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CANDIDA ALBICANS, UROGENITAL INFECTIONS: EFFECTS OF ALKALINIZATION OF THE URINE, AND THE ROLE PLAYED BY, ORAL SODIUM BICARBONATE – EFFICACY, EVALUATION AND RISK CONSIDERATIONS

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ABSTRACT

Aim of this work is to verify the effect of urinary alkalinization in Candida A. genitourinary infections.

Sodium bicarbonate have a great varieaty of use in medicine, cosmetics or used since to inibith bacterial growth in vegetables at home.

Its proprerties with antibacterial and anti fungi is of interest also as remedy for Candida A.

Are so analyzed the use of this ancient product, the mechanism of action, and the side effects.

The lack of clinical studies with results related this approach and the mechanicistic efficacy of SB to

Inibith CANDIDA A. in vitro or in other local situation (dermatological condition, dentistry) require an specific investigation.

Even if the therapy of this condition is an physician's responsability it is of interest to summarize some aspects of interest also for other healthcare professionals.

This article is produced under a chemico- pharmacological point of view.

KEYWORDS: candida A., chronic prostatitis, relapses, genitourinary infections, drug resistance alkalinization, oral sodium bicarbonate, remedy, toxicity.

INTRODUCTION

Urinary tract infections often come on suddenly and can feel intense.
Burning, pressure, and frequent bathroom trips can make it hard to sleep, focus, or get through the day.
Between the cause bacteria and fungi.
This work is focused on the Candida Albicans urogenital infection and the role played by the alkalinization of the urine according scientific literature.
According
F Murina et al

"The mycotic vulvovaginitis is a common infection. It is estimated that about 75% of women will experience this infection at least once during their life time. In 15% of these cases the mycotic infection may evolve in a "cyclic recurrent type" defined as four or more episodes of mycotic vulvovaginitis during one year"

Related pH and Candida Growth in fact it is possible to verify that:
Candida species are pH-responsive organisms capable of adapting to acidic and neutral environments. Vaginal candidosis typically occurs in acidic vaginal pH (3.8–4.5), whereas urinary Candida colonization occurs across a range of pH values.

The Environmental pH can influences:
Hyphal transformation, Biofilm formation, Adhesion to epithelial surfaces, Expression of virulence genes.
Experimental research data indicate that the alkaline conditions can inhibit certain virulence traits and reduce biofilm biomass in vitro.

And about the Candida Albicans UTI infections it is possible to see in literature:

Jade Poole:
"The following are the typical signs and symptoms of candidiasis:
Recurring UTI and vaginal infections – Recurrent infections are often a result of candidiasis in women.

Oral thrush – This is a yeast infection and is the result of overgrowth of Candida A. In infants it may occur as the immune system is not yet completely developed. In adults it is often caused by medications like as oral corticosteroids. If this is left untreated it can spread throughout the body, becoming invasive and can affect the lungs, liver, digestive tract and heart valves.

Intestinal distress – Burping, bloating, diarrhoea, constipation or **flatulence** that is persistent may be a result of unhealthy gut bacteria. If the Candida yeast overgrows in the intestine, the healthy bacteria component may become unbalanced and are therefore not strong enough to fight off the infection.

Chronic fatigue – Feeling constantly exhausted is characteristic of the Candida infection. If fatigue lasts for at least 6 months the sufferer may be diagnosed with chronic fatigue syndrome. This condition is characterised by symptoms of chronic fatigue along with joint pain, **headaches, memory issues** and a sore throat.

Mood disorders – People who suffer from candidiasis may experience major mood swings that are characterised by **irritability, depression, anxiety** and since panic attacks.

Brain fog – is a result of the Candida overgrowth causing a lack of focus, poor memory and even poor coordination physically.

Nail and skin fungal infections – Fungus affecting the toenails and Athlete's foot are extremely common yeast infections and can stem from Candida A. If these infections are experienced continuously, then this may be a sign that the affected person has a systemic Candida infection (affecting the body as a whole).

A Candida infection can cause a hormonal imbalance which can lead to migraines, mood swings, endometriosis, a low sex drive and even also early menopause. During a Candida overgrowth, inflammation occurs and results in the yeast growing and spreading throughout the body, a by-product of this is that Candida is able to mimic oestrogen which can lead to a hormonal imbalance.

Nappy / Diaper Rash - While most cases of nappy rash have more to do with the impairment of skin, in some cases a fungal infection is responsible. The most common fungal infection occurs due to Candida A., the result - a diaper yeast infection. This type of infection often occurs on the thighs, genitals and abdomen and also appears in the skin creases in this area. This with the small, raised infected red bumps make it easily distinguishable from other types of diaper rash."

According guideline the therapy is based on antimicotics like Fluconazole but In biomedical database or in other healthcare website are reported also the use of alkalinization of the urine and since various use of sodium bicarbonate in different other conditions:
from the foot bath for tinea pedis, other skin fungal infections, antiseptic to treat conditions like psoriasis, eczema, acne, and pruritus, the use in dentistry since its deodorant properties or the use to disinfect vegetables durign washing at home before the use.
in all this condition the antifungal properties are commonly reported.

From https://www.slideshare.net/slideshow/urine-alkalizerpptx/255624314
Various Bacterial infections on urinary tract can cause more acid urine then normal and this provide painful and burning sensation. when passing urine.

Sodium bicarbonate oral can be used as urinary alkalinizer.

Sodium bicarbonate is a salts and make the water solution alkaline.

In the side effects: alkalosis, hypernatriemia, irregular heartbeat (high doses), urination more then natural, increased thirst, gas abdominal bloating.

Contraindication: hypernatriemia, metabolic ore respiratory alkalosys, hypocalcemia.

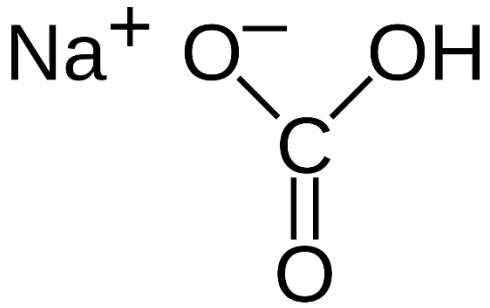

Fig n 1: Sodium bicarbonate chemical structure formula.

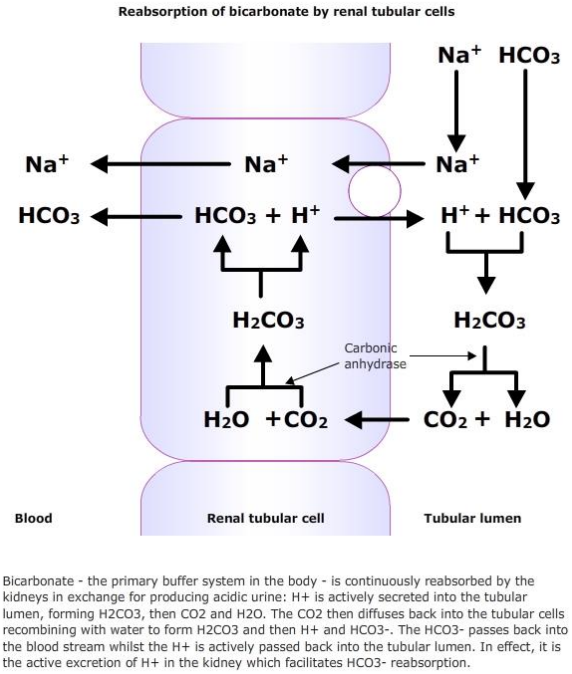

Fig n 2: from https://www.rcemlearning.co.uk/modules/arterial-blood-gas-analysis/lessons/basic-science/topic/bicarbonate-control/

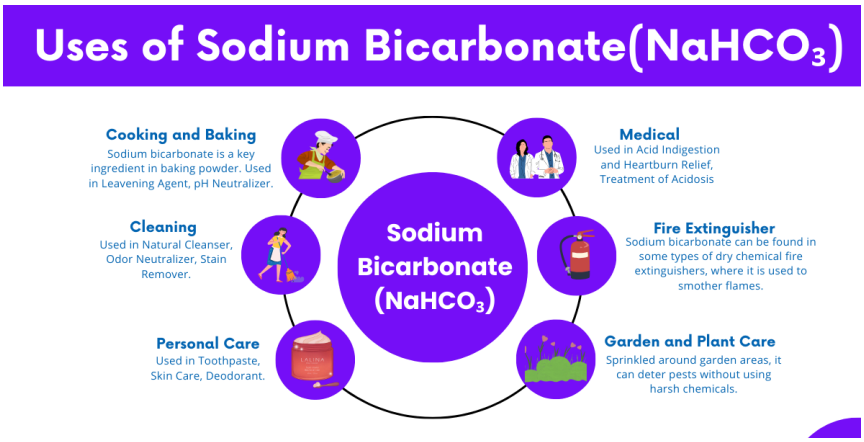

Fig n 3: Use of Sodium Bicarbonate From Examples.com.

In the website https://www.distripark.eu/en/blog/baking-soda-use-in-cosmetics 2022 is reported that:
"What properties does baking soda have? Soda powder is poorly soluble in water. When heated or combined with acids, it begins to release carbon dioxide.

Sodium solutions, used in cosmetics and medicine, have a versatile effect:
eliminate bacteria, brighten the skin, regulate the pH of the skin and organs of the digestive system, soothe inflammation, reduce swelling after the insect bites" and Nicola X. Et al in 2025

"Baking soda or SB has been documented as beneficial for cleaning teeth and aiding plaque removal for many years, also being considered to have low abrasivity. It is hypothesized that sodium bicarbonate toothpaste properties are attributable to: (A) its physical properties as its large crystals aid in displacing plaque from the tooth surface; (B) interactions with plaque matrix by dissolved sodium bicarbonate, which may, for example, reduce plaque viscosity of the polysaccharide matrix which bind the bacteria together and make it more readily removable by the toothbrush; (C) **its ability to favour the disruption of plaque biofilm by improving the penetration of biofilm by toothbrush bristles**."

D M Brunette in 1997

"Oral malodor, also known as bad breath or halitosis, is an extremely common problem. Bad breath can arise from many sources in the body, but most frequently is produced in the mouth by the action of gram-negative anaerobic bacteria on sulfur-containing proteinaceous substrates in the saliva, such as debris and plaque. The primary molecules responsible for oral malodor are volatile sulfur compounds, like as hydrogen sulfide and methylmercaptan. Increased malodor production is related to greater bacterial numbers, reducing conditions, availability of protein substrates, and a pH above neutral. Results of controlled double-blind crossover studies, using both organoleptic (sensory) and gas chromatographic GC analysis of mouth air VSC, indicate that 2 dentifrices with high baking-soda concentrations, reduce oral malodor."

From Niluk Leon Senewiratne et al 2024.
"Absorption: Following oral (OS) administration, excess bicarbonate is absorbed, resulting in metabolic alkalosis and alkalinization of urine. IV administration results in complete bioavailability.
Distribution: Sodium bicarbonate is widely distributed in the extracellular fluid.
Metabolism: S. bicarbonate has an unknown half-life.
Excretion: Bicarbonate is excreted in the urine; it is excreted and reabsorbed by the kidneys. Bicarbonate is also transported to the lungs and exhaled as carbon dioxide."

Fig n 4: Candida A. in Saboraud agar.

Fig n 5: Microscopic view of Candida A. from V. Shegokar et al.

In dermatology:
From
Jillian Foglesong Stabile et al 2025
"A 2022 study found that sodium bicarbonate, also known as baking soda, does have antifungal abilities on another type of Candida infection named Candida glabrata.

To make a foot soak, mix about a half cup of baking soda SB in a large bucket or basin of warm water. Soak feet for 15 to 20 minutes, twice a day. When done, dry the feet thoroughly but do not rinse."
From https://health.clevelandclinic.org/home-remedies-for-athletes-foot

"Baking soda: Putting baking soda SB on your feet may prevent fungi from growing."

V Letscher-Bru et al 2013 was written:
"we documented the antifungal activity of SB on the most common agents of cutaneous fungal infection and onychomycosis, and we specified the effective concentrations for the different groups of pathogenic fungi."

In dentistry it is of interest to verify that:
Sathyasree Madeswaran et al

"Baking soda SB, being a common household item, with its ready availability, safety, minimal abrasivity, and bactericidal property makes it a patient-friendly mouthwash, component in dentifrice, or chewing gum, which can be used on a long-term basis as an adjunct virtually free of any side effects."
Madeswaran et al 2018.

"Denture stomatitis is associated with poor denture hygiene and candida infection. Soaking heat-activated acrylic resin in a solution of 5% SB has been proven to be successful in controlling the adherence of Candida albicans."

And In cosmetics fields:
JOHN HENDERSON LAMB 1946

"Clinical studies on more than 90 persons have indicated that SB is a valuable underarm deodorant for common daily usage."

Of interest also to verify In domestic activity:
From Healths Cynthia Sass 2026

"Baking soda SB can effectively remove germs, pesticides, and soil from produce. Here's how to clean fruit and vegetables with baking soda"

In article:
Donna M. Curran et al 1989

"SB at concentrations of 0.06, 0.12, and 0.24 M was added to pasteurized apple juice that was then inoculated with 103 cfu/ml of either yeast. Growth of both yeasts was inhibited by 0.12 M sodium bicarbonate when incubation was at 4°C; 0.24 M SB caused a slow die off of yeast. **At 18°C, H. wingei became more sensitive and died in the presence of 0.12 M SB**, but S. cerevisae became resistant to 0.24 M sodium bicarbonate. These results could not be attributed to bicarbonate-induced pH elevation or sodium. **Potassium and ammonium bicarbonate were also inhibitory, implicating bicarbonate ion as the antimicrobial agent**."

Fig n 6: Urinary Ph measure.

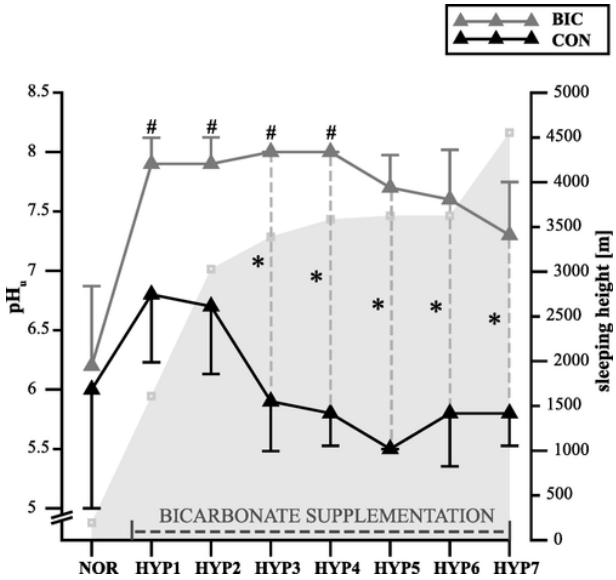

Fig n. 7: From M Limmer et al 2022 https://doi.org/10.1186/s12970-020-00351-y Early morning urinary pH values (means ± standard deviation) in subjects with (BIC) and without (CON) bicarbonate supplementation before (NOR) and during hypoxic exposure (HYP1-HYP7). * p ≤ 0.05 vs. CON; # p ≤ 0.05 vs. PRE

To be considered also:
J T Hill 1974

"General measures should include alkalinization of the urine. Yeasts have been known to grow less readily in the alkaline media."

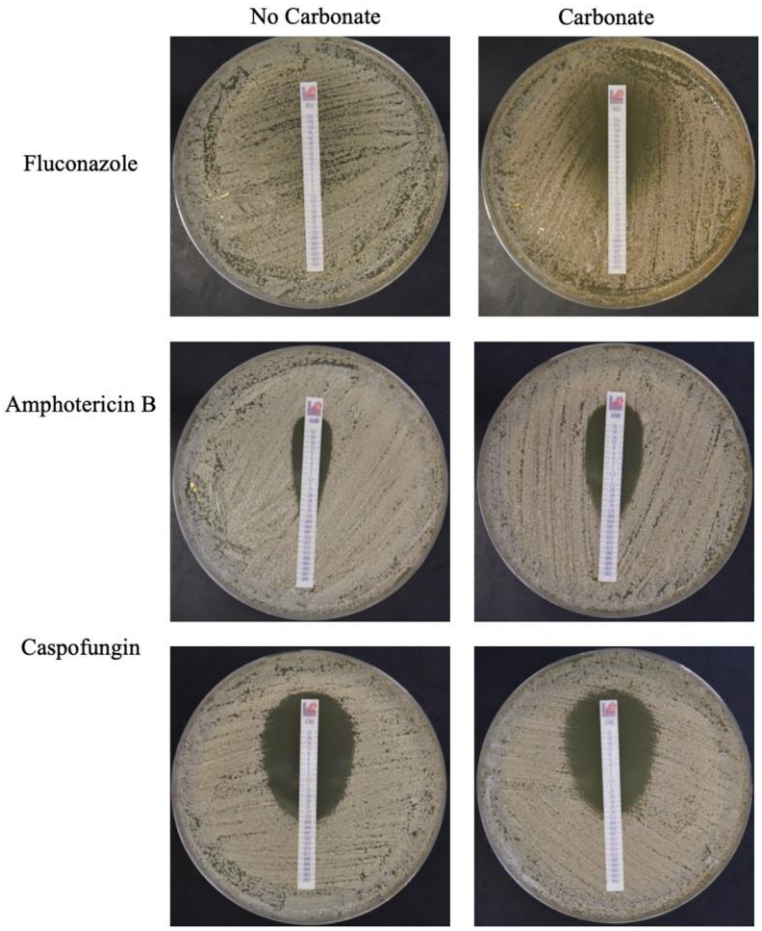

Fig n 8: Antifungal Drug Resistance ADR. Cells were grown overnight at 28℃ then spread on YPD plates buffered to pH7 with MOPS, +/− 1% carbonate to form a lawn. Antifungal test strips were applied, and plates were incubated overnight at 37℃. From https://doi.org/10.1002/mbo3

According
Roberto Manfredi et al 2016
"**Urinary alkalinisation is a common practice in the management of dysuria in patients with urinary tract infection.** Although there is wide empirical experience with this approach, scientific literature is limited. The mechanisms by which modifying urinary pH reduces dysuria is poorly understood. This brief review examines the theory and practical implementation of urinary alkalinisation UA in patients with infections of the urinary tract and dysuria.

UTI are one of the commonest forms of infection and are frequently encountered by both hospital and community physicians. UTI is an umbrella term describing infection anywhere in the urinary system.

Cases typically manifest with distressing symptoms such as a frequent urge to urinate, difficulty initiating voiding and pain on voiding. **Dysuria is the term for painful urination and is usually described as burning, stinging or itching in nature.** Urinary alkalinisation UA is common practice in the management of UTI for its ability to provide symptomatic relief of dysuria.

"MECHANISMS OF DYSURIA IN UTI: contribute to the pathophysiology of pain. The pathogenesis linking dysuria and UTI is not clearly established. Dysuria can be partly explained by inflammatory mediators of pain which are produced in response to the infection. Elements of the inflammatory cascade is hypothesised to indirectly increase C-fibre afferent sensitivity to noxious stimuli. This hypersensitivity results in an excessive pain perception in the setting of urinary system infection**. Urine acidity itself is also widely believed to contribute to the sensation of dysuria**. The pH of infected tissues is usually lower than that of normal non-infected tissue surrounding it. **Lower pH elicits greater pain because various pain receptors and afferent C-fibres in the bladder wall are stimulated by hydrogen H+ ions**, which are more highly concentrated at greater acidity".

And by Mycopathologia Article
Antifungal Activity of Sodium Bicarbonate Against Fungal Agents Causing Superficial Infections
19 Sep 2012
"Although SB has many domestic and medical, traditional and empirical uses, only little scientific documentation of its activity is available. The aims of this study were to investigate the antifungal activity of SB on the three fungal groups (yeasts, dermatophytes, molds) responsible for human skin and nail infections. We first evaluated the in vitro antifungal activity of SB on 70 fungal strains isolated from skin and nail infections: 40 dermatophytes, 18 yeasts and 12 molds. We documented the antifungal activity of SB on the most common agents of cutaneous fungal infection and onychomycosis, and we specified the effective concentrations for the different groups of pathogenic fungi. The mechanism of action of SB has yet to be explored."

Finally In veterinary field:
Lora Koenhemsi 2024

"Alkalinizing the urine could be beneficial, as Candida species thrive most effectively at a urine pH between 5.1 and 6.4. Urine alkalinization UA can be achieved through the oral administration of sodium bicarbonate (12 mg/kg every 8 hours) or potassium citrate (50 mg/kg every 12 hours), with the dosage adjusted to elevate urine pH to 7.5 or higher (Lulichet al, 1996 **in feline**)."
https://www.cambridgeurologypartnership.co.uk/urology-info-for-patients/bladder/urinary-tract-infections-overactive-bladder/

"Advice for Patients with possible symptoms of UTI: A UTI can be usually be treated with a short course of oral antibiotics, but some infections may need to be treated for longer time. You must complete the full course of medication prescribed for you even if all your symptoms improve, otherwise the infection may return. Things which you can do to help yourself can include: As soon as you feel the first twinges, start drinking a lot of water. **Avoid strong coffee, or alcohol**. For the first 3 hours, drink at least half a pint every 20 minutes to flush out the infection before it gets a grip.

Take one teaspoon of SB dissolved in water as soon as possible and repeat this every 3-4 hours
Keep warm and place a hot water bottle over your tummy or between your thighs to ease the abdominal discomfort. Take a mild painkiller such as paracetamol. Do not self-medicate with antibiotics. If you have been prescribed "self-start antibiotics" by your doctor or urologist, start taking the tablets, after you have provided a urine sample for your doctor to send to the laboratory"

MATERIAL AND METHODS

Whit an observational point of view various relevant literature is reported related the topic of investigations.
All literature comes form scientific database like PubMed and Clinical trial.gov.
Figure reported (1-8) helps in the general meaning.
An specific case report is submitted, then after observing all this a general conclusion is finally provided.

Results from literature

Seyed Mohammad Karim Hosseini et al
"The fluconazole/sodium bicarbonate SB combination displayed synergistic and antagonistic effects (FICI= 0.375-4.25). In C. glabrata ATCC, SN 152, and SN 164, the fluconazole/ SB combination exhibited a significant fungicidal activity ($p< 0.05$) but antagonistic effect in the case of SN 283.

With exception of SN 283, a significant reduction was noted in phospholipase production in clinical isolates of C. glabrata treated with fluconazole/ SB. The PLB was

down-regulated significantly by 0.168-0.515 fold in C. glabrata treated with fluconazole/ SB.
The results suggested fluconazole/SB to have a potential synergistic interaction in C. glabrata, and the underlying mechanism may be associated with phospholipase gene."[1]
Barak Cohen et al

"Oral administration of a standard dose of sodium bicarbonate SB tablets resulted in effective urine alkalinization."[2]
C. Strassner et al

"Eighteen hospitalized patients with candiduria were treated with oral potassium-sodium-hydrogen citrate to alkalinize the urine. The results obtained were compared with those observed in an untreated retrospective control group. Dosage was adjusted in accordance with the pH of the urine measured immediately before treatment with the aim of achieving a pH of 7 to 7.5.

All patients had an indwelling catheter, which is a predisposing factor for candiduria. In 16 out of 18 patients (89%) treatment with K- NA -hydrogen citrate raised pH and resulted in the disappearance of candiduria. Duration of treatment varied between 2 days and one month (mean: 7 days). In four patients the urine became completely sterile; during treatment 12 out of 18 patients developed significant bacteriuria (in eight cases of these the indwelling catheter had been left in place).

Alkalinization of the urine is a simple and effective method of treating candiduria in patients with an indwelling catheter."[3]
Mehmet Giray Sönmez et al

"In this study, we planned to explore the effects of sodium bicarbonate orally treatment on female patients with lower urinary tract symptoms who have acidic urine pH values (<6).

NaHCO3 was given orally to 33 female patients for 4 weeks at a dose of 2 × 4 g/day. Lab. values, bladder diary, the Patient Perception of Bladder Condition Score, Patient Perception of Intensity of Urgency Scale, Overactive Bladder-Validated 8-question Awareness tool, Pelvic Pain and Urgency & Frequency Patient Symptom Scale tests, and the King's Health Questionnaire (KHQ) scores before and after treatment were compared.

A significant increase was detected in urine pH values measured after the treatment (5.31 ± 0.52 to 7.2 ± 0.66, $p < 0.001$), but not in the blood pH values (7.369 ± 0.33 to 7.384 ± 0.28, $p = 0.14$). After treatment, a significant decrease was detected in daily frequency, nocturia, urgency, and urge incontinence prevalence ($p < 0.001$, $p = 0.003$, $p < 0.001$, $p = 0.002$) and PPBC, PPIUS, PUFSS, OAB-V8 symptom scores ($p = 0.004$, $p = 0.002$, $p < 0.001$, $p < 0.001$). A significant decrease was detected in all KHQ subunit scores.

Urine alkalinization with NaHCO3 orally in female patients with LUTS and acidic urine pH has a significant level of positive effects on the symptoms and symptom scores. Our results show that this new treatment modality-which is inexpensive, easy to use, and has a low side-effect profile is effective in this chronic patient group."[4]

From https://www.urotoday.com/2014-09-18-02-47-34/infections-main/6523-genitourinary-fungal-infections-4949.html
Genitourinary Fungal Infections: CANDIDIASIS

"**Asymptomatic candiduria implies a colonization of the urinary tract without an tissue invasion Usually disappears when predisposing factors (antibiotics, indwelling catheters) are removed Urinary alkalinization with sodium bicarbonate SB to a pH of 7.5 is helpful"[5]**
Paula Faria-Gonçalves et al

"Sodium bicarbonate has a fungistatic effect independent of pH
We found that SB had the ability to inhibit the growth of all Candida spp. isolates in test. TheMIC of NaHCO3 against the yeast strains tested ranged between 12.5 mg/mL (pH 8.97) and 25 mg/mL (pH 9.45) in RPMI broth and between 1.56 mg/mL (pH 7.66) and 6.25 mg/mL (pH 8.02) in YPD broth. The inhibitory effect was equally observed among fluconazole-resistant and fluconazole-susceptible isolates. The minimum lethal concentration of NaHCO3 against the tested yeast was higher than the observed MIC, which is an indication that the inhibitory effect was fungistatic.

Previous studies suggest an **antifungal role of the Na + ion. A supplementation with Na + ion could cause an imbalance of the intracellular K+/Na + ratio,** whose homeostasis is crucial for the physiology of the fungal cell. In the presence of the NaHCO3, **the excess of extracellular Na+ would cause a massive influx of Na + by a non-specific transport mechanism, and the intracellular accumulation of Na + would be responsible for a growth arrest of the cell**.

Other studies suggest a role of the HCO3- ion, since other salts such as KHCO3 and NH4HCO3 also have an antifungal activity, possibly by **alkalinizing** the medium and favoring the stability of KH and NH4, which would in its turn damage the cell wall and compromise the membrane. This latter hypothesis is somewhat supported by our research, since when the YPD medium was supplemented with sorbitol or ergosterol, the inhibitory effect of SB was abolished. Sorbitol has an osmoprotector function; and ergosterol is part of fungal membranes. Our results suggest that SB **fungistatic effect is related to damage to the cell wall and**

destabilization of the membrane. As a future perspective, total RNA sequencing would reveal the fungistatic effects at the molecular level.

In order to rule out structural effects caused by exposure to SB, such as cell wall damage, we observed treated cells with SEM. We conclude that cells showed no significant ultrastructural damage. Previous studies have showed that SB **has an impact in filamentation**; in smaller concentrations it induces filamentation, **while in higher concentrations it is inhibited**.

In this research, we found that the proportion of germ tubes (considering in general both hyphae and pseudo-hyphal forms) was significantly reduced in the presence of SB ($p < 0.05$), both considering weak-germ tube producer C. albicans ATCC10231 and strong-germ tube-producers such as clinical isolates; and that cells collected from culture medium supplemented with 12.5 mg/mL (MIC), showed that the yeast cells were not damaged, but evidence of disrupted hypha in some cell clusters were observed.

We also investigated the role of sodium bicarbonate in the dispersal of biofilms, which is one of the most important virulence factors for the onset of VVC. **We found that biofilm biomass was severely reduced after treatment with SB,** evidencing that its local use on the vaginal mucosa might help the dispersal of Candida spp. biofilms. In fact, formulations with SB have already been proved to be efficient for this purpose. The metabolic activity of biofilms was also impaired, which is an indication that NaHCO3 could be a valuable adjuvant in therapy, combined for instance with azole compounds.

We observed a slight increase in biofilm biomass in the presence of low concentrations of SB that was statistically non-significant ($p > 0.05$); this might be a mechanism used by the microorganism to cope with the presence of the compound, as previously observed with other compounds. More insights on the effect of SB on Candida spp. biofilms could be obtained by testing under fluid flow conditions, that have not been optimized yet to mimic vaginal conditions.

Treatment strategies including SB should take into account that the vaginal ecosystem is complex, and includes many beneficial microorganisms such as Lactobacillus spp. In VVC cases, the Lactobacillus community seems to be depleted, although not entirely. VVC infection develops along with strains of lactobacilli present in the vagina, explaining why it is not usually associated with a pH increase. In fact, the use of Lactobacillus probiotics to treat VVC has been so far unsuccessful. The effect of SB should be ascertained against Lactobacillus, since these contribute to a healthy vaginal ecosystem.

A recent study has revealed that SB gels have the potential to modulate Lactobacillus crispatus' behaviour, particularly on the context of cytolytic vaginosis. Since L. crispatus is also one of the most frequent vaginal lactobacillary species, it can be assumed that SB could be used safely in the vaginal cavity.

The pH of healthy women is around 4.5, which could be disturbed by using NaHCO3. We hypothesize that vaginal douching with SB, since it constitutes a brief contact, might be sufficient to inhibit Candida without disturbing the overall ecosystem. Another strategy could be the formulation of SB in the gel form, which has already showed overall good technological parameters, including low toxicity to vaginal porcine explants and low osmolality upon dilution with vaginal fluid simulants; but still needs to be tested in-vivo."[6]

And related the predisposing factors Varsha Shegokar et al written:
"In almost all instances of acute disseminated candidiasis the defence mechanisms of the host have been reduced by predisposing factors such as prior antibiotic therapy, systemic adrenocortical steroids, indwelling intravascular catheters, diabetes mellitus, and other serious chronic diseases. Various neoplastic diseases like as lymphoma and Hodgkin's disease favour the development of Candida infection and dissemination, but even in these diseases the development of systemic candidiasis was a rare event before modern therapy with bone marrow suppressants, antibiotics uese, steroids, and roentgen RX irradiation."[7]
Mehmet Giray Sönmez et al

"Urine alkalinization with SB orally in female patients with LUTS and acidic urine pH has a significant level of positive effects on symptoms and symptom scores. Our results show that this new treatment modality—which is inexpensive, easy to use, and has a low side-effect profile is effective in this chronic patient group."[8]
Diaconu A et al

"While baking soda is generally considered safe, various cases who developed metabolic alkalosis and electrolyte imbalances due to SB overdose have been documented."[9]

Sodium bicarbonate cp 500 mg Precautions and contraindications: form Gov. UK.

"Large doses of bicarbonate could produce an metabolic alkalosis. The sodium content could elevate blood pressure BP or contribute to fluid retention and pulmonary oedema.

Hypokalaemia may be exacerbated. The product should be avoided in patients on saltrestricted diets and administered with caution in patients suffering from heart failure, hypertension, or hepatic / renal impairment. The absorption of some drugs can be affected by antacids and the renal excretion of certain pH dependent drugs may be altered. Lithium excretion may be increased.

Local release of CO2 after ingestion of inappropriate amounts has been reported to cause abdominal discomfort - distension or in extreme cases, gastric damage.“[10]
Barak Cohen et al

“We evaluated the efficacy of oral SB administration for urine alkalinization. Methods In a prospective open-label trial, 4 g of sodium bicarbonate was administered orally 3 times daily to 9 healthy volunteers for 24 hours. Serial blood and urine samples were collected, and urine pH was evaluated. Plasma electrolytes and pH were also measured for safety purposes. Results All participants had a urine pH of at least 7 after 10 hours. At 20 hours, all participants had a urine pH of at least 8**. No adverse effects or abnormal blood results were documented during the 24-hour follow-up.** Oral administration of a standard dose of SB tablets resulted in effective urine alkalinization.”[11]

In https://www.droracle.ai/articles/541921/what-is-the-recommended-oral-dose-of-sodium-bicarbonate

“Oral S. B. Dosing for Antacid Use For antacid use, the FDA-approved dose is 1 tablet (typically 325 mg or 650 mg) dissolved in a glass of water as needed, with a maximum of 24 tablets daily for adults under 60 years and 12 tablets daily for adults 60 years and older.“[12]

From MAYOCLINIC:
“US sodium bicarbonate: sodium bicarbonate powder:
Sodium bicarbonate, is used to relieve heartburn, sour stomach, or acid indigestion by neutralizing excess stomach acid. When used for this purpose, it is said to belong to the group of medicines called antacids. It may be used to treat the symptoms of stomach or duodenal ulcers. SB is also used to make the blood and urine more alkaline in certain conditions.
Antacids should not be given to young children (up to 6 years of age) unless prescribed by their doctor.
SB for oral use is available without a prescription.
To relieve heartburn or sour stomach: Adults and teenagers—One-half teaspoonful in a glass of water every two hours. Your doctor may change the dose if needed.
To make the urine more alkaline (less acidic): Adults and teenagers—One teaspoonful in a glass of water every four hours. Your doctor may change the dose if needed.”
E Gabrielli et al
“the research data suggest that the beneficial effect exerted by this S. cerevisiae-based probiotic is the result of its interference with the expression of fungus virulence factors coupled with the modulation of the inflammatory response of the host.”[13]
Mariana Tomás et al

“formulation C (5% SB 1% carbomer and 94% water) was the most effective in inhibiting the C. albicans’ growth. This gel presented the same potential (the same MIC 2.5%) to inhibit other etiological agents of VVC (C. glabrata, C. krusei, C. tropicalis and C. parapsilosis) for all species tested.”[14]

Barrak M. Pressler — 2006
“Alkalinization therapy has historically been recommended as an adjunctive treatment of candiduria.
Although growth of Candida sp. is inhibited in alkaline environments in vitro, potential interference with the antifungal drug efficacy and lack of consistent results has caused this therapy to be abandoned in treatment of people with the candiduria.”[15]
Paula Faria-Gonçalves et al

“**We found that C. albicans ATCC 10231’ biofilms are less dense in the presence of SB**.”[16]
Aida Abd El-Razek et al

“Vaginal washing by SB helps to reduce vaginal yeast infection, particularly when it is used in combination with medication.”[17]

GOOLGE PATENT WO2018141063A1 WIPO (PCT)
Eric Brown Maya et al 2018.

“The present application relates to the activity of bicarbonate as a modulator of antimicrobial agents, and in particular the use of SB as a modulator of antibiotics. Over the past 20 years, there has been an explosion in the prevalence of antibiotic resistant bacterial infections, both in the hospital and in the general community.

The invention provides methods for inhibiting the growth of a virus, a bacterium, a fungus or a parasite, comprising contacting the virus, the bacterium, the fungus or the parasite with an effective amount of (A) bicarbonate and (B) an antimicrobial agent. n some embodiments, the bicarbonate and/or an antimicrobial agent can be administered to the subject, or used, by oral (including sublingual and buccal) or parenteral (including, IV, intraperitoneal, SC, IM, transepithelial, nasal, intrapulmonary, intrathecal, rectal, topical, patch, pump, intraocular and transdermal) administration and the compound(s) formulated accordingly. In some embodiments, both the bicarbonate and the antimicrobial agent are administered orally.”[18]
Maya A. Farha et al

“The antibacterial properties of SB have been known for years, yet the molecular understanding of its mechanism of action is still lacking. We conclude that bicarbonate has remarkable power as an antibiotic adjuvant and suggest that there is great potential to exploit this activity in the discovery and development of new antibacterial drugs by leveraging testing paradigms that better reflect the physiological concentration of bicarbonate.“[19]
Sönmez, M.G. et al

"Deterioration in the bladder's glycosaminoglycan layer and urothelium exposure to irritants increases LUTS. **In particular, hyperexcitability of afferent C fibers in the bladder plays a role in the higher number of symptoms. Transient receptor potential cation channel subfamily V member 1 (TRPV1) capsaicin receptors and acid-sensing ion channels are expressed from the terminal end of the afferent C fibers.** U**rine alkalinization as a result of SB treatment may relieve symptoms by decreasing stimulation of these areas by hydrogen H+ ions and decreasing acid stimulation of sensing nerves under bladder mucosa."**[20]

And from Maidstone and Tunbrigde Wells hospital Adult antifungal guideline ti is possible to see:
"Candida in UTIs: if symtoms of cystitis oral fluconazole 200 mg daily for 14 days
If phyeloneprithis: oral or IV fluconazole 400 mg daily for 14 days.
Fluconazole is the preferred treatment for candida urinary tract infections as it reaches high concentrations in the urine. Other azoles do not."[21]

According NHS Scotland 2023

Candida species in Urine (Antimicrobial)
"Lower UTI/cystitis due to fluconazole-susceptible Candida spp. Fluconazole 200mg daily, 14 days"
Arif Demirbas et al 2015

"Acidic urinary pH was determined in 61.4% of patients with OAB. **There was a significant association between the presence of acidic urine and overactive bladder**. Also, the OAB-V8 scores of patients were significantly higher in patients with acidic urine than nonacidic urine. OAB-V8 scores of patients showed statistically significant improvement after a diet therapy (17.87 ± 6.52 vs. 10.43 ± 7.17; $p < 0.001$)."[22]
Tomohiro Ueda et al

"After the treatment, a significant increases in the urine pH value (from 5.8 ± 0.4 to 6.3 ± 0.4; increment of 0.5 ± 0.4; $P < 0.01$), and significant decreases in the n. of micturitions per day (from 14.5 ± 6.5 to 13.5 ± 5.9; $P = 0.02$) and the n. of episodes of pain/discomfort per day (from 7.8 ± 6.8 to 6.1 ± 7.1; $P = 0.02$) were observed. In the King's health questionnaire, the sleep/energy domain score was significantly improved (from 60.0 ± 25.0 to 50.3 ± 29.6; $P < 0.01$)."[23]
S. A. Al-Abri et al 2013

"Of the 192 cases we identified, 55·8% were female, ages ranged 2 months to 79 years, and the most common reasons for misuse included antacid (60·4%), 'beat a urine drug test' (11·5%) and treat a UTI (4·7%). Most cases (55·2%) had significant symptoms warranting a medical evaluation, whereas 12 patients required an hospital admission developed either electrolyte imbalances, metabolic alkalosis or a respiratory depression."

Controindications sodium bicarbonate oral 500 mg cp
-hypersensibility to the API or the excipients
- severe renal failure - respiratory alchalosys - ipocalcemia, for an increased risk of tetania
-hypocloremia induced by diuretics - excessive chlorine lost, due by vomit od by suking gastrointestinal continue, for the major risk of methabolic alchalosis.
-Children less then 12 year of age - generally controindicated in pregnancy.

Precautions of use SB 500 m cp
- hystory of cardiac congestive failure - renal impairment
- hypertension- liver cirrhoris
- concomitant steroids use

The cp contain sodium, this must to be taken in consideration when it is recomended a particulary poor of sodium diet, in example if heart congestive failure, renal impairment, hypertension.

Sodium bicarbonate must to be used with caution in anuria or oliguria, bacuse risk of increased sodium rentention.

To be pay attention to edematous condition with sodium retention, like liver cirrhosis, heart congestive failure, renal insufficiency, toxiemia or pregnancy.

In the patients with very low level of gastric acid it is possible that the efficacy of sodium bicabonate o the stomach acidity is inferior, and in this subjects there is the possibility of an increase of its absorbtion in plasma with possibility of systemic side effects.

In the patients with potassium depletions the subministration of sodium bicarbonate must to be with caution and must to be monitorized repeatedly the cardiac and electrolite parameter.

In the patienst affected by gastric inflamation or of the small intestine or by renal failure, sodium bicarbonate increase the risk of an excess in blood sodium level.

SB can produce stomach pH modifications and of the urine, alter the absorbtion process and elimination of many drugs.

It is advisable let it pass at least 2 hour between the taking of the SB with other drugs.

Side effects SB: for oral use
Immune systems disorders
Allergy manifestation like urticary and bronchospasm, anaphylactic reaction or anaphylactoid.

GI pathology, stomach cramps, flatulence vomit and gastric lesion. Vascular pathology.

Hydric retention (edema), expecially in elderly patients and in presence of heart failure o renal.

SB when taken orally at reccomended doses is is absorbed only in little amount with minimal systemic effects.

Side effects due to systemic effects
metabolism and nutrition disorders metabolic alchalosis, expecially in patietns with renal failure; the symptoms include labored breathing (due by the compensatory iperventilation, that can last also 48 hours), muscolar weakeness associated to potassium depletion, muscolar hyipertone, muscolar spasms and tetaniathat can manifest expecially in ipocalcemic patients.

hypernatriemia, hyperosmolarity with increase of the liquid volume and pulmonar edema, heart pahtology, reduced heart output, vascular pathology, hypotension, Cerebral edema.

Intracranial hemorragy, Respiratory patology, thoracic and mediastinal hypercapnia.

Experimental part
it is submitted a case report of a chronic prostatitis (age 60 years) with many relapses after antibiotic therapy.

Many years of antibiotic therapy: efficacy ciprofloxacin and claritromicyn.

Trimetroprim sulfametoxazole used also as profilactis measure.

Positive culture for Candida albicans in seminal liquid, increased volume of seminal vescicle at retrograde prostate echography with microcalcification.

PSA negative, iperactive bladder, prostatic uretra resctriction diagnostiched, diabetes tipe II controlled in the last years, little hemorroids bleeding phimosis, In therapy with tamsulosin, serenoa repens, Fenolmicina P3 (polifenols of propoli) e Boisexil (Boswellia serrata Fitosoma) and beclometason suppository.

Agravating factors: sedentariety, too much sitting position on rigid chair, alchool intake for more then 3 days (acute prostatitis), spicies in food.

Saccharomyces Cerevisiae extract suppository: efficacy in reduce pain and congestion (probably due to the antagonist effect vs Candida methabolism)

Used also urtica dioica oral cp: efficacy to reduce inflamation from alchool intake and spicies.

Table 1: Patient self evaluation report for acute prostatitis episode, therapy used and remedies (not to be generalized)

	Antibiotics – ciproxin or calritromicin or (trimetoprim sulfametazole As profilaxis)	**itraconazole**	**Oral sodium bicarbonate 1 cp 500 mg every 10 days**	**Antinflamatory** Oral	**Suppository** 1) Beclometason or 2) Fenolmicin boisexil or 3) Saccaromices cerevisiase	**Natural products** Serenoa repens Or Urtica dioica cp
disuria	reduced After 1-2 cp	reduced	reduced	No effect	Effect reduced pain and congestion Effect after 2-3 supp	Improved Urine flux Reduced pain for prostate capsule contraction
Pelvic pain	reduced	reduced	reduced	Little effect	Effect	Little reduced
itching	reduced	reduced	reduced	No effect	Effect	Little reduced
urgency	reduced	reduced	reduced	No effetc	Effect	reduced
Inflamation	reduced	reduced	reduced	Little effect	Reduced	Reduced (Urtica dioica)
Irritability	reduced	reduced	reduced	Little effect	reduced	reduced
Prostate congestion	reduced	reduced	reduced	Little/no	reduced	Little reduced
Prostate capsule contraction sensation	reduced after 2-3 cp	reduced after 2-3 cp	reduced after 1 doses	No / low	Little reduced Max effect after 2-3 supp	reduced Serenoa repens
Urinary flux	Very good after therapy 2-3 cp	Very good after therapy 1-3 cp	Very good after 1 subm	Not improved	Improved	Improved
Urination n. by night	Similar to normal	Similar to normal	Similar to normal	3-4 by night	2 -3 by night	1-2 by night

Sleep disturbance	Reduced	reduced	reduced completly	Not reduced in sufficient way	Little improved	Little improved
relapses	**Yes about every 2 month if short therapy 3 -5 days or Every 6 month if prolonged antibiotic therapy of 15 days**	About Every 6 month	No ? After and during the use no needed antibiotics or antimicotics preventive – therapy **Ongoing evaluation**	Yes not reduce duration of the episode acute efficacy only if combined with antibiotics or antimicotics	Yes More efficacy if prolonged therapy (various days under medical prescriction)	Not efficacy to stop an acute prostatitis event

In every way after the use of 1 CP of sodium bicarbonate cp 500 mg (every 10 days) in **this specific case report it was avoided** the need of antibiotic use as in past required, the itching sensation and irritablity was no more present and the sleep was regular. (no adverse event reported in this specific case)

Alone the antinflamatory oral therapy or suppository not controlled adeguatley the acute episode.

With the need of antibiotics.
The antibiotics was efficacy for 6 month if prolonged therapy: 2 weeks.
If short antibiotic therapy 3 days: Relapses every about 2 month.

Maximum effect if used first ciproxin then clarytromicin or inverse and after itraconazole.
Flux improved using serenoa R.
Bladder overactive controlled with tamsulosin

Kegel excercise: some efficacy in reduce pain from prostate capsule contraction.

Increased urination: if diabetes tipe II not controlled.
After a doses of sodium bicarbonate (less then half teaspon in a glass of water) great reduction of itching, bladder irritation or disconfort (only 1 day), with a Good sleep.

Table n. 2: aggravating and ameliorating factors – Patient self report.

Agravating factors			**Ameliorating factors**
Alchool assumption	Great pain after 4-5 days of use during an acute episode	Reduced urine flux Prodromic of cistitis episode	Drink water -1 liter day
Chili	Great inflamation after use		
Sedentariety	Aggravating edema - congestion		
Diabete not controlled			
constipation			
Non controlled diabtes			Phisical excercises
			Antidecupibs donuts
			Kegel exercise

DISCUSSION
Various and relevant are the symptom associated with the urogenictal candida A. infection: inflamations, itching, pelvic pain, pain during urination, disuria, irritability and also depression, brain fog and other.

The prevention vs Candida A can include modification of life style like the reduction of diet carboidrate intake o since other natural products (probiotics use, topic tea tree oil as antiseptic, reduction of alchool, coconut oil and other).

Of interest to observe that the saccaromyces cerevisiae probiotics show and anti candida effect.
(antagonistic, inhibit the growth)

For current therapy are used antimicotics like Fluconazole also oral.

There is little and no solid medical evidence showing that drinking baking soda treats UTIs or cures the underlying infection. (an **anedoctal home remedy).**

In Candiduria Possible **theoretical of this use** benefits can include:
Reduction in fungal growth under alkaline conditions, Impaired biofilm development on uroepithelial surfaces or catheters, Altered fungal metabolism, Enhancement of certain antifungal drug activity (pH-dependent pharmacodynamics)

Of interest to observe the **wide use** of sodium bicarbonate in medicine, dermatology dentistry, in cosmetics or in daily home life in disinfections of fruit or vegetables (for fungi and bacteria).

Its specific properties and its alkalinizant effects also as oral product for fungal infections is of great interest.

Empirical and historical clinical observations:
Several observational reports and non-controlled clinical studies have described vaginal washes/douches with sodium bicarbonate solutions in chronic or recurrent vulvovaginal candidosis, often cited in local gynecologic practice texts, though rigorous RCT data are lacking.

Supporting mechanistic context (biofilms and pH effects):
Although not focused on urogenital candidosis, in **vitro biofilm research** shows that alkalinizing conditions (including bicarbonate) can disrupt fungal and bacterial biofilms and inhibit growth – relevant mechanistic background for sodium bicarbonate's potential antifungal effects.

Effect on Candida Culture and Mechanism Fungistatic Action:
NaHCO3_ directly inhibits the growth of Candida species (including C. albicans) by **interfering with metabolic processes**, even in unbuffered media. pH-Independent: **The antifungal effect is not solely due to increased alkalinity;** studies show that NaOH-adjusted, high-pH media does not replicate the inhibitory effects of NaHCO3. **Biofilm Reduction:** Sodium bicarbonate severely reduces pre-formed biofilm biomass and limits the formation of new biofilms. **Adherence Inhibition**: It interferes with the ability of Candida albicans to adhere to surfaces, such as acrylic resins. **Synergy with Antifungals: NaHCO enhances the effectiveness of antifungals like fluconazole and amphotericin B**.

In literature there are not specific controlled clinical trial that have evaluated the efficacy of the SB in preventing ore treating urogenital infection, but there are various article involved in the mechanicistic effects of SB vs CANDIDA A.

Since acidic urine can sometimes make that burning sensation feel worse, some people believe that changing urine acidity will reduce symptoms or even stop the infection.

A UTI isn't just irritation caused by acidic urine. It's an infection caused by bacteria or fungi.

To be considered that also even if Changing urine pH doesn't remove those germs, even if symptoms briefly feel different.

There are no **high-quality randomized controlled clinical trials** specifically evaluating sodium bicarbonate or alkalinization for candiduria or vulvovaginal Candida infections; most evidence is in-vitro, empirical, or mechanistic. There are in vitro (6) or topical studies (dermatologic use, dentistry) about sodium bicarbonate effects vs fungi or bacteria.

"Alkalinization of the urine is a simple and effective method of treating candiduria in patients with an indwelling catheter."[3]

Also there are evidence related the efficacy of oral sodium bicarbonate for urine alkalinization in LUTS in female patients:
"After treatment, a significant decrease was detected in daily frequency, nocturia, urgency, and urge incontinence prevalence ($p < 0.001$, $p = 0.003$, $p < 0.001$, $p = 0.002$, respectively) and PPBC, PPIUS, PUFSS, and OAB-V8 symptom scores ($p = 0.004$, $p = 0.002$, $p < 0.001$, $p < 0.001$, respectively). A significant decrease was detectedin all KHQ subunit scores. ""[4]"" in genito - urinary candidiasis the Urinary alkalinization with sodium bicarbonate to a pH of 7.5 is helpful".[5]

"Sodium bicarbonate has a fungistatic effect independent of pH".[6]

"Urine alkalinization with NaHCO3 orally in female patients with LUTS and acidic urine pH has a significant level of positive effects on symptoms and symptom scores".[8]

Of interest the efficacy of sodium bicarbonate in alleviate LUTS or pain or sleep disorder in OVB and Hypersensitive bladder syndrome.[22,23]

Topical alkalinization (vaginal gels) and systemic urine pH modulation are promising adjunctive strategies, but they should be interpreted cautiously and not substitute standard antifungal therapy without robust clinical evidence.

There are studies related the efficacy of oral bicarbonate sodium in urine alkalinization.

Even if the therapy of the genito urinary CANDIDA A infections are a phisicians competence it is of interest to summarize some facts from scientific literature:
Candida A like other fungi are sensible to bicarbonate sodium (skin infections, oral infections)

Bicarbonate sodium is commonly used also to wash vegetables at home before the use because antibacteric and anti fungal properties.

Litearture report efficacy of the combination of fluconazole and bicarbonate sodium in various candida infections.

The mechanism of action seem to be related the urinary alkalinization and due by the sodium and to the HCO3- ions.

The fungistatic effect is related to damage to the cell wall and destabilization of the membrane.

Of interest to observe the wider use od sodium bicarbonate for other scope like in oral candida (mounth wash), foot wash for fungal infection and since to the cosmetic use like in natural deodorant (as antimicrobic and Ph regulator) or the home use for disinfect the fruit and vegetables befor the use.

The safety profile of the oral use is different vs the parenteral, to be mandatory considered the contraindication and the side effects.

Related the safety or not of oral sodium bicarbonate it can be seen the posology when used as anticacid: OTC product from 500 mg to 5 Gr day in adults (1-2 cp after the meal) and before go to bed.

For urine alkalinization is reported if Oral: 325 to 2000 mg orally 1 to 4 times a day.

In pharmacy oral cp it is calssified as OTC, with a low cost.

CONCLUSION

Medical guidelines don't include baking soda or other urine-alkalizing remedies as treatments for UTIs.

Antibiotics and antimicotics are the standard of care because they target the organisms causing the Infection (in example bacteria and fungi).

It is clear that the urogenital infection need a physician treatement with efficacy drugs but all this reported in this work can be taken in consideration.

The specific case report submitted is of interest expecially for the rapid (with the first doses of SB oral) reduction of itching, pain, reduction in urination prequency and better urinary flux.

Also of interest that the use of SB avoided the use of the antibiotics as instead needed in past situations.
(ongoing evaluation).

Even if not generalizable, and observing the risk of this remedy The authors **suggest to test** the efficacy or not of the use of oral SB in order to provide urine alkalinization or direct actions vs urogenital candida A in preventcion or to treat in specific **controlled** clinical trial to verify the results of the reported literature.

The alkaliniziation of urine can be achieved also orally, but it must to be take in considerationthe safety profile.

Mechanistic literature supports that alkaline environments can affect Candida growth and virulence factors, which may be the biological rationale for these approaches.

No established guideline recommending oral sodium bicarbonate for candiduria and no controlled evidence supporting its use for vulvovaginal candidosis.

Limited mechanistic data directly correlating urinary pH elevation with Candida eradication.

Of interest the effect of the SB in reducing bladder irritation by the H+ acid nerve stimulation.

Amon the risk it must to To be considered that the use of "natural remedy" can delay to take the rigth drugs therapy and that Drinking baking soda isn't harmless, especially when used repeatedly or in larger amounts.

Conflict of interest: no.

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