ROLE OF *FUSARIUM* SPECIES FROM AGRICULTURAL ENVIRONMENTS IN CORNEAL INFECTIONS

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Mycotic keratitis is a serious, usually ulcerative disease of the cornea, which may result in visual impairment or even blindness. Agricultural workers are representing the main risk group in the case of such infections, followed by construction workers and housewifes – all active occupations with certain risks of eye injuries that are facilitating keratitis development. In South India, the largest number of cases is usually diagnosed between June and September, the summer period of the year in which the agricultural activities are the most intensive. The main age group of patients comprises 31-50 years, which can be considered as the mostly active years of agricultural and construction workers. The male:female ratio among the patients is about 2:1.

The most frequent etiologic agents of mycotic keratitis in South India are species from the filamentous fungal genus *Fusarium*, with the *Fusarium solani* species complex (FSSC) being predominant, followed by the *Fusarium dimerum* (FDSC), *Fusarium fujikuroi* (FFSC), *Fusarium oxysporum* (FOSC) and *Fusarium incarnatum-equiseti* (FIESC) species complexes. Representatives of FSSC are the most frequently isolated members of the genus *Fusarium* from soil, furthermore, they are also known as plant pathogens affecting more than 100 various host plants. Most of the *Fusarium* strains isolated from keratitis patients of the Aravind Eye Hospital, Coimbatore, South India and identified by partial sequence analysis of the translation elongation factor 1α gene proved to belong

to the species *F. falciforme*, followed by *F. keratoplasticum* and *F. solani sensu stricto*, all of them from FSSC and also occurring in agricultural environments. The sexual fungus *Fusarium neocosmosporiellum* from FSSC was firstly detected from keratitis. A rapid identification method was worked out for the members of FSSC based on a specific *Eco*RI restriction site found only in the *tef1α* sequences of FSSC members.

The species complex diversity of fusaria from keratitis infections showed a change over time between 2004-05 and 2010-11, in addition to FSSC, FFSC and FIESC, representatives of FDSC and FOSC also appeared during the latter period, while *F. napiforme* from FFSC was identified during 2010-2011 as a new, emerging causal agent of mycotic keratitis.

The susceptibilities to antifungal drugs may vary between different fungal species, even between different isolates belonging to the same species, suggesting the importance of routine antifungal susceptibility testing of keratitis isolates, as an inappropriate choice of the therapeutic agent may result in the loss of vision. Antifungal susceptibility testing of the isolates by the CLSI M38-A2 broth microdilution method revealed that the first generation triazoles, fluconazole and itraconazole are ineffective, which is due to the widespread agricultural application of azole compounds. Changes in the antifungal susceptibilities of keratitis isolates could also be detected over time, with clotrimazole and econazole showing decreasing efficiencies. However, the imidazole class of antifungals proved to be still applicable against fusaria. The essential oil of *Cinnamomum zeylanicum* and its main component, trans-cinnamaldehyde were found to have the potential to form a new basis of promising antifungal therapy for *Fusarium* keratitis. Furthermore, *Drosophila melanogaster* proved to be an applicable model organism to study the virulence of *Fusarium* species causing fungal keratitis.

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