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THE INFLUENCE OF ECOLOGICAL SITUATIONS IN BUILDINGS OVER THE MYCODIVERSITY

Abstract. *The main aim of present study was to investigate the mycodiversity of micromycetes settled in buildings built in different years in Baku. It was defined that depending on ecological situations different-membered fungi associations appear in different rooms. Bad ecological situations and nonobservance sanitary hygienic instructions environment in buildings result in an active migration of microscopic fungi from the environment into the buildings. This creates a potential infection source in building and causes the increase of risk factor among the people.*
Key words: *buildings, micromycetes, mycodiversity, ecological situations, fungus associations.*

Introduction. The basis of mycological analysis of atmosphere air was put in the middle of last century. It is clear that as an ecosystem, air is an open system consisting of mutual unity and functioning of different microorganisms [2, 8]. If we consider that human organism can not exist without breathing it is unescapable to avoid the mutual influence of atmosphere air, in other words, microorganisms existing in the air, all his life [4]. It is a fact that while living or functioning human organism continuously faces the influence of microorganisms, including microscopic fungi, at home, at work and outdoors.

Also as a result of emergency in buildings, including the corrosion of water tubes, flowing of heating systems, misuse of buildings by people destroy the stable humidity and increases aggression and expansion of microscopic fungi settled here [1, 5, 9].

That's why at the present time (nowadays) when the ecological situation gets worse the biological pollution level of air and its mutual relation to human organisms health is very important and it is the main aim of the present study.

Materials and methods. Samples have been taken using special tools and application method from the ceilings, walls and floors of different rooms, including halls, bathrooms, kitchen, living-room and bedroom of 27 buildings investigated in Baku and they were inoculated to Petri dishes with medium Saburo: neopepton -10 g, glucose-40g, agar-15g, distilled water- 1000 ml (6).

Fungus cultures incubated for 7 days in thermostat under 28^{o}C±2 degree. Fungus colonies formed from this were counted and they were identified according to their morphological and cultural properties. Also the number of fungi were identified by defining the propagules in a gram of applicative material [3, 7].

$$n = \frac{N}{\mathrm{Q\ x\ t}}$$

n-number of fungi in a gram of applicative material; N-number of fungus colonies,

Q-productivity of taking an example, g/min; t-time spent on taking an example, min.

Results and discussion. For investigation examples taken from ceilings, walls, wall-papers, carpet and rag of living room, bedroom, kitchen, bathroom and halls of 23 buildings where emergency were noted, have been analysed. It was shown that in the noted buildings there were 51 micromycetes belonging to 16 genera (Table). The taxonomic structure of aeromicobiota formed in buildings consist of groups (classes) including *Zygomycetes* 6 species of 3 genera, *Ascomycetes* having 3 species of 2 genera, and *Hypomycetes* having 42 species of 11 genera. 82,4% of aerogenmycobiota formed in the investigated buildings belong to *Hyphomycetes* group.

At the same time *Penicillium* represented in 11 species and *Aspergillus* in 9 species make up 47,6% of *Hypomycetes* group and more than half of the whole

aeromycobiota, in other words 52,4%. Together with *Aspergillus* and *Penicillium* genera, *Cladosporium* and *Mucor* both having-represented 4 species, also *Alternaria* represented by 3 species are included to the dominant nucleus of the formed aeromycobiota. Other genera have 1 or 2 species.

As we can see aeromycobiota formed in buildings in (state of emergency) emergent

Table

Taxonomic structure of the micromycetes settled in buildings

№	Micromycetes genera	Micromycetes species
1.	Acremonium	A.charticola W.Gams; A. strictum W.Gams
2.	Alternaria	A.alternata (Fr.) Keissl; A. tennuissima Wiltsehr; A.radicina Meier
3.	Aspergillus	A.clavatus Desm; A.flavus Link:Fr; A.fumigatus Fresen; A.niger Tiegh; A.repens Fischer; A.terreus Thom; A.versicolor Tirab; A.ochraceus K. Will; A.ustus Bainier
4.	Aureobasidium	A.pullulans Arnaud
5.	Chaetonium	Ch.globosum Kunze; Ch. dolichotrichum Ames
6.	Cladosporium	C.cladosporiodes de Vries;C.elatum Nannf; C.herbarum Link; C.sphaerospermum Penz
7.	Eurotium	E.amstelodami Mangin
8.	Fusarium	F.moniliforme Sheld
9.	Mucor	M.circinelloides Tiegh; M.hiemalis Wehmer; M.plumbeus Bonord: M.racemosus Fresen
10.	Paecilomyces	P.aerugineus Samson; P.variotii Banier
11.	Penicillium	P.aurantiogriseum Dierckx; P.brevicompactum Dierckx; P.chrysogenum Thom; P.crustosum Thom; P.cyclopium Westling; P.expansum Link; P.funiculosum Thom; P.ochreceum Thom; P.oxalicum Thom;P.decumbens Thom; P.verrucosum Dierckx.
12.	Stachybotrys	S.atra Corda; S.icolor Gray
13.	Rhizomucor	R.pusillus Schipper
14.	Rhizopus	R.nigricans Ehrenb
15.	Trichoderma	T.polysporum Rifai; T.viride Pers.
16.	Ulocladium	U.chartarum Simmons; U.consortiale Simmons

situation changed noticeblenot only in number, but also in quality.

If we consider that noted micromycetes have pathogen and conditional-pathogen properties, then it is unescapable that infection sources may appear in the ecologically dangerous buildings.

Thus potential pathogen fungi settled in buildings show their opportunistic activity not only (alone) in isolation, but in association as well, which increases the level of micotic diseases among the people. That`s why examples have been taken and analyzed from different rooms. It was defined that depending on the function of the rooms consistent components of fungi associations may increase. Depending on people's preference the walls of the living-room are decorated with colorful wallpapers or colors and they are kept clean as much as possible. It was defined that on the surface of the walls of the living rooms covered with colorful wallpapers usually there are 2 membered fungi associations, including Aspergillusflavus + A.niger or A.fumigatus + A.niger. But in the livingrooms having walls colored with structurally different colors fungi associations are 3 membered: Aspergillus niger+Rhizopus nigricans + Ulocladium Chartarum və ya Aspergillus versicolor + Penicillium fumiculosun + Alternaria alternata.

In the rooms where humidity is destroyed or in the bedrooms, where the level of water activity is more than $a_w \geq 0{,}80$ the structure of fungi associations increase even more and have 6 member:Aspergillus niger + A. Clavatus + Penicillium cyclopium + P.expansum + Cladosporium cladosporioides + Mucor racemosus or Aspergillus niger + A. Terreus + Penicillium decumbens + P. Verrucosum + Alternaria alternata + Mucor circinelloides.

In the bathrooms having non-stablehydrothermic environment there exist special fungi associations and as a rule they have 4 members. It was shown that in bathrooms with tilewalls fungi associations consist of Aspergillus niger + Alternaria alternata+ Penicillium brevi compactum + Cladosporium herbarumand in bathrooms with colored walls fungi associations consist of Aspergillus ustus + Penicillium crustosum + Alternaria tenuissima + Mucor plumbeus.

The kitchens of buildings are always rich with greenery and meet food, and their rests.

That's why the fungi associations formed in kitchens have 6 members characterized with quite enough different speciesAspergillus niger + Penicillium chrysogenum + Cladosporium herbarum + Fusarium moniliforme + Chaetomium globosum + Mucor hiemalis or Aspergillus ochraceus + Penicillium aurantiogriseum + Paecilomyces variotti + Fusarium moniliforme + Rhizomucor pusillus + Trichoderma polysporum.

The halls of the long-termedbuildings are also places where micromycetes are settled intensively and they are characterized with 6 members Aspergillus niger + Penicillium aurantiogriseum + Aureobasidium pullulans+ Cladosporium elatum + Paecilomyces aerugineus + Stachybotrys atra orAspergillus niger + Acremonium charticola + Eurotium amstelodam + Penicillium oxalicum + Ulocladium chartarum + Trichoderma viride.

Microscopic fungi living in the air of buildings reproduce intensively depending on the ecological situation and increase their density in a single screen.

As a result of thisAspergillus niger, A. clavatus, A. ochraceus, Penicilliumexpansum, Chaetonium crustosum, Chaetonium globosum, Trichoderma polysporum, Cladosporium elatum dominate in aeromycobiota. It was even shown that this fungus exists in different associations forms depending on different forms of the aspergillosis diseases that they cause in human organism. For example, Aspergillus niger + Penicillium verocosum; Aspergillus niger + Penicillium expansum; Aspergillus niger + Penicillium cyclopium; Aspergillus niger + Alternaria alternata; Aspergillus niger + Fusarium moniliforme; Aspergillus niger + Mucor hiemalis and etc.

Generally, in the transportation of mycotic diseases species of Aspergillus genera have a special role.

It must be noted that currently there doesn't exist generally accepted norms about the number of microscopic fungi in the air of buildings. Because the difference of the use-length and using rules of buildings cause dramatic change in humidity and temperature factors and it cause a big difference between them. This stimulation or inhibits the spread of microscopic fungi in room environment.

Conclusion. It was defined that depending on ecological situations different-membered fungi associations appear in different rooms. Bad ecological situations and nonobservance sanitary hygienic instructions environment in buildings result in an active migration of microscopic fungi from the environment into the buildings. This creates a potential infection source in building and causes the increase of risk factor among the people.

References:

1. Aliyev I.A., Dzhabrailzade S.M., Akhmedova F.R., Ibrahimov E.A., Asadova Sh.F. Some ecological and biological properties of opportunistic representatives mycobiota in residential buildings. Herald MSOU series "Natural Science", 2014, № 2, p. 15-19.

2. Antropova L.B., Makeeva V.L., Bilanenko E.N., Chekunova A.N., Zheltikova T.M., Petrova - Nikitina A.D. Aeromikota a residential area of Moscow. Mycology and Phytopathology, 2003, vol. 37, № 6, p. 1-11.

3. Bilai T.I., Zakharchenko V.A. The determinant of thermophilic fungi. Kiev, publishing house "Naukova-Dumka" 1987, 112 p.

4. Burge h.broaerosds: prevalence and health effects in the indoor environment. Journal of Allergy and clinical İmmunol, 1990, vol. 86, p. 687-701.

5. Mitrofanov V.S., Kozlova Y.İ. Mould in the home (review). Sample of Medical Mycology, 2004, vol. 6, № 2, p. 10-19.

6. Muller G.M., Bills G.F., Foster M.S., Biodiversity of fungiInventory and monitoring methods. ELSEVIER, Academic Press, 2004, 777p.

7. Satton D., Fothergill A., Rinaldi M. The determinant of pathogenic and opportunistic fungi. Moscow, Publishing House "Mir", 2011. 468 p.

8. Stanger V., Potgieter – Vremaak s.s., Van Grieken R. Comparative overviev of indoor air quality in Antwerpen, Belgium. Environment International, 2003, vol. 33, p. 789-797.

9. Zheltikova T.M., Antropova L.B., Petrova-Nikitina A.D., Makeeva V.L. Bilanenko E.N., Chekunova A.N. Ecology rooms and allergy. Allergology, 2004, №3, p. 37-39.