Chapter 4

Pityriasis Versicolor
4.1 Introduction

Fungi are a large and diverse group of heterotrophic organisms that exist as saprophytes, parasites or commensals. Most of the fungi are found over decaying organic material and in the soil. This is an independent group of organisms, differing from higher plants in structure, nutrition and reproduction. Between 50,000 to 1,00,000 species of fungi are known, out of these less than 100 are human pathogens.

Fungi may be contaminants, opportunistic invaders or true pathogens. They can produce harmful effects by the production of mycotoxins, by evoking allergic reactions or by direct tissue invasion. Superficial infections such as piedra or tinea versicolor do not elicit any host response and are asymptomatic. Dermatophytes, though superficial, do evoke a host inflammatory response by their metabolic activities in the form of scaling, vesiculations, pustulation and sometimes abscess formation. Clinical infection results if fungi penetrate the host’s protective barrier, i.e. skin or mucous membrane. Establishment of the disease in the body depends on the portal of entry of the organisms.

4.1.1 Classification of fungal diseases

Fungal diseases can be classified according to the primary site of infection.
1. Superficial mycoses: In this case the infection is limited to the outermost layer of the skin and its appendages. The immune response is rarely induced.

2. Cutaneous mycoses: In this case the infection extends deeper into the epidermis and also invades the hairs and nails. It evokes a high inflammatory response in the host.

3. Subcutaneous mycoses: In this case the infection is due to a pathogenic organism of low virulence and usually follows traumatic injury. It involves the dermis, subcutaneous tissues, muscles and fasciae.

4. Systemic mycoses: In this case the infection originates primarily at one site like the lung and disseminates systemically to other body sites.

The main superficial fungal infections are dematophytosis, candidiasis, pityriasis versicolor, tinea nigra and piedra.

4.2 Tinea versicolor (pityriasis versicolor)

4.2.1 Definition

It is a mild chronic superficial fungal infection of the stratum corneum characterized by patchy and scaly discoloration of the skin.

Pityriasis versicolor: *Eichstedt’s disease, t. furfuracea, chromophytosis, an eruption of tan or brown, branny patches on the skin of the trunk and appearing white in color with hyperpigmented skin after exposure to the summer sun, caused by Malassezia furfur.

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4.2.2 Historic development of scientific principles

Tinea versicolor was first recognized as a fungal infection of the skin in 1846 by Eichstedt. For several years the disease was considered to be dermatophyte in origin, but first breakthrough came when Baillon, impressed by the yeast like nature of the organism, coined the name Malassezia in 1889 to distinguish this organism from the Microsporum species of dermatophytes. Over the intervening years, numerous investigators claimed to have isolated the etiologic agent and suggested various epithets for their isolates, but it was a major breakthrough in 1951 when Gordon isolated, characterized, and authenticated the organism M. furfur and renamed it P. orbiculare.  

4.2.3 Etiology

The involved organism is Malassezia furfur or Pityrosporum, a yeast like lipophilic fungus. Immunological and ultrastructural studies have proved that M. furfur and M. orbiculare are the same organism. Previously the term M. furfur was used to describe the mycelial phase, whereas the yeast form was called either P. ovale or P. orbiculare depending upon the shape of the budding cells. Members of the Pityrosporum genus comprise three main varieties: P. ovale, P. orbiculare and P. pachydermatitis. The first two are found in human beings while the third one is found in other hosts. Both species are capable of causing scaling when they increase in number and undergo yeast or mycelial shift but spherical forms are more likely to do so. Observation points out that P. ovale and P. orbiculare are the same organisms. The factors
contributing to the yeast or mycelial shift are warm humid environment, malnutrition, diabetes mellitus, cushing’s disease, corticosteroids, immunosuppression and hereditary predisposition.\(^5\)

*Malassezia furfur* is a dimorphic, lipophilic, organism that grows in vitro only with the addition of C12 to C24 sized fatty acids to the medium. Under appropriate conditions it converts from the saprophytic yeast to the predominantly parasitic mycelial morphology that is associated with clinical disease.

In its true sense, tinea versicolor represents an opportunistic infection, although specific deficiencies in antibodies or complement components have not been associated with the disease. Experimentally, inoculation of the organism under occlusion can cause infection. The resulting increase in humidity, temperature, and CO\(_2\) tension appear to be important factors that make the skin susceptible to infection. When the occlusive state is terminated, self healing occurs. The organism is not eradicated from the skin and can be cultured from clinically resolved areas.\(^6\) It may also colonize follicular structures. For these reasons, a high clinical recurrence rate is expected.

### 4.2.4 Epidemiology

*Pityrosporum* yeasts are found on human skin from an early age.\(^3\) Pityriasis versicolor commonly affects young adults having age between 15 and 35 years. They are a component of the normal skin flora in 90-100 % of adults living in tropical area.\(^5\) The peak presence of this organism is in the young age
and early adulthood and their prevalence increases in the elderly. The organism is usually clustered around the hair follicles apparatus. Pityriasis versicolor is more common in the tropics than in the temperate zone and as many as 40% of the population may be affected. The prevalence in colder climates is less than 1%. In temperate region the condition is more favorable for the growth in the warmer months.

4.2.5 Pathogenesis

The fungus interferes with melanin production. It induces the production of azelaic acid (a dicarboxylic acid) that affects the ability of melanocytes to form melanin by competitive inhibition of dopa tyrosinase (enzyme), thus inducing a light or faint color. However these acids have no effect on normal melanocytes in tissue culture. There is evidence that products of the organism may have a direct cytotoxic effect on hyperactive melanosomes. The explanation for pigmentation in fair skin colored persons remains faint dark although electron microscopy reveals abnormally large melanosomes in hyper pigmented areas and smaller than normal ones in hypo pigmented lesions.

The hypo pigmentation may persist for weeks or months after the fungal disease is cured unless an effort made to regain the lost pigmentation through UV exposure.

4.2.6 Histopathology

The characteristic changes include hyperkeratosis, parakeratosis, acanthosis and a mild inflammatory infiltrate in the upper dermis. The organism
can be seen in the upper layers of the stratum corneum and electron microscopy shows the presence of organisms intercellularly as well as intracellularly. Increased cell turnover is found in affected cells.

4.2.7 Clinical features

The condition is usually asymptomatic and lesions are only of cosmetic importance to the patient. Sometimes mild irritation may occur. The organism enters the follicles, begins to spread and produces fine scales. The chief lesion is a macule that may be hypo-pigmented or hyper-pigmented and covered with branny (fish like) scales. An important diagnostic clue may be the loosing of hardly noticeable scales with a fingernail (known as coup d’ongle or stroke of the nail). The typical eruption shows large confluent areas and scattered patches with satellite lesions.

The upper trunk is most commonly involved but the infection usually extends to the upper arms, neck and abdomen. The anatomical distribution of the organism in the disease reflects the distribution of the organism in the skin. Extension of the axillae, groins and genitalia occurs and the forearm, dorsa or aspects of the hands are involved. Facial and scalp involvement is also recognized. Pityriasis versicolor inversus involves mainly the extremities with lesser involvement of the trunk. Palmar lesions can also occur in areas under pressure.

Pityriasis versicolor is associated with the mycelial phase of the fungus, whereas the yeast phase has been implicated in other disorders like seborrhoeic
dermatitis, *Malassezia* folliculitis etc. Obstructive dacrycystitis can also be caused by *M. furfur*.

Cutaneous infections with *M. furfur* may take three forms:

1. Papulosquamous lesions  
2. Folliculitis  
3. Inverse tinea versicolor

Rarely, *M. furfur* can infect organs other than the skin. A premature infant on total parenteral nutrition with intravenous lipid supplementation has been reported who showed no skin lesions but had an extensive vasculitis of small pulmonary arteries and broncho-pneumonia. *Malassezia furfur* organisms were seen microscopically in areas of lipid deposition. The organism has been cultured from peritoneal dialysate, blood, and with increasing frequency in patients receiving parenteral intralipid supplementation. Presumably, intravenous lipid supplementation provides an appropriate culture medium for *M. furfur*.

All of the cutaneous clinical variants have an equal sex distribution. Small children and elderly adults are infected only in unusual circumstances such as prolonged occlusion or immunosuppression.

![Image](image-url)

**Fig 4.1** Skin scales mounted in Parker's stain, bright field. *Malassezia* yeasts are seen present.
4.3 Laboratory diagnosis

4.3.1 Direct examination:

Direct examination of a lesion under Wood’s lamp (Fig. 1.2 page 31) shows pale yellow fluorescene. Direct microscopic examination of scales in 10 % KOH or Parker Quink stain shows characteristic yeast and mycelia. The round yeast cells are 2 to 7 μm in size with occasional budding. The hyphae are short, stout and may be curved, infrequently branched and have a characteristic bananas and grapes or spaghetti and meatballs appearance. Histopathology with H & E stain shows typical morphology of the yeast in the stratum corneum and sometimes in the perifollicular region. Periodic Acid Schiff (PAS) staining is confirmatory test.

4.3.2 Culture

Culture is rarely needed to establish the diagnosis. However, Sabouraud’s dextrose agar with chloramphenicol, Acti-Dione, Tween-80 and layered with olive oil produces yellowish colonies within 5 to 7 days.

4.3.3 Serology and immunology

The poor immune response of the host can be assessed by lymphocyte blastogenesis to the specific tissue antigen. Antibody specific to *M. furfur* can be determined by transferable solid phase Enzyme Linked Immunosuppressive Assay (ELISA). Fluorescent microscopy shows green and orange fluorescent fungal elements.
4.3.4 Animal serology

M. *furfur* can rarely infect organ other than the skin. *M. furfur* infects human skin and not other animals or living organisms. Ordinary animals appear immune to the fungus applied in scales. The disease has not been reported in domestic, wild or laboratory animals.

4.3.5 Differential diagnosis

Tinea versicolor must be differentiated from seborrhoeic dermatitis, pityriasis rosea, pityriasis rubra pilaris, pityriasis alba, leprosy, syphilis, and vitiligo. In the atrophic variant, the lesions may suggest para-psoriasis, mycosis fungoides, anetoderma, lupus erythematosus, or steroid atrophy.

The diagnosis in all forms of tinea versicolor is generally easily established by Wood’s lamp and KOH examination. In seborrhoeic dermatitis the patches have an erythematous yellowish tint and the scales are soft and greasy, whereas in tinea versicolor the scales are furfuraceous.

4.4 Treatment

Imidazoles, triazoles, selenium sulfide, ciclopirox olamine, zinc pyrithione, sulfur preparations, salicylic acid preparations, propylene glycol and benzoyl peroxide have been used successfully as topical agents. Selenium sulfide lotion is very cost-effective, and can be applied daily for a week, washed off after 10 min. It is also effective in a single overnight application. This can be repeated monthly as prophylaxis. The scalp can be shampooed
monthly with selenium sulfide to reduce scalp colonization. Zinc pyrithione soap is also cost effective and well tolerated for treatment and prophylaxis.

Ketoconazole in 400 mg doses repeated at monthly intervals is very effective. Oral itraconazole 200 mg once a day for 7 days is effective and can be followed by prophylactic treatment with itraconazole, 200 mg twice a day for a month. In a study of 50 patients, 400 mg single dose intraconazole was shown to be equivalent to 200 mg /day itraconazole for 7 days. Fluconazole, 400 mg once, may also be effective and can be repeated at monthly intervals. In one study of 128 patients, weekly dose with two 150 mg capsules of fluconazole for two weeks was found equivalent to weekly dose of two 200 mg tablets of ketoconazole for two weeks. The effect of a single dose, not repeated in 2 weeks, was not assessed in this study, and may have proved just as effective. Although terbinafine has been shown to be ineffective as a systemic agent, it is effective topically. Its application twice a day is superior to once a day application.

Patients should be informed that the hypo and hyper pigmentation will take time to recover and is not a sign of treatment failure. Relapse is likely if prophylactic doses are not given occasionally, but many options are available for prophylactic treatment. After initial therapy, patients may prefer weekly washing with a topical zinc pyrithione bar, single overnight applications of selenium sulfide, ketoconazole, econazole or bifonazole shampoo every 30 to 60 days, or monthly oral therapy.
4.4.1 First time use of photon in pityriasis versicolor

Use of lasers was found through literature during eighth and ninth decade of 20th century. In India it started late in last decade of 20th century. Our group achieved a great breakthrough by using pulsed nitrogen laser, incidentally we found no paper mentioning its use for treatment of pityriasis versicolor.

4.4.2 Present case study: UV nitrogen laser in the treatment of pityriasis versicolor

We studied the potential of UV nitrogen laser in the treatment of pityriasis versicolor. Digital photographs shows the course of treatment. (Fig. 4.2, page 122, 123)

A patient aged 37 years had pityriasis versicolor since last one year. The lesion affected his nape of neck, front of neck and upper chest involving at least 9% of the body surface area. The patient belongs to the skin type V according to Fitzpatrick scale. The patient had family history of pityriasis versicolor. Wood’s light (Fig. 1.2 page 31) examination was carried out as a separate diagnostic technique. Part of the affected portion was exposed to UV lamp. The intensity of UVB light was 9.00 mW/cm². The initial dose of energy was about 2.60 J/cm², when the irradiation time was adjusted to 4 min 49 sec erythema occurred. Additional doses were given on alternate day by increasing exposure time by 22 sec per dose. Treatment was terminated when irradiation time was 9 min 16 sec corresponding to the total energy of 8.34 J.
The patient was administered different combination therapies with topical agents like Nuforce and systemic agent like Fluconazole\textsuperscript{13}. Two Fluconazole tablets after the dinner were suggested\textsuperscript{14}. After 15 days from the beginning of treatment two more tablets were suggested. Antidandruff shampoo Nizral 2\%, 5 ml was suggested on alternate days.

\textbf{4.4.3 Results and discussion}

The remaining part of the affected portion was exposed to UV nitrogen laser to number of pulses which give same number of photons as the UVB lamp. The digital photographs were taken before, during and after treatment showing completely treated portion.

\textbf{4.4.4 Conclusion}

Though the laser treatment in case of pityriasis versicolor is apparent to be costly, it has its own advantages

1) Relapse rate of pityriasis versicolor is nearly negligible.

2) Uniform pigmentation takes place as compared to drug treatment alone.\textsuperscript{15}

3) Drug reaction reduces.

4) Treatment time is curtailed to half of its proposed period.\textsuperscript{16}

5) Large scale production of UV laser like home made nitrogen laser can brings treatment cost to minimum affordable price.\textsuperscript{17}
References


Fig. 4.2 (a) Pityriasis versicolor lesions before first laser treatment

Fig. 4.2 (b) Pityriasis versicolor diagnosis with wood's lamp
Fig. 4.2 (c) Pityriasis versicolor lesions after one month of laser treatment

Fig. 4.2 (d) Completely treated pityriasis versicolor lesions