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PRESENCE OF SPORES IN THE AIR OF LABORATORIES

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A phenomenon which is commonly observed in microbiology laboratories is the contamination of test tubes during the seeding of pathological material or microbial cultures from one culture medium to the other. This phenomenon should not surprise us, since the contaminating microbes always represent ubiquitous microbes of the *Aspergillus*, *Penicillium*, *Alternaria* species and other types of molds as well as species of different bacteria (*Staphylococci*, etc.). It may sometimes occur and it is not altogether exceptional that in such a tube there may grow in addition to the dermatophytes which were seeded, colonies of other species of dermatophytes. In similar cases we will invariably conclude that the insemination of seeding was not done quite according to the proper way, that the loop with which the seeding was done may not have been flamed up properly after having been used in the seeding of other cultures. This explanation is not quite universally valid, since the contamination of the dermatophytes may have been also done in some cases through the test tubes which may not have been properly flamed prior to seeding. It is understandable then, in such cases, that the contaminant could not have come from anywhere else but the air.

In a recently published article [3] Lorraine Friedman and her collaborators have attracted attention to the possibility of contamination of culture media with spores of dermatophytes from the air of laboratories.

They have recommended that the diagnosis of mycosis should not be based on a colony of dermatophytes which has developed in a test tube seeded with the pathological specimen unless the diagnosis of the species of the dermatophyte in question has not been specifically established and considering that the dermatophytes which have grown in the seeded tube may have come from the air. Examining the Petri dishes which have been filled with glucose agar in the laboratory in which the mycologic studies were done, the authors mention that in some of the Petri dishes which had been left open for 1 to 2 hours in the vicinity of patients with dermatomycosis from whom the pathologic material was collected, it was observed that not only the usual contaminants have developed but also the agents of these mycoses which have not been seeded directly. The spores which were seeded in this manner from the air in the Petri dishes belonged to the species of *Microsporum audouini* and *Trichophyton tonsurans*. Other species were not mentioned.

A fact which has not been reported as occurring to date is that in a tube seeded with pathological material collected from a patient with a specific mycotic disease, there may develop besides the dermatophyte which is the cause of this mycosis, a different dermatophyte which has not been identified in the repeated experience of the cited authors. Our own studies were carried out specifically in the laboratory of mycology of the First Clinic of Dermatovenereology by utilization of Petri dishes containing Sabouraud medium. This experience has been repeated 7 times, on different days. Similar Petri dishes were studied at the laboratory of mycology of the Center of Dermato-venereology of the Ministry of Health and Social Welfare, where such experiments had not been carried out until this date. The method which we have followed was that recommended by the above authors, with the specific exception that instead of keeping the Petri dishes open for 1 to 2 hours, we have reduced the time of exposure from 5 up to 10 minutes. More prolonged exposure has been consistently followed by massive invasion of the medium by species not only of *Aspergillus* and *Penicillium*, but also by *Mucor*, which have developed with extreme rapidity to the point of covering the complete surface of the medium.

The results of our experiments have been as follows: in the laboratory of mycology of the First Clinic of Dermatovenereology there has developed in Petri dishes exposed to the air, 4 strains of *Microsporum audouini* and 1 strain *Microsporum (Achorion) gypseum (fulvum)*; in these laboratories there have not developed, in Petri dishes exposed to the air, colonies of common dermatophytes. Of these 4 strains of *Microsporum audouini* which were isolated, 3 have developed in Petri dishes which were placed open next to patients suffering from a *Microsporum* infection, at a distance of about one meter from the patients during the time that the pathological specimens were being collected. It is worthwhile to stress the fact that for one of the strains of *Microsporum audouini* as well as for the strain of *Microsporum gypseum*, the contamination of the media in Petri dishes

discovered at the laboratory occurred during the time when there were no patients hospitalized with mycoses caused by these dermatophytes and there were no patients suffering from these diseases during the time of collection and culturing.

The presence of dermatophyte spores in the air was thus confirmed by cases of contamination of test tubes containing the culture. This shows that the cases of this type are not usually accorded the attention which they deserve. We have ourselves repeatedly observed cases of this type during a recent period of time. In one of the cases which we have observed, the contamination by air brought the appearance of a colony of *Microsporum gypseum* in a tube in which *Trichophyton terrestre* was being cultured. In another case the contamination brought the growth of a colony of *Trichophyton interdigitale* next to a colony of *Trichophyton schoenleinii* during the occasion of culturing the latter dermatophyte. The spores of these two species of dermatophyte (*Microsporum gypseum* and *Trichophyton interdigitale*) could not have come from anywhere else but the air of the laboratory, because the flaming of the seeding loop was carried out very carefully prior to seeding. Furthermore, in the vicinity of the area where contamination of these tubes occurred no work was being done with cultures of these species and no pathological material containing them had been kept.

When we add these last two cases to the five above-mentioned in which there was contamination of the medium in Petri dishes exposed to the air, the total number of cases of strains of dermatophytes which we observed as contaminating cultures is 7. Three of these strains, all of them belonging to the *Microsporum audouinii* species, have contaminated the laboratory atmosphere during a time in which we were collecting pathological material containing spores of this dermatophyte from patients. The spores of the other four strains, including one strain of *Microsporum audouinii*, two strains of *Microsporum gypseum* and one of *Trichophyton interdigitale* have obviously been dwelling in the air of the laboratory in the absence of patients harboring them.

Discussion - As we have mentioned, these three strains of *Microsporum audouinii*, which have contaminated the medium coming from the air during the time of collection of pathological material from patients, have actually come from these patients. On the other hand, we have the problem of the origin of the spores of dermatophytes which have been present in the air during the period in which no mycological study was being carried out. In this connection we may postulate two hypotheses; the first, which is the simpler, is that the spores of dermatophytes came from patients who were examined in the laboratory during the preceding day at which time the spores may have fallen onto the floor or deposited on the furniture, then drying and coming into the air with the dust during the time of the cleaning of the laboratory. This hypothesis is probably valid in the case of the strains of *Microsporum audouinii* mentioned above. According to the second hypothesis, the spores of one of these dermatophytes may come from the

soil on which as we know, one of these strains will exist as a simple saprophyte. The floor may have easily become contaminated with dust coming into the air of the laboratory through an open window. This hypothesis is worth considering with regard to *Microsporum gypseum*, a saprophyte of the soil. With regard to the possibility of existence of *Trichophyton interdigitale* as a soil saprophyte, further and new studies are required.

The results of the experiments carried out by Lorraine Friedman and collaborators, together with our experiments have shown the possibility of infection of culture media within the laboratory with dermatophyte spores present in the air. This calls our attention to one of the possible causes of error in interpreting the results of seeding carried out in the laboratory. It also suggests the possibility of transmission of dermatomycosis through the air. While transmission of some bacterial and viral diseases as well as some specific mycotic diseases (for instance coccidiomycosis) through the air is quite well known, the transmission by this way of infectious skin diseases is quite questionable. It is surely unlikely that a sufficient volume of such microbes might be deposited on any area of the skin which would be voluminous enough to overcome the resistance of the skin. These microbes reach the level of the skin more probably indirectly by the circulation, after entering the lungs. While at first glance this hypothesis may seem somewhat unlikely, it should not be ruled out a priori¹⁾ in view of the possible presence of dermatophytes (*Epidermophyton floccosum*) in human sputum [7] as well as in the lungs of experimental animals [2, 4]. The problem certainly deserves being studied in greater detail, since in the literature we could only find a very small number of studies in which this is mentioned. We may briefly comment here on the experiments of Lurie and Way [4], who have kept different animals in a cave whose atmosphere was infested with spores of *Trichophyton mentagrophytes* which had originated with bats. The authors have been able to isolate this dermatophyte from the lungs of animals which were so exposed.

Suppositions regarding the role of the air in the transmission of some mycoses have also been recently formulated by Mackenzie [5]. While studying an epidemic of trichophytia caused by *Trichophyton tonsurans* in a school, he found a large quantity of spores of this dermatophyte not only on objects which belonged to the pupils, but also in the air of the dormitory²⁾

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- 1) This supposition has been expressed by, among others, Vanbreuseghem [6].
 - 2) M. Chandler cited by Ajello [1] has isolated *Microsporum audouinii* from a Petri dish which had been exposed to the air in a post office.

Conclusion:

From what has been presented above we see that we must include the air among the agents which play a role in the dissemination of dermatophytes. Spores which may float on the air are capable of infecting culture media in mycologic laboratories, leading to false results of cultures. Until the present time it has not been possible to find out whether or not spores disseminated by air in this way are able to product dermatomycosis. The answer to this problem will surely come in the future.

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SUMMARY

R. Evolceanu, Georgeta Donciu -- THE PRESENCE OF DERMATOPHYTE SPORES IN THE AIR OF LABORATORIES

Resuming the experiments of Freidman and co-workers, the authors exposed open Petri dishes with Sabourand's medium to the air in the Mycology Laboratories of the Dermatovenereologie Centre of the Ministry of Health and Social Welfare and of the First Clinic of Dermatovenereology. Thus, 4 strains of *Microsporum audouini* and 1 strain of *Microsporum gypseum* were isolated from the air. Three strains of *Microsporum audouini* were isolated while pathological material was collected from patients suffering from microsporosis which proves that they came directly from the patients from whom they were seeded on the medium via the air. The fourth strain and the *Microsporum gypseum* strain contaminated the Petri dishes in the absence of patients. Mention is also made of casual seeding of culture

tubes, likewise via the air, in the absence of patients with another *Microsporum gypseum* strain and a *Trichophyton interdigitale* strain. To conclude, the authors draw attention to possible errors due to these casual seedings and pose the question of the spread of dermatomycoses via the air, already raised by other authors.

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