Canine ehrlichiosis in Egypt: Sero-epidemiological survey

B.A.M. BOTROS¹, M.S. ELMOLLA², A.W. SALIB¹, C.A. CALAMAIO¹, G.A. DASCH³ and R.R. ARTHUR¹

INTRODUCTION

Tropical canine pancytopenia (TCP) or canine ehrlichiosis is a tick-borne haemorrhagic disease of dogs caused by the rickettsial organism, Ehrlichia canis. The disease is transmitted by the brown dog tick Rhipicephalus sanguineus (Groves, Dennis, Amyx & Huxsoll 1975), and is known to occur in Africa, south-east Asia, and the USA. In Africa, the disease was first recognized in Algeria (Donatien & Lestoquard 1935) and later reported in Tunisia (Babin, Chabassol, De Brux, Fiehrer, Guillot, Michel & Pigoury 1962). The rate of infection is especially high in tropical zones (up to 30%), and was reported in Puerto Rico (Huxsoll, Hildbrandt, Nims, Ferguson & Walker 1969), the Middle East (Seamer & Snape 1970), and East Africa (Kaminjalo, Nyindo, Sayer, Rurangir, Johnson, Hird, Rosenbaum, Maxie & Ogaa 1976). Recently, 34 of 68 (50%) military dogs from Tunisia, Senegal and Chad were found positive for E. canis antibody (Brouqui, Davoust, Haddad, Vidor, Raoult 1991).

Clinically, the most overt sign of the disease is unilateral or bilateral epistaxis (Ewing 1969; Walker, Rundquist, Taylor, Wilson, Andrews, Barek, Hogge, Huxsoll, Hildbrandt & Nims 1970). Death often occurs 5–7 d after epistaxis. Dogs with TCP usually have a history of a febrile episode two or more months before the onset of epistaxis. Following the febrile episode, the dog may appear normal, but pancytopenia persists and animals become severely debilitated. Death may also be attributed to internal hemorrhages. Dogs that...
survive the episode usually remain carriers of the organism for several months and develop antibodies, but are susceptible to reinfection (Weisger, Ristic & Huxsoll 1975). In the German shepherd, immunosuppression has been observed, with \( E. \) canis infection causing serious impact on their efficiency (Nyindo, Huxsoll, Ristic, Kakoma, Brown, Carson & Stephenson 1980).

In Egypt, this disease has not been previously reported. However, epistaxis which is a clinical sign suggestive of this disease, has been recognized among German shepherd dogs in military units (Botros, unpublished data 1992). Also, the tick species \( (Rhipicephalus sanguineus) \) responsible for transmission is quite common in this geographic area (Moe & Vasiliades 1963). Human infection with \( E. \) canis or a closely related organism was first described in the USA by Maeda, Markowitz, Harley, Ristic, Cox & Mcdade (1987). However, genetic-sequence-comparison studies have recently indicated that the agent of human ehrlichiosis, while closely related to \( E. \) canis, is a new species and has been named \( Ehrlichia chaffeensis \). (Anderson, Dawson, Jones & Wilson 1991).

The purpose of this study was to survey dogs, privately owned as well as military working dogs, for evidence of exposure to \( E. \) canis.

**MATERIAL AND METHODS**

Samples from military working dogs were collected during the period December 1991 to June 1992, at five locations: War Dogs Unit in Almaza, about 5 km east of Cairo, \( (n = 35) \); Presidential Guards Dog Unit in Cairo \( (n = 14) \); the Police Academy in Cairo \( (n = 109) \); Transportation and Railway Police Unit in Cairo \( (n = 74) \); and Transportation and Railway Police Unit in Alexandria \( (n = 20) \). All the dogs at these units were included in the study. Samples from privately owned household dogs \( (n = 122) \) were collected at the People’s Dispensary for Sick Animals (PDSA), where dogs were brought from various parts of Cairo for treatment or for boarding. Samples were obtained from all the dogs presented to the hospital on a randomly selected day, weekly, during April, May and June 1992.

Age, sex, breed, signs of disease, infestation with ticks and history of epistaxis were recorded at the time of sample collection. Blood was drawn by venipuncture and serum was separated and stored at \(-20 \) C. Serum from 11 dog caretakers who had worked at the PDSA for more than 5 years were submitted for \( E. \) canis antibody testing.

Sera were tested at 1:20 dilution by standard two-step IFA test (Ristic, Huxsoll, Weisger, Hildbrandt & Nyindo 1972). \( E. \) canis cell-culture antigen on 8-well slides (ProtaTek International, Inc. St. Paul, MN) was used. Negative and positive control \( E. \) canis sera were included with each test.

## RESULTS

A total of 374 military and privately owned dogs of both sexes and various ages were enrolled in this study. The results are summarized in Table 1. The majority (88%) of military dogs \( (n = 252) \) were of the German shepherd breed while privately owned dogs \( (n = 122) \) were of various breeds.

Among the military working dogs, 202 (80%) were males and 50 (20%), females. Ninety-six per cent were adults older than one year: the average age was 4.2 years. The overall prevalence of \( E. \) canis antibody among military dogs was 29%, with a similar figure in young and adult animals. Prevalence among males was not significantly different from females (Table 1).

Prevalence was highest (46%) among war dogs, followed by transportation police dogs in Alexandria (35%), police academy dogs (28%), transportation police dogs in Cairo (23%) and presidential guard dogs (21%).

Of the privately owned dogs, 70 (57%) dogs were males and 52 (43%), females. Sixty-six per cent were adults; the average age was 3.5 years. The overall prevalence of \( E. \) canis antibody among privately owned dogs was 41%. There were no statistically significant differences between young and adult animals, nor between males and females (Table 1).

Overall, antibody prevalence among privately owned dogs (41%) was significantly higher than among military dogs (29%, \( P < 0.05 \)) and significantly higher among adults and males (45% v 29% and 44% v 30%, respectively). Of the total number of dogs tested for \( E. \) canis antibody, 54 dogs (14%) were infected with \( R. \) sanguineus ticks. Forty-four per cent (24/54) of tick-infested dogs, as compared to 31% (100/320)

### TABLE 1 Relationship of age, sex and tick infestation to prevalence of \( Ehrlichia canis \) antibody in military working and privately owned dog populations in Egypt

<table>
<thead>
<tr>
<th>Risk group category</th>
<th>Military working dogs</th>
<th>Privately owned dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. pos./ No. tested (%)</td>
<td>No. pos./ No. tested (%)</td>
</tr>
<tr>
<td>Young (age &lt; 1 year)</td>
<td>3/10 (30)</td>
<td>14/42 (33)</td>
</tr>
<tr>
<td>Adult (age &gt; 1 year)</td>
<td>71/242 (29)</td>
<td>36/80 (45) ***</td>
</tr>
<tr>
<td>Male</td>
<td>60/202 (30)</td>
<td>31/70 (44) **</td>
</tr>
<tr>
<td>Female</td>
<td>14/50 (28)</td>
<td>19/52 (37)</td>
</tr>
<tr>
<td>Tick-infested</td>
<td>1/1 (100)</td>
<td>23/53 (43)</td>
</tr>
<tr>
<td>Tick-uninfested</td>
<td>73/251 (29)</td>
<td>27/69 (39)</td>
</tr>
<tr>
<td>All dogs</td>
<td>74/252 (29)</td>
<td>50/122 (41) ***</td>
</tr>
</tbody>
</table>

* \( P < 0.05 \) (Chi-square test) for the difference in the number of \( E. \) canis-seropositive adult dogs between military dogs (71 of 242) and privately owned dogs (36 of 80)

** \( P < 0.05 \) (Chi-square test) for the difference in the number of \( E. \) canis-seropositive male dogs between military dogs (60 of 202) and privately owned dogs (31 of 70)

*** \( P < 0.05 \) (Chi-square test) for the difference in the number of \( E. \) canis-seropositive animals between military dogs (74 of 252) and privately owned dogs (50 of 122)
of uninfested dogs, were positive for *E. canis* antibody (Table 1), but the difference is not statistically significant \( (P = 0.08) \). Three dogs had epistaxis or a history of epistaxis shortly before sample collection, and all were *E. canis*-seropositive with antibody titres that exceeded 1:320. Serum samples collected from the 11 dog caretakers were all antibody-negative to *E. canis*.

**DISCUSSION**

The lower *E. canis* antibody prevalence among military dogs, as compared to privately owned dogs, could be attributed to better housing conditions and to the regular use of acaricides. Only one of all the military dogs tested, was infested with ticks. Prevalence differences at the various military kennels appeared to correlate with the sanitary conditions at each location. Age- and sex-related prevalence differences within the two dog groups were not significantly different, although privately owned adult and male dogs had the highest prevalences, significantly higher than military adult and male dogs \( (P < 0.05) \).

Although only three of the dogs studied had epistaxis or a history of epistaxis, all were *E. canis* positive. Epistaxis is reported as a classic clinical sign of *E. canis* infection (Ewing 1969; Walker et al. 1970).

Negative *E. canis* antibody results obtained on the serum samples from the dog caretakers are consistent with previous evidence that *E. canis* is not a human pathogen (Anderson et al. 1991) and that dogs are not a reservoir of human ehrlichiosis. In summary, data from this study demonstrated the first laboratory evidence of *E. canis* infection among dog populations in Egypt.

**ACKNOWLEDGEMENT**

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