



TECHNICAL REPORT

1/96

LEISHMANIASIS SURVEILLANCE IN THE SINAI WITH SPECIAL EMPHASIS
TO THE MULTINATIONAL FORCE AND OBSERVERS AND ASSOCIATED AREAS

By

W.W. Kanour, S.M. Presley, G.E. Tetreault,
I. H.M. Helmy, M.O. Ibrahim and H.A. Hanafi

19960910 138

DTIC QUALITY INSPECTED 3

U.S. NAVAL MEDICAL RESEARCH UNIT NO. 3
(CAIRO, ARAB REPUBLIC OF EGYPT)
PSC 452, BOX 5000
FPO AE 09835-0007

**U. S. NAVAL MEDICAL RESEARCH UNIT NO. 3
CAIRO, ARAB REPUBLIC OF EGYPT**

TECHNICAL REPORT 96-01

**LEISHMANIASIS SURVEILLANCE IN THE SINAI WITH
SPECIAL EMPHASIS TO THE MULTINATIONAL FORCE
AND OBSERVERS AND ASSOCIATED AREAS**

LCDR W. W. KANOUR, JR., MSC, USN

LCDR S. M. PRESLEY, MSC, USN

LCDR G. E. TETREAULT, MSC, USN

I. H. M. HELMY

M. O. IBRAHIM

H. A. HANAFI

TABLE OF CONTENTS

	PAGE NO.
ABSTRACT.....	2
INTRODUCTION.....	3
LEISHMANIA DISTRIBUTION.....	3
SAND FLY SPECIES.....	3
RODENT SPECIES AND RESERVOIR HOSTS.....	4
HUMAN CASES.....	4
SURVEILLANCE STRATEGIES.....	6
ACKNOWLEDGEMENTS.....	7
LITERATURE CITED.....	8
TABLES:	
TABLE 1. SAND FLIES COLLECTED IN THE MFO AREAS, SINAI, EGYPT, 1993-1995	09
TABLE 2. FERAL RODENTS COLLECTED IN MFO AREAS, SINAI, EGYPT, 1994 - 1995	10
TABLE 3. NUMBER OF CASES OF CUTANEOUS LEISHMANIASIS DIAGNOSED IN MFO TROOPS DURING VARIOUS YEARS, SINAI, EGYPT	11
TABLE 4. PERCENTAGE OF FEMALE SAND FLIES FOUND TO BE POSITIVE FOR LEISHMANIA PARASITES, COLLECTED IN THE MFO AREAS, SINAI, EGYPT, 1989-1991 AND 1993-1995	12
FIGURES:	
FIGURE 1. AVERAGE SAND FLIES/ST TRAP/N ALL SITES, SINAI, EGYPT, 1993-1995	13
FIGURE 2. AVERAGE SAND FLIES/LT TRAP/N ALL SITES, SINAI, EGYPT, 1993-1995	14

ABSTRACT

Leishmaniasis is a wide spread disease throughout many regions of Southwest Asia. Military personnel deployed into the Sinai as members of the Multinational Force and Observers (MFO) contingent are at risk from Cutaneous Leishmaniasis (CL). This disease is vectored by various anthropophilic sand fly species, of which at least nine have been reported in the Sinai region.

Sand flies were collected through various years and *Phlebotomus papatasi* accounts for greater than 96% of species collected. Seasonal distribution of sand flies was studied. Feral rodents are implicated as reservoir hosts for CL. *Gerbillus sp.* and *Meuones crassus* account for nearly 80% of those collected during the survey.

Survey results for the isolation of *Leishmania* parasites indicate that a small percentage of sand flies are infected, ranging from zero to 5.07%. No feral rodents were found to be infected during the most recent (1993-1995) collection period. Human cases were reported, varying in number over different years, with a slight resurgence in 1995. Cutaneous leishmaniasis continues to pose a risk to troops deployed into the region and efforts to prevent the disease should be given priority.

INTRODUCTION

Leishmaniasis is a wide spread disease throughout many regions of Southwest Asia. *Leishmania* species may cause infections which vary greatly in pathology depending on the species of parasite involved. Although not a new disease to the military, leishmaniasis gained a renewed prominence in military medicine with a new form, viscerotropic, seen in some military personnel serving in the Middle East during the Persian Gulf War. Cutaneous Leishmaniasis (CL) is a polymorphic disease of the skin caused by an infection of an intracellular protozoan and is the most common form of leishmaniasis in the Sinai.

Personnel deployed to the Sinai as members of the Multinational Force and Observers (MFO) contingent are at risk from cutaneous leishmaniasis. This group of peacekeepers resulted from a three-party protocol, signed in 1981 by the United States, Egypt and Israel, when the United Nations Security Council announced it could not provide a peacekeeping force as outlined in the Treaty of Peace signed 26 March 1979 by Egypt and Israel. The MFO is not part of a United Nations peacekeeping force and is not part of NATO. Nations providing support to the MFO in the Sinai during the period of this study include: Australia; Canada; Columbia; Fiji; Hungary; Norway; France; Italy; Netherlands; New Zealand; United Kingdom; Uruguay; and the United States.

LEISHMANIA DISTRIBUTION

In the Sinai region and surrounding areas of Egypt and Israel three species of *Leishmania* have been reported, viz., *Leishmania major*, *L. infantum* and *L. tropica*.¹ *Leishmania major* has been the only Old World species isolated from the Sinai from humans, animals or sand flies in NAMRU-3 studies commencing in 1982.

SAND FLY SPECIES

At least nine different anthropophilic sand fly species are

reported in the literature from the Sinai,^{1,2} six of which are potential or confirmed vectors of leishmaniasis.¹ The most prevalent species of sand fly collected from the MFO study areas was *P. papatasi*, accounting for more than 96% of the anthropophilic species collected (Table 1.). Other species collected include the possible vectors *P. alexandri*, *P. kazeruni* and *P. sergenti* and the reptile feeder, *Sergentomyia antennata*.

Phlebotomus kazeruni Theodor & Mesghali is a suspect vector of CL¹ and has been established in a laboratory colony at NAMRU-3. This is the first time this species has been successfully colonized in the laboratory. The initial specimens used to start this colony were collected from the Nawara Farm in the southern Sinai Peninsula near the Southern Camp of the MFO.¹ Studies to determine the ability of this species to vector CL are planned as well as studies of its bionomics.

RODENT SPECIES AND RESERVOIR HOSTS

Rodents have been implicated to be the natural zoonotic reservoir for *L. major* in the Sinai region. Desert gerbils and merinos are the reported reservoirs. *Gerbillus* species (*G. pyramidum floweri*, *G. gerbillus asyutensis*, *G. andersoni bonhotei*) and *Meriones crassus* account for nearly 80% of the feral rodents trapped in the study areas. The population composition of feral desert rodents trapped in MFO areas is shown in Table 2. The trapping of feral rodents and the use of sentinel animals (Syrian hamsters, *Mesocricetus auratus*) revealed an extremely low percentage of animals infected with *L. major*. Starting in 1989 until late fall 1995, *L. major* has been isolated from only one feral animal.¹ Fryauff et al. (1993)⁷ reported two sentinel hamsters developing multiple cutaneous lesions with *L. major* amastigotes present. All subsequent sentinel animals were shown to be negative for *Leishmania* infections.

Human Cases

Human cases have decreased in MFO personnel from the

inception of the study to the present. From October 1982 to July 1985, 113 members of the MFO were diagnosed as having CL.⁵ In a study conducted from 1989-91 by Fryauff et al. (1993)⁷, 21 human cases were reported with successful isolation in 17 of the cases. *Leishmania major* was identified in 15 of the cases and *L. panamensis* was isolated from the other two cases. The *L. panamensis* cases were from Columbian soldiers and represented recrudescence of infections acquired in Columbia prior to deployment with the MFO in the Sinai. During the period of 1993-94, no cases of CL were reported by the MFO medical contingent. However, one case of CL was diagnosed in an active duty U.S. Navy member who had worked in the study area. During 1995, a slight resurgence was seen in the MFO troops with 7 suspected cases of CL reported. Table 3 represents the number of cases of CL during the years mentioned. Historically the soldiers having the highest risk potential have been those who stationed at the outer checkpoints, primarily soldiers from Columbia, Fiji, Uruguay, and the United States of America. The Fijian soldiers have had the greatest number of cases of CL over the years. Even with the decrease in cases in deployed personnel, CL still poses a risk to deployed troops in the Sinai.

Although reported human cases of leishmaniasis in MFO personnel had declined to zero as of 1994, anecdotal reports from the local Bedouin community still suggested seasonally (May-July) high numbers of sand flies and reports of lesions believed to be CL. Additionally, one American civilian teenager who visited the Southern Sinai had a confirmed case of CL. On several occasions active lesions have been seen by NAMRU-3 personnel on Bedouins near MFO sites. These lesions appear to be CL and may further confirm that active transmission was taking place in the area.

The importation of New World leishmaniasis into the Sinai is a possibility, as seen with the two cases of *L. panamensis* reported from the Columbian soldiers. Currently studies at

NAMRU-3 are being undertaken to ascertain whether Old World sand flies are capable of vectoring New World leishmaniasis in the region.

SURVEILLANCE STRATEGIES

During the months of April through November 1993-95, NAMRU-3 personnel conducted surveillance at MFO sites. Sand flies were collected by CDC light traps, light traps with CO₂, and oiled paper sticky traps. Feral rodents were collected using baited Tomahawk and Sherman live traps. Sentinel hamsters were utilized at the MFO checkpoints to monitor possible transmission.

Seasonal occurrence of sand flies collected at the MFO checkpoints surveyed in 1993-95 is depicted in Figure 1 and Figure 2, these are the numbers of sand flies collected with light traps and on oiled paper sticky traps, respectively. A reduction of sand fly activity was seen at the outlying checkpoints during 1994. This reduction was most likely due to increased sanitation, elimination of rodent habitat and the routine use of insecticides within the outposts. Slight increases occurred again in 1995, possibly due to abnormal weather patterns in the area, as more rainfall was recorded in late 1994 than had been recorded in the past 80 years.

Live collected sand flies were sexed and the females stored in a DMSO solution, frozen in liquid nitrogen and returned to NAMRU-3 for examination to determine infection rates. Data from six different years 1989-91 and 1993-95 has been examined and is presented in Table 4. In 1989, 0.69% of the sand flies collected were found to be infected; in 1990, 0.93%; in 1991, none; in 1993, 1.38%; in 1994, 0.56%; and in 1995, 5.07%. The percentage of infected sand flies was variable and was possibly influenced by any number of reasons such as climatic changes or by unknown factors such as the movement of Bedouin camps which could alter the presence of feral rodent populations.

ACKNOWLEDGEMENTS

The authors would specifically like to thank all of the active duty Navy and Army personnel who spent time in the desert and helped to collect the various specimens for this study in the Sinai. We gratefully acknowledge the following personnel:

NAMRU-3 PERSONNEL:

LT M. Wilson, MSC, USN	DK1 B. Colligan, USN
EOC J. Hurley, USN	SSG R. Barajas, USA
HMC C. Houston, USN	HM2 M. Vanek, USN
HM1(AW) J. Garcia, USN	HM2 V. Gaudia, USN
HM1(SW/AW) A. Burch, USN	HM1(AW) J. Berry, USN
HM1 L. Lint, USN	HM2 S. Strocko, USN
HM1 H. Ramos, USN	HM2 K. Light, USN
HM1(SW) J. Young, USN	

MFO PERSONNEL:

CPT D. Snow, MS, USA	SGT Vasquez, USA
1LT C. Wooten, MS, USA	
SSG Conteras, USA	

Additionally we would like to thank Mrs. Fetouh Ali and Mrs. Hilda Youssef Wassef for their excellent support in the laboratory and help in processing and identifying arthropod specimens.

LITERATURE CITED

1. World Health Organization. 1990. Control of the leishmaniasis. WHO Tech. Rep. Ser. 793.
2. Lane, R. P. 1986. The sand flies of Egypt (Diptera: Phlebotominae). Bull. Br. Mus. Nat. Hist. 52: 1-35.
3. El Sawaf, B. M., A. Shoukry, S. El Said, R. P. Lane, M. A. Kenawy, J. C. Beier, and S. Abdel Sattar. 1987. Sand fly species composition along an altitudinal transect in southern Sinai, Egypt. Ann. Parasitol. Hum. Comp. 62: 467-473.
4. Killick-Kendrick, R. 1990. Phlebotomine vectors of the leishmaniasis: a review. Med. Vet. Entomol. 4: 1-24.
5. Lewis, D. J. 1982. A taxonomic review of the genus *Phlebotomus* (Diptera: Psychodidae). Bull. Br. Mus. Nat. Hist. (Ent.). 45(2): 121-209.
6. Kanour, W. W., Jr. and H. A. Hanafi. 1995. A new Phlebotomine sand fly colony: Laboratory colonization of *Phlebotomus kazeruni* (Diptera: Phsycodidae). Submitted for publication to the J. Med. Entomol.
7. Fryauff, D. J., G. B. Modi, N. S. Mansour, R. D. Kreutzer, S. Soliman, and F. G. Youssef. 1993. Epidemiology of cutaneous leishmaniasis at a focus monitored by the Multinational Force and Observers in the Northeastern Sinai Desert of Egypt. Am. J. Trop. Med. Hyg. 49(5): 598-607.

Table 1. Sand Flies Collected in the MFO Areas, Sinai, Egypt, 1993-1995

Species	Location of collection	% of collection
<i>Phlebotomus papatasi</i>	A	> 96
<i>Phlebotomus alexandri</i>	N	< 1
<i>Phlebotomus kazeruni</i>	S	< 1
<i>Phlebotomus sergenti</i>	N	< 1
<i>Sergentomyia antennata</i> ¹	N	< 1

Location Key

A - All Areas
 N - Northern Sinai Only
 S - Southern Sinai Only

¹Reptile feeder

Table 2. Feral Rodents Collected in MFO Areas¹, Sinai, Egypt, 1994 - 1995

Species	Common Name	% of Collection
<i>Meriones crassus</i> Sundevall	Silky Jird <u>OR</u> Sundevall's Jird	25.8%
<i>Gerbillus pyramidum floweri</i> (Thomas)	Greater Gerbil	20.0%
<i>Gerbillus gerbillus asyutensis</i> Setzer	(N/A)	17.1%
<i>Gerbillus andersoni bonhotei</i> (Thomas)	Anderson's Gerbil	15.1%
<i>Gerbillus</i> sp.		1.7%
<i>Dipodillus dasyurus dasyurus</i> (Wagner)	Rough-tailed Dipodil	15.4%
<i>Dipodillus</i> sp.		0.3%
<i>Mus musculus</i> Linnaeus	House Mouse	3.5%
<i>Eliomys quercinus melanurus</i> (Linnaeus)	Garden Doormouse	0.3%
<i>Acomys cahirinus</i> (Desmarest)	Egyptian Spiny Mouse	0.3%

¹All rodents were captured in Northern MFO areas.

Table 3. Number of Cases of Cutaneous Leishmaniasis Diagnosed in MFO Troops During Various Years, Sinai, Egypt

Year(s)	Number of Cases
1982 - 1985	113
1989 - 1991	21
1992	(No surveillance)
1993 - 1994	1 ¹
1995	8 ²

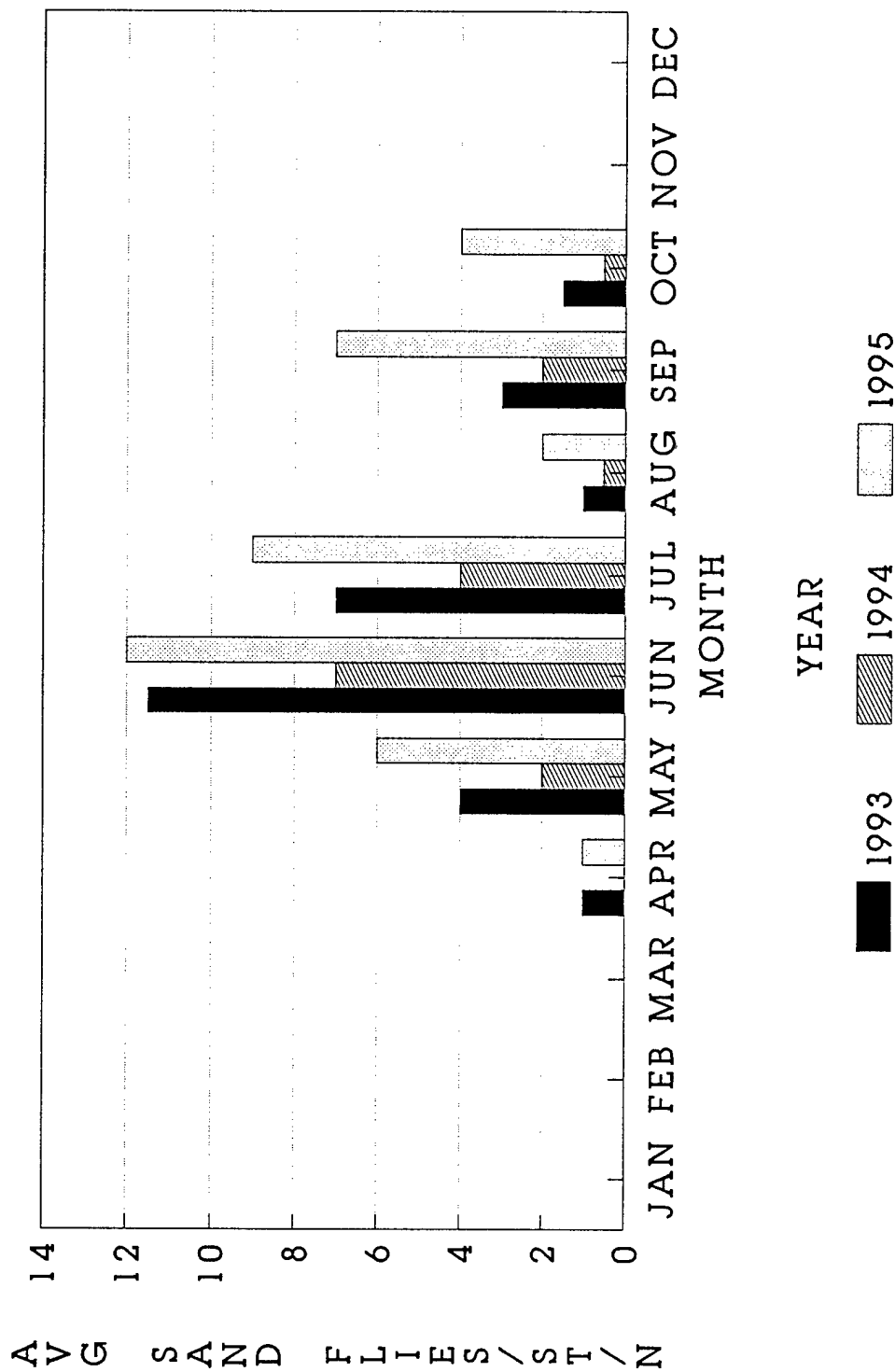
¹1 case was that of an adult U.S.N. person.

²1 case was that of an American civilian teenager.

Table 4. Percentage of Female Sand Flies Found to be Positive for Leishmania Parasites, Collected in the MFO Areas, Sinai, Egypt, 1989-1991 and 1993-1995

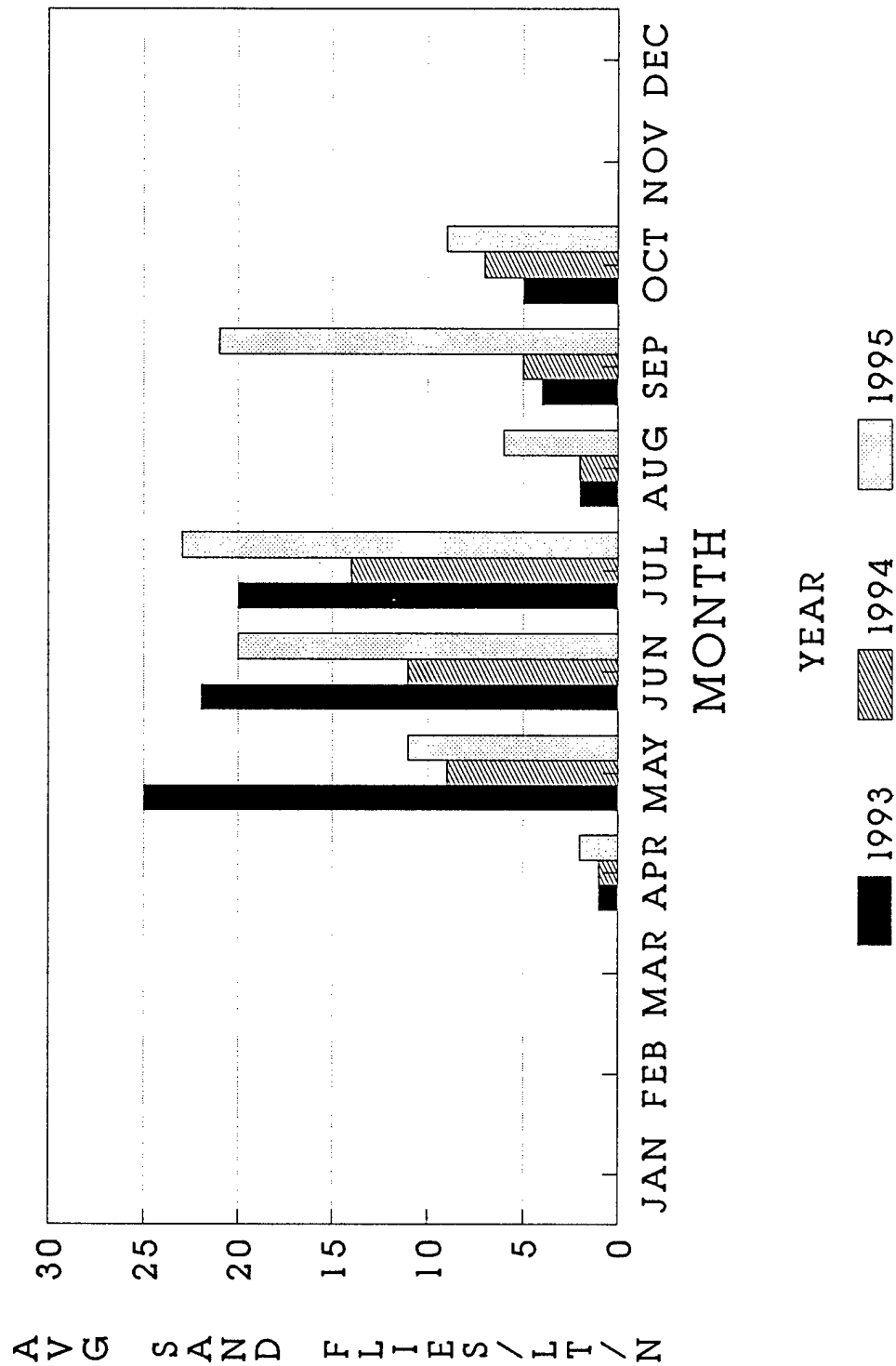
Year	% Infected
1989	0.69
1990	0.93
1991	0.00
1992	No collections
1993	1.38
1994	0.56
1995	5.07

Figure 1. Average Sand Flies/ST Trap/N
All Sites, Sinai, Egypt, 1993-1995



NORTHERN MFO SITES

Figure 2. Average Sand Flies/Lt Trap/N
All Sites, Sinai, Egypt, 1993-1995



NORTHERN MFO SITES

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 1996		3. REPORT TYPE AND DATES COVERED
4. TITLE AND SUBTITLE Leishmaniasis Surveillance in the Sinai with Special Emphasis to the Multinational Force and Observers and Associated Areas			5. FUNDING NUMBERS WU - 00101.EUX.3409	
6. AUTHOR(S) Kanour, W.W., Presley, S.M., Tetreault, G.E., Helmy, I.H.M., Ibrahim, M.O. and Hanafi, H.A.				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Naval Medical Research Unit No. 3 PSC 452, Box 5000 FPO AE 09835-0007			8. PERFORMING ORGANIZATION REPORT NUMBER TR 1/96	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Medical Research and Development Command, National Naval Medical Center Building 1, Tower 12 Bethesda, MD 20889-5044			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES U.S. Naval Medical Research Unit No. 3, Cairo, Egypt				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; Distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) Leishmaniasis is a wide spread disease throughout many regions of Southwest Asia. Military personnel deployed into the Sinai as members of the Multinational Force and Observers (MFO) contingent are at risk from Cutaneous Leishmaniasis (CL). This disease is vectored by various anthropophilic sand fly species, of which at least nine have been reported in the Sinai region. Sand flies were collected through various years and <i>Phlebotomus papatasi</i> accounts for greater than 96% of species collected. Seasonal distribution of sand flies was studied. Feral rodents are implicated as reservoir hosts for CL. <i>Gerbillus sp.</i> and <i>Meuones crassus</i> account for nearly 80% of those collected during the survey. Survey results for the isolation of <i>Leishmania</i> parasites indicate that a small percentage of sand flies are infected, ranging from zero to 5.07%. No feral rodents were found to be infected during the most recent (1993-1995) collection period. Human cases were reported, varying in number over different years, with a slight resurgence in 1995. Cutaneous leishmaniasis continues to pose a risk to troops deployed into the region and efforts to prevent the disease should be given priority.				
14. SUBJECT TERMS Leishmaniasis; Sand flied; <i>Phlebotomus papatasi</i> ; Feral rodents; Military personnel; Multinational Forces and Observers (MFO); Sinai, Egypt			15. NUMBER OF PAGES 14	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT	