

Department of Entomology, Faculty of Science, Ain Shams University,
and Faculty of Veterinary Medicine Cairo-University, Giza

A study of the fungi associated with the house fly, *Musca domestica* L. and allied spp. in Cairo

A. I. MERDAN, M. REFAT and FEKRIA ALLAM

Introduction

The common house fly, *Musca domestica* Linnaeus, has been incriminated in transmitting various organisms pathogenic to man, animals and plants. Very few data are available as regard its role in transmission and dissemination of fungal pathogens. In the literature, we found more discussions of a hypothetical nature than of facts, and only sporadic reports on the fungi associated with the house-fly (JACOBSON, 1932; CHARLES, 1941 and USUI, 1960).

The present work has been undertaken to establish the types of fungi which may be associated with *Musca domestica* in Cairo.

Material and Methods

100 fly samples, each about 200 flies, were collected once weekly from 10 different localities in Cairo for almost two successive years. A standardized collecting net was used. The muslin part of the net was autoclaved at 121 °C prior to each application in each locality. The collected flies were transferred to the laboratory in sterile wooden cages (40 x 40 x 40 cm), where they were introduced in sterile glass bottles containing saline. The bottles were shaken gently for about half an hour to suspend the external fungal flora. The suspensions were then centrifuged and the sediments were inoculated on Sabouraud glucose agar, Littman agar, Malt extract agar and Potato dextrose agar media.

The flies remaining in the bottles were washed for 2 minutes in a solution of 1:1000 mercuric chloride in 80% alcohol, and then 4 times in saline to get rid of the disinfectant. The surface disinfected flies were transferred aseptically into a sterile mortar and triturated with sterile pestle using sterile saline. The resulting mixture was covered with sterile muslin and the clear suspension was pipetted and used for culturing the internal fungal flora on the previously mentioned media. The inoculated plates were incubated both at 37 °C and at room temperature.

The isolated fungi were identified according to their macro- and microscopic morphology.

Results

From 100 fly samples 242 strains of fungi were isolated; most of them were moulds belonging to the genera *Aspergillus*, *Penicillium*, *Mucor*, *Rhizopus*, *Alternaria*, *Phoma*, *Paecilomyces* and *Scopulariopsis*. The yeasts were represented by *Candida*, *Torulopsis*, *Pityrosporum* and *Saccharomyces*. Of the dermatophytes only *Microsporum canis* and of the diphasic fungi only *Sporothrix schenckii* were isolated (table 1).

A. niger was the most common external contaminant, followed by *A. flavus*, *Penicillium sp.* and *Mucor*, while *Mucor*, *A. flavus* and *Geotrichum* were the most frequent internal contaminants. In general, there was a slight difference between

Table 1: Incidence of fungi in 10 districts in Cairo in association with the house-fly, *Musca domestica*

	Rod El- Faraq	Shobra El- Khema	Misr El- Kadema	Ain Shams garbage	Arab El- Mohamady	Bab El- Shareia	Boulak El- dakror	Slaugh- ter house	El- Helmia El- Gedida	El- Zamalek	No. of fungi
<i>Microsporium canis</i>					*X			*X			2
<i>Candida albicans</i>	X				*	X			*		4
<i>Torulopsis</i> sp.		X		○	+X			*			5
<i>Saccharomyces</i> sp.	*○	*○	*X	+X					X○		5
<i>Pityrosporium ovale</i>								*○			1
<i>Geotrichum</i> sp.	*X	X	X	*X	○	+			*X		7
<i>Aspergillus niger</i>	+*X	*X○	+*X○	*X	+X○	+*○	*X○	○	*X○	+*X○	10
<i>A. flavus</i>	+*X	*X	*○	+*○	*○	*X	*X	+*X	○	*X	10
<i>A. species</i>	*X○	+	+X	X	*		*			*	8
<i>Penicillium</i> sp.	*○	*○	*○	*	+*X	X	X○	○		+*X○	9
<i>Paecilomyces</i> sp.			○				*				2
<i>Scopulariopsis brevicaulis</i>							X		*		2
<i>Phoma</i>	○				+*X○	X	○				5
<i>Alternaria tenuis</i>		+X	+	X		X	+*	+	+X		7
<i>Rhizopus oryzae</i>	*	*	+					X			4
<i>R. nigricans</i>	+	X		○		*○	+X		+*	+*	7
<i>Mucor</i> sp.		+	*X	+*X○	+X	+X○	X○	+*X	+*	X	9
<i>Sporothrix schenckii</i>			*			*	X	+			4
No. of fungi	10	11	12	10	9	9	8	14	6	6	

the numbers of fungi found outside and those inside the flies. The yield of isolates was higher in spring and summer and lower in autumn and winter.

The largest number of fungal species recorded in the districts of slaughter house, Misr El Kadema, El-Helmia, Shobra and Rod El-Farag. All these districts are of

low sanitary condition. El-Zamalek, which was taken as a check district of higher sanitary level, presented the least number of fungi. *A. niger* and *A. flavus* were isolated from all 10 districts and *Penicillium sp.* and *Mucor sp.* from 9 districts. *Candida albicans* and *Sporothrix schenckii* were found in 4 districts, while *Microsporum canis* in only 2 (table 2).

Table 2: Seasonal incidence of external and internal fungal contamination of the house-fly, *Musca domestica*

Organisms isolated	Numbers of isolates in two years								Total	Per-centage	
	Spring		Summer		Autumn		Winter				
	Ex.	IN.	Ex.	IN.	Ex.	IN.	Ex.	IN.			
1 <i>Microsporum canis</i>	1	2	1	2	-	-	-	-	2	4	2.5 %
2 <i>Candida albicans</i>	1	2	-	2	-	-	-	-	1	4	2.1 %
3 <i>Torulopsis sp.</i>	1	2	-	2	-	1	-	1	1	6	2.9 %
4 <i>Saccharomyces sp.</i>	1	2	-	3	-	3	1	1	2	9	4.5 %
5 <i>Pityrosporum ovale</i>	-	1	-	-	1	1	-	-	1	2	1.2 %
6 <i>Geotrichum sp.</i>	1	3	1	5	-	1	1	1	3	10	5.4 %
7 <i>Aspergillus niger</i>	8	2	8	1	8	5	5	-	29	8	15.3 %
8 <i>A. flavus</i>	8	6	6	4	4	2	3	1	21	13	14.0 %
9 <i>A. sp.</i>	4	3	2	2	2	1	1	1	9	7	6.6 %
10 <i>Penicillium sp.</i>	5	1	4	-	6	1	2	-	17	2	7.9 %
11 <i>Paecilomyces sp.</i>	1	1	-	-	-	1	-	-	1	2	1.2 %
12 <i>Scopulariopsis brevicaulis</i>	-	1	-	1	-	-	-	-	-	2	0.8 %
13 <i>Phoma</i>	1	-	2	2	4	2	1	1	8	5	5.4 %
14 <i>Alternaria tenuis</i>	-	1	1	4	-	-	2	4	3	9	4.9 %
15 <i>Rhizopus oryzae</i>	2	1	1	1	-	-	1	-	4	2	2.5 %
16 <i>R. nigricans</i>	3	3	2	2	2	2	4	2	11	9	8.3 %
17 <i>Mucor sp.</i>	2	4	5	6	2	3	3	5	12	18	12.4 %
18 <i>Sporothrix schenckii</i>	1	1	-	1	-	-	1	1	2	3	2.1 %
	40	36	33	38	29	23	25	18	127	115	
Total number	76		71		52		43		242		
Percentage	31.4 %		29.3 %		21.5 %		17.8 %		52.5 47.5		

Discussion

The aforementioned results demonstrate clearly the importance of the house-fly as a possible vector which is able to transmit and disseminate various types of fungi to man and animals. It is expected that most of the isolated fungi are moulds, which are ubiquitous in nature and the spores of which are disseminated everywhere and contaminating several objects. However, some of these moulds are known to produce toxins in food and feeding stuffs contaminated by them e. g. *Aspergillus flavus* and *Aspergillus niger* (ALLCRAFT et al., 1961, HANSEN and HAGEDORN, 1969, and KAMEL et al., 1974). Other moulds e. g. *Scopulariopsis*, *Alternaria* and *Paecilomyces* have been incriminated as causes of onychomycoses and chronic paronychia (KREMPL-LAMPRECHT, 1967; SOKOLOWSKA, 1967, and REFAI and AMER, 1974).

The isolation of *Microsporium canis* in association with flies is of great interest, because this dermatophyte has unknown saprophytic habitat or source of infection (DVOŘÁK and OTČENÁŠEK, 1969). Furthermore it is the cause of ring-worm in cat, dog, horse, lion, tiger, monkey and man (AINSWORTH and AUSTWICK, 1959; REFAI and BISPING, 1964, REFAI and RIETH, 1965, ABDEL FATTAH et al., 1967 and DVOŘÁK and OTČENÁŠEK, 1969). In this respect, KOCH (1966) was able to ascertain that flies may transfer dermatophytes from agar plates to others. He also trapped flies in buildings in which cattle infected with trichophytosis were housed; and in several instances he isolated *Trichophyton verrucosum* from them. Accordingly, in this investigation, it seems most probable that the flies have obtained the *M. canis* from infected stray dogs in both the slaughter-house and Arab El-Mohamady districts.

It is noteworthy that *Candida albicans* was also isolated in association with flies. This yeast has been recovered in Egypt from sputum and urine of patients suffering from chest and urinary troubles (REFAI et al., 1971) and from cases of macerated toe webs (ABDALLAH et al., 1971).

In the present work it is clear that the house-fly is highly contaminated during the spring and summer seasons. This may be explained by the fact that the seasonal abundance of this insect in Egypt reach its maximum during April and May. In this period the fly becomes more active and hence the possibility of contamination may be raised.

There is a significant difference in the number and types of isolates as regards the sanitary condition of the districts. The contamination of the fly was high in districts of low sanitary level as the slaughter-house district and it was low in districts of higher sanitary level as the Zamalek.

This survey on the fungi associated with the *Musca domestica* in Cairo is a step on the threshold of the epidemiological studies concerning this insect as a vector of several fungi pathogenic to man and animals.

Summary

From 100 samples of the house-fly, *Musca domestica*, each about 200 flies collected from 10 different districts in Cairo during two successive years, 242 strains of fungi were isolated. Most of them were moulds belonging to the genera *Aspergillus*, *Penicillium*, *Mucor*, *Rhizopus*, *Alternaria*, *Phoma*, *Paecilomyces* and *Scopulariopsis*. The isolated yeasts were *Candida albicans*, *Torulopsis*, *Pityro-*

sporium and *Saccharomyces*. Of the dermatophytes, only *Microsporum canis* and of the diphasic fungi only *Sporothrix schenckii* were isolated. The importance of the house-fly as a possible vector for fungal pathogens was discussed.

Zusammenfassung

Die gewöhnliche Stubenfliege stand schon lange unter dem Verdacht, verschiedene Krankheiten auf Mensch, Tier und Pflanze zu übertragen.

Um Daten zu sammeln, inwieweit die Stubenfliege auch als Überträger von pathogenen Pilzen in Betracht gezogen werden muß, wurden Reihenuntersuchungen durchgeführt.

In 10 verschiedenen Bezirken Cairos wurden 100 Proben zu je etwa 200 Stubenfliegen, *Musca domestica*, im Verlauf von zwei Jahren gesammelt.

Von diesen Fliegen wurden 242 Pilzstämmen isoliert, meist Schimmelpilze der Gattungen *Aspergillus*, *Penicillium*, *Mucor*, *Rhizopus*, *Alternaria*, *Phoma*, *Paezilomyces* und *Scopulariopsis*.

Die isolierten Hefen waren *Candida albicans* sowie Arten aus den Gattungen *Torulopsis*, *Pityrosporum* und *Saccharomyces*.

Sehr bemerkenswert ist, daß auch ein Dermatophyt in zwei Bezirken isoliert wurde, nämlich *Microsporum canis*, der hauptsächlichste Erreger der Mikrosporie.

Als Vertreter der diphasischen Pilze wurde *Sporothrix schenckii* in 4 Bezirken nachgewiesen.

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Address for reprints:

Dr. A. I. MERDAN, Dept. of Entomology, Ain Shams University, Cairo, and Prof. Dr. M. REFAI, Faculty of Veterinary Medicine, Giza, Egypt.