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# Prevalence of anti-Rift-Valley-fever IgM antibody in abattoir workers in the Nile delta during the 1993 outbreak in Egypt\*

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*In the early summer of 1993, an outbreak of Rift Valley fever (RVF) was reported among both humans and animals in Aswan Governorate, Upper Egypt. To determine whether RVF infection had spread to the Nile delta region of the country, we carried out a cross-sectional survey of 1181 occupationally exposed abattoir workers (97% male; age 10–72 years) in 15 governorates of Egypt in November 1993. The overall prevalence of anti-RVF virus IgM antibody was 2% (range: 0% (7 governorates) to 10%). The highest prevalences were in Ismailia (10%) and Sharqīya (8%) Governorates. None of the seropositive subjects reported having experienced an episode of fever in the 2 months prior to the study. The prevalence of antibody was significantly higher ( $P < 0.05$ ) among workers employed in high-risk jobs such as cutting animals' throats (relative risk (RR) = 2.24) and handling animal parts (RR = 2.37). The findings suggest that abattoir workers represent a useful sentinel population for surveillance of RVF.*

## Introduction

An extensive epizootic/epidemic of Rift Valley fever (RVF) occurred in Egypt during 1977–78 (1, 2), with a recurrence in Aswan Governorate, Upper Egypt, in 1993 (3). At present it is not known how RVF was reintroduced into Egypt. RVF virus has been isolated from numerous species of mosquitos and other vectors in Africa (4, 5), and the epizootics are presumed to be the result of arthropod-borne transmission. Transmission of RVF virus by arthropods may also be responsible for infections in humans, although there is evidence that inhalation of the virus through contact with infected animals or

animal tissue is a significant transmission route (6). The presence of RVF in Upper Egypt in 1993 was well substantiated and a preliminary report indicated extensive transmission of the RVF virus in this part of the country (3). The present article reports the distribution of RVF in the Nile delta of Egypt, as determined by measurements of the point prevalence of anti-RVF virus IgM seropositive individuals in selected high-risk, occupationally exposed abattoir workers in 15 governorates.

## Materials and methods

**Study subjects.** During November 1993, abattoir workers in 31 slaughterhouses from 15 governorates in Egypt were invited to participate in the study. The largest slaughterhouse(s) in each governorate were selected and workers were sampled from 1–4 slaughterhouses per governorate (Table 1). Attempts were made to collect samples of blood from 100 subjects in each governorate.

**Specimen and data collection.** Subjects who gave their informed consent were interviewed and 10-ml samples of peripheral venous blood were collected from them at their place of employment. During the interviews, demographic and occupational exposure data were collected and details of any fever episode they had experienced over the previous 2 months were obtained.

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\* The opinions and assertions contained herein are the private ones of the authors and are not to be construed as official or as reflecting the views of the Navy Department, Department of Defense, the U.S. Government, or the Egyptian Government.

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Reprint No. 5686

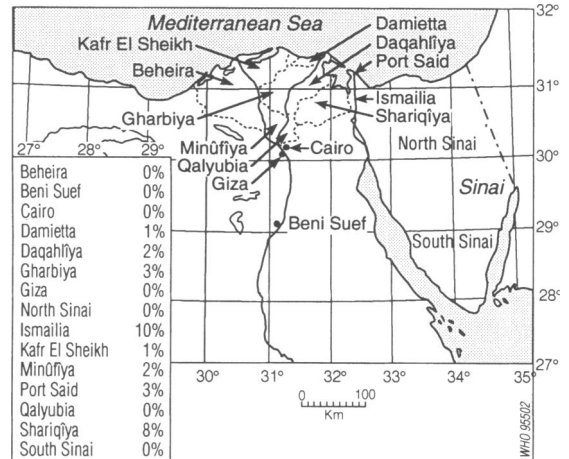
Table 1: Prevalence of anti-Rift-Valley-fever-virus (anti-RVF-virus) IgM in a sample of abattoir workers in 15 governorates in Egypt in November 1993

Governorate	No. of slaughterhouses	No. of samples	No. anti-RVF-virus IgM positive
Beheira	1	46	0 (0) <sup>a</sup>
Beni Suef	2	65	0 (0)
Cairo	3	100	0 (0)
Damietta	1	100	1 (1)
Daqahliya	3	99	2 (2)
Gharbiya	2	100	3 (3)
Giza	2	68	0 (0)
North Sinai	1	47	0 (0)
Ismailia	2	100	10 (10)
Kafr El Sheikh	3	100	1 (1)
Minūfiya	3	100	2 (2)
Port Said	1	99	3 (3)
Qalyubia	2	100	0 (0)
Sharqiya	1	26	2 (8)
South Sinai	4	31	0 (0)
<b>Total</b>	<b>31</b>	<b>1181</b>	<b>24 (2)</b>

<sup>a</sup> Figures in parentheses are percentages.

**Laboratory procedures.** Blood samples were transported to the U.S. Naval Medical Research Unit No. 3, Cairo, Egypt, where they were centrifuged and sera separated from cells. Sera were tested for the presence of anti-RVF virus IgM at 1:100 dilution by an IgM-capture enzyme-linked immunosorbent assay (ELISA) using a cell lysate antigen prepared in Vero cells (7).

Fig. 1. Map showing the location of the 15 governorates that took part in the study. Inset shows the prevalence of anti-RVF-virus IgM in abattoir workers in these governorates, November, 1993.



## Results

A total of 1181 abattoir workers participated in the study. Nearly all the study subjects (97%) were males and their ages lay in the range 10–72 years. The serology results showed that anti-RVF virus IgM antibody was present in 24 (2%) of the study subjects; workers in 9 of the 31 (29%) slaughter-

Table 2: Prevalence of anti-Rift-Valley-fever-virus (anti-RVF-virus) IgM antibodies among abattoir workers, according to their job

Type of job	No. of workers <sup>a</sup>	% prevalence of anti-RVF-virus IgM	Relative risk	P-value
<i>Cut animals' throats</i>				
Yes	347	3.46	2.23 (1.00, 5.01) <sup>b</sup>	0.04
No	710	1.55		
<i>Skinned animals</i>				
Yes	409	3.18	2.06 (0.91, 4.65)	0.07
No	648	1.54		
<i>Butchered carcasses</i>				
Yes	403	2.48	1.25 (0.55, 2.82)	0.59
No	654	1.99		
<i>Handled animal parts</i>				
Yes	519	3.08	2.37 (1.00, 5.71)	0.05
No	538	1.30		
<i>Cleaned up</i>				
Yes	176	1.14	0.48 (0.11, 2.01)	0.30
No	881	2.38		
<i>Administrative</i>				
Yes	52	0	0	—
No	1005	2.29		

<sup>a</sup> A total of 124 additional subjects with incomplete data were not included.

<sup>b</sup> Figures in parentheses are the 95% confidence limits.

houses were seropositive. RVF-virus-specific antibody was not present in seven governorates, while Ismailia and Sharqīya had the highest prevalences — 10% and 8%, respectively (Table 1 and Fig. 1). All the positive subjects were males, and there was no significant difference in age between seropositives (mean age, 36.5 years) and seronegatives (mean age, 33.7 years). Abattoir workers employed in high-risk jobs such as cutting animals' throats or handling animal parts had a statistically significantly higher ( $P \leq 0.05$ ) prevalence of anti-RVF virus IgM antibodies than those with other responsibilities (Table 2). None of the administrative workers was seropositive for anti-RVF-virus IgM. None of the seropositive workers reported that either he or members of his household had experienced any episodes of fever during the 2 months prior to the study.

## Discussion

The 1977 RVF epidemic in Egypt was first recognized in the Nile delta governorates, mainly Ismailia and Sharqīya (6). Transmission of RVF virus through contact with infected tissue was considered to be a major mode of transmission to humans during epizootics in southern Africa and probably played an important role in spreading the virus during the 1977–78 Egyptian outbreak (8). During the 1993 epidemic, human and animal cases (confirmed serologically and/or by virus isolation) were first documented in Aswan Governorate in May, and later reported in Ismailia and Sharqīya Governorates in October (R. Arthur, personal communication, 1993).

No community-based seroprevalence data are available for comparison with the seroprevalences observed among slaughterhouse workers in this study. None the less, the results of our survey suggest that high-risk, occupationally exposed abattoir workers represent a useful sentinel population for surveillance of RVF, especially in the absence of clinical disease. While it is difficult to segregate slaughterhouse activities involving exposure to animal tissue, our findings demonstrate that those tasks with highest exposure to animal blood, i.e., cutting animals' throats and handling animal parts, were associated with increased risk of infection with RVF virus. This provides further evidence that direct contact with potentially infected animals is a prominent mode of transmission of the virus. Also, the study documents the occurrence of sub-clinical RVF infections and confirms that transmission of RVF virus occurred in several areas of the Nile delta region where no clinical disease has been reported.

## Acknowledgements

We thank the Egyptian Ministry of Health's Preventive Medicine Officers in each of the participating governorates for their assistance in collecting samples. The study was supported by the U.S. Naval Medical Research and Development Command, Bethesda, MD, USA (Work Unit No. 00101. ETX. 3410).

## Résumé

### Prévalence des anticorps anti-fièvre de la Vallée du Rift chez les employés des abattoirs du delta du Nil au cours de la flambée de 1993 en Egypte

Au début de l'été 1993, une flambée de fièvre de la Vallée du Rift a été signalée chez l'homme et chez les animaux du Gouvernorat d'Aswân, Haute Egypte. En novembre 1993, nous avons effectué une enquête transversale dans 15 gouvernorats d'Egypte chez 1181 employés d'abattoirs exposés professionnellement (97% d'hommes; âge: 10–72 ans) afin de déterminer si cette affection avait atteint la région du delta du Nil. La prévalence générale de l'anticorps anti-virus de la fièvre de la Vallée du Rift s'est avérée être de 2% (éventail : 0% (7 gouvernorats) à 10%). On a rencontré les prévalences les plus élevées dans les Gouvernorats d'Ismailia (10%) et de Sharqīya (8%). Aucun des sujets séropositifs n'a signalé avoir eu un épisode fébrile au cours des 2 mois ayant précédé l'étude. La prévalence de l'anticorps a été sensiblement plus élevée ( $p > 0,05$ ) chez les employés occupant des postes de travail particulièrement exposés, tels ceux qui égorgent les animaux (risque relatif  $RR = 2,24$ ) et manipulent les quartiers de viande ( $RR = 2,37$ ). Les cas cliniques de fièvre de la Vallée du Rift recensés chez l'homme dans les Gouvernorats d'Ismailia, de Sharqīya et de Gīza au cours de la flambée de 1993 avaient été notifiés aux autorités sanitaires, mais nos résultats indiquent que les infections survenues dans le delta du Nil ont été plus répandues qu'on ne l'avait pensé jusqu'ici). Même si l'on ne dispose pas pour la comparaison des données de la séroprévalence de cette affection au niveau communautaire, la stratégie employée dans cette étude laisse à penser que les employés des abattoirs constituent une population sentinelle utile pour la surveillance de la fièvre de la Vallée du Rift.

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