1955

Problem of Common Fungus Infections

Calvin J. Dillaha

University of Arkansas, Fayetteville

Follow this and additional works at: http://scholarworks.uark.edu/jaas

Part of the Fungi Commons, and the Integumentary System Commons

Recommended Citation

Available at: http://scholarworks.uark.edu/jaas/vol8/iss1/24

This article is available for use under the Creative Commons license: Attribution-NoDerivatives 4.0 International (CC BY-ND 4.0). Users are able to read, download, copy, print, distribute, search, link to the full texts of these articles, or use them for any other lawful purpose, without asking prior permission from the publisher or the author.

This Article is brought to you for free and open access by ScholarWorks@UARK. It has been accepted for inclusion in Journal of the Arkansas Academy of Science by an authorized editor of ScholarWorks@UARK. For more information, please contact scholar@uark.edu, ccmiddle@uark.edu.
THE PROBLEM OF COMMON FUNGUS INFECTION

CALVIN J. DILLAHAN, M.D.
University of Arkansas

Superficial fungus infections of the skin constitute one of the most common of all diseases. This is particularly true in the South where the higher mean temperature promotes their growth. The superficial fungus infections about which I will speak today require keratin for growth. It is because of this that they involve only the skin and its appendages and do not invade deeper organs and structures. Keratin is the main constituent of the outermost layer of the skin and is the substance of which nail and hair are composed. The superficial fungus infections are not considered consequential by the clinician and the researcher as they are not crippling or killing diseases. Nevertheless, the chronic fungus infection with its periodic acute flareups is, for the patient afflicted, indeed a serious disorder, not only from the standpoint of his suffering, but also because it may constitute such a financial burden as a result of the time lost at work and the expense of the treatment. During World War II fungus infections were one of the more common causes, if not the most common, of non-battlefield casualties. Because there is such widespread involvement of the population with superficial fungus infections, the loss to the country as a whole undoubtedly amounts to many millions of dollars every year.

Bacterial infections have fallen in face of the onslaught of the numerous antibiotics, but no such broad approach is yet available in the superficial fungus infections -- with one exception, this being the fungistatic effect on certain fungi of the fatty-acid preparations. Although time honored, remedies containing sulfur, salicylic acid, benzoic acid, amine dyes, or ammoniated mercury are nevertheless of limited usefulness. It, therefore, seems appropriate that more attention be directed to everyday fungus infections, and today I should like to discuss this problem with you, including the relationship of therapy to the growth characteristics of the organisms on the human skin.

MALASEZIA FURFUR: This organism is the etiologic agent for a disorder known as tinea versicolor. It lives in the keratin layer of the skin and usually causes no symptoms but constitutes only a cosmetic problem. It cannot be cultured on ordinary media, and because of this it has been impossible to study its metabolism and to develop more effective therapeutic agents. Microscopic examination of preparations of scales removed from lesions readily reveals short, curved, hyphae and grape-like clusters of spores. This constitutes the characteristic and diagnostic picture of this disease. Although this infection is widely prevalent, it is not particularly contagious even among members of the same family. It would appear that part of the population is susceptible to this infection, while the remainder are completely immune. The disease is commonly active during the summer months, recurring year after year and involving principally the trunk and the proximal portions of the extremities. In areas unexposed to the sun the lesions are fawn-colored, slightly scaling, rounded patches, while in areas exposed to the sun the lesions are depigmented in sharp contrast to the normally tanned skin. The fact that the organism prevents tanning in areas exposed to the sun has, to my knowledge, never been studied. It has never been determined whether this lack of tanning is a result of the organism or its products acting as a physical screening agent such as paraaminobenzoic acid, or whether this effect is due to a biochemical inhibition of pigmentation. Treatment consists of the use of elementary sulfur in varying vehicles, and although the response is usually good, the disease is very prone to recur.

CANDIDA ALBICANS: This organism grows very rapidly on Sabouraud's media, and produces a disease known as moniliasis or thrush. Growth on corn meal agar media is an acceptable means of distinguishing it from other species of Candida. Candida albicans may be a normal inhabitant of the lower gastro-intestinal tract, and is therefore readily available to produce cutaneous disease in the susceptible patient by contamination of the skin surface. Monilial involvement of the vaginal vault is a common disorder, and, under proper circumstances, external cutaneous involvement may take place. Diabetes, for instance, predisposes to such cutaneous involvement because of the increased sugar in this area as a re-
result of urinary contamination. Thrush, a common monilial infection of the mucous membranes of infants is another example of the growth of the organism as a result of the host’s inability to resist. In markedly debilitated patients, generalized cutaneous involvement may be seen. At times the use of the bacterial antibiotics enhance the growth of monilia in the gastro-intestinal tract previously inhibited by the bacterial flora. Overgrowth of Candida albicans in the gastro-intestinal tract of course increases the likelihood of cutaneous infection. Moniliasis of the paronychial areas of the fingers in women who have their hands in water frequently is common. Eventually the organism invades the nails, and this may result in considerable disfigurement of the nails.

Treatment in any of the above conditions is far from ideal. It usually involves an attempt to improve the host’s physical state -- for example, the administration of insulin to control the glucose level in a diabetic and the administration of a topical remedy. A standard remedy is the purple dye, gentian violet. This is frequently effective if the patient’s general status is good. Occasionally the fatty-acid preparations are helpful.

Rarely moniliasis may result in granulomatous lesions of the skin similar to the disease produced by the deep fungi such a blastomycosis. This granulomatous condition is unresponsive to all therapy and is in time fatal.

**TRICHOPHYTON RUBRUM:** This organism, easily cultured on Sabouraud’s media, produces a fluffy white surface growth with a characteristic dark red pigment on the reverse. Cutaneous involvement may result in a most recalcitrant and resistant type of disease. Many patients, when first seen by a physician, have already had their disease for years. An individual lesion may arise in an area no larger than a few millimeters in diameter, but in time, with peripheral extension, the lesion may reach a diameter of a foot or more. This gradual increase in the size of a lesion may take place in the face of the best available treatment. Trichophyton rubrum is also quite prone to involve the fingernails and toenails, producing a gradual degeneration and destruction of the nails. One of the most striking features of Trichophyton rubrum infections is the common occurrence of involvement of the skin of one palm, producing a scaling, hypertrophic, diffuse type of lesion. This lesion may exist on one palm for many years without involvement of the opposite palm. Here it is evident that local susceptibility is an important factor, for obviously there is ample opportunity for the infection to spread to the normal palm. This is a most interesting phenomenon and should point to some clue as to the nutritional requirements of the organism.

Although this disease may exist continuously for many years in one form or another in a patient, there are only two reports in the entire medical literature in which the infection spread from the patient to other members of the same household, thus indicating that there is also a marked variation in susceptibility between individuals as well as between local areas in the same individual. One recent report demonstrated that these people have an increased tolerance to glucose; i.e., a flattened curve on intravenous administration of a test dose of glucose. This is one of the first available clues to possibly explain the variations in individual susceptibility. Skin involvement with Trichophyton rubrum shows striking seasonal variation in Arkansas. Here the lesions become active in April, gradually enlarging until November when, with cooler weather, they subside almost completely. In the North, because the period of warm weather is shorter, the involvement is never as extreme and the lesions never as large. Extensive Trichophyton rubrum infections are actually very rare in the North. In contrast, in southern Florida the lesions persist and continually enlarge the year round without seasonal fluctuation. Thus, all the advances of modern medicine must bow to Mother Nature, for cool weather is for the most effective treatment, topical remedies being of limited value.

The nail involvement also is just as unresponsive to treatment. Fungus infections of the nails as a whole are quite difficult to treat, Trichophyton rubrum being the most obstinate. Experienced dermatologists have remarked many times that they have never seen a Trichophyton rubrum infection of the nail cured.

**TRICHOPHYTON MENTAGROPHYTES:** This is the most common of the superficial fungi and can be easily cultured on Sabouraud’s media. In Arkansas it is the usual etiologic agent in athlete’s foot (Tinea pedis), crotch itch (Tinea cruris), and other forms of ringworm. Frequently this type of infection is overtreated with one or several proprietary preparations, producing more irritation than the
disease itself. If an effective treatment is used, it is very often used only until the patient is free of symptoms, and not necessarily free of the infection. Therefore, recurrence at a later date is the rule. This infection responds well to therapy with the fatty acid preparations. Treatment, to be effective, must usually be persisted in for from four to six weeks even though all visible signs of the disease may have disappeared during the first two weeks of therapy.

**Microsporum Audouini:** Beginning about 1940 the United States came to grips with a virulent pandemic of ringworm of the scalp. Originally the northern and eastern states, particularly the metropolitan areas, were confronted with thousands of cases in children. In time the pandemic involved the Middle West, and by 1947 approximately 4,000 cases were estimated to be present in St. Louis, Missouri. Gradually the epidemics waned in those areas but were not there contained, for the infection now has spread to the South. Recently in several localities in Arkansas large numbers of cases have been reported, and it is quite likely that the infection now smoldering in other areas of the state will soon demonstrate heightened activity.

The etiologic organism of this pandemic of ringworm of the scalp is Microsporum audouini. This organism is easily cultured on Sabouraud’s media, producing a characteristic growth. When invasion of hair takes place, the disease eventually so weakens the hair that it is easily broken, and if a number of hairs are involved, patches of partial alopecia appear. Examination of an area of involvement under a filtered ultraviolet light reveals a striking green fluorescence in contrast to the non-fluorescence of non-infected hair. The nature of this phenomenon has been studied, but it is not at all clearly understood. Microsporum audouini, in addition to causing ringworm of the scalp, may also invade the non-hairy skin and the nails. The scalp disease is primarily an infection of children and adolescents below age fifteen. The organisms form a sheath of spores and hyphae around the hair and gradually grow down the hair shaft and into the root. As new hair is formed at the root and grows out, the infection spreads to the new hair so that there is continuous involvement of the entire hair shaft including the root, although new hair is being formed all the time. Unless proper therapy is instituted, the disease may last from months to years. However, during puberty, infection undergoes spontaneous healing. It has been demonstrated that this is due to a fungistatic effect of changes in the sebum occurring at puberty. Topical therapy for tinea capitis has never been very effective. Although fungistatic agents locally applied kill the fungus exposed on the surface of the hair, they will not penetrate to the infection in the root of the hair shaft. Therefore, effective therapy has always involved removal of infected hair from the patient.

**Comment:** From what has been said, it should be apparent that fungus infections constitute an ever-present problem, particularly in Arkansas and in the South. It will be solved only by continued research both at basic and clinical levels, directed on the one hand to determining the growth habits and requirements of the fungi, and on the other hand to the pathologic physiology of the host that accounts for the differences in susceptibility between individuals and between different areas of the same individuals.

In considering the possible solutions to the problem, two are worthy of mention. Certainly an effective antibiotic or other chemo-therapeutic agent for topical application in a limited disease, or for systemic administration when involvement is widespread, would be of considerable value, particularly in Trichophyton rubrum infections. It is doubtful that a systemically administered fungistatic agent would be effective in nail disease as the agent would not actually reach the disorder. Nail disease might well be cured by a physical agent such as intense cold.

It has not been my purpose to appear pessimistic or assume a defeatist attitude, but rather to present the problem of the superficial fungus infection in its true light in the hope that new awareness of its magnitude and importance might be aroused.