

## Commentary: *Pythium insidiosum* keratitis

*Pythium insidiosum* is a filamentous parasitic Oomycete belonging to genus *Pythium* of family Pythiaceae and order Pythiales. It was considered to be fungus until it was realized that the cytoplasmic membrane does not contain ergosterol, and the organism exhibits asexual reproduction through formation of sporangia containing zoospores as well. Most species of the genus are plant parasites except *Pythium insidiosum*, which causes diseases in animals and humans. The organism primarily causes three forms of infections: cutaneous, vascular and ocular although there are reports of gastrointestinal and systemic infections as well. In the eye the organism is primarily described as a cause of keratitis. Until recently, the infection by *Pythium* was presumed to be endemic in Thailand.<sup>[1]</sup> The clinical presentation of the keratitis characterised by features such as cotton wool like infiltrate, hyphate edges with filamentous lesions extending

into surrounding cornea resembles that of filamentous fungi. Even the microscopic examination of smears show filaments that on cursory look mimic filaments of filamentous fungi. Many of these cases in non-endemic areas were labelled as unidentified fungal keratitis cases.

Last few years have witnessed a lot of development in understanding of the epidemiology, pathology and management of this infection. In 2015 our group led by Dr. Savitri Sharma identified this pathogen during an unrelated project aimed at molecular identification of 162 stocked morphologically unidentified fungal isolates from keratitis patients.<sup>[2]</sup> This discovery led to a series of publications describing clinical features, microbiology, *in-vitro* antimicrobial susceptibility and the treatment.<sup>[3]</sup> Key findings of these publications are following:

A) Clinical features: the clinical picture resembles that of fungal keratitis cases. However, a combination of presence of tentacle like lesions or dot lesions in surrounding cornea and no response to antifungal treatment should alert one to consider the infection by *Pythium*.

- B) Microbiology: Careful microscopic examination of smears reveals sparse or complete absence of septa in filaments. The filaments are broad ribbon shaped rather than round. This unique morphology is different than that of filaments of true molds. The growth on blood agar is characterised by flat, colorless or light brown glabrous colonies. Further, the identification is best confirmed by demonstrating zoospore formation or DNA sequencing of ITS region of rDNA.
- C) In-vitro antimicrobial susceptibility results show that the organism demonstrates maximum inhibition to tigecyclin followed by linezolid and minocyclin. Other antibiotic active against *Pythium* are tetracyclin and doxycyclin. The organism demonstrates poor activity to most antifungal agents.
- D) Medical treatment: The *Pythium insidiosum* keratitis patients show good response to medical treatment with Linezolid. Fewer patients needed surgical treatment when treated with linezolid antibiotic. This a breakthrough invention as until 2015 the disease was considered to be a surgical entity with poor outcomes.

Our group also made a conscious effort at publicising the knowledge so gained and encouraged other groups for studying this infection in their population. In last two years various other groups have also published their experience with this infection.<sup>[4-6]</sup> As a result – an entity considered to be endemic in Thailand is now reported from India and other parts of the world – the most desired impact of publicising science.

In this issue the group from Arvind eye care system has shared their experience with *Pythium* keratitis.<sup>[7]</sup> The publication highlights that the infection does not respond well to medical treatment with antifungal agents. Even surgical option in the form of penetrating keratoplasty is associated with a high risk of recurrence of infection and graft failure.

To summarise, it is clear that a section of cases of so called fungal keratitis are caused by fungal like but non-fungal pathogen *Pythium*. There is some headway in solving the puzzle of infection by this pathogen. In India where close to 50% cases are labelled to be caused by fungi we have a unique opportunity to find solutions for this challenging infection. Some groups have come forward in this endeavour and I will encourage others also to join.

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