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Hygienic Characteristics of Mycological Contamination of the Indoor Environment of Hotel Complexes

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Abstract The article addresses the issues of hygienic assessment of mycological contamination of the indoor environment in residential and public buildings. The study presents the results of an analysis of the quantitative and qualitative composition of microscopic fungi in indoor air and on interior surfaces of premises with different functional purposes. The prevalence of opportunistic pathogenic and allergenic fungal species is assessed, as well as their role in the formation of unfavorable sanitary and hygienic living and occupancy conditions. The main factors contributing to the development of mycological contamination are considered, including humidity levels, ventilation efficiency, temperature conditions, and the condition of building structures. A comparative evaluation of the obtained data with current hygienic standards and sanitary regulations is carried out. The results of the study may be used to substantiate preventive measures aimed at improving indoor environmental quality and reducing the risk of adverse biological effects on human health.

Keywords Mycological contamination, Microscopic fungi, Indoor environment, Residential and public buildings, Sanitary and hygienic assessment, Biological factors, Indoor air quality, Environmental hygiene

1. The Relevance of the Topic

In the context of modern urbanization and the increasing length of human stay in enclosed spaces, the quality of the internal environment of hotel complexes is becoming one of the key factors affecting the health of the population. Microscopic fungi occupy one of the leading places among biological pollutants of the indoor environment, since they have the ability to actively colonize the air environment and indoor surfaces [1].

An increased level of mycological contamination of the indoor environment is associated with an increased risk of developing allergic diseases, bronchopulmonary pathology and mycoses, as well as with a deterioration in general health and a decrease in the working capacity of the population. Conditionally pathogenic and toxigenic species of microscopic fungi that produce mycotoxins and volatile organic compounds that adversely affect the human body, even in small concentrations, are of the greatest hygienic importance [2].

The increase in the number of buildings characterized by microclimate disturbances, insufficient ventilation, high humidity and defects in building structures makes it important to assess mycological contamination in a hygienic manner, since such conditions contribute to the growth and spread of fungal microflora. The problem of biological pollution of the internal environment acquires additional importance in the conditions of reconstruction and operation of modern energy-efficient buildings [3].

Despite the existence of sanitary and hygienic standards, the issues of a comprehensive assessment of the mycological condition of the premises, as well as the scientific justification of preventive and sanitary measures, remain insufficiently studied. In this regard, the study of mycological contamination of the indoor environment of the hotel complex and the development of approaches to its hygienic assessment are an urgent scientific and practical task aimed at preserving and strengthening public health [4].

Currently, air pollution by microscopic fungi is considered as one of the biological risk factors contributing to the development of allergic reactions of the population in closed rooms of hotel complexes. Microscopic fungi, whose natural reservoir is the soil, are characterized by their ubiquitous and permanent presence in the human environment. They are found on the surfaces of various structures and objects, are capable of colonizing food, pharmaceuticals and cosmetics, and their spores are easily transported by air currents and enter the human body during respiration. The high ex-position of myco-allergens in the residential environment contributes to the sensitization of the population. According to some authors, 6-15% of the total population and 2-30% of allergic patients are sensitized to fungal allergens. At the same time, an analysis of the literature indicates that the mycological factor in relation to the hygienic aspects of enclosed spaces is currently insufficiently covered in modern

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scientific works, has not been worked out regarding the patterns of its formation, taking into account the specifics of different types of buildings, premises, building and finishing materials, and microclimatic parameters of the indoor environment [5,6,14]. Exposure to mycoallergens in a residential environment is significant - a factor contributing to the development of sensitization of the population. According to individual studies, fungal sensitization is detected in 6-15% of the general population and in 2-30% of people suffering from allergic diseases. At the same time, the results of the analysis of literary sources indicate that the mycological factor has not been sufficiently studied in the context of the hygienic assessment of enclosed spaces, as well as the lack of systematic data on the patterns of its formation, taking into account the type of buildings and premises, the construction and finishing materials used, and the microclimatic characteristics of the indoor environment [7,10]. It should be noted that the current methodological documents regulating the assessment of fungal contamination of premises, including State standard ISO 16000-20-2017 "Indoor air. Detection and counting of mold fungi. Determination of the total number of spores" and sanitary norms and rules 0282-09 "Hygienic requirements for catering and living conditions in hotel complexes, motels, campsites, tourist bases and individual accommodation facilities" mainly reflect certain technical aspects of the detection and quantitative accounting of mold fungi. At the same time, these documents do not contain clearly regulated requirements defining indications for mycological examination, as well as the procedure, timing, location and volume of sampling for laboratory tests [8,9]. There are no hygienic criteria in the current regulatory documents that make it possible to assess the risk of fungal contamination and the factors contributing to its occurrence. The results of numerous studies show that a person's stay in a mycologically polluted environment can lead to the development of allergic diseases, including bronchial asthma, especially in the most susceptible groups of the population. It should be considered that microscopic fungi, being a natural factor, are constantly present both in the atmospheric air and in the indoor environment. Hygienic assessment of mycological contamination of the indoor environment is especially relevant due to the long time spent indoors and the high allergenic load. This requires studying the patterns of mycogenic pollution formation and defining specific conditions for establishing an approximate safe level of exposure. [11,12,13].

The purpose of the study is a comprehensive hygienic assessment of the fungal contamination of the indoor environment of hotel complexes.

2. Materials and Methods

To achieve this goal, a comprehensive mycological assessment of the internal environment of 40 residential premises was carried out, of which 15 had fungal damage to the walls; 5 rooms in public buildings, of which 2 facilities had fungal damage to enclosing structures, and the results of a mycological contamination examination of 1 room for various medical purposes in hotels were studied. The mycological examination of the premises was carried out in stages and included the following measures:

1) visual inspection of the enclosing structures of the walls, floor and ceiling to identify signs of fungal damage;
2) determination of the amount of microscopic fungi in 1 m3 of air (CFU/m3);
3) determination of the content of viable fungal spores in scrapings from surfaces suspected of having fungal lesions;
4) humidity measurement of enclosing structures;
5) determination of microclimatic parameters of indoor air;
6) evaluation of the ventilation system.

For the quantitative analysis of microscopic fungi in 1 m3 of air, samples were taken at the level of the human respiratory zone in each room, both directly at the sources of fungal damage to the walls and in the center of the rooms, using the aspiration method using a PU-1B aspirator device designed for bacteriological analysis of air.

Air sampling in residential buildings was carried out in all residential areas where there were signs of suspected fungal damage to wall structures. In public areas, samples were taken in areas with visible traces of fungal damage to enclosing structures or in the presence of employee complaints of allergic reactions. Additionally, samples of the air coming through the supply ventilation were taken. In parallel, the composition of microscopic fungi in the air environment of various types of buildings and in atmospheric air was evaluated. The studies were performed in different seasons of the year to account for the seasonal variability of mycophlora.

The assessment of the content of viable fungal spores in the enclosing structures was carried out after sampling construction and finishing materials from areas suspected of fungal damage, including scrapings of painted plaque, destroyed paint and plaster layers, damaged wallpaper, as well as samples of concrete and other materials.

In laboratory conditions, the selected samples were suspended in saline solution at dilutions of 1:10, 1:100 and 1:1000, after which they were inoculated on Petri dishes with a dense nutrient medium. In the presence of fungal films on the surfaces of furniture, tiles and other dense materials, when it was impossible to obtain samples by scraping, the method of flushing from an area of 100 cm2 was used. A swab with the collected material was placed in a test tube with 10 ml of sterile isotonic sodium chloride solution or sterile distilled water. In the laboratory, 0.1 ml of the flush was inoculated onto the surface of a dense nutrient medium using a sterile spatula. If necessary, a series of sequential dilutions of 1:10, 1:100 and 1:1000 were prepared from the initial washout, and 0.1 ml of each dilution was inoculated on Petri dishes with a dense nutrient medium. Agar wort, Czapek Dox agar and Saburo media were used to cultivate

microscopic fungi. The inoculants were incubated at a temperature of +28 ℃ for 7 days, after which qualitative and quantitative accounting of viable fungal spores was carried out in 1 g of the sample or on 1 dm2 of the surface. All identified fungi were subject to mandatory macroscopic identification by colony shape, color, and consistency, as well as microscopic identification by basic morphological features using special fungal determinants.

Colony identification was additionally performed using automated systems based on the MALDI-TOF platform using matrix-associated laser mass spectrometry. When assessing the qualitative and quantitative composition of fungal air pollution in hotel complexes and atmospheric air, attention was paid mainly to allergenic types of fungi. The study examined representatives of the so-called "big four" genera Penicillium, Aspergillus, Cladosporium, Alternaria, as well as fungi of the genera Mucor, Rhizopus and Candida.

3. The Results of the Study

The results of the study showed that the concentration of fungal spores in indoor air without signs of fungal damage to wall structures is primarily determined by the level of fungal air pollution, which is the main source of mycological pollution of the internal environment. At the same time, seasonal changes in mycological indoor air pollution differed from similar indicators of atmospheric air. The peak fungal load in unaffected rooms, as well as in the atmospheric air, was observed in spring and summer, however, the total mycological air pollution of residential premises during this period was lower than the level of microscopic fungi in the outdoor atmosphere. In the autumn-winter period, on the contrary, the level of fungal indoor air pollution exceeded atmospheric air indicators both in terms of the total content of fungi and in individual genera.

Table 1. Qualitative and quantitative characteristics of mycological pollution of atmospheric air and the air environment of residential and public buildings of the hotel

Indicator	Genera of fungi								Common fungal contamination
	Penicillium	Aspergillus	Cladodporium	Alternaria	Mucor	Fusarium	Rhisopus	Candida	
Atmospheric air									
Frequency of occurrence,%	75,3	72,1	50,3	29,2	30,1	29,5	10,2	14,9	1,0
Concentration range, CFU/m3	10-80	10-70	30-250	10-50	10-50	10-50	10-40	10-20	40-350
Residential apartments without fungal infestation									
Frequency of occurrence,%	77,5	72,1	45,2	20,1	24	6,8	10,4	4,6	100
Concentration range, CFU/m3	20-130	20-130	20-110	10-50	10-30	10-30	10-40	10-80	20-250
Residential apartments with fungal infestation									
Frequency of occurrence,%	92,0	74,7	30	5,8	4,3	1,0	10,9	-	100
Concentration range, CFU/m3	500-10500	70-1500	40-1100	10-600	10-100	10-300	10-500	-	590-11500
Office buildings without fungal infestation									
Frequency of occurrence,%	70	60,1	17,6	13,5	10,1	3,2	10,1	4,1	88
Concentration range, CFU/m3	10-110	10-60	10-70	10-20	10-20	10-50	10-50	10-50	30-130
Office buildings with fungal infestation									
Frequency of occurrence,%	90	82	39,5	14,3	14,3	4,2	10,2	-	100
Concentration range, CFU/m3	900-8700	60-1200	50-1100	10-500	30-100	20-400	30-100	-	950-9700
Stationary medical facilities without fungal infestation									
Frequency of occurrence,%	82	67,9	30,1	8,9	10,5	3,0	8,2	62,4	90,5
Concentration range, CFU/m3	20-250	10-120	10-240	10-40	10-30	10-30	10-40	20-410	50-460

A particularly high level of fungal contamination was observed for the genera Penicillium and Aspergillus, while the maximum concentrations of these fungi were recorded in winter. According to the data presented in Table 1, mold fungi of the genus Penicillium were most often found in the atmospheric air of the city of Nukus, the frequency of detection of which in the selected samples was 77.6%. Mold fungi of the genera Aspergillus and Cladosporium were in the second and third places in terms of detection frequency (74.6% and 59.2%, respectively). The next most common fungi were the genera Mucor (31.4%), Alternaria (29.5%), Rhizopus (15.31%) and Fusarium (10.7%).

In residential areas of hotels without signs of fungal damage to wall structures, the concentration of microscopic fungi in the air remained at a low level and averaged 50-80 CFU/m3, while the range of fluctuations varied from 0 to 250 CFU/m3.

It has been established that fungi of the genera Penicillium, Aspergillus, and Cladosporium are most common in the air environment of residential buildings. The incidence of fungi of these genera was 78.8%, 73.1%, and 46.1%, respectively. Fungi of the genus Mucor were found in 25% of the samples, Alternaria – in 21.2%, Rhizopus – in 11.5%, Fusarium – in 7.7%, Candida – in 5.8%. Microscopic fungi of the genus Penicillium have been found in the air environment of food storage containers (especially in places where vegetables and fruits are stored), which indicates the presence of their own internal sources of fungal air pollution. In addition, the results of the conducted studies have shown that the microflora inside the premises largely depends on their functional purpose and human activity. It was revealed that the highest concentrations of microscopic fungi are present in the air environment of bathrooms, which is explained by the presence of a ventilation system and a higher level of humidity, which promotes the growth of fungal spores. There are significant differences in the qualitative composition of fungi. Fungi of the genera Penicillium, Aspergillus, and Cladosporium were most common in residential areas, with a frequency of 78.8%, 73.1%, and 46.1%, respectively. Fungi of the genera Mucor, Alternaria, Rhizopus, Fusarium, and Candida were detected in 25%, 21,2%, 11,5%, 7,7% and 5.8% of samples, respectively.

The detection of Penicillium fungi in the air of food storage tanks, especially vegetables and fruits, indicates the presence of internal sources of mycological contamination. The research results also showed that the microflora of the premises largely depends on the functional purpose of the premises and the nature of human activity. The highest concentrations of fungi are found in the air of bathrooms, which is explained by high humidity and the presence of ventilation systems that promote the growth of fungal spores. In addition to quantitative differences, there were significant changes in the qualitative composition of the fungal flora.

The kitchen air was characterized by the widest range of fungal contamination, which is associated with the storage of food products, which are the source and environment for the development of fungal spores. In quantitative terms, the level of fungal air pollution in kitchens was on average 30% lower than in atmospheric air, but in terms of qualitative composition it often exceeded the outdoor air. The frequency of occurrence of individual genera of fungi in the air of kitchens exceeded the indicators of other rooms of the apartment and atmospheric air. In particular, spores of the genus Penicillium were detected in 97% of samples, while they were detected in rooms in 69% of cases. The concentration of Mucor fungi in the air of kitchens exceeded the level of atmospheric air pollution by more than two times.

Microscopic fungi are constantly present in the residential environment. It has been established that the level of general fungal air pollution in residential premises in the autumn-winter period exceeds atmospheric air levels by two times or more, whereas in the air of bathrooms such an excess is recorded all year round. The highest concentrations of fungi were found in the air of kitchens and bathrooms, mainly representatives of the genera Penicillium (78.5% of samples) and Aspergillus (73% of samples).

In the office premises of public buildings without signs of fungal damage to the walls, the total content of fungal spores was significantly lower than in residential premises (see Table 1). At the same time, saprophytic fungi of the same genera as in the residential environment with the highest frequency of occurrence of Penicillium and Aspergillus (71% and 60.4% of samples, respectively) were identified by the qualitative composition of office air.

Fungi of the genus Cladosporium were found in 18.8% of samples, Alternaria – in 14.6%, Fusarium – in 4.2%, Mucor and Rhizopus – in 10.4%, Candida – in 4.2% of samples. Fungal lesions of wall structures were not detected in any of the examined medical facilities. At the same time, the content of fungal spores in the air of rooms of different functional purposes ranged from 0 to 460 CFU/m3. The lowest content of microscopic fungi was determined in the air of operating units, treatment rooms and dressing rooms (from 0 to 40 CFU/m3), the highest in physiotherapy rooms (80-460 CFU/m3) and wards (60-380 CFU/m3). Analysis of qualitative and quantitative characteristics of mycological air pollution showed that in medical premises, as well as in the air of residential and public premises, fungal pollution is mainly represented by mold fungi of the genera Penicillium (83% of samples), Aspergillus (68.7% of samples), Cladosporium (31.2% of samples) and Mucor (11.5% of samples). Fungi of the genera Cladosporium, Alternaria, Fusarium, Mucor, Rhizopus and Candida were found in 18,8%, 14,6%, 4,2%, 10,4%, 10,4% and 4.2% of samples, respectively. There was no fungal infestation of the walls in any medical room. The content of fungal spores in the air of rooms of various functional purposes ranged from 0 to 460 CFU/m3: the minimum concentrations were determined in operating rooms, treatment rooms and dressing rooms (0-40 CFU/m3), the largest are in physiotherapy rooms (80-460 CFU/m3) and wards (60-380 CFU/m3). Qualitative and quantitative analysis of mycological contamination showed that the microflora of medical premises, as well as in residential and public buildings, is mainly represented by

mold fungi of the genera Penicillium (83% of samples), Aspergillus (68.7% of samples), Cladosporium (31.2% of samples) and Mucor (11.5% of samples).

The content of mold fungi in the air of the surveyed rooms depended on the season and humidity of the air. Higher concentrations of micromycetes were detected in the spring, summer and autumn seasons, the lowest in the winter heating season. In the rooms of physiotherapy departments with the highest humidity, the highest levels of microscopic fungi were observed throughout the year: 46.2–63.8% in summer, 54.2–68% in the winter (heating) season. In the air of wards and diagnostic rooms, in contrast to residential and office premises, fungal contamination is mainly represented by yeast-like fungi of the genus Candida – 45-68% of the total number of detected micromycetes. The content of yeast-like fungi in the air of hospital rooms was constant and did not depend on the season of the year. The concentration of mold fungi in the air of the surveyed rooms turned out to be dependent on seasonal changes and humidity levels. The highest values were recorded in the spring, summer and autumn periods, the lowest in the winter heating season. In the rooms of physiotherapy departments with high humidity, maximum levels of microscopic fungi were observed: in summer — 46.2–63.8%, in winter (heating season) — 54.2–68%.

In medical office, unlike residential and office premises, the main proportion of fungal contamination was yeast-like fungi of the genus Candida, accounting for 45-68% of the total number of micromycetes. At the same time, their content remained stable regardless of the season of the year.

In residential and office premises of a hotel complex with fungal damage to wall structures, the content of fungal spores in the air, regardless of the time of year, ranged from 590 to 11,500 CFU/m3 and from 950 to 9,700 CFU/m3, respectively, which was tens and hundreds of times higher than in "healthy" rooms.

In residential areas with affected enclosing structures, mycological contamination is mainly represented by fungi of the genera Penicillium (93.1% of samples), Aspergillus (75.8% of samples), Cladosporium (31% of samples) and Rizopus (11.5% of samples). Penicillium (91% of samples), Aspergillus (83% of samples) and Cladosporium (40.5% of samples) prevailed in office premises.

The research results have shown that the main cause of fungal air pollution in the rooms of hotel complexes are the enclosing structures (floor, walls, ceiling) affected by microscopic fungi. A direct dependence of the concentration of fungi in the air on the area of damage to structures was established (correlation coefficient r = 0.85), while no dependence of the content of microscopic fungi on the depth of damage to structures was revealed (see Table 2).

Table 3 shows the frequency of occurrence of the main causes of fungal infection in residential areas. It was found that the main causes of fungal damage to the wall structures of residential premises are: violation of the tightness of seams and freezing of walls (the frequency of occurrence is 52.4% of the total number of surveyed rooms); flooding of premises (the frequency of occurrence is 20.4% of cases); violation of waterproofing of the roof and foundation (the frequency of occurrence is 18.9% of cases); violation of the technology of finishing work during repairs (the frequency of occurrence is 8.3% of cases). It has been established that the level of fungal infestation of residential premises depends on the type of building, materials and construction technologies. The highest percentage of fungal damage to wall structures was observed in panel buildings of residential buildings of standard series (6.9% of cases) due to a violation of the tightness of the inter-panel seams and the presence of open joints. Two-storey brick premises (18%) due to roof leaks and leak-proof basements. In modern monolithic houses (the incidence of fungal infection is 9.4%), the main causes of fungal infestations are violations of repair technology and emergencies during the operation of household appliances and heating systems.

Table 2. Dependence of the level of mold fungi in indoor air on the area of damage to enclosing structures

Characteristics of fungal damage to enclosing structures	The area of damage to wall structures,%	The content of mold fungi in indoor air, CFU/m3
Absence of infestations	0	122 ±57 (90–240)
Spot contamination on one wall	< 5	855 ±142 (590–1880)
Damage to 1-2 seams or a part of the wall	5	1580 ±195 (640–3360)
Damage to 1-2 seams or 1/4 of the wall	10–15	2857 ±485 (1410–9200)
Damage of 2 seams and ½ of the wall or more	25 and more	5078 ±537 (4260–10 500)

Table 3. The main causes of the occurrence and spread of fungal infestations of living quarters

Reason	Frequency of occurrence,%	Air pollution level, CFU/m3	Damage to wall structures, CFU/g
Violation of the tightness of seams and freezing of walls	55.2	7730 ±675	358 700 ±3876
Flooding premises	25.4	3669 ±383	206 600 ±24 200
Violation of roof and foundation waterproofing	19.8	2565 ±215	67 400 ±9390
Violation of the technology of finishing works during repairs	9.3	2388 ±145	70 200 ±5274

In apartments where the cause of fungal damage to wall structures was breaches of the tightness of seams and freezing of panels, the concentration of microscopic fungi in the air reached maximum values and averaged from 1,100 to 11,500 CFU/m3 and higher. Since eliminating these causes is a time-consuming and technically challenging task, living in such rooms for several days or more can contribute to the development of allergic pathology.

In public premises, the most common cause of fungal damage to enclosing structures (55.5% of the surveyed objects) is a violation of the waterproofing of floors during construction or repair.

An analysis of the research results, as well as domestic and foreign sources, shows that fungal contamination of the indoor environment of the hotel complex is an absolute risk factor for human health and contributes to the biodegradation of building materials.

People staying in rooms with high humidity and signs of mold damage are at increased risk of developing respiratory tract diseases (including mycogenic bronchial asthma, allergic rhinitis and bronchitis), as well as skin and other pathologies. Under normal operating conditions, rooms should be free from signs of microbial damage, such as mold stains on surfaces and a characteristic mold odor.

The presence of fungal-infested building and finishing materials contributes to air contamination by fungal spores and volatile metabolites, which can have a negative impact on the health of guests staying indoors for a long time. Therefore, when the first occurrence of fungal infestation are detected or if there are complaints of allergic reactions and other health disorders of unknown origin, it is recommended to conduct a mycological examination of the indoor environment. It allows you to identify the sources and ways of spreading mold fungi, assess the degree of risk of human exposure to these conditions and, based on the data obtained, determine the required amount and methods of biocidal treatment.

Despite the constant complaints of the population, mycological examination of human habitation facilities is either not carried out or is carried out at an insufficient methodological level. The main reason for this is the lack of a regulatory and methodological document regulating the procedure, methods and scope of research in assessing the risk of fungal contamination of the indoor environment.

Mycological examination of the indoor environment is recommended in the following cases:

1. In the presence of visible contamination of suspected fungal damage to enclosing structures.
2. When residents or employees complain about specific health problems (allergies, respiratory infections, etc.).
3. When there is constant dampness in the room (condensation on windows, walls and other surfaces).
4. When the relative humidity in the rooms is above 60% during the heating season.
5. In emergency situations, accompanied by the flow of large amounts of water into the room.
6. In case of violation of the waterproofing of the roof, attic or basement of the building.
7. In case of violation of the tightness of walls, inter-panel seams and floors.

This approach makes it possible to systematically identify and eliminate sources of mycological contamination, reducing risks to human health and preventing the biodegradation of building materials.

When conducting a mycological examination, the following tasks and questions are solved:

1. Determination of the total level of fungal spores in indoor air.
2. To determine whether visible changes in enclosing structures (stains, streaks, films, loose surface areas) are the result of a fungal infestation.
3. Determination of the degree and depth of damage to structures.
4. Identification of hidden areas of fungal infection.
5. Identification of suspected causes and factors contributing to the appearance and spread of fungal contamination.
6. Identification of the degree of health risk during prolonged stay in a room with fungal contamination.
7. Determination of the required volume and optimal methods of biocidal treatment.

Mycological examination of premises should include the following steps:

1. Visual inspection of premises and enclosing structures.
2. Study of the indoor air environment.
3. Research of building and finishing structures.
4. Determination of humidity of wall structures.
5. Measurement of microclimatic parameters of the indoor air environment.
6. Evaluation of the ventilation system.

This systematic approach provides a comprehensive assessment of the state of the indoor environment and makes it possible to identify sources of fungal contamination, assess health risks and develop effective measures to eliminate them.

4. Conclusions

As a result of the conducted research, new data were obtained on the quantitative and qualitative composition of microscopic fungi in the air environment of residential, public and medical premises of the hotel complex, taking into account the presence of damage to wall structures, the season of the year, the type of building and the functional purpose of the premises.

It has been established that microscopic fungi are constantly present in the air of residential, public and medical premises, even in the absence of visible damage to enclosing structures. Representatives of the genera Penicillium, Aspergillus and Cladosporium are most often detected in the air environment of residential and public premises. Medical premises are characterized by a higher content of yeast-like fungi of the

genus Candida.

The main cause of fungal air pollution in residential and public areas of the hotel complex are the enclosing structures affected by microscopic fungi — the floor, walls and ceiling.

In the residential and office premises of the hotel complex, which have fungal damage to wall structures, the content of microscopic fungi in the air, regardless of the season of the year, exceeded the level of fungal flora in "healthy" rooms and the surrounding atmospheric air by tens and hundreds of times.

Taking into account the fact that mycological examination of human habitation facilities is either not carried out or is performed at an insufficient methodological level, based on the results of the study, a draft methodological recommendations for conducting mycological studies of indoor air and building structures has been prepared.

The stages of the examination include:

1. Visual inspection of premises and enclosing structures.
2. Study of the indoor air environment with air sampling.
3. Investigation of enclosing surfaces and man-made substrates with sampling.
4. Determination of humidity of wall structures and man-made substrates.
5. Determination of microclimatic parameters of the indoor air environment.
6. Evaluation of the ventilation system.

This systematic approach provides a comprehensive assessment of the mycological state of the indoor environment and allows for the development of effective measures to reduce fungal contamination and risks to human health.

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