

EPIDEMIOLOGICAL - ASPECTS OF KALA- AZAR IN MESHKIN- SHAR, IRAN: INVESTIGATION ON VECTORS ★

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ADSTRACT

Visceral leishmaniasis caused by *Leishmania infantum* has become endemic in Meshkin-Shahr area, northwest Iran, so that in the last 8 years, more than 1600 cases have been diagnosed and treated, the majority of them among children younger than 5 years of age.

The present study was carried out to determine the probable vectors in this area. During the active season of sandflies in 1991, we collected sandflies from fixed catching

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sites by sticky traps. The result show that sandflies were active from mid-June through mid-October. The following species have been caught in this area: *Phlebotomus papatasi*, *Ph. sergenti*, *Ph. caucasicus*, *Ph. mongolensis*, *Ph. alexandri*, *Ph. kandelakii*, *Ph. major*, *Ph. perfiliewi transcaucasicus*, *Ph. kechishiani*, *Ph. halepensis*, *Ph. balcanicus*, *Ph. brevis*, *Sergentomyia dentata*, *S. pawlowskii* and *S. sumbarica*. As many of these are potential vectors, dissection was made in 1991 and 1992 on gravid and blood-fed flies caught by sticky traps and CDC light traps. We found promastigote infection in 2 *Ph. kandelakii* and 2 *Ph. perfiliewi transcaucasicus*. Hamster inoculation of one strain caused massive visceral infection. Further studies are planned to identify other probable vectors and also the principal definite vector.

INTRODUCTION

In the last decade or so, kala-azar has become an important endemic disease in parts of East-Azerbaijan province, northwest Iran, especially in the districts of Meshkin-Shahr, Germe, and Moghan. This area is adjacent to the southeastern part of the Republic of Azerbaijan (ex-Soviet Azerbaijan) to the west of the Caspian sea.

Edrissian et al. in 1988 (1) reported the results of some seroepidemiological surveys on the disease in this part of the country. Recently Soleimanzadeh et al. (2) have reported on the clinical aspects and treatment of more than one thousand cases of the disease seen in the Meshkin-Shahr district hospital from 1985 through 1989.

Since 1987, studies of the epidemiological aspects of the disease has started by the investigators of the Institute of Public Health Research, Teheran University of Medical Sciences, mostly by students who were preparing Master's or Doctoral theses (3).

In 1991, a pilot control project for kala-azar started in this area by the Institute of Public Health Research, Provincial Health Department and the Department General of the Control of Communicable Diseases of the Ministry of Health and Medical Education, with some financial support from the Leishmaniasis Steering Committee of

WHO/World Bank/UNDP TDR programme.

Part of this project is dealing with the identification of the vectors and the determination of their ecological and biological characteristics.

The present paper is a summary report of the investigations on sandflies from May 1991 through October 1992 in Meshkin- Shahr and Germi districts covering two active seasons of these insects in this area.

The pilot control project covers some 80 villages in the south and west of the Meshkin-Shahr city as intervention area and some 50 villages in the district of Germi as control area. The details of these villages is out of the scope of this paper, because we did not carry out entomological investigations in all of them. Generally speaking, it could be said that the areas mentioned above are at the foothills of Mount Sabalan, one of the highest peaks in the country (alt. 4811 m). As we go from the southwest to the northeast, the altitude decreases and the weather becomes warmer. The area with the highest incidence of kala-azar has an altitude between 1100 m and 1700 m above sea level. The city of Meshkin- Shahr, around which the majority of cases are found, has an altitude of 1490 m. The weather is very cold in the winter and warm in the summer. Warm season is rather short in the area lasting from mid May to late September. Fig. Fig.(1) shows the annual changes of the temperature in the Iranian Year Of 1370 (21 March 1991 to 20 March 1992).

There are changes in the starting date of the warm season from one year to the other active season starts sooner in some years and later in others. so that The topography of the area under investigation is sort of hills covered with fertile soils. The lower parts are usually under the cultivation of agricultural products (wheat, barley, potato, licern, etc.) and the higher parts are grazing areas for sheep. The main activity of the population of the area is agriculture and sheep and cattle breeding. There is practically no industry in this part of the country. In the areas with higher altitude there are some not very dense woods in the valleys, around the streams, but further north, these decrease in size and most of the lands are either under cultivation or used as pasture. Cow dung is an important item used as fuel in the villages. In most of the

villages there are many heaps of dried cow dung made in the form of cone-shaped heaps a few meters high. (Fig2) The cattle are mostly kept indoors at night and released during the day for grazing. The floor of the cow-shelters are covered with cow dung.

The walls and the floor are made of mud and this makes the places ideal for breeding of sandflies.

For the determination of seasonal changes of the activity, sandflies were collected by oiled-paper traps outdoors and indoors. In 1991, we identified 20 fixed catching sites on a hill slope of the village Hiagh. Capture was done once every week from the first week of May to the last week of September.

For the determination of vectors, we collected sandflies by aspirators, by CDC mini light-traps, as well as oiled-paper traps. Collection by aspirators were made within houses (stables, cow-shelters, living rooms, latrines). Oiled-paper traps were put both indoor and outdoor. Light traps were put in places protected from the wind, right after sunset, and sandflies were collected very early in the morning. Live sandflies were transferred to a holding tube, the bottom of which was made of one centimeter thick plaster. They were kept there for 48 hours to allow the blood to be partly digested and they were dissected for promastigote infection. Sandflies collected by the oiled-papertraps were dissected the same morning, before they were dead.

During the dissection, the head and the posterior part of the abdomen of each sandfly were mounted in a drop of Puri's mounting medium on a slide for later species identification in Teheran. Male sandflies and those collected by sticky traps for determination of fauna, were also mounted in Puri's medium. Species identification was carried out in Teheran.

As we were mostly interested in vector incrimination, we did not cover very large areas to complete the knowledge on fauna, especially as regards wild and cavernicolous sandflies.

Results

1- Fauna. Table 1 shows the list of all the sandfly species collected so far in Meshkin- Shahr area. As seen, the majority of them belong to the genus *Phlebotomus*. We are sure that there are more species of the genus *Sergentomyia*, but, as mentioned before, our main interest in these studies was vector incrimination.

Table 1- List of sandfly species collected in Meshkin - Shahr area

- 1- *Ph. (Ph.) papatasi*
- 2- *Ph. (Paraph.) sergenti*
- 3- *Ph. (Paraph.) caucasicus*
- 4- *Ph. (Paraph.) mongolensis*
- 5- *Ph. (Paraph.) alexandri*
- 6- *Ph. (Lar.) kandelakii*
- 7- *Ph. (Lar.) major*
- 8- *Ph. (Lar.) perfiliewi transcasicus*
- 9- *Ph. (Lar.) keshishiani*
- 10- *Ph. (Adl.) chinesis halepensis*
- 11- *Ph. (Adl.) chinensis balcanicus*
- 12- *Ph.(Adl.) chinensis brevis*
- 13- *Serg. dentata*
- 14- *Serg. pawlowskii*
- 15- *Serg. sumbarica*

2- Seasonal activity of sandflies. Fig 3 chows changes in the seasonal activity of sandflies collected in the village Hiagh from beginning to the end of active seasen. It is seen that sandflies are active only a little more than 3 monthes in this area.

3- Density of various species. Table 3 shows the number and species of sandflies collected in various villages. It shows clearly that the dominant species is *Ph. kandelakii* which has been found in almost all the villages of the area.

4- Narural promastigote infection. Table 3 shows the results of sandfly dissection

for promastigote infection in Meshkin-Shahr and Germi districts. It shows that promastigote infection has been found in *Ph. kandelakii* and in *Ph. perfiliewi transcaucasicus*. The number of dissected sandflies was less than two thousand.

Discussion

This study shows that there are several potential vectors of kala-azar present in this area. eg. *Ph. kandelakii*, *Ph. perfiliewi transcaucasicus*, *Ph. major* and various species of *Adlerius* group, but only in the first two species we did find promastigote infection. We may assume that these two species are probable vectors but we cannot rule out the role of other potential vectors such as *Ph. major* that its role as vector of kala-azar has been reported by Sahabi et al in Fars province, southern Iran (4). The active season of sandflies is very short in this area, but the way the people keep their cows provides the best breeding sites for sandflies especially for *Ph. kandelakii*. Further studies are being planned to clarify the ecology of probable vectors and the role of other species as potential vectors.

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REFERENCES

1. Edissian, G.H. et al. (1988) :An endemic focus of Visceral leishmaniasis in Meshkin shahr, east Azerbaijan province northwest part of Iran. *Bull. Soc. Path. Exo* 81:238-248.
2. Soleimanzadeh, G. et al. (1993) @Epidemiological Aspescts of kala- azar in Meshkin Shahr Iran: Human infection *Bull WHO* 71: 759-761.
3. Abai, M.R. (1989) "Sandflies in Meshkin Shahr area" MSPH thesis, School of Public Health Tehran.
4. Sahabi, Z. et al. (in press) " Natural leptomoand infection of visceral leishmaniasis (VL) in Fars province south of Iran.

TABLE 2 Sandfly species collected in Meshkin- shahr area in the Summer 1991

village	no cases in 1991	sanfly species												
		p	s	c	mon	kan	ad1	mj	kesh	perf	den	paw	sum	a11
Jabdaragh	7	6	56	7	—	3	13	—	1	—	3	12	2	103
Parikhan	32	8	2	13	—	14	—	—	—	—	—	—	—	37
Gharaghieh	—	16	2	34	—	3	—	—	—	—	—	—	—	55
Ghassabeh	2	3	—	—	—	2	1	—	—	—	—	—	—	6
Kharavan	0	26	3	—	1	43	5	—	—	25	—	—	—	103
Ahmadbeygloo	9	16	—	15	—	44	4	—	—	—	—	—	—	79
Mejandi	16	—	1	2	—	12	—	1	—	6	—	—	—	22
Mirak	10	6	2	8	—	99	—	—	—	—	—	—	—	115
Ahmadabad	23	5	—	6	—	3	7	—	—	—	—	—	—	21
Mazraeh	3	5	—	—	—	23	2	—	—	—	—	—	—	30
—khalaf														
Ourkandi	13	1	—	—	—	28	—	1	—	—	—	—	—	30
Mehreh	—	1	—	—	—	37	17	3	—	1	1	—	—	60
Perazmian	—	137	1	131	—	5	6	3	—	—	8	—	—	291
Hajiloo	—	2	—	4	—	—	—	—	—	—	—	—	—	6
Hiagh	2	94	168	3	4	150	90	1	1	—	—	—	—	511
all collection No.	117	326	235	223	5	466	145	9	2	32	12	12	2	1469
Percent	—	22.2	16	15	.3	31.7	9.8	.6	.1	2.2	.7	.7	.1	100

p=papatasi

s=sergenti

c=caucasicus

mon=mongolensis

kan=kandelakii

adl=adlerius group

mj=majer

kesh=keshishiani

perf=perfiliewi

den=dentata

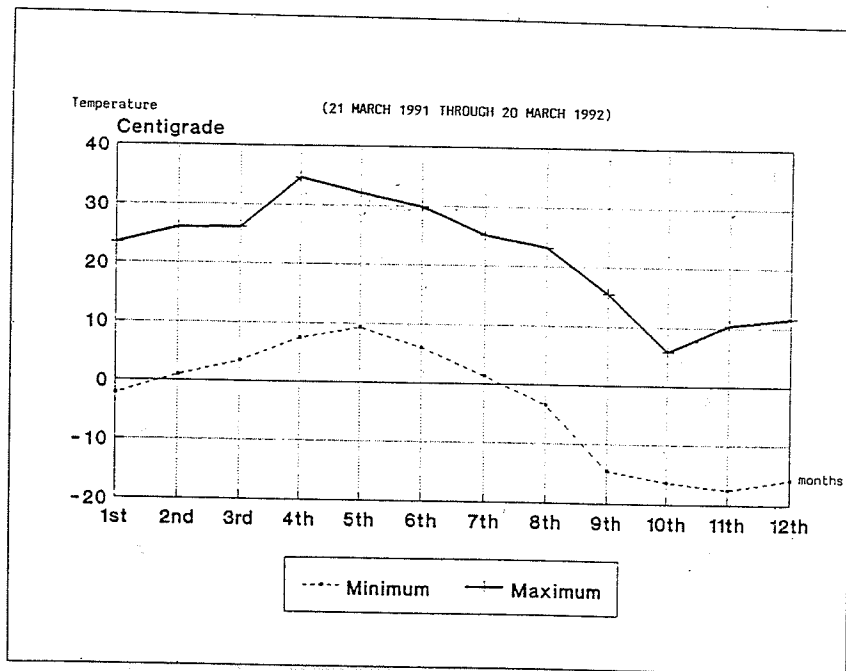
paw=pawlowskii

sum=sumbarica

Table 3 : Results of sandfly dissection for pramastigote infection in Meshkin-shahr area in 1991 and 1992

Dates of dissection	place	Species dissected											
		Phandelkii		Ph.pertilewi		Ph.chinensis group		Ph.papatasi		Ph.canonicus		Ph.sergenti	
		no.diss.	No.pos	no.diss	No.pos	no.diss.	Mo.pos	no.diss	No.pos	no.diss	no.pos	no.diss	no.pos
12-19 august 91	Meshkin shahr	169	0	6	0	34	0	120	0	138	0	21	0
28 june 2 july 92	Meshkin shahr	11	0	0	0	0	0	47	0	145	0	0	0
4 july 6 july 92	Germi district	130	0	28	0	7	0	0	0	0	0	0	0
30 july 12 aug 92	Meshkin shahr	206	1	0	0	41	0	4	0	53	0	0	0
13 aug 18 aug 92	Germi district	59	0	96	0	120	0	0	0	22	0	0	0
9 aug 21 aug	Meshkin shahr	33	1	2	0	2	0	0	0	1	0	0	0
26 aug 31 aug 92	Germi district	41	0	80	2	96	0	0	0	0	0	0	0
all dissections		649	2	212	2	300	0	171	0	359	0	21	0

Fig1- SEASONAL CHANGES IN THE MAXIMUM AND MINIMUM TEMPERATURE IN MESKIN-SHAHR IN THE IRANIAN YEARS 1370



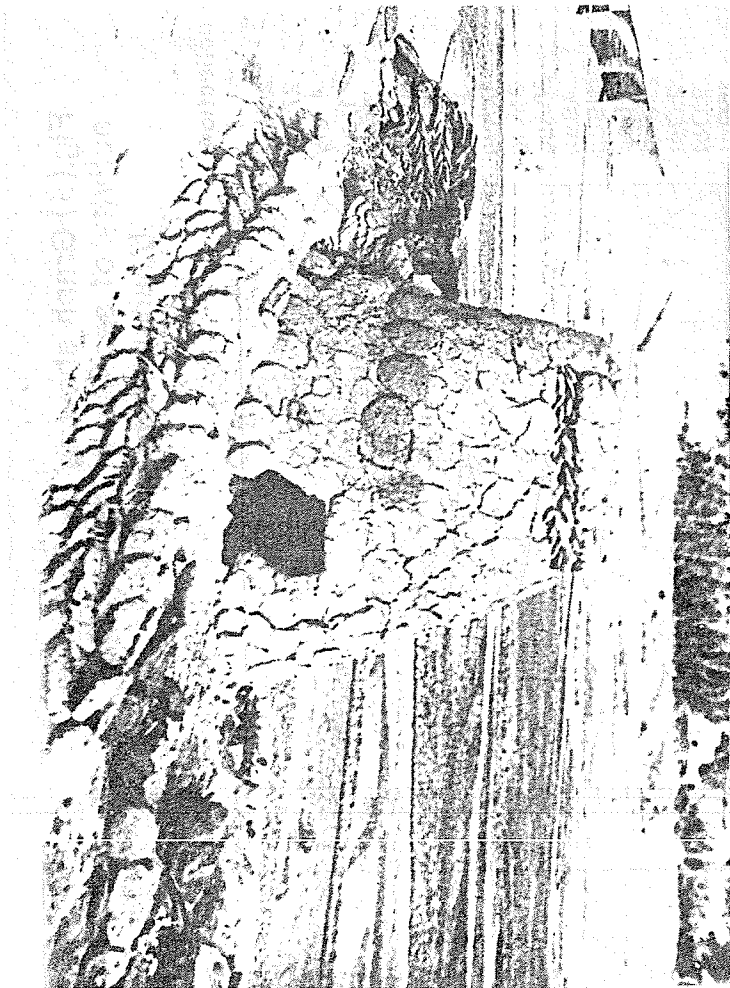


Fig 2 – Cowdungs to be dried and used as full in the winter

Fig.(3):Graph showing the seasonal activity of sanflies in Hiagh village ,Meshkinsshahr in 1991

