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Inhibitory Effects of *Saccharomyces cerevisiae* Against *Propionibacterium acnes*

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Abstract:

Acne is an inflammatory disease of the sebaceous glands that results in the formation of papules, pustules, and more advanced complicated scars by opportunistic microorganisms known as *Propionibacterium acnes, which feed* mainly on fat. This resulted in the development of this acne condition. Reduced use of antibiotics and discovery of medicinal plant treatments because most bacteria become resistant over time. *Propionibacterium acnes* is a Gram-positive bacterium that plays a major role in the development of some diseases. This study investigated the effect of bread yeast extract against *Propionibacterium acnes*, which causes acne. The study involved 65 samples collected from 45 patients with acne, 40 of which were comedones and 25 of which were pustules. These samples were collected from adolescent patients at Kirkuk Hospitals (Azadi Teaching Hospital and Kirkuk General Hospital/dermatology outpatient clinics). The patients' ages ranged between (15-30 years old). All 65 purified samples showed *P. acne*. In this study, we investigated the effects of *S. cerevisiae* yeast on the growth of *P. acne* bacteria. A marked effect was observed through the inhibition of the growth of this bacteria, as the diameter of inhibition resulting from the effect of the extract of *Saccharomyces cerevisiae* ranged from 9.5 mm to 11.5 mm. Based on these results, Can be used the *Saccharomyces cerevisiae* for acne-related skin treatment.

Keywords: *Saccharomyces cerevisiae*, *Propionibacterium acnes*, damaged cells

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Introduction:

In recent years, there has been a widespread trend in the use of microorganisms and their metabolic products in treating some pathological conditions through their use in the production of several antibiotics, vitamins, and enzymes as well as inhibitors of the growth of other microorganisms, and the term "Probiotic" was first invented by [1] in 1965. The most important used organisms are "Lactobacillus bacteria" and the yeast "*S.* cerevisiae", both have many properties as they work to balance natural growth by increasing beneficial anaerobic bacteria and reducing disease-causing microorganisms [2], stimulating mucous immune

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mechanisms through a competitive behavior with pathological microorganisms and their severity, reducing the risk of colon- causing cancer. Moreover, the production of probiotics, enzymes, vitamins, and antitoxins increases digestion improvement [3,4]. The bread yeast has occupied a wide area in the industrial and food field until further interest in other fields appeared not long ago, especially after discovering its ability to produce probiotics lethal for sensitive cells that accompany them in the growth medium it does not affect the protein substances secreted by them because there are no receptors on their surface that enable these substances to bind to them[5]. These properties helped in industrial fermentation to reduce the risk of undesirable crude contamination [6].

Materials and Methods:

sample collection:

In this report, 65 samples from 45 patients with acne were collected for both sexes ranging in age from 15 to 30 years. The samples were collected from Kirkuk Hospitals: Azadi Teaching Hospital and Kirkuk General Hospital (dermatology outpatient clinics), while laboratory steps were performed at Kirkuk Technical University (main lab. Samples including comedone and pustule were taken after wiping the skin 3-5 times with ethyl alcohol at a concentration of 70%. Comedone samples were collected by comedo extractor, whereas pustule samples were collected by sterile lancet (StenleLancet).

Diagnosis of bacteria separately in a tube containing thioglycolate broth and transported to the laboratory [7]. The samples were then removed using mixer tubes to homogenize the bacteria in the medium and incubated anaerobically for 5-7 days at 37 ° C,

After incubation, the anaerobic samples were incubated in a jar containing anaerobic gas, Pak, and demonstrated the cultural characteristic of colonies growing on the medium in an anaerobic medium according to the shape and color, then preparing bacterial gram-stained smears, which were examined under a microscope to see cell shapes and their positivity for gram stain[6], and also the biochemical reactions that were important in the diagnosis were made, such as oxidase, catalase, indole, urease, gelatine printing, and blood hemolysis test[8,9].

Bacterial Suspension:

Prepared by culturing pure colonies in test tubes containing thioglycolate broth and mixing well to ensure the spread of bacteria in the nutritive medium. They were then incubated anaerobically at 37°C for 3 days. The culture after incubation was compared to McFarland standards using several concentrations until reaching $1.5*10^8$ cells and incubated at 37C for 3 days [10,11].

"*S. cerevisiae*" samples:

Samples of dry yeast were used from different sources in local markets and these ,included two types of yeast, the Turkish type and the French type [12].

Activation and cultivating of "*S. cerevisiae*" suspension:

Dry yeast was activated by ingesting 50g of yeast powder and inoculating it into tubes containing 10 ml of the liquid medium yeast extract glucose peptone broth (YEGP), the tubes were then incubated at a temperature of 30°C for 48 h under air condition [13]. After the incubation period, the yeast was cultured using the scheme method on the surface of the sabouraud agar medium under the same conditions; after growing, by sterile loop take inoculum and streak on the sabouraud medium, [14]. The process is repeated more than one time until several pure colonies appear [15].

Diagnosis of *S. cerevisiae*:

S. cerevisiae suspension is diagnosed based on microscopic and morphological characteristics. [16].

Preparation of yeast cells supernatant:

The yeast cultures were inoculated into EGP medium and then incubated at 30°C for 24 h. Then, 100 ml from the same medium were placed in (a 250-milliliter flask) and inoculated with 3 ml of yeast pieces/ml from the same medium, we adjusted the pH to 5. 5 Incubated at a temperature of 30°C for 24 h in a vibrating incubator (125 rpm) [17], then the culture was placed in a collar centrifuge at rpm speed for 10 minutes, the supernatant is sterilized by Millipore with a diameter of 0. 22 um to ensure that the supernatant was empty from the cell. The supernatant was cultured on sabouraud agar and the absence of yeast growth after incubation, and a certain volume of the supernatant was kept, and the remaining volume was reduced to half for one time, and a certain volume was kept from it, and another time was reduced to quarter by using random osmosis at 8-12 KD by sucrose to kept water proportion and concentration of the components in it.[18].

Results and discussion:

We diagnosed the bacteria separately and *P. acne* was diagnosed depending of according to the colonies that appeared greyish white as shown in Figure 2, and that the colonies grew in size over time, as shown in Figures (1) and (2):

Figure 1: Bacterial Culture Media

Figure 2: Colonies of *P. acne*

Figuer3: *P. acne* under a microscope

The bacteria are gram-positive and take on different shapes, including Cocci or Bacilli, and are often arranged in a Y- or V-shape, as shown in Figure 3: Biochemical tests of *p. acnes* bacteria are Catalase positive; gelatine liquefies [19]. 50 samples of *p. acnes* bacteria were identified from 65 samples, 35 samples of which were collected from patients with comedones, and 15 samples were isolated from patients with pustules. The dominance of bacterial type in the comedones samples is virulent due to the increase in oxygen pressure in comedones, which creates favorable conditions for bacterial growth and its reproduction supernatant of *s. cerevisiae* culture effect in inhibiting the growth of *p. acnes* bacteria [20].

The results showed the capacity of *S. cerevisiae* culture supernatants against the growth of *p. acne* bacteria that were used in the study. We also observed the variety of effects of this supernatant on bacterial growth as recorded in the supernatant of yeast culture in Y and G isolates at 15 and 11 ml, as shown in Figure 4.

Inhibition of acne-causing bacterial growth was observed. The diameter of inhibition was approximately 9.5 mm for sample G and 11.5 mm for sample Y.

The variation in the inhibitory effect on bacterial growth may be due to the yeast genera and their ability to produce toxins and also due to the process of purification of the yeast to obtain *S. cerevisiae* in pure form and free from bacterial products, it may reach 41% and lead to impairment of its ability to produce toxins.[21]

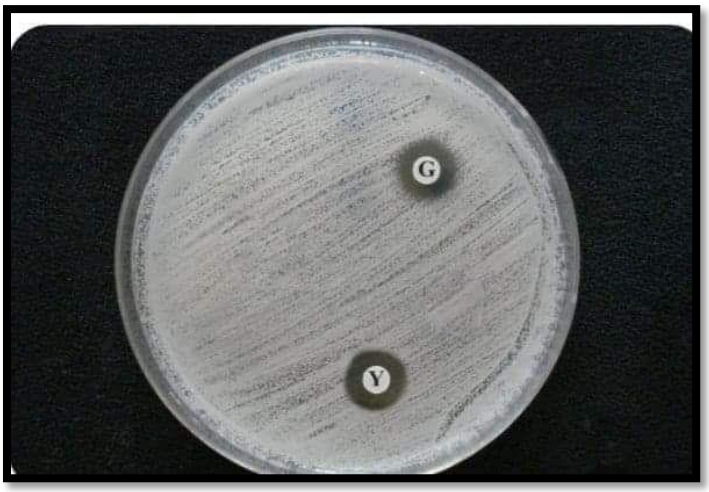

Figure 4: Inhibitory effect of *S. cerevisiae* on *P. acne* growth

Conclusion:

S. cerevisiae inhibits the growth of *P. Acne* revealed by the study. Due to the increasing resistance of *P. acne* to various antibiotics in addition to the vigorous use of antibiotics against the disease, it will be a good opportunity to conduct further studies to include the biological treatment of such diseases of bacterial origin using S. cerevisiae or other biological agents.

Ethical statement

This study was conducted following standards accepted in medical manuscripts, including obtaining informed consent from all participants before the trial began. Where the study was conducted on a group of students at the Mosul Medical Technical Institute, Northern Technical University after obtaining the approval of the university, the institute, and the students participating in the study, we are committed to protecting the privacy of the participants and not disclosing any personal information.

Conflict of interest

The authors declare no conflicts of interest.

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