertan P, Limoncu E, Ece A, Ozbakkaloglu B. Department of Microbiology and Clinical Microbiology, Faculty of Medicine, Celal Bayar University, Manisa, Turkey.

APMIS 1999 May;107(5):474-6

Urinary tract infection is particularly common in young girls and Enterobius vermicularis (pinworm) is one of the most prevalent worms found in children worldwide. Young girls, with or without urinary tract infection, were examined for pinworms in order to explore a possible relationship between these two problems. Of the 55 young girls with urinary tract infection, 20 (36.4%) had pinworm eggs in the perianal and/or perineal region monitored using the cellophane tape method, while 9 (16.4%) of 55 young girls who had never previously had a urinary tract infection were found to have Enterobius eggs in at least one of the cellophane tape tests, and the difference was found to be significant ($p<0.05$). These results suggested that urinary tract infections may be related to pinworms. When a urinary tract infection is diagnosed in young girls, cellulose tape should be applied to both the perianal and the perineal regions on at least three consecutive occasions.

[Human urinary myiasis caused by Fannia canicularis (Diptera, Muscidae) larvae in Algeria] [Article in French]

Perez-Eid C, Mouffok N. Unite d'Ecologie des Systemes Vectoriels, Institut Pasteur, Paris.

Presse Med 1999 Mar 20;28(11):580-1

BACKGROUND: Human urinary myiasis is caused by fly larvae which complete their entire cycle in the human body.

CASE REPORT: A 37-year-old woman living in a village near Sidi Bel Abbes (Algeria) developed a parasite syndrome caused by Fannia canicularis larvae. About twenty larvae specimens were collected during her hospitalization. Larvae were emitted for 2 weeks after a 6-day treatment with cefotaxime for urinary tract infection.

DISCUSSION: Urogenital myiasis is almost always subsequent to conditions of poor personal hygiene. In this case authentic larvae infestation was evidenced. The diagnosis of true urinary myiasis was confirmed by repeated emissions of different larval stages including the nymph.

Enterobius vermicularis (pinworms), introital bacteriology and recurrent urinary tract infection in children.

Kropp KA, Cichocki GA, Bansal NK.

J Urol 1978 Oct;120(4):480-2

The relationship between pinworm infectation and introital cultures was investigated in 2 groups of girls. Those children with recurrent urinary tract infections were compared to agematched controls who had never had a urinary tract infection. We found a higher incidence of enteric organisms on the introital area and pinworm ova on the perianal skin in the group of girls with recurrent infection.

Enterobiasis and urinary tract infection.

Jojart G.

Acta Paediatr Acad Sci Hung 1978;19(2):145-8

The correlation between enterobiasis and urinary tract infection was studied in girls aged 6-14 years. Enterobius ova were demonstrated in anorectal scrapings, carried out three times in each case. Of the 84 patients suffering from urinary tract infection, 55 were Enterobius positive, as compared to 60 among 100 control girls. The difference was not significant. Enterobiasis was not found to be more frequent even when urinary tract infection reappeared within 6 months. There was no significant difference among patients with monosymptomatic bacteriuria and pyuria either. Enterobiasis thus seems to play no pathogenic role in urinary tract infections of girls.

Roles of host and bacterial virulence factors in the development of upper urinary tract infection caused by Escherichia coli.

Tseng CC, Wu JJ, Liu HL, Sung JM, Huang JJ. Division of Nephrology, Department of Internal Medicine, National Cheng Kung University Hospital, Tainan, Taiwan, Republic of China.

Am J Kidney Dis 2002 Apr;39(4):744-52

Aims of this study are to identify host and Escherichia coli virulence factors associated with upper urinary tract infection (UTI) by comparing them with those for lower UTI and determining the association between major predisposing host factors for upper UTI and urovirulence genes for E coli. Host factors and urovirulence genes of E coli associated with bacteremia in patients with upper UTI and their interactions also were studied. One hundred thirty-nine adult patients who fulfilled clinical diagnostic criteria for upper (n = 81) or lower UTI (n = 58) caused by E coli between January 1997 and December 1999 were retrospectively enrolled into this study. Old age (> or =60 years), male sex, diabetes with poor blood glucose control (ie, glycosylated hemoglobin A1C > or = 8.1%), immunosuppression, and urinary tract obstruction were more frequently associated host factors for patients with upper UTI than for those with lower UTI. Using polymerase chain reaction, the papG class II allele was detected more frequently for E coli strains isolated from patients with upper UTI than for those from patients with lower UTI (85% versus 52%; P < 0.0001). Multivariate analysis showed that diabetes with poor blood glucose control, immunosuppression, urinary tract obstruction, and papG class II allele were independently associated with upper UTI. For patients without these three predisposing host factors, the prevalence of papG class II allele was significantly greater in those with upper UTI than those with lower UTI. However, the papG class II allele

was less prevalent in strains isolated from patients with upper UTI with urinary tract obstruction or with two of the three predisposing host factors. In addition, both univariate and multivariate analyses showed that old age and papG class II allele were risk factors for the development of E coli bacteremia in patients with upper UTI. In conclusion, both host and E coli virulence factors contribute to the development of upper UTI, and less virulent strains can cause upper UTI in hosts with predisposing factors. Copyright 2002 by the National Kidney Foundation, Inc.

Anastrozole alone or in combination with tamoxifen versus tamoxifen alone for adjuvant treatment of postmenopausal women with early breast cancer: first results of the ATAC randomised trial.

The ATAC Trialists' Group. Arimidex, tamoxifen alone or in combination.

Lancet 2002 Jun 22;359(9324):2131-9

BACKGROUND: In the adjuvant setting, tamoxifen is the established treatment for postmenopausal women with hormone-sensitive breast cancer. However, it is associated with several side-effects including endometrial cancer and thromboembolic disorders. We aimed to compare the safety and efficacy outcomes of tamoxifen with those of anastrozole alone and the combination of anastrozole plus tamoxifen for 5 years.

METHODS: Participants were postmenopausal patients with invasive operable breast cancer who had completed primary therapy and were eligible to receive adjuvant hormonal therapy. The primary endpoints were disease-free survival and occurrence of adverse events. Analysis for efficacy was by intention to treat.

FINDINGS: 9366 patients were recruited, of whom 3125 were randomly assigned anastrozole, 3116 tamoxifen, and 3125 combination. Median follow-up was 33.3 months. 7839 (84%) patients were known to be hormone-receptor-positive. Disease-free survival at 3 years was 89.4% on anastrozole and 87.4% on tamoxifen (hazard ratio 0.83 [95% CI 0.71-0.96], p=0.013). Results with the combination were not significantly different from those with tamoxifen alone (87.2%, 1.02 [0.89-1.18], p=0.8). The improvement in disease-free survival with anastrozole was seen in the subgroup of hormone-receptor-positive patients, but not the receptor-negative patients. Incidence of contralateral breast cancer was significantly lower with anastrozole than with tamoxifen (odds ratio 0.42 [0.22-0.79], p=0.007). Anastrozole was significantly better tolerated than tamoxifen with respect to endometrial cancer (p=0.02), vaginal bleeding and discharge (p<0.0001 for both), cerebrovascular events (p=0.0006), venous thromboembolic events (p=0.0006), and hot flushes (p<0.0001). Tamoxifen was significantly better tolerated than anastrozole with respect to musculoskeletal disorders and fractures (p<0.0001 for both).

INTERPRETATION: Anastrozole is an effective and well tolerated endocrine option for the treatment of postmenopausal patients with hormone-sensitive early breast cancer. Longer follow-up is required before a final benefit:risk assessment can be made.

[The role of E. coli adhesins in the pathogenesis of urinary infection] [Article in Spanish]

Dalet Escriba F, Segovia Talero T, del Rio Perez G. Servicio de Microbiologia, Fundacion Puigvert, Barcelona. Rev Clin Esp 1991 Jun;189(1):8-13

One thousand five hundred strains obtained from patients suffering from different clinical forms of urinary infections (UI) and dependent glands have been studied with the aim of establishing the pathogenic responsibility of E. coli adhesion protein (ADH) in urinary infections (UI). ADH were determined using agglutination techniques with guinea pig and human red cells, C. albicans and S. cerevisiae spores and GAL-GAL sensitized latex. In non complicated UI, the presence of ADH is the main invasion mechanism for E. coli. The frequency of adherent strains is very high (569/648) in acute cases (207/247 cystitis + 69/98 recurrent cystitis + 108/114 pyelonephritis + 140/154 prostatitis + 28/35 orchyepidimitis and scarce (14/184) in asymptomatic or chronic cases (6/107 bacteriurias + 7/67 prostatitis + 1/10 orchyepidimitis). A close relationship is established between the presence of ADH and clinical symptoms. The acute cases with general symptoms are caused in 85% of cases (188/216) by strains with ADH type MR specially subtype P. The acute cases with local symptoms (only urinary syndrome) are caused in 77% of cases (297/387) by strains with ADH type Ms. In complicated UI the expression of adhesion proteins does not constitute and essential requisite in order to invade the urinary tract. It is suggested that males are significantly more resistant the females to UI both parenchymal and urinary tract. It is deduced that underlying factors are more predisposing to UI the smaller the adherence rate of isolated strains is. Thus, reflux and neurogenic bladder probes are by far more aggressive alterations than prostatic adenoma, bladder tumor and lithiasis.

History, clinical findings, sexual behavior and hygiene habits in women with and without recurrent episodes of urinary symptoms.

Tchoudomirova K; Mardh PA; Kallings I; Nilsson S; Hellberg D Institute of Clinical Bacteriology, Uppsala University, Sweden.

Acta Obstet Gynecol Scand (Denmark) Jul 1998, 77 (6) p654-9

BACKGROUND: To compare women with and without a history of recurrent symptoms suggestive of a urinary tract infection but a current negative urine culture regarding symptoms and signs of a genital infection, carriership of sexually transmitted agents and vaginal flora changes, sexual behavior and genital hygiene practice.

SETTINGS: Contraceptive attendees at family planning and youth clinics.

MATERIALS AND METHODS: Two hundred and seventeen women who reported recurrent symptoms of dysuria, frequent micturition, and urgency and had a negative bacterial urine culture were recruited as cases. Seven hundred and ten culture-negative women lacking such symptoms served as controls. A careful record was made including details about gynecological symptoms, sexual behavior and genital hygiene practice. Gynecological signs were noted at gynecological examination. Genital infections, including sexually transmitted diseases, were diagnosed.

RESULTS: The mean age of the two groups studied was 26.2 and 25.8 years, respectively. Symptoms, such as dysmenorrhea, vaginal discharge, genital pruritus, abdominal pain and superficial dyspareunia were more frequent in the study group than among the controls. On examination, only erythema was observed more often. However, the cases more often had a history of genital herpes and vulvovaginal candidosis. They used tampons only for menstrual purposes, and soap for genital hygiene, but more often used low-pH solutions and took hot baths less frequently. The women with recurrent urinary symptoms more often masturbated and more often had experience of anal sex and sex during menstruation than the control group.

CONCLUSIONS: Sexual behavior and genital hygiene habits may play an etiological role in the lives of women with recurrent episodes of urinary symptoms with a negative bacterial urine culture.

Acupuncture in the prophylaxis of recurrent lower urinary tract infection in adult women.

Aune A; Alraek T; LiHua H; Baerheim A Bryggen Medisinske Senter, University of Bergen, Norway.

Scand J Prim Health Care (NORWAY) Mar 1998, 16 (1) p37-9

OBJECTIVE: To evaluate the effect of acupuncture in the prevention of recurrent lower urinary tract infection (UTI) in adult women.

DESIGN: A controlled clinical trial with three arms: an acupuncture group, a sham-acupuncture group, and an untreated control group. Patients were followed for 6 months.

SETTING: An acupuncture clinic in Bergen, Norway.

SUBJECTS: Sixty-seven adult women with a history of recurrent lower UTI.

MAIN OUTCOME MEASURES: Acute lower UTIs during the 6-month observation period.

RESULTS: Eighty-five percent were free of lower UTI during the 6-month observation period in the acupuncture group, compared with 58% in the sham group ($p < 0.05$), and 36% in the control group ($p < 0.01$). There were half as many episodes of lower UTI per person-half-year in the acupuncture group as in the sham group, and a third as many as in the control group ($p < 0.05$).

CONCLUSION: Acupuncture seems a worthwhile alternative in the prevention of recurring lower UTI in women.

Urinary tract infections in children: Why they occur and how to prevent them

Hellerstein S. Dr. S. Hellerstein, Section of Pediatric Nephrology, Children's Mercy Hospital, 2401 Gillham Rd., Kansas City, MO 64108 United States

American Family Physician (United States), 1998, 57/10 (2440-2446)

Urinary tract infections (UTIs) usually occur as a consequence of colonization of the periurethral area by a virulent organism that subsequently gains access to the bladder. During the first few months of life, uncircumcised male infants are at increased risk for UTIs, but thereafter UTIs predominate in females. An important risk factor for UTIs in girls is antibiotic therapy, which disrupts the normal periurethral flora and fosters the growth of uropathogenic bacteria. Another risk factor is voiding dysfunction. Currently, the most effective intervention for preventing recurrent UTIs in children is the identification and treatment of voiding dysfunction. Imaging evaluation of the urinary tract following a UTI should be individualized, based on the child's clinical presentation and on clinical judgment. Both bladder and upper urinary tract imaging with ultrasonography and a voiding cystourethrogram should be obtained in an infant or child with acute pyelonephritis. Imaging studies may not be required, however, in older children with cystitis who

respond promptly to treatment.

Urogenital aging - A hidden problem

Samsioe G. Dr. G. Samsioe, Dept. of Obstetrics and Gynecology, University of Lund, University Hospital, Lund S-22185 Sweden

American Journal of Obstetrics and Gynecology (United States), 1998, 178/5 (S245-S249)

Urogenital problems in the elderly female population are experienced by one third of women from the age 50 years and onward. Symptoms from the lower urinary tract include incontinence, urethritis, and recurrent urinary tract infections. Atrophic changes within the bladder neck and urethra could be corrected by estrogen administration even at doses so low that endometrial proliferation is avoided. Hence such estrogens could be given without progestogen comedication. Control of micturition is a complex process of which estrogen deficiency is only one of several factors. The aging process with subsequent changes in membrane permeability, neuromuscular function, and collagen synthesis contributes to the local problems of control of micturition. In addition, the central control may also be affected by degenerative changes of the nervous system. Vaginal symptoms comprise dryness of vagina, dyspareunia, and recurrent vaginitis often followed by a fowl odor and discharge. The microflora with lactobacilli and low pH as seen in fertile women is gradually replaced by a mixed germ flora including several of the pathogenic organisms common in urinary tract infections. Vaginal pH increases from around 4 to between 6 and 7. It is a puzzling fact that the urogenital tissues seem to be more 'sensitive' to estrogens than other tissues. Conformational changes of the estrogen receptor(s) brought about by the local cytokine milieu is one possibility to explain the situation. The systemic absorption of low-dose estrogen preparations is dependent on the status of the vaginal mucosa. Absorption is high when the vaginal mucosa is atrophic and gradually decreases (but not to zero) as the vaginal mucosa matures under estrogen influence.

Herbal urinary antiseptics - Still up-to-date?

Stammwitz U. U. Stammwitz, Schape and Brummer GmbH and Co. KG, Bahnhofstrasse 35, 38259 Salzgitter-Ringelheim Germany

Zeitschrift fur Phytotherapie (Germany), 1998, 19/2 (90-95)

For herbal urinary antiseptics a positive monograph by the commission E of the former German Bundesgesundheitsamt (BGA) has been issued for bearberry leaf horseradish roots and white sandalwood. Bearberry leaf is the only one of these drugs suited for the (sole) therapy of inflammable diseases of the lower urinary tract. Recent investigations regarding pharmacokinetics and toxicology of Uvae-ursi folium confirm the precautionary nature of restricting the application. Herbal urinary antiseptics are preferred if antibiotic treatment/chemotherapy is not considered essential: for uncomplicated cystitis, asymptomatic bacteriuria or in patients with permanent catheter.

Effect of cranberry juice on urinary pH in older adults.

Jackson B; Hicks LE Department of Veteran Affairs, Medical Center, Bay Pines, Florida, USA.

Home Healthc Nurse (United States) Mar 1997, 15 (3) p198-202

Most research suggests that ingestion of cranberry juice may be useful in preventing urinary tract infections. This pilot study examines the effect of drinking moderate amounts of commercially available cranberry juice cocktail on urinary pH in older, institutionalized adults. The results of the study have implications for home care nurses who have similar patients in their case loads. (17 Refs.)

Infection control. The therapeutic uses of cranberry juice.

Nazarko L

Nurs Stand (England) May 17-23 1995, 9 (34) p33-5

This article considers the treatment of recurrent cystitis. It examines the evidence for drinking cranberry juice to prevent recurrent urinary tract infections and discusses the nursing issues raised, drawing conclusions from the evidence presented.

Urinary problems after formation of a Mitrofanoff stoma.

Gibbons M

Prof Nurse (England) Jan 1995, 10 (4) p221-4

1. Bladder irrigation reduces occlusion of drains with clots and debris, thus protecting anastomoses.

2. Leakage from anastomoses is an acknowledged problem postoperatively but resolves spontaneously in the majority of cases.

3. To establish urinary continence a good fluid intake is essential, bladder capacity must be developed, intermittent catheterisation taught and excessive mucus production eliminated.

4. The risk of urinary tract infections can be minimised by drinking cranberry juice, prophylactic antibiotic therapy and a good intermittent catheterisation technique. A degree of bacteria is inevitable and not always significant.

Inhibitory activity of cranberry juice on adherence of type 1 and type P fimbriated Escherichia coli to eucaryotic cells.

Zafriri D; Ofek I; Adar R; Pocino M; Sharon N Department of Human Microbiology, Sackler Faculty of Medicine, Tel Aviv University, Israel.

Antimicrob Agents Chemother (United States) Jan 1989, 33 (1) p92-8

Inhibition of bacterial adherence to bladder cells has been assumed to account for the beneficial action ascribed to cranberry juice and cranberry juice cocktail in the prevention of urinary tract infections (A. E. Sobota, J. Urol. 131:1013-1016, 1984). We have examined the effect of the cocktail and juice on the adherence of Escherichia coli expressing surface lectins of defined sugar specificity to yeasts, tissue culture cells, erythrocytes, and mouse peritoneal macrophages. Cranberry juice cocktail inhibited the adherence of urinary isolates expressing type 1 fimbriae (mannose specific) and P fimbriae [specific for alpha-D-Gal(1----4)-beta-D-Gal] but had no effect on a diarrheal isolate expressing a CFA/I adhesin. The cocktail also inhibited yeast agglutination by purified type 1 fimbriae. The inhibitory activity for type 1 fimbriated E. coli was dialyzable and could be ascribed to the fructose present in the cocktail; this sugar was about 1/10 as active as methyl alpha-D-mannoside in inhibiting the adherence of type 1 fimbriated bacteria. The inhibitory activity for the P fimbriated bacteria was nondialyzable and was detected only after preincubation of the bacteria with the cocktail. Cranberry juice, orange juice, and pineapple juice also inhibited adherence of type 1 fimbriated E. coli, most likely because of their fructose content. However, the two latter juices did not inhibit the P f that cranberry juice contains at least two inhibitors of lectin-mediated adherence of uropathogens to eucaryotic cells. Further studies are required to establish whether these inhibitors play a role in vivo.

Inhibition of bacterial adherence by cranberry juice: potential use for the treatment of urinary tract infections.

Sobota AE

J Urol (United States) May 1984, 131 (5) p1013-6

Cranberry juice has been widely used for the treatment and prevention of urinary tract infections and is reputed to give symptomatic relief from these infections. Attempts to account for the potential benefit derived from the juice have focused on urine acidification and bacteriostasis. In this investigation it is demonstrated that cranberry juice is a potent inhibitor of bacterial adherence. A total of 77 clinical isolates of Escherichia coli were tested. Cranberry juice inhibited adherence by 75 per cent or more in over 60 per cent of the clinical isolates. Cranberry cocktail was also given to mice in the place of their normal water supply for a period of 14 days. Urine collected from these mice inhibited adherence of E. coli to uroepithelial cells by approximately 80 per cent. Antiadherence activity could also be detected in human urine. Fifteen of 22 subjects showed significant antiadherence activity in the urine 1 to 3 hours after drinking 15 ounces of cranberry cocktail. It is concluded that the reported benefits derived from the use of cranberry juice may be related to its ability to inhibit bacterial adherence.

Effect of cranberry juice on urinary pH.

Nahata MC, McLeod DC

Nurs Res (1979 Sep-Oct) 28(5):287-90

Twenty-one female and 19 male subjects who had normal physical and laboratory examinations were randomly assigned into four groups of 10 subjects each. Each group was then randomly assigned a number (150, 180, 210, 240) which determined the amount of cranberry juice, in milliliters, members of that group would ingest with each meal during the experimental phase of the study. The study took place over a 12- day period. A one-group before-and-after design was used, with each subject serving as his or her own control. Diet was controlled; menus on days 1 through 6 were repeated on days 7 through 12 with the addition of cranberry juice at each meal. Subjects used nitrazine pH tape to measure the pH of midstream urine at each voiding. There were significant (.01 level)

differences in mean urinary pH between each control group and its corresponding experimental group. Anticipated problems with increased number of bowel movements, weight gain, increased voiding frequency, and subject pH measurement inaccuracy did not occur.

Urinary tract infections due to Candida albicans.

Fisher JF, Chew WH, Shadomy S, Duma RJ, Mayhall CG, House WC.

Rev Infect Dis 1982 Nov-Dec;4(6):1107-18

Infection of the urinary tract due to Candida albicans is an uncommon but well-described complication of modern therapeutics. Despite the rarity of this infection, culture of properly collected urine yielding C. albicans requires an explanation. The significance of systemic factors in the defense of the urinary tract against candidal infection is unknown, but secretions from the prostate gland in men and from periurethral glands in women have been reported to be fungistatic. In addition, growth of Candida at sites on mucous membranes may be suppressed by other normal flora. Conditions that predispose to candiduria include diabetes mellitus, antibiotic and corticosteroid therapy, as well as factors such as local physiology and disturbance of urine flow. Lower urinary tract candidiasis is usually the result of a retrograde infection, while renal parenchymal infection most often follows candidemia. In addition to asymptomatic candiduria, recognized clinical forms of candidal urinary tract infections include bladder infection, renal parenchymal infection, and infections associated with fungus ball formation. Unfortunately, clinical criteria alone are insufficient to distinguish reliably among these clinical types. If the urine is found to contain candidal organisms, the condition of the patient should be considered for determination of appropriate therapy. When infection is thought to be confined to the bladder, patients without indwelling bladder catheters should be considered for flucytosine therapy. For patients requiring indwelling bladder catheterization, irrigation with amphotericin B is usually successful. Although flucytosine alone may be useful for renal parenchymal candidal infection, iv amphotericin B alone or the combination of amphotericin B and flucytosine is indicated when systemic candidiasis cannot be excluded.

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