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ROLE OF SOIL AS A RESERVOIR FOR SOME PATHOGENIC AGENTS TRANSMITTED TO MAN AND ANIMALS

(With 2 Tables)

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دور التربة كمأوي لبعض المسببات المرضية التي تنتقل للانسان والحيوان

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تناولت هذه الدراسة : تم جمع ٥٥ عينة من أماكن مختلفة لمزارع الماشية في محافظتي البحيرة والاسكندرية وتم فحصها بكتريولوجيا وميكولوجيا لوجود بعض المسببات المرضية التي تنتقل للانسان والحيوان ، وقد أسفرت النتائج على وجود عدد من البكتريا والفطريات التي تم عزلها بنسب مختلفة ، ، هذا وقد نوقشت تلك النتائج وأهميتها على صحة الانسان والحيوان .

SUMMARY

Fifty five soil samples were collected from some animal enclosures located at Behera and Alexandria Governorates and examined for the presence of some pathogenic and potentially pathogenic bacteria and fungi.

Bacterial isolates were found to belong to the genera: E.coli (100%), Proteus (67.3%), Staphylococcus (43.6%), Streptococcus (43.6%), Providencia (40%), Corynebacterium (21.8%), Citrobacter (18.2%), Klebsiella (9.1%), Shigella (9.1%) and Pseudomonas (5.5%). The isolated fungi were Aspergillus niger (83.6%), Aspergillus fumigatus (16.4%), Aspergillus flavus (14.5%), Mucor spp. (60.0%), Rhizopus (30.9%), Penicillium (27.3%), Candida spp. (14.5%), Alternaria (10.9%) and Rhodotorula mucilagnosa (7.3%).

The hygienic and public health importance for each isolates were discussed.

INTRODUCTION

Soil plays a dangerous role as a source of some bacterial and fungi which may cause health problems among man and animals through contaminating feeds, water,

wounds and inhalation of dust particles arised from contaminated soil.

In Egypt, several studies have been carried out on soil as a reservoir of many bacteria and fungi (RAJAB, 1956; ABDEL-KARIM, 1968; HAFEZ, 1976; AMIN, 1980; MOWAFI, et al. 1980; SAMAHA, 1983 and EZZAT, et al. 1986).

The aim of this work is to investigat the possible role of soil as a reservoir of some of the zoonotic infectious agents.

MATERIAL and METHODS

Fifty five soil samples were collected from cattle byers located at Alexandria and Behera Governorates.

A quantity of dust amounting 250 gm was collected by a sterile spatula and transfered to a sterile brown glass bottle of 500 ml capacity, fitted with ground glass stopper. Each bottle was labelled indicating date, site and animal species. Samples were then transefered with minimum of delay to the laboratory for bacteriological and mycological examination.

A.Bacteriological examination:

Five grams of thoroughly mixed soil samples were triturated in a sterile morter using 50 ml distelled water. The suspension obtained is strained through a narrow meshed sterile gauze into a sterile flask. The soil filtrate was used for baceriological examination.

Isolation and identification of the bacteria were carried out according to MERCHANT and PACKER (1961); EDWARDS and EWING (1972) and CRUICKSHANK, et al. (1975) and entailed the following:

Coliform organisms:

Loopfuls of the soil filtrate were inoculated into 5 tubes of MacConkey's broth containing inverted Durham's tubes. The tubes were incubated at 37°C for 48 hours. Loopfuls from positive tubes (acid and gas) were streaked on MacConkey's agar plates and incubated at 37°C for 24 hours. Suspected colonies was picked up for identification.

Enterococci:

Loopfuls of the filtrate were steaked on the surface of enterococcus selective differential medium (EPHTHYMIOU, et al. 1975) and incubated at 37°C for 24 hours.

Staphylococci:

Plates of salt mannitol agar were streaked with the filtrate and incubated at 37°C for 24 hours. Suspected colonies were picked up and kept for further identification.

Salmonella:

10 ml of the soil filtrate was inoculated into 50 ml selenite F broth and incubated after thorough mixing at 37°C for 18 hours. Loopfuls from these tubes were streaked on MacConkey's agar plates and incubated at 37°C for 24 hours.

Other pathogens:

Plates of blood and nutrient agar were streaked with the soil filtrate and incubated at 37°C for 24 hours. The developed colonies were picked up for identification.

B.Mycological examination:

One ml of each filtrate was transfered into sterile petridish, after which 10 ml of Sabouraud's dextrose agar which was previously melted and cooled to 45°C, were added and carefully mixed in a horizontal position. After solidification, the plates were incubated at 25°C for 4-6 days and observed daily for the growth of any suspected colonies.

Identification of mould and yeast isolates were carried out according to SAMSON (1979); ONION, et al. (1981); RIETH and SCHOENFELD (1959) and LODDER and KREGER VAN-RIJ (1970).

RESULTS

The results are tabulated in tables (1 and 2).

DISCUSSION

It is evident from table (1) that typical E.coli was isolated from all examined soil samples. This results agreed with those recorded by ABDEL-KRIM (1968) and SAMAHA (1983), but it is considered higher than those obtained by HAFEZ (1976) and MOWAFI, et al. (1980). The stirring of infected dust was undoubtedly an important means where by the atmosphere of the enclosures become contaminated with such organisms that can survive in the soil for several days or weeks (HUTCHINSOM, 1957). E.coli type I was reported to be responsible for joint ill and white scours in calves. In addition, E.coli is considered to the major causative agent of diarrhea, urinary tract infections and haemorrhagic colitis in humans (ABRAHAM, et al. 1983).

Proteus rettgeri and Proteus vulgaris were recovered from the examined soil samples in a percentage of 45.5 and 21.8 respectively (Table 1), a result which is relatively lower than that reported by HAFEZ (1976) and SAMAHA (1983). However, the presence of proteus species in cattle environment may indicate the exitent of unhygienic condition

under which they were occupied. Proteus species are considered as a secondry invadors in wound infection and diseases of mucous membranes in man and animals (SOLTYS, 1963). They were also incriminated in cases of severe diarrhoea and dysentry in young animals, sheep and goats (BUXTON and FRASER, 1977). In addition, Proteus vulgaris causing food poisoning and urinary tract infection (BANWART, 1981).

Staphylococcus aureus was isolated at an incidence of 43.6% (Table 1). Nearly similar results were obtained by MOWAFI, et al. (1980) and SAMAHA (1983) and as much as 40% and 42% respectively. However, the environmental pollution with Staphylococcus aureus may occur through the distribution of contaminated dust particles from the skin of animals or clothing during movement of carriers or person with lesions (MCDADE and HALL, 1964). The presence of such organisms in the soil potentially contaminate milk or other products which subsequently causing acute food poisoning characterized by vomiting and diarrhoea by virtue of their production of powerful exotoxin (TOPLEY and WILSON, 1975). In addition, Staphylococcus aureus was incriminated in many suppurative lesions in different species of animals (MERCHANT and PACKER, 1967).

Streptococci were isolated from 24 samples (43.6%). Of these 23.6% were Strept. faecalis var faecalis, 12.7% Strept. faecium, 3.6% Strept. faecalis var liquefaciens and 3.6% Strept. pyogenes (Table 1). These data are coloectively higher than those obtained by BASSO (1962), ABDEL-KRIM (1968) and KIBBY, et al. (1978) and lower than that recorded by HAFEZ (1976), MOWAFI, et al. (1981) and SAMAHA (1983). However, mastitis, urinary and other infections in cattle were reported to be due to Strept. faecalis var zymogenes and Strept. faecalis var faecalis (BUXTON and FRASER, 1977). The varity faecalis as well as Strept. faecalis var liquefaciens were reported to be the most important cocci causing sweet curdling of milk (ATHERTON and NEWLANDER, 1977). Strept. pyogenes have been implicated in acute and chronic cases of mastitis, metritis, cervicitis and general pyogenic infections as well as sore throat, scarlet fever and adenitis in man (CRUICKSHANK, et al. 1973). In addition, faecal streptococci are considered as the most reliable index of faecal pollution in soil (KUNKLE and SHODE, 1976).

Coli-aerogenes groups were isolated from examined soil samples of cattle byres in percentages of 40% Providencia, 18.2% Citrobacter freundii and 9.1% Klebsiella aerogenes (Table 1). Coli-aerogenes groups have been reported by BAILY and SCOTT (1974) to be associated with cases of enteritis and frequently in man and animals (Cruickshank, et al. 1970; BAILEY and Scott, 1974 and TOPLEY and WILSON, 1975).

Corynebacteria were isolated from the soil samples of cattle byres (Table 1) including Corynebacterium pyogenes (14.5%), Corynebacterium renale (5.5%), and Corynebacterium ovis (1.8%). This result is almost nearly similar to ABDEL-KRIM (1968). Corynebacteria have been implicated in summer mastitis and other suppurative condition as pyaemia,

abscess formation, nephritis and pyelonephritis (MERCHANT and PACKER, 1967; CRUICKSHANK, et al. 1975 and BUXTON and FRASER, 1977).

Shigella flexneri was incriminated in 9.1% of the examined samples from animal dewllings (Table 1), a result which is lower than that recorded by HAFEZ (1976). However, Shigella flexneri was found to be responsible for cases of dysentery in man and some species of animals (TOPLEY and WILSON, 1975).

Pseudomonas aerogenosa was recoverd from soil samples of cattle enclosures repri-senting 5.5%. The percentage is considered lower than that obtained by HAFEZ (1976) and SAMAHA (1983). Pseudomonas aerogenosa has been recognized by WILSON and MILES (1957) to be responsible for cases of mastitis and wound infections in domestic animals as well as enteritis, peritonitis, artheritis and pneumonia in calves (BUXTON and FRASER, 1977). It is also considered a potential pathogens in case of wound infec-tion among human-beings (JENNING, 1975).

Salmonella spp. failed detection any of the examined samples. Similar result was obtained by MOWAFI, et al. (1980). On the other hand, ABDEL-KRIM (1968); HAFEZ, (1976) and SAMAHA (1983) could isolate Salmonella species from examined soil samples and in a percentage of 3.0%, 2.5% and 21.0% respectively.

Soil act as a reservoir for some pathogenic fungi responsible for diseases in man and animals. Table (2) revealed that Aspergillus species including Aspergillus niger (83.6%), Aspergillus fumigatus (16.4%) and Aspergillus flavus (14.5%) were recovered from soil of cattle byers. Aflatoxicosis among animals feed on mouldy rations was repor-ted by FREY, et al. (1979). Pulmonary aspergillosis was also recorded by GRFFIN (1966) as one of the most significant diseases which occuring three weeks old calves. Moreover, Aspergillus fumigatus was incriminated in cases of mycotic abortion in cattle at the 3rd and 8th months of pregnancy (HILLMAN, 1960). Besides, Aspergillus species have been incriminated as causative agents in many human mycotic infections especially broncho-pulmonary aspergillosis (JORDAN, et al. 1971).

Mucor, Rhizopus, Penicillium and Alternaria species were isolated at percentage of 60, 30, 27.3 and 10.9 respectively (Table 2). Penicillium and Mucorspecies were included in infections of the bronchi and lungs in man and animals (CRUICKSHANK, et al. 1970). Moreover, many of the Mucors and Rhisopus spp. were reported to produce mycotic abortion in cattle and other animals (AINSWORTH and AUSTWICK, 1959).

Candida albicans, Candida tropicals and Rhodotorula mucilagnosa were recovered from examined soil samples representing 9.1., 5.5 and 7.3% respectively (Table 2) which is lower than those obtained by ABDEL-KRIM (1968), HAFEZ (1976), SAMAHA (1983) and EZZAT, et al. (1986). It is responsible for Monilliasis which ranged from a localized

infection of the skin and mucous membranes to a dissiminated acut and oftenly fatal infection involving one or more organs of the body (CRUICKSHANK, et al. 1970). In addition, Candida is responsible for thrush of the mouth (MARPLES, 1960). Rhodotorula mucilaginosa is incriminated in human mycosis RIETH, 1973).

From the results acheived, we can conclude that soil of animal enclosures may be contaminated with secreta and excreta of the infected or carrier animals as well as from waste material of animal. stable. Thus, floors should be constructed of concrete. They must be subjected to frequent cleaning and disinfection. The hygienic measures should be performed to avoid the risk of dissomination of pathogens from contaminated soil.

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Table 1: Number and percentage of isolated bacteria from soil

Isolate	No.	%
E.coli	55	100.0
Proteus rottgeri	25	45.5
Proteus vulgaris	12	21.8
Staphylococcus aureus	24	43.6
Streptococcus faecalis var faecalis	13	23.6
Streptococcus faecium	7	12.7
Streptococcus faecalis var liquefacions	2	3.6
Streptococcus pyogenes	2	3.6
Providencia spp.	22	40.0
Citrobacter freundi	10	18.2
Klebsiella aerogens	5	9.1
Corynebacterium pyogenes	8	14.5
Corynebacterium renale	3	5.5
Corynebacterium ovis	1	1.8
Shigella flexneri	5	9.1
Pseudomonas aeregenosa	3	5.5
Salmonella	-	0.0

Table 2: Number and percentage of fungi isolated from soil

Isolte	No.	%
Mould spp.		
Aspergillus niger	46	83.6
Aspergillus fumigatus	9	16.4
Aspergillus flavus	8	14.5
Mucor spp.	33	60.0
Rhizopus spp.	17	30.9
Peniciiiium spp.	15	27.3
Alternaria spp.	6	10.9
Yeast spp.		
Rhodotorula mucilagnosa	4	7.3
Yeast-like organism		
Candida albicans	5	9.1
Candida tropicalis	3	5.5