The dynamic progress of modern medicine, based on the use of broad-spectrum antibiotics and immunosuppressive drugs, has contributed to the prevalence of fungal infections, particularly among patients in intensive care units. These therapies significantly affect the natural human microflora and weaken the host defence mechanisms, thus facilitating the development of fungi. The most common pathogen causing fungal infections in humans is *Candida albicans*, which colonises various niches in the host organism, mainly the skin and mucous membranes. Disruption of the delicate balance between the immune system and opportunistic yeasts leads to the development of both mild superficial but also life-threatening bloodstream infections. Invasive *Candida* infections are often associated with high rates of morbidity and mortality. According to recent data, hospital-acquired *C. albicans* infections are associated with a mortality rate of up to 70%.

The development of difficult-to-treat fungal infections is related to the development of sophisticated virulence strategies that allow partial deception of the host's immune system. Among these, an important mechanism is growth in form of so-called biofilm, which is a complex multicellular structure surrounded by a layer of organic substances produced by yeast. This structure has excellent adhesive properties and to both the surface of the host's tissues and to artificial elements used during medical procedures, e.g. cannulas. Additionally, the biofilm provides yeasts with partial protection against a range of antifungal compounds. Intensive biofilm development is associated with significant oxygen consumption by *C. albicans* resulting in a hypoxic environment that can significantly affect the host cell response.

The development of fungal infection drives leukocyte migration. The most important cells that represent the first line of defence against fungal infection are neutrophils. These cells are equipped with various mechanisms to neutralise pathogens, the most important of which are phagocytosis, degranulation, generation of reactive oxygen species and a unique mechanism involving the release of neutrophil extracellular traps (NETs). NETs consist of DNA fibres that are decorated with biocidal agents. Such structures can be effective in the removal of pathogens characterized by large cell sizes. Most of the research to date on the neutrophil response has focused on the planktonic growth form of yeast or isolated virulence factors. However, the immune response to such a complex structure as a biofilm, is much more complicated and sometimes contradictory.

Given the existing gap on possible pathways for the regulation of neutrophil response by *C. albicans* biofilm structure, this project aims to determine the influence of the specific biofilm microenvironment on the observed neutrophil response. To verify the initial observations, detailed analyses of the migration and localisation of human neutrophils in *in vitro* cultured biofilms at various stage of infection development will be performed. This will be followed by an analysis of the modulation of the neutrophil apoptosis by fungal component at the molecular level. Bearing in mind that the biofilm is not only a set of virulence factors, but also a specific environment characterised, among others, by reduced oxygen concentration, the second part of the project will be devoted to analysis of the induction of the hypoxic response in human neutrophils during contact with fungal biofilm.

The rapid evolution of *C. albicans* favors the emergence of strains resistant to most antimycotics, hence new ways to prevent and treat infectious diseases are urgently needed. Therefore, the final stage of the study will consider the possibility of regulating the neutrophil response by using drugs that affect the hypoxia pathway. The obtained results may contribute to a better understanding of the influence of fungal infection on the modulation of neutrophil response and will underline the need to consider different immunomodulatory strategies when designing new antifungal therapies.