

10th International Congress on

CLINICAL VIROLOGY, FUNGAL INFECTIONS & INFECTIOUS DISEASES

December 04-05, 2017 Dubai, UAE

The role of TLRs signaling in fungal infections

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Fungi are the most common microorganisms found in the environment. Fungal immunity is vital in the treatment of immune-compromised patients, especially those involved with HIV infection, cancer, or organ transplant recipients. There are numerous immune mechanisms against fungal infections, ranging from nonspecific protective mechanisms (innate immunity) to sophisticated acquired one that are activated during an infection or a disease (adaptive immunity) with the former (innate immunity) being the first line of defense against many fungal infections. Pattern recognition receptors (PRRs) such as Toll-like receptors, C-type lectin receptors (CLRs), and galectin family proteins exist on the surface of host cells to identify PAMPs in fungi. The major components of fungal cell wall are beta-glucan and chitin. Depending on the molecular size, chitin induces innate or adoptive immunity activity while beta-glucan activates innate immunity during fungal infections. PRRs, existing on different cells such as phagocytes, epithelial, and dendritic cells initiate intracellular events that activate immune system and fungal clearance. TLRs are pathogen recognition receptors that detect specific PAMPs in microbes. They exist on host cell surfaces or into cytoplasm regions, identifying microbial ligands. The interaction between TLRs and PAMPs activates immune cells, followed by antimicrobial proteins and cytokines secretion, respiratory burst, and phagocyte degranulation. TLRs can be divided into two groups: those like TLR1, 2, 4, and 5 that exist on the surface of plasma membrane and TLR3, 7, 8, and 9 which are placed in intracellular components such as endosomes. The type of immunity provoked depends on the cells involved, e.g., neutrophils, macrophages, and some other cell types generally promote innate immune responses, while antigen uptake by dendritic cells results in differentiation of naïve T cells and specific immunity responses. This paper describes the role of Toll-like receptors for the identification of immune responses to fungal infections.

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