

Full Length Research paper

Treatment of oral candidiasis (thrush) by *Saccharomyces cerevisiae*

Mariappan Premanathan^{1,2,6*}, Fathi Abdullah Amaar Shakurfow¹, Ahmad Ali Ismail³, Mohamad Ayad Berfad⁴, Adel Tawfik Ebrahim⁵ and Moussa Milad Awaj⁶

¹Faculty of Medical Technology, Misurata University, Misalata, Libya.

²Faculty of Science, Misurata University, Misalata, Libya.

³Department of Dentistry, Al Tawfiq Polyclinic, AlKhoms, Libya.

⁴Faculty of Science, Misurata University, AlKhoms, Libya.

⁵Department of Gynecology and Obstetrics, Suk Al Khamees General Hospital, Suk Al Khamees, Libya.

⁶Almadina Medical Laboratory, AlKhoms, Libya.

Accepted 17 March, 2011

Oral candidiasis is a fungal disease caused by *Candida albicans*. *Saccharomyces cerevisiae* is a probiotic often used as dietary supplements and in food preparation. In this study, we explored the treatment modality of *S. cerevisiae* on oral candidiasis in 15 patients belonging to verum group (n = 10) and placebo group (n = 5). All 10 patients in verum group have recovered from the oral candidiasis in 2 to 3 days whereas in the placebo group, it was a minimum of 12 days. Two patients from the verum group did not respond to antifungal treatment with miconazole but recovered within 3 days of *S. cerevisiae* treatment.

Key words: Oral candidiasis, *Candida albicans*, thrush, probiotics, *Saccharomyces cerevisiae*, thrush treatment.

INTRODUCTION

Candidiasis of the mouth and throat, also known as a "thrush" or oropharyngeal candidiasis (OPC), or oral moniliasis, is a fungal infection that occurs when there is overgrowth of *Candida albicans*. It is normally found on skin or mucous membranes. However, if the environment inside the mouth or throat becomes imbalanced, *Candida* can multiply (Bologna et al., 2003). When this happens, symptoms of thrush can appear. Thrush may appear as white or pale yellow spots on the inner surfaces of the mouth and throat, the tongue, and the lips. It may resemble cottage cheese or milk curds. Thrush may be accompanied by a burning sensation in the mouth or throat. Further, diabetes or other glandular (endocrine) disorders, genetic disorders such as, Down syndrome, a course of oral antibiotics, chemotherapy, leukemia or lymphoma, malnutrition, immunodeficiency such as HIV/AIDS, use of inhaled steroids for certain lung

conditions may also cause thrush (Rippon, 1988; Freedberg et al., 2003). Thrush may make eating and drinking uncomfortable, and children with thrush may lose water in their body tissues and become dehydrated (Freedberg et al., 2003).

C. albicans is a fungal pathogen that, when growing in the yeast form, is morphologically similar to *Saccharomyces cerevisiae* (Enjalbert et al., 2003). *C. albicans* has a commensal relationship with warm-blooded organisms and thus would be expected to live in a relatively stable environment in terms of temperature and osmotic conditions (Enjalbert et al., 2003).

Brewer's yeast, also known as *S. cerevisiae*, is commonly used in baking and fermentation of alcoholic drinks; hence, the common name. Brewer's yeast is rich in nutrients like chromium, vitamin B, protein, selenium, potassium, iron, zinc and magnesium. Brewer's yeast, along with its closely related species *Saccharomyces boulardii*, is considered a probiotic. Probiotics are foods or dietary supplements that contain organisms, like bacteria or yeast, which provide health benefits for humans. Bacteria and yeasts naturally live in our bodies,

*Corresponding author. E-mail: ma.premanathan@gmail.com.
Tel: +218-53-2622098. Fax: 218-53-2628041.



Figure 1. Preparation of *Saccharomyces cerevisiae* paste.



Figure 2. Treatment with *Saccharomyces cerevisiae* paste.

mainly in the digestive tract. Probiotics contain “good” bacteria or yeasts that keep our digestive tract functioning properly, as well as keeping the population of harmful or “bad” organisms low (Moyad, 2007; Jones, 2010).

Augmentin is a broad spectrum antibiotics used in various bacterial diseases. The use of augmentin can lead to the development of thrush in children. In the present investigation, we have explored the treatment modality of *S. cerevisiae* on oral candidiasis in children.

METHODOLOGY

From July to December 2010, 872 children were attended to at, Suk Al Khamees General hospital, Suk Al Khamees, and, Department of Dentistry, Al Taufiq polyclinic, Al Khoms, Libya, with various diseases like tonsillitis, bronchitis, oral and gum infection, etc. They were prescribed augmentin 156 or augmentin 312 syrup, according

To their weight, for various ailments for, 5 to 7 days. Among 872 patients treated with augmentin, 164 (19%) patients developed candidiasis after 3 to 5 days of augmentin treatment. Of these 164 patients, 7 were excluded from the study due to their genetic disorders and congenital abnormalities including congenital immunodeficiency. Others developed candidiasis only by the treatment of augmentin. Before carrying out the study, the patients were explained about the treatment and their parents were counseled about the throat scrapings and the treatment details. Among these 157 patients, only 15 (9.6%) consented to participate in the study. All the patients were started the treatment for oral thrush immediately after the diagnosis.

Throat scrapings were collected by using a sterile plastic scrapper, transferred to sterile eppendorf tube containing peptone water. The *Candida* species were identified by wet and KOH mount, culture of MGYB agar, Gram staining for Gram positive hyphae and buds, biochemical tests, and germ tube method (Williams et al., 2003).

Treatment

One gram of *S. cerevisiae* was activated by soaking in lukewarm sterile water for 5 min (Figure 1). For the patient in verum group, the paste was applied to cover the infected area (Figure 2) for 3 min, thrice a day until the recovery. For the patients in placebo group, the lukewarm water was gargled for 3 min, thrice a day until recovered totally. The patients were not allowed to take anything for 15 min after the treatment. The patients were closely monitored for one month after the treatment to rule out any complication developed with the treatment.

RESULTS

Fifteen patients were included in the study. They were 9 female and 6 male children. By culture, wet and KOH mount and biochemical analysis, it was confirmed that all 15 patients developed thrush by *C. albicans* since all samples showed positive in germ tube test.

According to their age, gender and the previous disease history, the 15 patients were divided into verum and control groups. Verum group, comprised of 4 male and 6 female, were treated with *S. cerevisiae* paste and placebo group comprised of, 2 male and 3 female patients were treated with only lukewarm water.

Figure 3 shows a patient with thrush before treatment. Figures 4 and 5 shows during, and after treatment, with *S. cerevisiae* paste, respectively. All 10 patients in verum group totally recovered from the thrush within 2 to 3 days whereas in placebo group, the thrush was persistent for about 12 to 15 days for all 5 patients. Among 10 patients in the verum group, the first 2 cases were treated with antifungal drug miconazole for 3 days and no improvement was seen. Then, they were treated with *S. cerevisiae* paste. Since in the first 2 cases we found the *S. cerevisiae* treatment was effective in drug resistant candidiasis, we started the *S. cerevisiae* treatment directly from the third patient. Figure 6 shows a patient with thrush even after 3 days of miconazole treatment and was totally recovered from the drug resistant candidiasis in 3 days of *S. cerevisiae* treatment (Figure 7).



Figure 3. Patient with candidiasis before (1st day of) treatment.



Figure 4. During treatment (2nd day).



Figure 5. After treatment (3rd day).

DISCUSSION

In the present study, all the children developed the thrush



Figure 6. Patient having thrush after 3 days of antifungal drug (miconazole) treatment.



Figure 7. Recovered from the drug resistant thrush after 3 days of treatment with *S. cerevisiae*.

only because of the use of the antibiotic augmentin. It is common to develop thrush in the patients undergoing treatment with broad spectrum antibiotics because of the elimination of commensal bacterial population from the body. Candidiasis may occur either because of imbalance of commensal bacterial population or immunosuppression.

Candidiasis growth was effectively limited by *S. cerevisiae* compared to control group. This finding supports the fact that *S. cerevisiae* competes with *C. albicans* which responds poorly to stress compared to *S. cerevisiae* (Enjalbert et al., 2003).

During treatment, 6 of 10 patients from verum group exhibited mild bloatedness and gas in the stomach for a day. No other adverse events were reported. After treatment, the patients were under follow-up for one month to rule out any complication developed related with the treatment. They were found to be normal without any complications.

S. cerevisiae is currently authorized by European Food Safety Authority for use in pigs, horses, rabbits,

ruminants for fattening and ruminants for milk production (dairy cows, buffalos, sheep and goats) (Bories et al., 2008). Supplement of *S. cerevisiae* in poultry feed is reportedly improving the feed conversion in broilers and immune response of broilers at challenge with strain velogenic of Newcastle disease virus (Santin et al., 2003). Oral administration of the microcapsules containing *S. cerevisiae* to uremic rats has been observed to decrease urea levels by 18% over a period of eight weeks without altering the gut microflora (Coussa et al., 2010). *S. cerevisiae* is well known in the baking and brewing industry and is also used as a probiotic in humans. It is used in Europe for the treatment and prevention of *Clostridium difficile* - associated diarrhea (Bleichner et al., 1997).

However, it is a very uncommon cause of infection and fungemia. The only identified risk factor for *S. cerevisiae* infection is treatment with a probiotic containing *S. boulardii* (Muñoz et al., 2005). Three patients aged between 72 and 76 years in the ICU of a hospital in Spain received the product via nasogastric tube for a mean duration of 8.5 days before they developed fungemia (Muñoz et al., 2005).

In this study, 2 patients who were non-responsive to antifungal drug, miconazole were totally recovered from the thrush within 3 days of treatment with *S. cerevisiae*. Several studies showed that *Candida* species display varying resistance to commonly used antifungal agents (Aperis et al., 2006; Pfaller and Diekema, 2007).

Oral candidiasis is prevalent in 75% of the HIV/AIDS patients (Pindborg, 1989). Oral lesions are more common in smokers (Swango et al., 1991). Identification of oral candidal infection in HIV patients is an early sign of subsequent development of multiple opportunistic infections in nearly 50% of cases (Williams et al., 2003). In Africa, more children are suffering with AIDS and oral candidiasis (Kline, 1996, 1998; Kamiru and Naidoo, 2002; NIAID, 2004). If *S. cerevisiae* treatment helps in the immunosuppressive patients especially against the drug resistant candidal infection, it can improve their health conditions.

In this present study, all patients under verum group are immunologically healthy patients. Care should be taken to apply this treatment to the immunosuppressive HIV patients. Based on this preliminary clinical study, a pilot study of this treatment has been suggested on AIDS patients.

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