Original Article

Fungicidal effects of homoeopathic medicines versus allopathic ketoconazole in *Candida albicans*

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Abstract

Background: *Candida albicans*, accounts for more than 75% of all *Candidal* infections. Apart from its growing prevalence, it is also one of the most resistant strains against antifungal medication. Homoeopathy is an alternative to allopathic medication and has shown inhibiting fungal growth. **Objective:** This study was to determine effectiveness of homoeopathic tinctures and medications versus allopathic Ketoconazole in growth inhibition and fungicidal properties against *in vitro* cultures of *C. albicans.* **Materials and Methods:** Efficacy of five antifungal agents were tested for inhibiting fungal growth and their fungicidal properties on cultured *C. albicans* the agents tested were *Eucalyptus globulus* and *Ocimum basilicum* in essential oil form, *Benzoicum Acidum* 30C and *Kali Iodatum* 30C in tablet form, and compared with the effect of 100 mg Ketoconazole in powder form. **Results:** In the growth inhibition trial, *O. basilicum* had the largest zone of inhibition followed by *E. globulus* following. The ketoconazole group showed similar inhibition rates with *Benzoicum Acidum* 30C, and *Kali Iodatum* 30C showed more inhibition than Ketoconazole. The present data suggests that no individual agent had an effective fungicidal effect on *C. albicans*, only causing a minimal reduction on the surface in the fungal colony. **Conclusion:** Results indicate that essential oils *O. basilicum* and *E. globulus* were most effective in growth inhibition. However, both essential oil and homoeopathic treatment had limited fungicidal properties. This concludes that homoeopathic alternatives can be effective in preventing fungal infections but may be less effective in treatment of a fully developed *C. albicans* infection.

Keywords: Antifungal, *Candida albicans*, Essential oils, Fungicidal properties, *In vitro* inhibition

Introduction

Over one billion people have been impacted by fungal infections with various clinical manifestations, affecting hair, nails, and skin among other types.[1] These infections can pose a threat by causing damage to organs.[1] It has been reported that fungal disease mortality is similar to that of tuberculosis and is 3 times the malaria mortality.[1] The rise of fungal infections in immunocompromised patients is a significant factor for the mortality of these cases, along with the acquired resistance of fungi to allopathic treatment.[2]

The severity of the infection varies by the fungi identified; some are mucocutaneous which target the mucosal membrane of the epidermis, and the other systemic fungi are life-threatening to immunosuppressed patients.[1] Severe infections include invasive candidiasis, histoplasmosis, and aspergillosis which affect those with weakened immune systems by attacking blood flow and lung function.[3] Immunocompromised patients are most susceptible, and at risk for fungal infection, these include patients suffering from AIDS, chemotherapy treatments, cystic fibrosis, and diabetes.[4]

The number of estimated *Candidal* infections resulting in invasive candidiasis seems to be growing each year. Candidiasis is one of the most prominent forms of fungal disease, and also harbors a strain of the most anti-fungal resistant fungi: *Candida albicans*.[5] There have been some studies conducted on *Candidal* infections obtained from human patients suffering from oral and vaginal candidiasis and the effects of homoeopathic treatment.[5,6] Studies show that recurrent vulvovaginal candidiasis affects 75% of women

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at least once and is recurrent in 5-8% of women in prime reproductive years.[6] The most common strain responsible for vulvovaginal candidiasis is *C. albicans*.[6]

A previous randomized trial of an oral regimen of fluconazole, a well-known conventional antifungal medication, showed a 50% relapse rate in patients after cessation of treatment.[6] Azole antifungals like the aforementioned Fluconazole are the primary treatment for several *Candidal* infections; however, there are several studies and documentation of intrinsic and acquired resistance to azole antifungals among the *Candida* genus.[7] Current antifungal drug limitations paired with the increased occurrence of systemic fungal infections and rapidly developed fungal resistance have raised awareness of the need of new drugs with novel mechanisms.[4] It has been demonstrated that although nosocomial Candidiasis can behave such as minor epidemics with selection of virulent strains, and it is usually the commensal organisms of the body that are the initial infection source.[5] Usually, *Candida* can live as a commensal organism in the body, being restricted from overgrowth by the hosts microflora, but when this microflora is disturbed such as the cases in antimicrobial or antifungal therapy there can be an increase in growth in the body.[5] This same study found that a select amount of homoeopathic drugs exhibited inhibitory properties on *C. albicans* comparable to ketoconazole.[5] This shows that although allopathic treatment still holds the maximum inhibition rate, homoeopathic drugs such as *Acidum Benzoicum* and *Kali Iodatum* 30C are comparable and effective in eradicating the fungal infection as well as inhibiting growth without risking development of resistance in the fungal strain.

Leading factors in raised incidences of fungal infections include excessive use of antimicrobial agents, immune system defects, and diseases that affect the human immune system.[8] Due to the recent rise in acquired drug resistance in fungal infections, researchers have been looking into alternatives for traditional allopathic -azole antifungal treatments such as peptide-based,[2] and plant-derived essential oil-based such as *Eucalyptus globulus* and *Ocimum basilicum*.[9,10] The utilization of natural sources and treatments has been imperative in developing new active molecules with unique chemical skeletons and bioactivities.[4] There has been a considerable amount of success and advancement in the use of peptide-based antifungal therapy found in both plant and animal kingdoms.[2] These studies conducted on natural sources have resulted in the discovery of potent antifungals found in nature such as plants, marine products, and microorganisms.[4]

The use of plant-derived essential oils such as *E. globulus* and *O. basilicum* is growing in antifungal treatment. The fungicidal properties found in Basil (*O. basilicum*) oil have been studied *in vitro* and showed that two chemotypes found in the essential oil link to its antifungal properties.[10] The chemotypes methyl chavicol and linalol were found to be equally effective in the same amount of quantity administered, reducing fungal growth by 78% 4 days post-inoculation.[10]

E. globulus is a well-studied oil that shows fungicidal properties and is used in the treatment of other existing conditions such as diabetes mellitus.[11] In a study on normal and diabetic rats, the antifungal properties of *E. globulus* essential oil were tested using sixty normoglycemic male rats randomly divided into six groups.[11] Overall, the study found that essential oil administration accounted for a reduction of hyperglycemia, polydipsia, polyphagia, and *Candidal* infection in the liver and kidneys.[11] Past research focused on a different species of *Eucalyptus* but bore similar effects as the previously mentioned study. It tested the effects of *Eucalyptus gomphocephala* on microbial infection, and looked at the epidemiology and toxicity.[9] The research concluded that *E. gomphocephala* bore a significant amount of inhibitory properties on microbial agents.[9] Another study looked at the chemical composition of eight *Eucalyptus* species harvested from various parts of Tunisia and their antimicrobial, antifungal, and antiviral activities.[12]

These studies provide precedence for a safer form of treatment than traditional oral and topical fungal treatments which can affect the liver and other organ systems. In addition, homoeopathic treatment and alternatives have been proven to be more cost-effective than traditional allopathic treatment, which is imperative with patient care to enable access to medical treatment.[13] This study expanded on previous studies of individual focus on homoeopathic alternatives and explored both the inhibitory growth rates and fungicidal effects on singular treatments between allopathic and homoeopathic medicine. It is hypothesized that essential oil and homoeopathic mother tincture treatments will exhibit measurable fungicidal effects that are equal to or greater than allopathic treatment on an existing *C. albicans* infection. In addition, it is hypothesized that homoeopathic and mother tincture treatments will have a measurable growth inhibitory effect on the *C. albicans* colony, aiding in preventative measures against fungal infections.

Materials and Methods

Model organism care and culturing

C. albicans was used as the model organism and was acquired from a commercial supplier (Carolina Biological Supply Company, Burlington, NC, # 155965). Sabouraud dextrose broth (SDB) (Sigma Aldrich, Saint Louis, MO, #S3306**)** was made for culturing *C. albicans* using Sigma-Aldrich protocol in a sterile hood. The fungal stock was added using an inoculating loop and swirled into the SDB Flask. The inoculated flask was incubated at 25 degrees for 7 days. Sabouraud dextrose agar (SDA) plates were prepared for running the experiments.

Growth inhibition

An individual analysis of each antifungal agent tested was conducted, including *E. globulus* and *O. basilicum* in essential oil form*, Benzoicum Acidum* 30C *and Kali Iodatum* 30C in paste form, and 100 mg Ketoconazole in paste form.

Trial 1

The five agents were turned into an aqueous solution that was used to soak diffusion discs for 30 min. *Benzoicum Acidum 30C* and *Kali Iodatum 30C* were obtained in pellet/solid form were crushed using a mortar and pestle until completely pulverized, and then 1 mL of distilled water was added and mixed into a solution with a concentration of approximately 1 CFU/mL McFarland opacity concentration.[14] Ketoconazole was acquired in powder form, so therefore it was measured out to 0.25 g and 300 uL of water was applied to create a solution. *E. globulus* and *O. basilicum* essential oils were acquired in aqueous form so 50 uL were simply pipetted out onto a weighing boat. One mL of the inoculated SDB broth was pipetted onto each of the prepared SDA plates and spread with an L spreader. The soaked discs were placed in the middle of the SDA plate and then the plate was turned. This was repeated for all 50 individual plates, 10 for each agent.

Fungicidal effect

All five agents were tested for their fungicidal efficacy on cultured *C. albicans.* with two different methods one with disc diffusion and another with pipetting the agent solution directly onto the cultured SDA. Concentrations of solutions were made using the same method and protocol as the agents used in the growth inhibition treatment, solutions were approximately 1 CFU/mL McFarland opacity concentration.[14] For both protocols, 1 ml of the cultured SDB broth was added to the SDA plates. The plates were incubated at 25°C for 7 days to ensure optimal growth. This experiment was completed over approximately a month-long period.

Pipetting solution

Concentration solutions were prepared for each of the five agents. Then, 50 uL of each respective solution was pipetted onto the center of the SDA plate, and then the plate was flipped. They were then covered with parafilm to seal the plate and reduce risk of contamination. Plates were stored in a 25°C incubator for 7 days, being monitored 2 days after application, 4 days after, and 6 days after.

Disc diffusion

The same solution concentrations were prepared for this protocol as in the pipetting solution. They were mixed thoroughly and then 10 diffusion discs were soaked in each agent solution for 15 min. Using sterile tweezers, each disc was placed directly in the middle of each SDA plate on top of the fungal growth. Plates were then stored upside down in a 25°C incubator for 7 days. Observations and measurements were taken 2, 5, and 7 days post-treatment. Treatment was started again using the diffusion disc method being mounted on top of the already treated SDA plates, observations were taken again after 1, 2, 3, 6, and 7 days post-treatment. The plates were moved to room temperature storage from day 3 to day 7 post-treatment.

Data collection and analysis

Qualitative and quantitative data were collected. The qualitative assay of this experiment was measured by visual observation of the eradication of fungal colonies in the trials. Colonies of *C. albicans* were measured at the start of trial and then re-measured 2 days post-treatment. Quantitative data were collected by measuring size of fungal colonies using a vernier caliper and then analyzed using analysis of variance statistical analysis.[15]

All measurements were taken in diameter × diameter, not excluding the diffusion disc which has a measurement of 5 mm × 5 mm (diameter × diameter). After the initial start of treatment when discs were applied simultaneously to the Sabaroud Dextrose Broth, measurements were taken the following day to provide details as to how the experiment was running.

Results

Growth inhibition

It was observed that *O. basilicum* showed a reaction with the fungi within 1 h and it had already begun to inhibit growth in large quantities, compared to other agents [Figure 1]. However, *O. basilicum* had a cloudy zone of inhibition [Figure 2]. During treatment set up it was recorded that on multiple incidents, *O. basilicum* showed corrosive properties to plastic, often corroding through plastic containers. It was also observed that ketoconazole did not harbor any results after 1 day. *E. globulus* also began to show a zone of inhibition, with a very clear area of inhibition, unlike *O. basilicum* [Figure 3].*Benzoicum Acidum* and *Kali Iodatum 30C* did not show any results after 1 day. Observations and measurements were recorded 2 days after the start of the trial. It was noted that some diffusion discs had dislodged and were in other locations besides the initial center of the SDA plate [Figure 3]. *Benzoicum Acidum 30C* and *Kali Iodatum 30C* had shown inhibition after 2 days of testing, with *Benzoicum Acidum* showing more inhibition. *E. globulus* showed high inhibition zones, following behind *O. basilicum* which showed the largest zone of inhibition. Ketoconazole showed approximately the same results as *Benzoicum Acidum 30C* and *Kali Iodatum* 30C.

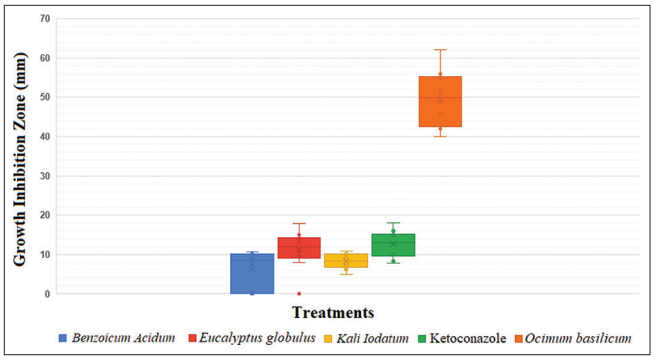

Figure 1: Growth Inhibition Zone The effect of each treatment's growth inhibitory properties was a measurement of the inhibition zone after 2 days of treatment in the agent solutions on the SDA plate. The diffusion disc measurement was 5mm and each separate treatment consisted of *Benzoicum Acidum, Eucalyptus globulus, Kali Iodatum* 30C, Ketoconazole, and *Ocimum basilicum* on *C. albicans*. Ketoconazole is used as positive control. The p-value is $< .00001$. The result is significant at $p < .05$

Fungicidal effect

This experiment tested efficacy of all 5 agents efficacy in treating an already present fungal infection [Figure 4]. Observations were recorded 1 day after application of agents. *Kali Iodatum 30C*, *Benzoicum Acidum,* and Ketoconazole had a slight zone of impact; that is, there were only slight indentations in the fungal colony [Figure 2]. *E. globulus* and *O. basilicum* showed no inhibition [Figure 2], but *O. basilicum* showed corrosive properties that fused petri plates together, making it impossible to open up the plate for closer inspection. *O. basilicum* plates showed no inhibition but they did show an oily residue on the surface of the fungal colony that reflected light [Figure 2]. All agents showed no changes in fungicidal properties or decrease in size of fungal colonies. There was no change noted for any of the days observed in the repeated treatment. After being moved to room temperature also there were no results or changes observed.

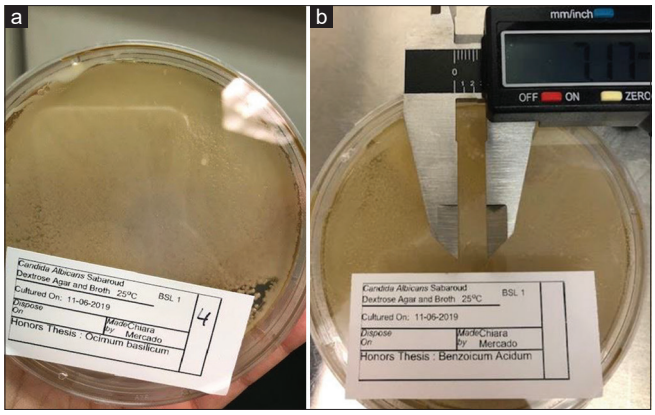

Figure 2: Fungicidal treatments using *Ocimum basilicum and Benzoicum Acidum* Figures showing the lack of fungicidal treatment zone after multiple days post treatment, under pipetting method. Figure 4A cloudiness is attributed to the O. *basilicum* corroding plastic of SDA plate. In figure 4B a Vernier caliper is used to mark indentations on fungal colonies after B. *Acidum* application.

Discussion

Growth inhibition

Results showed that the growth inhibitory properties of all agents used are valid, but some are more effective in inhibiting fungal growth than others. Results were noticed after only 1 day of disc application which accounts for the preventative properties of these agents. It was thought that the ketoconazole would have the most effective inhibitory characteristic and prevent growth altogether due to its use as an allopathic treatment in already cultured fungal infections. However, ketoconazole did not have either the largest nor clearest zone of inhibition. Similarly, *Benzoicum Acidum 30C* and *Kali Iodatum 30C* did not yield the most effective inhibitory properties, although it was thought that because they are a homoeopathic "drug" they would be clinically more efficient in preventing fungal growth. However, *Benzoicum Acidum* yielded the least results with the smallest zone of inhibition

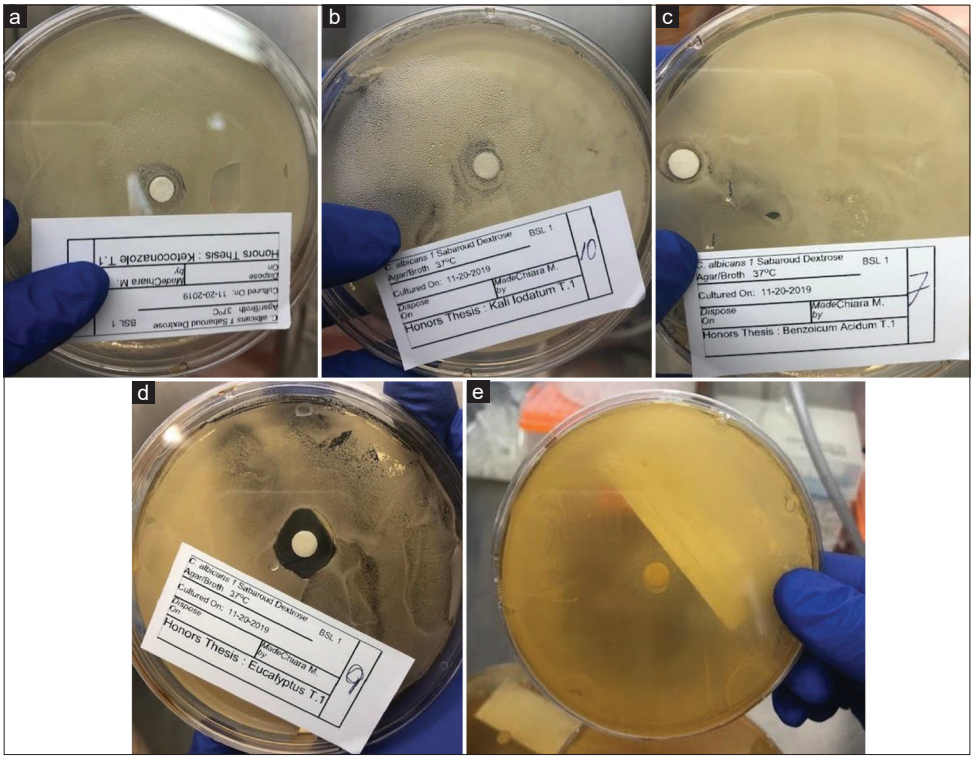

Figure 3: Growth Inhibition experiment on SDA plates with cultured *Candida albicans.* Images show the results of the diffusion discs soaked in the different concentrations. Image A shows the results of ketoconazole. Image B shows the results of *Kali Iodatum*. Image C shows the results of *Benzoicum Acidum.* Image D shows the results of *Eucalyptus globulus*. Image E shows the results of *Ocimum basilicum*.

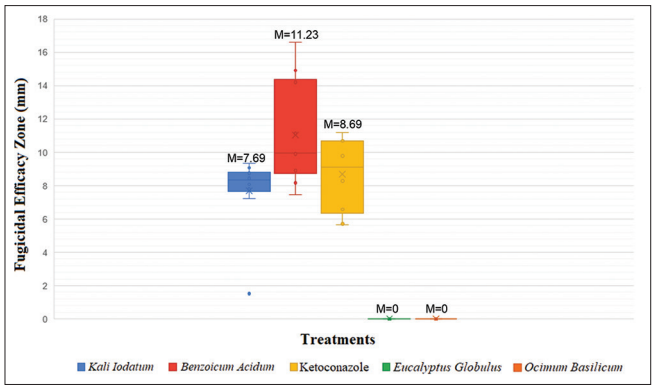

Figure 4: Fungicidal efficacy. The effect of each treatment's fungicidal properties of *Benzoicum acidum 30C*, *Eucalyptus globulus, Kali iodatum 30C*, Ketoconazole, and *Ocimum basilicum* on *Candida albicans*. Ketoconazole is used as positive control. The $P < 0.0001$. The result is significant at $P < 0.05$

and *Kali Iodatum 30C* showed similar results with a small inhibition zone slightly larger than *Benzoicum Acidum*. The agents that excelled in this treatment were the essential oils derived from *E. globulus* and *O. basilicum. O. basilicum* had the largest inhibition zone by far, and in some cases the fungal growth was very miniscule and sparsely located throughout the rim of the petri dish. These results correlate well with the observations taken during the application phase, where *O. basilicum* was found to have corrosive properties, thus meaning that this was a harsh essential oil that could easily corrode plastic and should be able to inhibit fungal growth. Although *O. basilicum* had the largest zone of inhibition, it did not have the clearest. The clearest inhibition zone belonged to the *E. globulus* SDA plates, that were the 2nd largest zones and they showed absolutely no fungal growth or colonies inside their inhibition zone. Results indicate that the proposed hypothesis is accepted, and homoeopathic drugs and tinctures are efficient in inhibiting fungal growth. One must consider that the essential oils used in this study may disperse throughout the agar plate and lead to challenges in identifying clear inhibitory zone borders. Although the edges were undefined, there was a clear indent in the *C. albicans* colony which coincides with growth inhibitory properties.

Fungicidal effects

This experiment tested the efficacy of each agent as a treatment for an existing and prevalent fungal infection. The method of incubation used in this study slightly varied from the standard 12 day incubation period. The results of this trial showed that none of the agents held an ability to efficiently treat or eradicate fungal growth and colonies. Initially the pipetting method was used but when that reared no viable results, diffusion disc testing was used. It was interesting to see the change in results with the change of methodology, when the pipetting method was used, the essential oils bore no results and the homoeopathic drugs and allopathic medicine only created an indent in fungal colonies. This can be attributed to the higher quantity of solution that was distributed through the diffusion disc. When discs are used, the concentrated solution is kept to one specific location and thus can be more effective in treating it. In future studies, a 1 day incubation of fungal colonies could be used to provide clearer difference of results when compared to other studies in the field of homoeopathy.

The aforementioned experiments were conducted to provide a detailed observation in regards to the efficacy of homoeopathic treatments and their inhibitory and fungicidal properties of *Candidal* infections. The inhibitory experiment showed that homoeopathic substances, specifically plant derived oils were most effective in preventing fungal growth. Clinically, this is relevant because it shows that it can successfully prevent the growth of *C. albicans* and therefore minimize the risk for infections that can result in a plethora of complications such as invasive candidiasis.[1] This is a cautionary treatment that can be conducted in the initial stages of fungal growth, and can prevent the chance of opportunistic fungal infections especially in immunocompromised patients.[2] The fungicidal experiment was conducted to find a homoeopathic treatment as a substitute to drug resistant cases of *C. albicans* with recurrent exposure to azole treatments. This hypothesis was disproved by multiple methods of application, where not even homoeopathic drugs showed an effective treatment. The allopathic agent used also did not rear successful results, which calls for a re-evaluation and adjustment of protocol. The findings were consistent with previous research done on homoeopathic drugs *Kali Iodatum 30C* which showed more growth inhibition than *Benzoicum Acidum 30C*.[5] However, that study did not include mother tinctures; therefore, the results of this study vary so as to include those agents. *E. globulus* was found to have a larger zone of inhibition than that of *O. basilicum* in past research, but that is not consistent with the data compiled in this experiment.[16]

Conclusion

Future research should include assessing the components of *E. globulus* and *O. basilicum* and attempt combination treatment for the most effective results. *E. globulus* was found to have a clearer zone of inhibition, but *O. basilicum* had the largest measurement therefore a combination may result in a more efficient treatment. Furthermore, a revision of the fungicidal treatment protocol is needed to provide more results and data. It may be possible that one dose of the medication is not sufficient to combat an already cultured and developed fungal colony.

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Nil.

Conflicts of interest

None declared.

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Efectos fungicidas de los medicamentos homeopáticos versus ketoconazol alopático en Candida albicans

Fondo: Candida albicans, representa más del 75% de todas las infecciones por Candidal. Aparte de su creciente prevalencia, también es una de las cepas más resistentes a los medicamentos antimicóticos. La homeopatía es una alternativa a la medicación alopática y ha demostrado inhibir el crecimiento de hongos. **Objetivo**: El propósito de este estudio fue para determinar la efectividad de las tinturas y medicamentos homeopáticos versus el ketoconazol alopático en la inhibición del crecimiento y las propiedades fungicidas contra cultivos in vitro de C. albicans.. **Materiales y métodos**: Se probó la eficacia de cinco agentes antifúngicos para inhibir el crecimiento de hongos y sus propiedades fungicidas en C. albicans cultivados.Los agentes probados fueron Eucalyptus globulus y Ocimumbasilicum en forma de aceite esencial, BenzoicumAcidum 30C y Kali Iodatum 30C en forma de tableta, y se comparó con el efecto de 100 mg de ketoconazol en forma de polvo. **Resultados**: En el ensayo de inhibición del crecimiento, O. basilicum tuvo la mayor zona de inhibición seguida por E. globulus. El grupo de ketoconazol mostró tasas de inhibición similares con BenzoicumAcidum 30C, y Kali Iodatum 30C mostró más inhibición que el ketoconazol. Los datos actuales sugieren que ningún agente individual tuvo un efecto fungicida efectivo sobre C. albicans, causando solo una reducción mínima en la superficie de la colonia de hongos. **Conclusiones**: Los resultados indican que los aceites esenciales O. basilicum y E. globulus fueron más efectivos en la inhibición del crecimiento. Sin embargo, tanto el aceite esencial como el tratamiento homeopático tenían propiedades fungicidas limitadas. Esto concluye que las alternativas homeopáticas pueden ser efectivas para prevenir las infecciones por hongos, pero pueden ser menos efectivas en el tratamiento de una infección por C. albicans completamente desarrollada.

Fungizide Wirkung von homöopathischen Arzneimitteln gegenüber allopathischem Ketoconazol bei Candida albicans

Hintergrund: Candida albicans ist für mehr als 75 % aller Candida-Infektionen verantwortlich. Abgesehen von seiner zunehmenden Verbreitung ist er auch einer der resistentesten Stämme gegen antimykotische Medikamente. Die Homöopathie ist eine Alternative zu allopathischen Medikamenten und hat gezeigt, dass sie das Pilzwachstum hemmt. **Zielsetzung**: In dieser Studie sollte die Wirksamkeit von homöopathischen Tinkturen und Arzneimitteln im Vergleich zu allopathischem Ketoconazol hinsichtlich der Wachstumshemmung und der fungiziden Eigenschaften gegenüber In-vitro-Kulturen von C. albicans bestimmt werden. **Materialien und Methoden**: Die Wirksamkeit von fünf antimykotischen Wirkstoffen wurde im Hinblick auf die Hemmung des Pilzwachstums und ihre fungiziden Eigenschaften bei kultiviertem C. albicans getestet. Bei den getesteten Wirkstoffen handelte es sich um Eucalyptus globulus und Ocimum basilicum in Form von ätherischem Öl, Benzoicum Acidum 30C und Kali Iodatum 30C in Tablettenform, und sie wurden mit der Wirkung von 100 mg Ketoconazol in Pulverform verglichen.. **Ergebnisse**: In der Wachstumshemmungsstudie wies O. basilicum die größte Hemmungszone auf, gefolgt von E. globulus. Die Ketoconazol-Gruppe zeigte ähnliche Hemmungsraten wie Benzoicum Acidum 30C, und Kali Iodatum 30C zeigte eine stärkere Hemmung als Ketoconazol. Die vorliegenden Daten deuten darauf hin, dass kein einzelner Wirkstoff eine wirksame fungizide Wirkung auf C. albicans hatte, sondern nur eine minimale Verringerung der Pilzkolonie an der Oberfläche bewirkte. **Schlussfolgerung**: Die Ergebnisse zeigen, dass die ätherischen Öle O. basilicum und E. globulus das Wachstum am wirksamsten hemmen. Sowohl das ätherische Öl als auch die homöopathische Behandlung hatten jedoch nur begrenzte fungizide Eigenschaften. Dies lässt den Schluss zu, dass homöopathische Alternativen bei der Vorbeugung von Pilzinfektionen wirksam sein können, bei der Behandlung einer voll entwickelten C. albicans-Infektion jedoch möglicherweise weniger wirksam sind.

顺势疗法药物与对抗疗法的酮康唑对白色念珠菌的杀菌效果比较

背景介绍:白色念珠菌，占所有念珠菌感染的75%以上。除了越来越普遍之外，它也是对抗真菌药物最有抵抗力的菌株之一。顺势疗法是一种替代对抗疗法的药物，并已显示出抑制真菌生长的作用。.

目标:

本研究旨在确定顺势疗法的酊剂和药物与对抗疗法的酮康唑对白喉菌体外培养物的生长抑制和杀真菌的有效性。.

材料和方法:测试了五种抗真菌药物抑制真菌生长的效果，以及它们对培养的白喉菌的杀真菌特性。被测试的药物是精油形式的桉树和罗勒，片剂形式的安息香酸 30C和卡利奥达图30C，并与粉末形式的100mg 酮康唑的效果进行比较。.

结果: 在生长抑制试验中，O.罗勒有最大的抑制区，其次是E..球状物。酮康唑组与安息香酸30C的抑制率相似，碘化钾30C的抑制率比酮康唑更高。本数据表明，没有任何一种药剂对白喉杆菌有有效的杀真菌作用，只是在真菌菌落的表面造成了最小的减少。.

总结: 结果表明，精油O. 罗勒 和E. 球状物在抑制生长方面最为有效。然而，精油和顺势疗法的杀真菌作用都很有限。这就得出结论，顺势疗法可以有效地预防真菌感染，但在治疗完全发育的白念珠菌感染方面可能效果较差。.

Effets fongicides des médicaments homéopathiques par rapport au kétoconazole allopathique sur Candida albicans

Contexte: Candida albicans, représente plus de 75% de toutes les infections à Candida. Outre sa prévalence croissante, c'est également l'une des souches les plus résistantes aux médicaments antifongiques. L'homéopathie est une alternative aux médicaments allopathiques et a montré qu'elle inhibait la croissance fongique. **Objectif**: Cette étude visait à déterminer l'efficacité des teintures et des médicaments homéopathiques par rapport au Kétoconazole allopathique en termes d'inhibition de la croissance et de propriétés fongicides contre les cultures in vitro de C. albicans. **Matériaux et méthodes**: L'efficacité de cinq agents antifongiques a été testée pour inhiber la croissance fongique et leurs propriétés fongicides sur la culture de C. albicans ; les agents testés étaient Eucalyptus globulus et Ocimum basilicum sous forme d'huile essentielle, BenzoicumAcidum 30C et Kali Iodatum 30C sous forme de comprimés, et comparés à l'effet de 100 mg de Kétoconazole sous forme de poudre. **Résultats**: Dans l'essai d'inhibition de la croissance, O. basilicum présentait la plus grande zone d'inhibition, suivi de E. globulus. Le groupe kétoconazole a montré des taux d'inhibition similaires avec Benzoicum Acidum 30C, et Kali Iodatum 30C a montré plus d'inhibition que le kétoconazole. Les données actuelles suggèrent qu'aucun agent individuel n'a eu un effet fongicide efficace sur C. albicans, ne provoquant qu'une réduction minimale de la surface de la colonie fongique. **Conclusion** : Les résultats indiquent que les huiles essentielles O. basilicum et E. globulus étaient les plus efficaces dans l'inhibition de la croissance. Cependant, tant les huiles essentielles que le traitement homéopathique avaient des propriétés fongicides limitées. Ceci conclut que les alternatives homéopathiques peuvent être efficaces dans la prévention des infections fongiques mais peuvent être moins efficaces dans le traitement d'une infection C. albicans pleinement développée.

कैंडिडा एल्बीकन्स में एलोपैथिक कीटोकोनैजोल की तुलना में होम्योपैथिक दवाओं के फंगीसाईडल प्रभाव

पृष्ठभूमि: कैंडिडा एल्बीकन्स, सभी कैंडिडल संक्रमणों में से 75 प्रतिशत के लिए जिम्मेवार होता है। इसकी बढ़ती हुई मौजूदगी के अतिरिक्त, यह एंटीफंगल दवा के विरुद्ध अत्यधिक प्रतिरोधी स्ट्रेन्स में से एक है। एलोपैथिक दवा का एक विकल्प होम्योपैथी है और इसने फंगल का अंतर्रोधी विकास दर्शाया है। **उद्देश्य:** इस अध्ययन का उद्देश्य सी.एल्बीकन्स के विट्रो कल्चर्स के विरुद्ध फंगीसाईडल विशेषताओं तथा अवरोधन विकास में एलोपैथिक कीटोकोनेजोल के बजाय होम्योपैथिक अपमिश्रणों तथा दवाओं की प्रभावित को निर्धारित करना था। **सामग्री एवं प्रणालियाँ:** कल्चरड सी आल्बिकन्स पर उनके फंगीसाईडल लक्षणों एवं अंतर्रोधी फंगल विकास हेतु पांच एंटीफंगल कर्मकों की प्रभावोत्पादकता जांची गई थी। जो कर्मक जांचे गए थे वे इस प्रकार हैं: तात्विक तैलीय रूप में यूकेलिप्टस ग्लोबुलस एवं ओकिममबेसिलिकम, टेबलेट रूप में बेंजोइकम एसिडम 30 सी एवं काली आयोडेटम 30 सी, तथा पाऊडर रूप में 100 एमजी कीटोकोनेजोल प्रभाव के साथ तुलना की गई थी। **परिणाम:** अंतर्रोधी विकास परीक्षण में, ओ.बेसीलिकम के बाद अंकित ई.ग्लोबुलस का अंतर्रोधी क्षेत्र सबसे बड़ा था। कीटोनेजोल समूह ने बेंजोइकम एसिडम 30सी के साथ समान अंतर्रोधी दरें दर्शायी थी, तथा काली आयोडेटम 30सी ने कीटोकोनेजोल के मुकाबले ज्यादा अंतर्रोधिता दर्शायी थी। मौजूदा आंकड़े सुझाते हैं कि किसी भी विशिष्ट कर्मक का सी.आल्बिकल्स पर कोई प्रभावी फंगीसाईडल प्रभाव नही है, और वह केवल फंगल कॉलोनी की सतह पर थोड़ा बहुत न्यूनीकरण कर रहा है। **निष्कर्ष:** परिणाम दर्शाते हैं कि ओ.बेसिलिकम एवं ई-ग्लोबुलस जैसे आवश्यक तेल अंतर्रोधी विकास में सबसे प्रभावी थे। हालांकि, दोनों आवश्यक तेल एवं होम्योपैथिक उपचार के सीमित फंगीसाईडल लक्षण हैं। अतः यह निष्कर्ष निकलता है कि फंगल संक्रमणों की रोकथाम में होम्योपेथिक विकल्प प्रभावी हो सकते हैं मगर पूर्णतः विकसित सी आल्बिकन्स संक्रमण के उपचार में शायद कम प्रभावी हैं।