

Candida albicans: Unveiling the Complexities of an Opportunistic Fungal Pathogen

Gordon Ramage*

Department of Microbiology, The University of Texas at San Antonio, San Antonio, TX, USA

*Corresponding author: Gordon Ramage, Department of Microbiology, The University of Texas at San Antonio, San Antonio, TX, USA, E-mail:

gordonram@gmail.com

Received date: February 27, 2023, Manuscript No. IPMMO-23-16654; **Editor assigned date:** March 01, 2023, PreQC No. IPMMO-23-16654 (PQ); **Reviewed date:** March 13, 2023, QC No. IPMMO-23-16654; **Revised date:** March 23, 2023, Manuscript No. IPMMO-23-16654 (R); **Published date:** March 30, 2023, DOI: 10.36648/ 2471-8521.9.1.54

Citation: Ramage G (2023) Candida albicans: Unveiling the Complexities of an Opportunistic Fungal Pathogen. Med Mycol Open Access Vol.9 No. 1:54.

Description

Candida albicans, a species of yeast, is one of the most common fungal pathogens that can cause infections in humans. While it is a normal resident of the human microbiota, under certain conditions, *C. albicans* can transition from commensal to pathogenic, leading to a range of infections that can affect various parts of the body. This article delves into the fascinating world of *Candida albicans*, exploring its characteristics, pathogenesis, and treatment options.

Invasive fungal infections claim more than 2000,000 deaths every year, while more than 90% of these death are caused by *Cryptococcus*, *Candida*, *Aspergillus*, and *Pneumocystis*. Among these fungal pathogens, *Candida* species are responsible for approximately 400,000 life-threatening infections while *Candida albicans* is the most notorious species. As an opportunistic fungal pathogen, *C. albicans* can colonize on skins and mucosal surfaces without causing diseases. However, when immune systems are compromised by drugs during organ transplantation or blood malignance, this fungus causes fungal infections including oral thrush, vaginitis or life-endangering candidemia.

The morphological transition from yeasts to hyphae confers *C. albicans* with an advantage to survive in host and to escape from immune surveillance, since hyphae are large for macrophages and neutrophils that are critical for killing fungal pathogens. In addition, *C. albicans* hyphae can secrete toxic candidalysin that induce cytolysis in phagocytes. Hyphae are also the critical components of *C. albicans* biofilms that can impede the access of antifungal drugs. With decreased antifungal susceptibility, *C. albicans* biofilms formed on medical devices pose bad influences on the medical interventions. Along with the increasing prevalence of drug resistance and the lack of antifungal drugs, this necessitates the development of antifungal agents, especially those effective for *C. albicans* biofilms.

As a huge reservoir for seeking lead compounds with therapeutic potentials, natural products have been focused on for developing drugs for fungal infections and fibrosis and so on. Phytochemicals account for a large part in natural products and

are generally considered as low-toxic and bioactive. Carnosol is an active polyphenolic compound that can be isolated from *Rosmarinus officinalis* L. (rosemary), *Salvia fruticosa* Mill and *Salvia officinalis* L.

Carnosol has demonstrated anticancer activities against colon cancer, lung cancer, breast cancer, pancreatic cancer, prostate cancer, brain cancer, skin cancer and leukemia. The anticancer activities involve DNA damages, cell cycle arrest, intrinsic apoptosis mediated by cytochrome C release and caspases activation. Carnosol can inhibit the pro-survival PI3K-Akt and STAT3 signaling. Carnosol also has anti-inflammatory and anti-oxidative activities. In addition, carnosol has also shown fungicidal activities against *Pyricularia oryzae* (the culprit for blast disease), *Microsporum canis*, *Aspergillus tubingensis*, *Botrytis cinerea* and *Penicillium digitatum*. Carnosol-containing acetonc extract of *Salvia fruticosa* Mill also showed fungistatic activity against *Botrytis cinerea*, a fungal pathogen of grape. Although carnosol-containing *Rosmarinus officinalis* extract also inhibits *C. albicans* ATCC 90,028 with MIC and MFC of 20 and 100 µg/mL, the antifungal activities of carnosol against *Candida* species has few been reported. In this study, we evaluated the antifungal activities of carnosol against *C. albicans*.

Understanding Candida albicans

Biology and Morphology: *Candida albicans* is an oval-shaped, unicellular fungus belonging to the genus *Candida*. It is a dimorphic organism, meaning it can exist in two distinct forms: yeast and filamentous. In its yeast form, it appears as a single-cell organism, whereas in its filamentous form, it develops elongated hyphae that allow it to invade tissues. This adaptability contributes to its ability to cause infections in various host niches. **Prevalence and Colonization:** *Candida albicans* is a commensal inhabitant of the human microbiota, commonly found in the oral cavity, gastrointestinal tract, and vaginal mucosa. It coexists harmoniously with other microorganisms in these locations, without causing harm. However, when the balance of the microbial ecosystem is disrupted, *C. albicans* can flourish and become pathogenic.

Pathogenicity of *Candida albicans*

Factors Influencing Pathogenesis: Several factors contribute to the transition of *C. albicans* from a commensal to a pathogenic organism. These include host factors (e.g., compromised immune system, underlying medical conditions), microbial factors (e.g., biofilm formation, secretion of virulence factors), and environmental factors (e.g., antibiotic use, high sugar diets). Together, these factors create an environment conducive to *C. albicans* overgrowth and invasion.

Types of Candidiasis: Oropharyngeal Candidiasis: Commonly known as thrush, oropharyngeal candidiasis affects the oral cavity, primarily seen in infants, elderly individuals, and those with weakened immune systems. It presents as white patches on the tongue, inner cheeks, and throat, causing discomfort and difficulty swallowing.

Vulvovaginal Candidiasis: Vulvovaginal candidiasis is a prevalent infection affecting many women during their lifetime. Symptoms include itching, burning, abnormal discharge, and redness of the vulva and vagina. Hormonal fluctuations,

antibiotic use, and compromised immune function can increase the risk of developing this condition.

Invasive Candidiasis: Invasive candidiasis is a severe systemic infection that occurs when *C. albicans* enters the bloodstream and spreads throughout the body. It primarily affects individuals with weakened immune systems, such as those with HIV/AIDS or undergoing chemotherapy. Invasive candidiasis can lead to severe complications and is associated with high mortality rates.

Diagnosis and Treatment:

A. Diagnosis of Candidiasis: The diagnosis of candidiasis involves a combination of clinical evaluation, microscopic examination, and laboratory tests. In most cases, a healthcare professional will collect samples from the affected site, such as oral swabs or vaginal discharge, and culture them in a laboratory setting. Molecular techniques, such as polymerase chain reaction (PCR), may also be employed for accurate identification.

B. Treatment Options: The treatment of *Candida albicans* infections depends on the type and severity of the infection. Antifungal medications, such as azoles (e.g., fluconazole) or echinocandins.