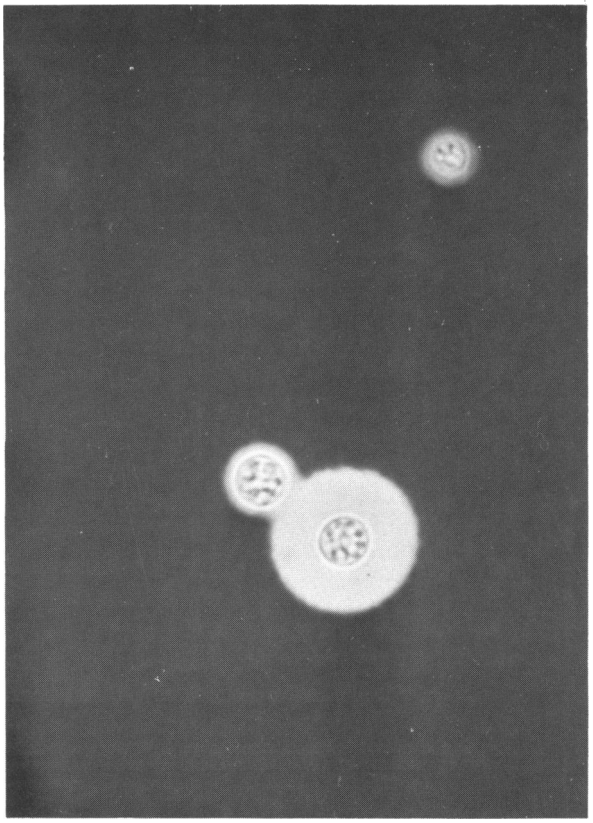
A STUDY OF INCIDENCE AND PREVALENCE

The Medical Mycological Iceberg



Cryptococcus neoformans in India ink preparation. 1175X

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ANY attempt to quantitate the impact of the mycoses on public health is doomed to failure. Since they are not classified among the notifiable diseases, hard data on their incidence and prevalence, as well as information on the morbidity and mortality they cause, are either fragmentary or simply not available.

The situation that confronts us can well be likened to an iceberg. The only visible portions of the vast bulk of the mycoses problem are a few peaks and crags. Even these are only dimly revealed at best by the scattered reports that are available on the incidence and prevalence of fungus infections.

Data on the number of persons affected by mycoses are not compiled regularly by any nation or organization. Information on the occurrence of mycoses is further obscured by commercial secrecy, which makes it difficult to obtain or to publish figures on the dollar and cents value of the antifungal pharmaceutical preparations marketed. Consequently, the public is apathetic, and public health organizations have not given any truly significant or sustained support to programs to control these diseases.

This report of the incidence and prevalence of mycoses was compiled from numerous case reports, reviews, and surveys published by investigators throughout the world.

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Cutaneous Mycoses

It should be obvious to all that the cutaneous mycoses do, indeed, constitute a serious public health problem. Their toll in terms of suffering, disability, man-hour losses, psychological trauma, and monetary expenditure is much greater than is generally realized. Among this group of diseases are some that approach dental caries and the common cold in both incidence and prevalence. Untold numbers of people throughout the world are af-

flicted by the specialized fungi that invade and destroy skin, hair, and nails.

Tinea versicolor. In tropical regions of the world, tinea versicolor is widespread. Millions of persons are infected in Africa, Asia, and Latin America. For example, in the Democratic Republic of the Congo, Vanbreuseghem (*1*) noted that this disease was the most prevalent of all the mycoses. The disease is rife among the inhabitants of the coastal areas of Mexico, the so-called tierras calientes, and Gonzalez-Ochoa (*2*) has observed a 50 percent rate of infection in the general population.

An equally high prevalence of this disease was encountered by Marples (*3*) in Western Samoa. A similar situation must exist throughout Melanesia and Polynesia. Indifference to tinea versicolor is universal; many victims are either unaware of their infection or are resigned to live with it because of limited financial resources and lack of medical facilities.

Although tinea versicolor is especially prevalent in the tropics, it occurs elsewhere as well. Stein's data (*4*) show that it is responsible for approximately 5 percent of the fungus infections in temperate regions. Certainly this disease is not uncommon in the United States. Dermatologists are well acquainted with it and treat many patients.

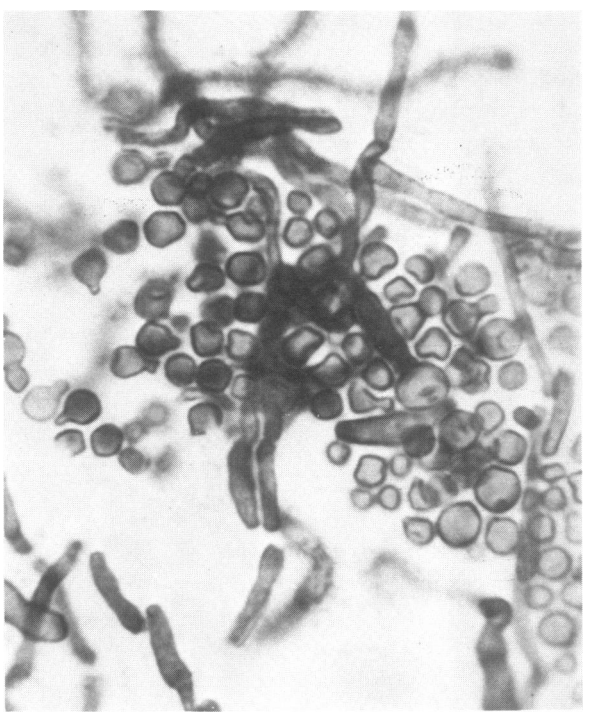
Tinea pedis. Tinea pedis is another cosmopolitan disease; myriads of cases occur in all countries of the world. In contrast to tinea versicolor, this disease is more widespread in temperate than in tropical areas. As it happens, athlete's foot is virtually unknown in those regions where large numbers of inhabitants go without shoes because of the combined factors of warm climate and low income. In other areas, however, it may affect from 50 to 90 percent of the people in the course of their lives (*5*). English (*6*) estimated that up to 70 percent of the general population may have clinical signs of tinea pedis, although only a small percentage of such persons can be proved to have a mycotic infection.

In certain population groups, however, the rate of confirmed cases may be high. Hulsey and Jordan (*7*) observed fungus infections in 63 percent of the university students they examined. During World War II, Hopkins and co-workers (*8*) found lesions in the feet of more than 80 percent of the men on an infantry post. Microscopic studies of the skin revealed fungus elements in 70 percent of those who had intertrigo of the toes and in more than 90 percent of those with dysidrotic lesions on the soles.

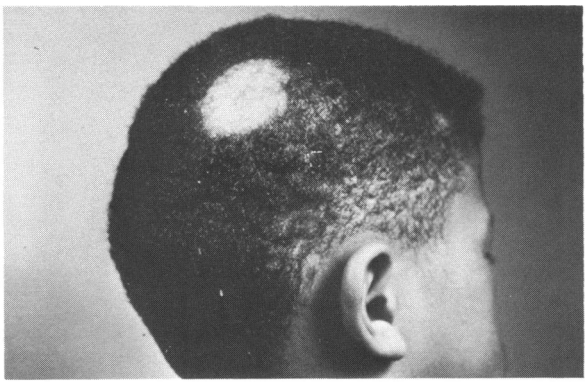
Blank and co-workers (*9*) reported that skin diseases among the American troops in Vietnam are the commonest cause of disability. In the Mekong Delta, for example, 77 percent of 209 men required hospitalization for foot infections. The most frequent etiologic agent of the dermatomycoses was *Trichophyton mentagrophytes.*

Tinea capitis. Despite such optimistic statements as "Ringworm of the scalp, a scourge of childhood for more than 2,000 years, has finally yielded to treatment with griseofulvin" (*10*), this disease still flourishes in many parts of the world (*11–13*). It is especially prevalent in the underdeveloped areas of Africa, Asia, and Latin America, where funds for specific medication with griseofulvin are not readily available. The prevalence of tinea capitis is directly related to the economic status of the families and of the country in which they live. For example, a survey by Vanbreuseghem (*14*) in Somalia showed a 36 percent prevalence among boys 5–10 years of age. In the Sudan, Mahgoub (*15*) noted that 17 percent of the students in a boys' boarding school were infected.

The incidence of scalp infections is also high in the Middle East and parts of Asia. Rates reached



Appearance of *Malassezia* (Pityrosporum?) *furfur* in skin scraping from a case of tinea versicolor. 1200X



Athlete's foot caused by *Trichophyton rubrum* (left). Loss of hair in circular patches caused by *Microsporum audouinii* (right).

23 percent in a home for boys in Poona, India, (*16*) and 10 percent in a school in Kashmir (*17*).

In general, scalp infections in Europe and the United States are relatively infrequent. As in other parts of the world, however, their prevalence is greatest among the socially deprived groups. Beginning in 1960, one of the most extensive surveys of tinea capitis in history was conducted in Yugoslavia under the direction of Grin (*18*). A total of 1,782,000 people were screened. Among them, 94,296 cases of tinea capitis were diagnosed, corresponding to an infection rate of 5.3 percent. In some villages, morbidity was as high as 8.6 percent. In Greece, a survey (*19*) revealed a 1.4 percent level of infection among 4,701 children examined. In one village, however, the incidence was 17 percent. A Washington, D.C., survey in 1959 (*20*) showed that 0.8 percent of the elementary school children were infected, and in an Atlanta, Ga., study, 2.6 percent of 1,753 school children had tinea capitis (*21*).

Although the tineas are not usually disabling, they do constitute an important public health problem. In many countries, children with ringworm of the scalp are barred from school until they are cured. Thus, at a critical age in their lives, they are deprived of their educational rights. In addition, they may be subjected to psychological traumas by being forced to wear distinctive headwear and by being shunned by their peers and by neighborhood families.

Tinea imbricata. The social consequences of *Trichophyton concentricum* infections in Melanesia and Polynesia merit special attention. Tinea imbricata is well established in many islands in the southern part of the Pacific Ocean. Infection rates of 18 percent have been observed in some villages of Papua and New Guinea (*22*).

In a carefully conducted epidemiologic study in New Guinea (*23*), the social consequences stemming from tinea imbricata were discovered to be profound. The shunning of infected men as prospective husbands contributes to bachelorhood. Infected women are married at a later age than uninfected ones, and then most often they become the second wife of a polygamous husband. In addition, infected children and adults are discriminated against educationally and in employment. Lack of funds for mass treatment and control programs prevents reduction or elimination of the disease and its attendant social problems.

Tinea corporis. Tinea corporis and nail infections are quite prevalent throughout the world. Data on their frequency are not available, but the general opinion is that these conditions are not uncommon and some, such as nail infections, are increasing in prevalence (*10*).

An indirect estimate of the size of the cutaneous mycoses infections can be obtained through data on expenditures for antifungal preparations. Information obtained in 1960 (*24*) revealed that $25 million had been spent for ringworm medications during the previous year. More recently, the Wall Street Journal of March 6, 1968, quoted the 1966 sales of griseofulvin at $6,700,000. If we assume, conservatively, that $25 million has been spent in the United States for ringworm medications every year since 1959, their dollar value to date in this country alone comes to $275 million for the past 11 years.

Subcutaneous Mycoses

Under the heading of subcutaneous mycoses the following three diseases are discussed: chromoblastomycosis, mycetomas, and sporotrichosis. The data on prevalence and incidence of these mycoses are even more fragmentary and incomplete than

Characteristic cauliflower-like outgrowths in case of chromoblastomycosis caused by *Fonsecaea pedrosoi* (above). Sporulation carried out by *Fonsecaea pedrosoi* in culture. 1660X (below).

those on the cutaneous mycoses. Nevertheless, occasional surveys give fleeting glimpses of the dimly sensed bulk of their numbers.

Chromoblastomycosis. Cases of chromoblastomycosis are especially prevalent in Africa and Latin America. The disease also occurs with less frequency in Asia, Australia, Europe, the United States, and Canada.

Every public health worker in Latin America and anyone who has visited hospitals there cannot fail to be impressed by the number of patients with chromoblastomycosis in the wards and outpatient clinics. Data compiled by Romero and Trejos (*25*) reveal how common this crippling and disfiguring disease may be. In Costa Rica, they estimated that the case rate was approximately one per 24,000 inhabitants. The prevalence rate in the Republic of Malagasy is also high. During the 4-year period, 1955–59, Brygoo and Segrétain (*26*) recorded 129 cases, signifying a case rate of one per 32,500 persons. In one district, the incidence reached an astounding rate of one per 7,000 inhabitants.

Such estimates, few and crude as they may be, provide an insight into the size of the problem that must exist in these and many other countries. Due to the therapeutic intractability of this infec-

tion and its high incidence, chromoblastomycosis looms as a disease of considerable public health importance.

Mycetomas. Mycetomas occur with striking frequency and have a devastating effect on the health of their victims in the tropical regions of the world. A survey by Abbott (*27*) in the Sudan revealed that for a 30-month period 1,231 persons had been admitted to hospitals and "a great many more were seen in outpatient departments."

Studies carried out in other parts of Africa reveal that mycetomas are prevalent in Algeria, Cameroun, Chad, Malagasy, Niger, Somalia, Tanzania, and Uganda (*28*). Data by Rey (*29*) support the thesis that mycetoma prevalence rates comparable to those of the Sudan exist across Africa in a belt characterized by an annual rainfall of 250–500 mm.

In Latin America, a survey conducted by Mariat (*28*) documented a large number of cases in Argentina, Mexico, and Venezuela. By far the greatest number was registered in Mexico. Latapi (*28*), during a 20-year period, compiled a list of 206 cases. Venezuela with 68 cases, and Argentina with 23, were the other countries with a relatively high frequency of mycetomas.

Mycetomas are less common in temperate regions. Green and Adams (*30*) supported the validity of reports of only 63 cases for the United States for the years 1896 to 1964. According to Nicolau and Avram (*31*), less than 100 cases had been reported in Europe up to 1960.

Since Asian reports on mycetomas are few in number, we have only a vague idea of the prevalence in that vast part of the world. A spot survey of material filed in the pathology departments of five medical colleges in southern India brought to light 187 cases (*32*). This report gives an inkling of the true size of the problem as it must exist not only in this area of India but also throughout Asia as well.

Mycetomas are not as uncommon as currently available data indicate. They occur frequently in a broad zone around the world. The numerous victims lead lives of resigned desperation, because in the absence of medical services and effective chemotherapy, they face the inevitable and irreparable loss of limbs and a desolate future. These infections challenge public health workers everywhere to develop preventive programs and to establish centers for early diagnosis and prompt surgical intervention.

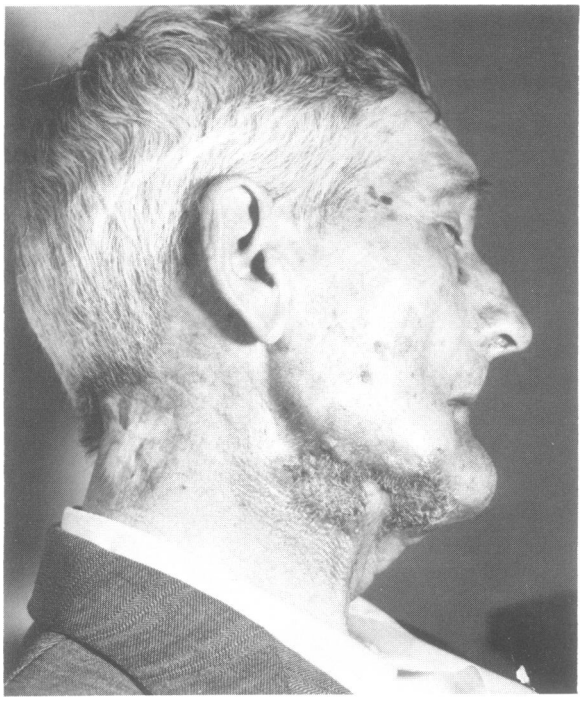
Sporotrichosis. In recent years, sporotrichosis has cropped up with surprising frequency in both temperate and tropical regions throughout the world. The greatest recorded outbreak of this or any other subcutaneous mycosis occurred in the deep subterranean gold mines of South Africa. During a period of 28 months, 2,825 miners became infected after contact with timber overgrown with *Sporothrix schenckii* (*33*).

Sporotrichosis is well known as an occupational hazard for florists, pottery packers, and others who come in contact with sphagnum moss (*34, 35*), straw (*36*), and wood products (*37*). But the majority of infections occur sporadically, usually following some traumatic incident in

Primary lesion in sporotrichosis (*Sporothrix schenckii*)

which soil-engendered spores of *S. schenckii* enter a wound. In parts of Brazil, sporotrichosis is estimated to account for 0.5 percent of all the dermatoses (*38*). The disease is especially common in Mexico (*39*); in the city of Guadalajara, it is considered to be the most prevalent of the noncutaneous mycoses (*40*). So many cases go unreported, however, that its true incidence remains unknown.

The development and use of antigens for a skin test of sporotrichosis have begun to reveal the occurrence of widespread subclinical infections by *S. schenckii* in the general population. Small scale surveys made in Louisiana showed a sensitivity level of 11 percent among prison and hospital inmates. In contrast, high-risk workers in plant nurseries had a 33 percent sensitivity rate, and the levels rose to 58 percent among those who had been employed 10 years or longer (*41*). In Arizona, the same antigen elicited positive reactions



in 10 percent of a group of 203 hospital patients (*42*). Sporothrixin prepared in Brazil elicited a 24 percent level of reactions in a small group of Brazilians and no reactions among 55 persons in Germany (*43*).

Systemic Mycoses

Five diseases—blastomycosis, coccidioidomycosis, cryptococcosis, histoplasmosis, and paracoccidioidomycosis—are discussed under the heading of systemic mycoses.

Blastomycosis. Although blastomycosis first came to medical attention in 1894 (*44*), much is still unknown about its geographic distribution, prevalence, and the natural habitat of its etiologic agent, *Blastomyces dermatitidis.*

At present, blastomycosis is known with certainty to be endemic only in the United States,

Secondary facial lesions in a case of blastomycosis, (below) close up

Canada, and eight African countries: Democratic Republic of the Congo (*45*), Morocco (*46*), Mozambique (*47, 48*), Republic of South Africa (*45*), Rhodesia (*49*), Tanzania (*45*), Tunisia (*45*), and Uganda (*45*).

By far the greatest occurrence has been recorded in the United States. A total of 1,470 cases, dating from 1894 to 1968, were tabulated (personal communication of September 4, 1969, from Dr. John F. Busey, director of education, Mississippi Baptist Hospital, Jackson, Miss.). A survey of the records of 170 Veterans Administration hospitals for the 12-year period 1946–57 disclosed reports on 198 proved cases or an average of close to 17 a year (*50*).

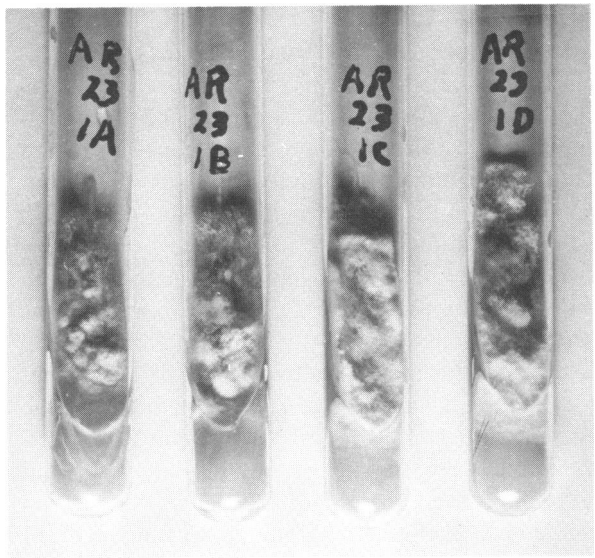
Another survey by Schwarz and Goldman (*51*) revealed that 99 patients were hospitalized in the United States during the first 6 months of 1953. A study of mortality from selected nonnotifiable diseases published by the National Communicable Disease Center (now, Center for Disease Control) showed 188 deaths attributed to blastomycosis—an average of 19 a year for the 10-year period, 1958–67 (*52*). Thus, the disease is a matter of considerable public health importance within the United States.

The prevalence of blastomycosis in Canada is relatively low compared with that in the United States. In the latest available compilation, 114 cases had been registered from 1906 to 1962, for a yearly average of 1.8 (*53*).

More time is needed before we can assess the nature and extent of blastomycosis in Africa. So far, information on only 11 diagnosed cases from Africa has been published.

Coccidioidomycosis. Coccidioidomycosis is a disease of limited distribution. It is only known with certainty to occur in North, Central, and South America, where its etiologic agent, *Coccidioides immitis,* flourishes in semiarid regions.

In the endemic areas of the United States, coccidioidomycosis is a major disease. Some 35,000 new infections are said to occur yearly in California alone (*54*). For the entire endemic area in Arizona, California, New Mexico, Nevada, Texas, and Utah, the annual total is believed to be about 100,000 cases. An estimated one-third of these persons have overt signs of infection. The latest compilation of deaths attributed to coccidioidomycosis in the United States reveals a yearly average of 53.3, for a total of 533 cases during 1958–67. As Fiese (*54*) has pointed out, however, it is morbidity rather than mortality that makes coccidioidomycosis a serious disease. "In the most highly endemic areas—Bakersfield, California; Phoenix, Arizona; and El Paso, Texas—nearly 100 percent of the population will have been infected in a few years, and about a fifth of them will have had an illness severe enough to cause temporary incapacity and to warrant medical care."



Group of cultures of *Coccidioides Immitis* isolated from Arizona soil

Unfortunately, data on coccidioidomycosis in Latin America are much less complete than those from the United States. In Mexico, results of a survey of reactions to skin tests have hinted at prevalence rates ranging from five to more than 50 percent in many States: Baja California, Chihuahua, Coahuila, Durango, Guanajuato, Jalisco, Nayarit, Nuevo León, San Luis Potosí, Sinaloa, Sonora, and Tamaulipas (*55*). Inhabitants of the tropical States of Colima, Guerrero, and Michoacán have significant coccidioidin sensitivity levels —10 to 30 percent of the population in Colima and Michoacán and 5 to 10 percent in Guerrero.

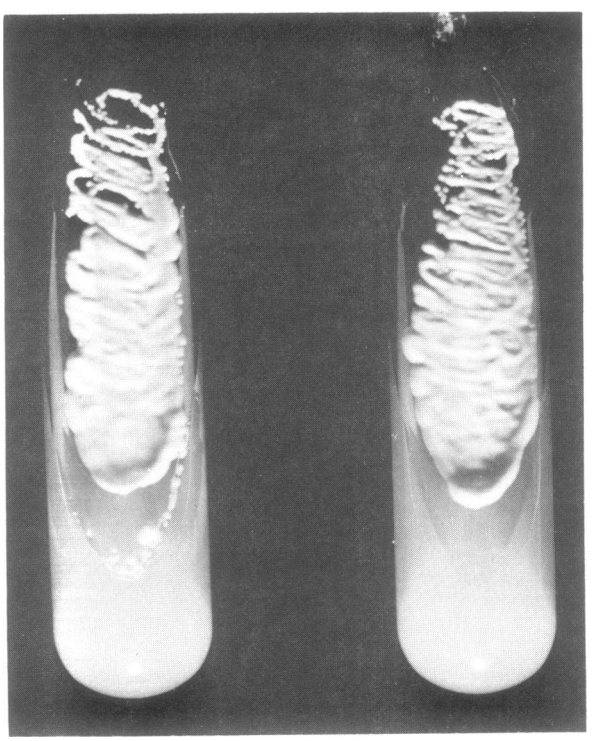
Endemic areas are small in Central America, appearing only in Guatemala and Honduras. Coccidioidin sensitivity levels of 26 percent were observed by Mayorga (*56*) in the population of two villages in the Motagua Valley of Guatemala. In Honduras, Trejos (in Mayorga, *56*) noted a reactivity level of 16 percent among the inhabitants of Comayagua Valley. A survey in 1969 showed that 9 percent of 448 residents of the city of Comayagua had positive reactions to skin tests (*57*).

In South America, Venezuela and Argentina have the most extensive endemic areas. The status of coccidioidomycosis in Venezuela was recently studied by Campins (*58*). The disease is endemic only in the States of Falcón, Lara, and Zulia. Coccidioidin sensitivity levels of 46 percent have been noted in Lara and of 24 percent in Falcón. Data on Zulia are not available.

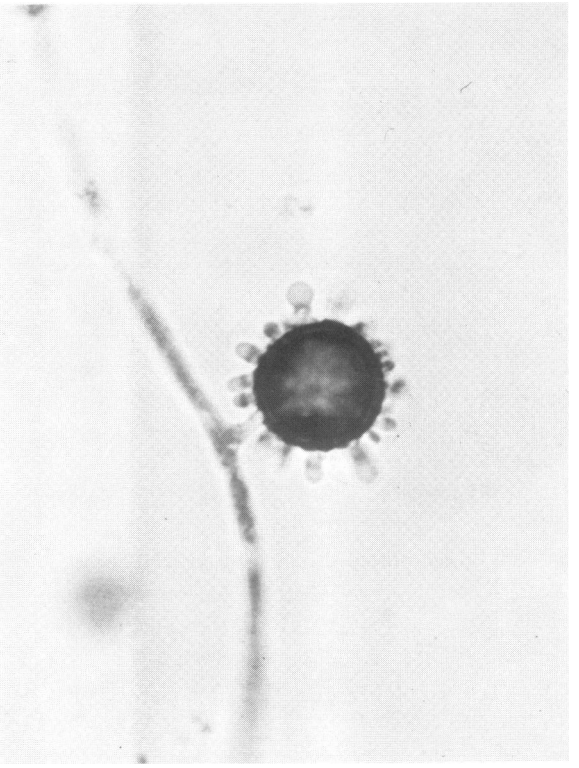
Few skin test surveys have been carried out in the remaining areas where coccidioidomycosis has been noted in South America. In Santiago del Estero, Argentina, a sensitivity level of 19 percent was recorded among 2,213 children between the ages of 6 to 16 (*59*). Only two surveys of coccidioidin have been carried out in Paraguay, and none have been made in Bolivia. The Paraguayan studies revealed reactivity among 82 Indians of 44 percent (*45*) and less than 3 percent reactivity in the residents of the city of Asunción (*60*).

Much remains to be done before the full extent of the coccidioidomycosis problem in Latin America becomes known.

Cryptococcosis. Cryptococcosis is one of the most serious and dreaded of the systemic mycoses. Its etiologic agent, *Cryptococcus neoformans,* has a marked tendency to invade the central nervous system and cause meningitis. Cases of this disease have been recorded in virtually all parts of the world. They present a diagnostic challenge, because the symptoms induce clinical and pathological changes that resemble tuberculosis, neoplasms, brain tumors, and insanity. Failure to recognize this mimicry leads to delays in accurate diagnosis and prompt administration of specific therapy and has even resulted in commitment to mental institutions.



Cryptococcus neoformans isolated from cat



Macroconidium produced by *Histoplasma capsulatum*

An accurate estimate of the prevalence of cryptococcosis and the morbidity that it causes is impossible to make at this time. Although cases are not required to be registered, other types of data indicate that this disease causes great suffering and that mortality is high. In the United States, 734 deaths have been attributed to cryptococcosis for the 10-year span 1958–67, for a yearly average of 73 (*49*). No statistics of this kind are available for other countries.

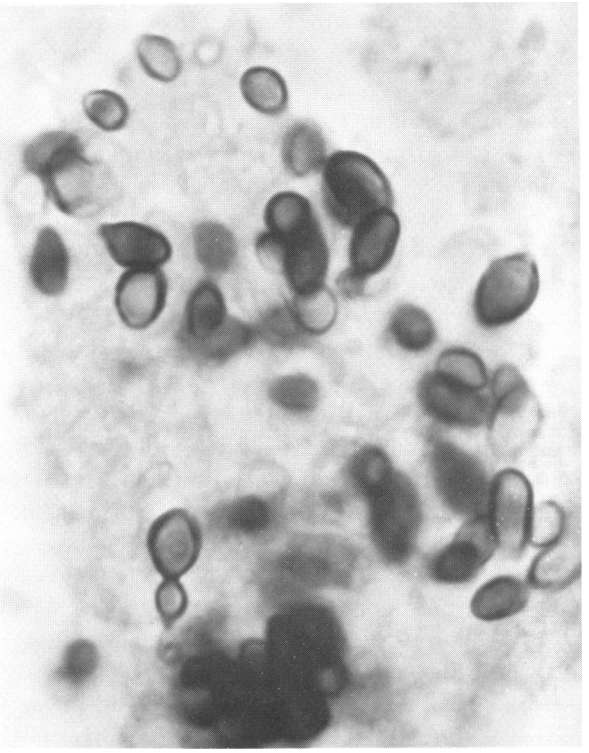
A few years ago, Utz (*61*) estimated that 200 to 300 cases of cryptococcal meningitis occurred annually in the United States. This figure, although based on an educated guess, may not be too far from reality. If the annual average of deaths attributed to *C. neoformans* is 73, and if we assume in this era of amphotericin B therapy

that fewer than one-fourth of the cryptococcosis patients die, then about 290 clinical cases of this disease probably occur annually.

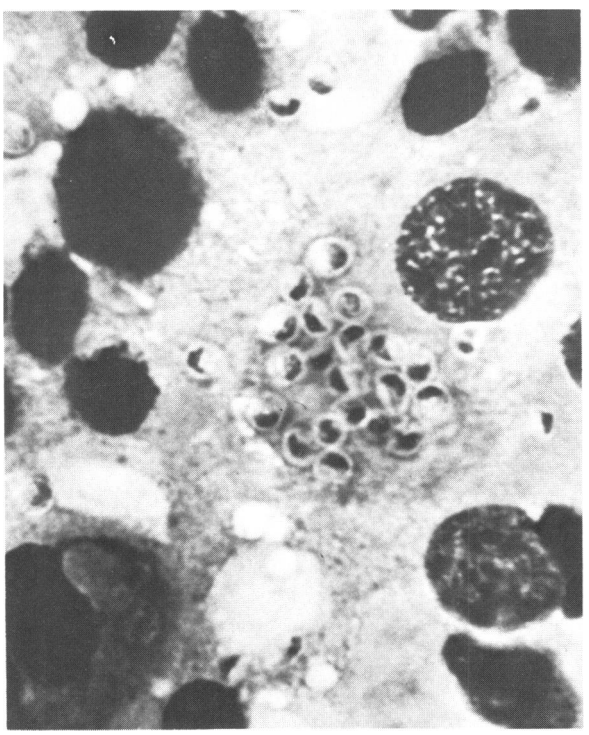
Last year the Fungus Immunology Unit of the Center for Disease Control received 666 serums and spinal fluids from 478 patients with suspected cryptococcosis, and 85 of these specimens gave positive reactions to tests. If other diagnostic centers released or recorded similar information, we could begin to get an idea of the prevalence of cryptococcosis, not only in the United States, but also in the rest of the world.

It is my belief that cryptococcosis is the sleeping giant among the deep mycoses. When reporting and surveillance programs are established, the number of cases of cryptococcosis will prove to be astonishingly high.

Histoplasmosis. Information on the prevalence and incidence of histoplasmosis is extensive when compared with that available for the other mycoses. Much remains to be learned, however, before we have the full picture of its impact on the welfare of human beings. Histoplasmosis cases have been diagnosed in virtually all parts of the world, but the frequency of infection varies considerably from region to region. Skin tests surveys with histoplasmin have revealed many areas with high levels of infection among certain groups of persons. Reaction levels of at least 10 percent were discovered in one or more regions of 25 countries: Algeria, Argentina, Brazil, Burma, Canada, Colombia, Cuba, Democratic Republic of the Congo, Ecuador, French Guiana, Honduras, Italy, Liberia, Malaya, Mexico, New Guinea, Nicaragua, Pakistan, Panama, Paraguay, Puerto Rico, Ruanda-Urundi, Surinam, the United States, and Venezuela (*62*).



Tissue form of *Histoplasma capsulatum* revealed by Gomori's methenamine silver stain. 1400X



Tissue form of *Histoplasma capsulatum in macrophage* (Giemsa tissue smear)

Absence of reporting makes it impossible to cite morbidity and mortality data for histoplasmosis. In the United States, estimated infections number in the millions. On the basis of one of the best planned and most extensive histoplasmin surveys ever carried out, it was determined that the sensitivity level of the populations in the 48 contiguous States averaged 20 percent (*63*). Using the latest U.S. Census Bureau estimate of 200,485,000 people for these States, and assuming that the yearly sensitization rate is constant and the histoplasmin reaction is specific, we can calculate that approximately 40 million persons are infected. On the basis of earlier data, Furcolow estimated that approximately 200,000 cases of acute pulmonary histoplasmosis occur yearly in

the United States (*64*). From 1958 to 1967, 736 deaths were attributed to this disease, for an annual average of 74 (*52*).

Information of this kind suggests the magnitude of the histoplasmosis problem. Additional attention is needed to insure that facilities are made generally available for the prompt and accurate diagnosis of the infection so that specific therapy can be initiated in the early and more responsive stages of the disease.

Paracoccidioidomycosis. Of all the systemic mycoses, paracoccidioidomycosis has the most restricted geographic distribution. As far as is currently known, this disease occurs only in Latin America. Its domain extends from Mexico to Argentina. Only Chile, Guyana, and Surinam in South America; British Honduras and Panama in Central America; and all the islands of the West Indies have no reported cases.

Case reports from Ghana (*65*) and Malagasy (*66*) are believed to be erroneous.

In the endemic areas, the incidence and prevalence vary greatly from country to country and from region to region within the countries. The greatest number of cases have been encountered in Brazil, Colombia, and Venezuela. Chirife and del Río (*67*) found that 1,724 cases had been recorded in Brazil, for a morbidity rate of 2.5 per 100,000 inhabitants. Venezuelan cases totaled 300, giving a rate of 5 per 100,000. Restrepo Morena and Sigifrédo Espinol (*68*) cited 373 cases for Colombia—337 more than were listed by Chirife and del Río (*67*) 3 years earlier. For all Latin America, 3,037 cases have been recorded. Such figures should be regarded as only an approximation of the true prevalence of paracoccidioidomycosis. The actual number of clinically manifest cases is probably much higher.

Until recently, lack of potent and specific antigens for skin tests prevented epidemiologic surveys from being used in determining the prevalence of infections and in locating endemic areas. Restrepo Morena, however, has now developed such an antigen. With it she and her collaborators (*69*) have begun population surveys. Among 3,938 persons tested, 10 percent were positive to a mycelial antigen and 6 percent to a yeast-form reagent. Variation among the counties in Colombia ranged from 6 to 13 percent.

Despite some evidence of cross-reactivity with histoplasmosis, the paracoccidioidin survey indicated that an asymptomatic benign form of paracoccidioidomycosis may occur in the endemic areas. There is an obvious need for more extensive field studies using standardized antigens. When these studies and surveillance programs are underway, we will begin to obtain a more objective picture of the extent of paracoccidioidomycosis.

Discussion

An attempt has been made to reveal the dimensions of the medical mycological iceberg. The information we have been able to gather, based on the meager data available and on educated guesses, incomplete as it may be, indirectly allows us to visualize and quantitate the dimensions of the infections. I am convinced that the mycoses represent a greater health burden and challenge than is realized by the public or by their health officials. Morbidity and mortality associated with the pathogenic fungi have been continuously underreported.

It is well known that whenever properly trained and motivated persons begin to study mycological problems, many cases are discovered where none had been thought previously to occur. As a result of this phenomenon, geographic distribution maps and prevalence and incidence data are misleading. The records generally reflect the location and activities of an investigator rather than true distribution patterns of the disease. Many regions considered to be relatively free of mycotic infections can properly be said to lack medical mycologists rather than mycoses.

The medical mycological picture is not all bleak, however. In the United States the recent second National Conference on Histoplasmosis (Atlanta, Ga., Oct. 6–8, 1969) passed a resolution recommending that steps be taken by the Center for Disease Control to have the mycoses classified as notifiable diseases. The lengthy process for implementing this resolution has already been initiated. In addition, CDC, through its Ecological Investigations Program, has begun to publish Mycoses Surveillance (*64*) which promises to provide much needed data.

At Buenos Aires in 1966 the 15th Pan American Congress on Tuberculosis and Pulmonary Diseases passed a resolution sponsored by the Union of Latin American Tuberculosis Societies, under the guidance of Dr. José I. Baldó, recommending that all member countries establish coordinating commissions for the study of mycoses at the national level. Several countries have already done

this. All others should be urged to follow their example. Once the commissions start to function, reporting mechanisms will be developed and implemented. Conceivably, the work of these groups could be coordinated under the auspices of the World Health Organization and the Pan American Health Organization. Global morbidity and mortality data would then be systematically collected, evaluated, and distributed to all persons interested in public health.

Until we can show that the apparent number of mycoses cases is deceptively small, that in reality the mycoses are common diseases, and that the toll they take in misery and mortality is high, we cannot expect to obtain the support needed for the development and implementation of control programs, research projects, and training courses.

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