قسم : الصحة ومراقبة الأغذية .
كلية : الطب البيطرى - جامعة أسيوط .
رئيس القسم : أ . د / على يوسف لطفي .

التلوث البيئ كنتيجة لانتشار الجراثيم من هواء الحظائر الى الخارج وتأثير ذلك على صحة الحيوان والانسان

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تم فحص عينات من الهواء مأخوذة من مختلف حظائر الحيوانات والدواجن بمحافظة أسيوط ، وكذلك من الهواء المحيط بهذه الحظائر على أبعاد ١٠ ، ٥٠ متر .

وقد أسفرت نتائج الفحص البكتريولوجي عن عزل ١١١ عترة أكثرها من المكورات العنقودية الذهبية والمكورات السبحية البرازية .

كما أسفرت نتائج الفحص عن عزل ١٢٩ فطر أكثرها الاسبرجيلس والبنسيليوم والكلادوسيورم .

وقد تم مناقشة مدى انتشار الجراثيم من هواء الحظيرة الى الخارج وتأثير ذلك على صحة الحيوان والانسان .

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THE RISK OF ENVIRONMENTAL POLLUTION ON ANIMALS AND MAN AS A RESULT OF DISSEMINATION OF AIRBORNE MICROBES FROM FARM BUILDINGS

(With 4 Tables)

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SUMMARY

The air inside and outside the farm buildings at 10 and 50 meterswas sampled for bacteriological and mycological examination.

The obtained results revealed the isolation of 111 strains of bacteria. The most common isolates detected were Staphylococcus aureus and Streptococcus faecalis.

The results of mycological examination revealed the isolation of 129 fungi belonging to 12 Genera. Aspergillus, Penicillium and Cladosporum were the most frequent isolates.

The dissemination of the airborne microbes from the inside to the outside of the farm buildings and the risk of the environmental pollution on animals and man were discussed.

INTRODUCTION

One of the global problems of air pollution is the dispersion of the pollutants throughout the entire atmosphere.

Many studies have been carried out to determine the number and types of airborne bacteria in the atmosphere. Although considerable amount of informations on the nature of these micro-organisms occurring in the indoor air is available, very little is known about their dissemnation and incidence in the outdoor air. Platz (1979) found a considerable reduction in the number of Staphylococci up to a distance of 20 meter followed by steady decrease up to 100 meter. SHAKARYAN et al. (1980) isolated 12,000-95,000 bacteria/m^3 of air from calf rearing unit and 1000-13000 bacteria/m^3 of air from the outside of the building.

Other workers examined the air both indoor and outdoor of the farm buildings. They found that certain types of pathogenic fungi are adopted for aerial dissemination (DE, VRIES, 1960, SREERAMULA, 1961; LACEY & LACEY, 1964 and PATHAK & PADY, 1965).

Because of the public and animal health significance of the aribome bacteria and fungal spores isolated by other workers as a causative agents of many respiratory affections and allergic diseases of farmers and their animals, a qualitative survey of the indoor as well as the outdoor of many farm buildings is carried out.

MATERIAL and METHODS

A total of 51 air samples were collected from 7 farm buildings enclosed different species of animals and poultry at Assiut Governorate.

Air was collected by means of liquid impinger at a flow rate of 5 liter per minute and as described by COWN et al. (1965).

The air samples were taken 2 to 3 times, with approximately one month interval, from each farm building. In every time, air was sampled from the indoor as well as from the outdoor of the building at a distance of 10 and 50 meters. The air-borne microbial suspensions obtained from the indoor and outdoor air of every farm building were thoroughly investigated for the presence of bacteria and fungi.

Isolation and identification of the isolates were fulfilled according to CRUICKSHANK et al. 1974; BAILY & SOOTT, 1974 for bacteria and RAPER & THOM, 1949; RAPER & FENNELL, 1965; ZYCHA et al. 1969 and SAMSON, 1979 for Fungi.

1. Staphylococcus aureus:

Nacl broth was inoculated with the specimens and incubated at 37°C. for 18-24 hours. Mannitol Salt agar and Staph. 110 plates were subcultured from the inoculated broth and incubated at 37°C. for 24 hours. The pure culture was examined for haemolysis and coagulase activity.

2. Streptococcus faecalis:

S.F. broth was inoculated with the specimens and incubated at 37°C. for 18-24 hours. MacConkey's agar plates were subcultured from the inoculated broth and similarly incubated for 24 hours. Representive colonies were identified according to their culture characters and biochemical activities.

3. Enterobacteria:

MacConkey's broth as well as selenite F broth were inoculated together with each specimen and incubated at 37°C. for 18 hours. Subcultures were carried on MacConkey's and SS agar plates respectively. The inoculated plates were incubated at 37°C. for 24 hours. Identification of pure cultures was based on growth characteristics and biochemical reaction.

4. Mycobascteria:

Part of each specimen was treated by modified Pettrof's method. The sediment obtained was evenly distributed onto four slopes of Loewenstein - Jensen medium, The inoculated slopes were incubated at 37°C. for 6-8 weeks.

5. Clostridia:

Cooked meat broth was used as enrichment medium. Subculture was carried out on neomycin blood agar and anaerobically incubated at 37°C. for 48 hours.

6. Fungi:

Malt extract agar and Czapek - Dox agar media are inoculated with 1 ml. of saline from liquid impenger. The inoculated plates were incubated at 25°C. for 7 days. The isolated fungi were subcultured on 3% malt slope agar. Identification of pure cultures was carried out according to growth characters and microscopical exmination.

RESULTS and DISCUSSION

The results are tabulated in Tables, (1,2,3 & 4). The bacteriological examination of the air revealed the isolation of 111 bacterial isolates. (Tables, 1 & 2). Of these 49 (44.14%) were Staphylococcus aureus, 35 (31.53) Stretpococcus faecalis, 4 (3.60%) Proteus morganii, 11(9.91%) Proteus rettgeri, 8 (7.21%) Enterobacter and 2 (1.80%) of each Serratia marcescens & Serratia rubidaea. On the other hand, Mycobacteria and Clostridia failed detection in any of the samples examined.

It is also evident from Tables (1 & 2) that Staphylococcus aureus and Streptococcus faecalis were the only isolates which recovered from the vecinity of the sources at the two different distances. On the other hand Serratia sp. failed detection in any of the samples taken from the outdoor air. The other bacterial isolates including Proteus morganii, Proteus rettgeri and Enterobacter could be isolated from the indoor and outdoor air at the distance of 10 meters only. However the considerable variability of these bacterial isolates in the different sources may be attributed to the behavior of the air-borne particles which are mostly caused by the interaction of their single properties as size, shape, density, structure and chemical composition. (MULLER et al. 1977). On the other hand, the failure of detection of other bacteria may be due to the direct sun light as well as the high temperature, radiation and low humidity which have an adverse effect on the bacteria in the air. (HARRY, 1964 and GUNDERMANN, 1972).

As shown from Tables (1 & 2) the great majority of the bacterial isolates are harmless. Staphylococcus aureus is the only pathogen most commonly found in the indoor and outdoor air. The incidence of air contamination with such pathogen is obviously the most dangerous.

The mycological examination of air revealed the isolation of 129 fungi, belonging to 12 Genera, from the indoor and outdoor air. These fungi comprised of 36 (27.91%) Aspergillus, 26 (20.61%) Penicillium, 4 (3.1%) Absidia, 7 (5.43%) Alternaria, 25 (19.38%) Cladosporum, 6 (4.65%) curvularia, 8 (6.2%) Fusarium, 3 (2.33%) Mucor, 7 (5.43%) Paecilomyces, 1 (0.78%) Geotrichum, 3 (2.33%) Basidiospores and 3 (2.33%) Nigrospora sp. (Tables 3 & 4).

It is also evident from the results obtained in Tables (3 & 4) that most of the fungal spores in the environment of the farm buildings are only differed quantitatively from that of the outdoor air. Therefore, it is likely that the components of the indoor air with the fungal spora are emitted to the outdoor air and subjected to the dispersing action of the atmosphere, occurring simultaneously with transport by wind and turbulent mixing.

Concerning the different species of the fungal isolates, Aspergillus was the commonest species detected in the indoor and outdoor air. It comprised of 36 fungi belonging to 5 different species. Of these, A. fungatus, A. niger, A. sydowii and A. flavus were the most frequently occurred. The other two, A. nidulans and A. terreus were scarcely found.

Penicillium were also surprisingly abundant in the air inside and outside the farm buildings. It formed 26 isolates of which P. cyclopium was the most common species followed by other species including P. funiculosum, P. rugulosum, P. caseicolum P. chrysogenum, P. Purpurogenum, P. urtica, P. italicum, and P. vridicatum.

Cladosporum was found to be one of the most important constituents of the indoor and outdoor and outdoor air spora. It consisted of 25 fungi belonding to 2 species. The most promenant one was the Cladosporum herbasrum.

Other pathogenic and saprophytic fungal species were encountered in the air inside and outside the farm buildings (Tables 3 & 4). The lower incidence of these species may be attributed to the loss of large spores as suggested by HUDSON (1969) or may be due to other factors such as loss of viability by spores or their failure to germinate.

From the epidemiological point of view, the great majority of the fungal isolates especially Aspergillus, Penicillium, Cladosporum, Absidia and Mucor are considered as an etiologically significant agents in mycotic affection of animals and man (AINOWORTH & AUTSWICKI, 1950 and LACEY & LACEY, 1964). The mycotic abortion in animals is one of the most important fungal diseases, in which the infection is primarily respiratory, spreading to the placenta from the lungs (SREERAMULA, 1961). Also the possibility of human affection by inhalation of fungal sporesis very often present. As, cases of farmer's lung diseases are frequently occurred (FULLER, 1953; DE VRIES, 1960; and SREERAMULA, 1961). In addition some of these fungi especially Cladosporum is regarded as the most frequent causes of allergic symptoms in human beings (SREERAMULA, 1961).

Anyhow, under the supervision of trained personnel greatcare must be taken to keep to keep the animal houses neat and tidy. Also the regular washing of the floor and such other operations do not allow the build up of the air-spora. In addition prevention of accumulation of the great amounts of hay and straw in the animal enclosures may also suppress the formation of air-spora.

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Table (1)

The number of different species of bacterias isolated from indoor and outdoor of the farm buildings

bacterial isolates	No. of isolates	Sampling from		
		Inside	at 10 m.	at 50 m.
Staphylococcus aureus	49	17	17	15
Streptococcus faecalis	35	12	12	11
Proteus morganii	4	2	2	-
Proteus rettgeri	11	7	4	-
Enterobacter	8	5	3	-
Serretia marcescens	2	2	-	-
Serretia rubidaea	2	2	-	-
Total	111	47	38	26

Table (2)

The different types of bacteria isolated from inside and outside of the farm buildings

Locality	Sampling	No. of samples	No. of isolates	Types of bacterial isolate				
				Staph. aureus	Strept faecalis	Proteus sp.	Enterobact	Serretia spp.
Bani-more Cattle farm	inside	3	10	3	2	2	2	1
	at 10 m.	3	8	3	2	2	1	-
	at 50 m.	3	6	3	3	-	-	-
El-Hawatika Cattle farm	inside	3	9	3	2	3	-	1
	at 10 m.	3	6	3	2	1	-	-
	at 50 m.	3	4	2	2	-	-	-
Bani-Sanad Sheep enclosure	inside	3	8	3	3	1	1	-
	at 10 m.	3	6	3	3	-	-	-
	at 50 m.	3	6	3	3	-	-	-
Camel enclosure	inside	2	6	2	2	2	-	-
	at 10 m.	2	6	2	2	2	-	-
	at 50 m.	2	4	2	2	-	-	-
Equine stable	inside	2	3	2	1	-	-	-
	at 10 m.	2	3	2	1	-	-	-
	at 50 m.	2	3	2	1	-	-	-
Bani-more Poultry house	inside	2	8	2	1	1	2	2
	at 10 m.	2	6	2	1	1	2	-
	at 50 m.	2	2	2	-	-	-	-
Rifa poultry house	inside	2	3	2	1	-	-	-
	at 10 m.	2	3	2	1	-	-	-
	at 50 m.	2	1	1	-	-	-	-
Total		51	111	49	35	15	8	4

Table (3)
The number of different species of fungi isolated from indoor and outdoor of farm buildings

Species of isolated fungi	Number of isolates	Sampling from		
		Inside	at 10 m.	at 50 m.
Aspergillum flavus	7	3	3	1
A. fumigutus	8	6	2	-
A. nidulans	3	1	1	1
A. niger	10	4	3	3
A. terreus	1	1	-	-
A. sydowii	7	4	2	1
Penicillium caseicolum	2	1	1	-
P.Chrysogenum	2	2	-	-
P.Cyclopium	10	4	3	3
P.funiculosum	3	1	1	1
P. italicum	1	1	-	-
P.purpurogenum	2	1	1	-
P.rugulosum	3	2	1	-
P.vridicutum	1	1	-	-
P.urticæ	2	2	-	-
Absidia spp.	4	3	1	-
Alternaria spp.	7	3	2	2
Cladosporium herbarum	22	12	6	4
C.werneckii	3	1	1	1
Curvularia spp	6	2	2	2
Fusarium spp	8	4	3	1
Mucor spp	3	2	1	-
Paecilmyces spp	7	3	2	2
Geotrichum candidus	1	-	-	1
Basidiospores spp	3	1	1	1
Nigrospera spp	3	1	1	1
Total	129	66	38	25

Table (4)
The different genera of fungi isolated from inside and outside of the farm building

Locality	Sampling	No. of isolates	Genera of fungi isolated									
			Asperg-ill	Pencill-ium	Absidia	Alter-naria	Clados porium	Curv-ularia	fusa-rium	Muc-or	Paeci-lomyces	ether
Bani-more Cattle farm	inside	18	4	4	1	1	5	-	2	-	-	1
	at 10m.	11	4	1	-	1	2	-	2	-	-	1
	at 50m.	5	1	1	-	1	2	-	-	-	-	-
El-Hawatika Cattle farm	inside	14	5	2	1	1	1	1	1	1	1	-
	at 10m.	8	1	2	1	-	1	1	1	-	1	-
	at 50m.	5	1	1	-	-	-	1	1	-	1	-
Bani-sanad Sheep enclosure	inside	15	2	5	1	1	3	-	1	1	1	-
	at 10m.	7	2	2	-	1	1	-	-	1	-	-
	at 50m.	8	2	2	-	1	1	-	-	-	-	2
Camel enclosure	inside	4	2	1	-	-	1	-	-	-	-	-
	at 10m.	1	-	1	-	-	-	-	-	-	-	-
	at 50m.	-	-	-	-	-	-	-	-	-	-	-
Equine stable	inside	4	1	1	-	-	1	1	-	-	-	-
	at 10m.	4	1	1	-	-	1	1	-	-	-	-
	at 50m.	1	-	-	-	-	-	1	-	-	-	-
Bani-more Poultry house	inside	9	3	2	-	-	2	-	-	-	1	1
	at 10m.	7	3	-	-	-	2	-	-	-	1	1
	at 50m.	6	2	-	-	-	2	-	-	-	1	1
Rifa poultry house	inside	2	2	-	-	-	-	-	-	-	-	-
	at 10m.	-	-	-	-	-	-	-	-	-	-	-
	at 50m.	-	-	-	-	-	-	-	-	-	-	-
Total		129	36	26	4	7	25	6	8	3	7	7