

IMPACT OF MICROWAVE PLASMA TORCH ON THE YEAST *CANDIDA GLABRATA*

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Recently, various cold plasma sources have been tested for their bactericidal and fungicidal effects with respect to their application in medicine and agriculture. The purpose of this work is to study the effects of a 2.45 GHz microwave generated plasma torch on a model yeast example *Candida glabrata*. In recent decades, a number of discovered pathogenic microorganisms has rapidly grown, and their resistance to antibiotics or antifungals has increased as a result of the excessive use of antibiotics, antifungals and immunosuppressants (drugs that suppress the function of the immune system) [1, 2]. Therefore, the attention of scientists has focused on finding new ways to inactivate unwanted microorganisms (ideally without the side effects or potential enhancement of microorganism resistance). One of these new ways is also the plasma medicine, which offers new possibilities for food sterilization, sterilization of medical equipment and tools or direct therapeutic treatments of various diseases. Thanks to a high number of active particles generated in a low-temperature plasma operating at atmospheric pressure, this type of plasma has become highly popular, especially thanks to its bactericidal effects. However, its antimycotic effects and mechanisms of fungal inactivation are still not fully understood. Therefore, this study focuses on the antifungal effects of the microwave discharge on *Candida glabrata*. *Candida glabrata* is usually well controlled or harmless in healthy people. However, it may cause problems to people with a suppressed immune system. Particularly at risk are hospitalized patients, people with HIV, people being treated for cancer and people who have had organ transplants [3]. The danger of the infections caused by *Candida glabrata* lies in its innate resistance to the azole antifungal therapy, which is very effective in treating infections caused by other *Candida* species. *Candida glabrata* retains many other virulence factors, such as the ability to adapt quickly to stressful conditions and the ability to secrete phospholipases, lipases and hemolysins, expression of the gene adhesin and biofilm formation. Infections caused by the yeasts of the genus *Candida* are called candidiasis. *Candida glabrata* is currently ranked the second or third in the world as a cause of superficial (oral, esophageal, vaginal, urinary) or systemic candidiasis [4]. Based on these facts, there is an emergent necessity to find new nontraditional ways to inactivate this yeast. In our experiment the microwave plasma was generated by a surfatron resonator, and pure argon at a constant flow rate of 5 Slm was used as a working gas. The main study focus is on the measurement and evaluation of changes in inactivation effects caused by varying initial concentration of *Candida glabrata* cells, applied microwave power and exposure time. The discharge was applied on freshly inoculated colonies of *Candida glabrata* spread on the agar plates and its inhibitory effects were observed in the form of inhibition zones formed after the subsequent cultivation.

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References:

- [1] Grzegorzewski, F. Influence of Non-Thermal Plasma Species on the Structure and Functionality of Isolated and Plantbased 1,4-Benzopyrone Derivatives and Phenolic Acids. Ph.D. Thesis, Technische Universität Berlin, Berlin, German, 2011.

- [2] Soloshenko, I.A.; Tsiolko, V.V.; Pogulay, S.S.; Kalyuzhnaya, A.G.; Bazhenov, V.Y.; Shchedrin, A.I. Effect of Water Adding on Kinetics Of Barrier Discharge in Air. *Plasma Sources Sci. Technol.* 2009, 18, 045019.
- [3] Mendes-Giannini, M.J.S.; Bernardi, T.; Scorzoni, L.; Fusco-Almeida, A.M.; Sardi, J.C.O. Candida Species: Current Epidemiology, Pathogenicity, Biofilm Formation, Natural Antifungal Products and New Therapeutic Options. *J. Med. Microbiol.* 2013, 62, 10–24.
- [4] Sykes, J.E. Candidiasis. *Canine Feline Infect. Dis.* 2014, 67, 653–659.