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Authors: PEIRCE, M. A., and CASTLEMAN, A. R. W.

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## AN INTRAERYTHROCYTIC PARASITE OF THE MOROCCAN TORTOISE

M. A. PEIRCE and A. R. W. CASTLEMAN, The Central Veterinary Laboratory, Ministry of Agriculture, Fisheries and Food, New Haw, Weybridge, Surrey, England

**Abstract:** Intraerythrocytic organisms were found in a Moroccan tortoise *Testudo graeca* imported into England. It is suggested that the parasites belong to the Rickettsia group of organisms and that *Hyalomma aegyptium* is possibly the vector.

### INTRODUCTION

A Moroccan tortoise *Testudo graeca* L., recently imported into England was found to be parasitized by two ticks. These were removed and identified as *Hyalomma aegyptium* (Linné), the common tortoise tick of the Mediterranean region. Both specimens were males. *H. aegyptium* is the vector of *Hepatozoon mauritanicum* in *T. graeca*<sup>8</sup> and the recently imported specimen was therefore examined to see if it was harbouring this parasite.

### METHODS

Peripheral blood was obtained by clipping one of the claws and thin smears were made. The smears were fixed in methyl alcohol and stained with Giemsa's solution at a strength of 1 in 10 at pH 7.2 for 1 hour. Microscopical examination was carried out using a x90 oil immersion objective and a x10 eye piece. Further peripheral blood smears were made after an interval of 21 days.

### RESULTS

Examination of the initial blood smears revealed that 32% of the erythrocytes were harbouring a small bluish-violet organism. The range of morphological forms encountered is illustrated in Figures 1 and 2. The most common forms present were small anaplasmod bodies measuring up to 1.0  $\mu$  in diameter, (Fig. 1, No. 4), and in some instances

these were in groups of 3 or more, joined by fine cytoplasmic strands (Fig. 1, Nos. 5 and 10). Some of the organisms were vacuolated (Fig. 1, Nos. 2, 3, 7, 8, 9 and 11 to 14) although this was not the whitish vacuole typical of piroplasms. Other more rare forms were pear shaped measuring up to 2.5  $\mu$  in length (Fig. 1, Nos. 8 and 9). Some of these gave the appearance of having a nucleus and terminal cytoplasm (Fig. 1, Nos. 8, 9 and 12), although the staining reaction was entirely basophilic. Where two anaplasmod bodies were adjacent to one another (Fig. 1, No. 6) they appeared to have separated by budding, whereas the more elongate forms indicated binary fission (Fig. 1, No. 12). Generally the organisms were situated mid-way between the host cell nucleus and membrane. There was no particular preference for a polar position within the erythrocyte and more than one parasite per cell was not uncommon. The second series of films made after an interval of 21 days showed that the parasitaemia had dropped to 14%, with a predominance of anaplasmod forms. No stages of *H. mauritanicum* were seen in any of the blood smears.

### DISCUSSION

The exact taxonomic position of these parasites is obscure. Initially they were thought to be of protozoan origin and their morphology was compared with parasites described previously from poikilothermic hosts.

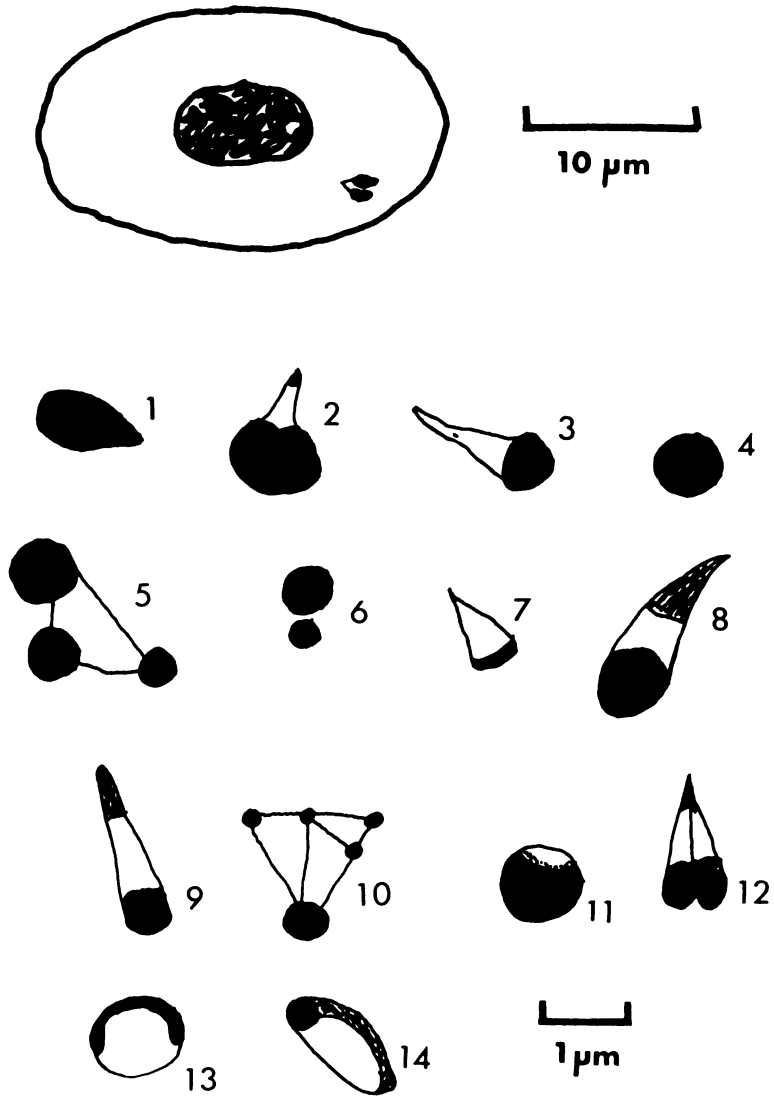


FIGURE 1. An intraerythrocytic parasite of *Testudo graeca*. Drawings to illustrate a parasitized erythrocyte and the various morphological forms seen.

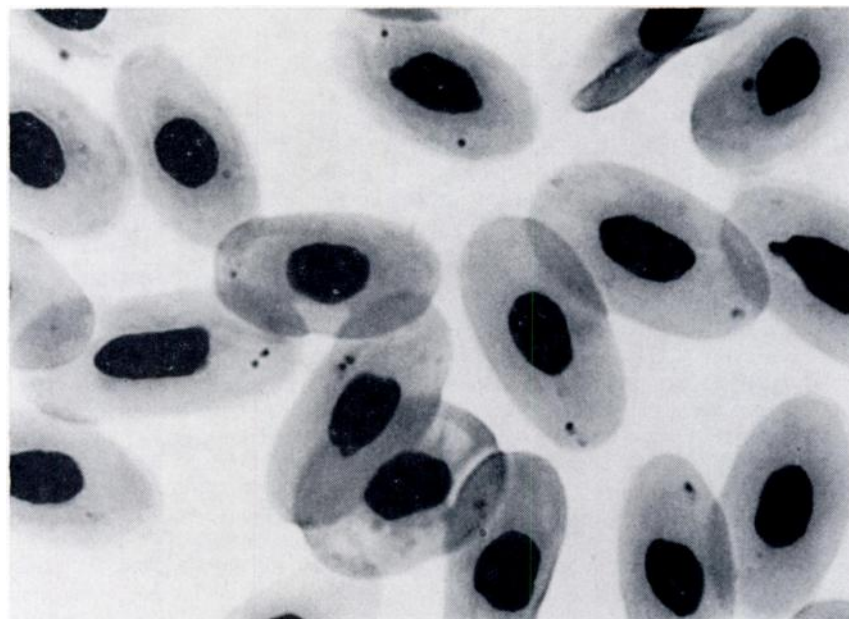


FIGURE 2. A Giemsa-stained blood film showing parasitized erythrocytes of *T. graeca* with Rickettsia-like organisms.

*Pirhemocytos* spp.<sup>2,3</sup> are characterized by the association with globular refractile bodies containing fine granules. No such bodies were present in the *T. graeca*. A parasite of *Emys leprosa* (= *Mauremys caspica leprosa* (Schweigger)) was designated *Tunetella emydis*<sup>4</sup> but subsequently considered to be a synonym of *Aegyptianella*.<sup>5</sup> This organism is considerably larger than the one found in *T. graeca*, and has a more clearly defined globular appearance.

*Sauroplasma thomasi*<sup>6</sup> has some characteristics of the *T. graeca* parasite but the former has a clearly defined vacuole and distinctive reproduction by budding. The parasite in *T. graeca* does not appear to have a distinct schizogony producing numerous merozoites and is therefore not related to the *Dactylosoma* spp.<sup>7</sup> The organism which most clearly resembles ours is *Nuttallia guglielmi*<sup>8</sup> a parasite of *Testudo campanulata* Strauch, recently designated as a synonym of *Haemohor-*

*midium*.<sup>7</sup> Parasites of this genus produce four merozoites resulting from schizogony. The parasite in *T. graeca* differs from Carpano's original description of *N. guglielmi* in one major aspect; the absence of the characteristic maltese-cross forms which he described as the precursor to the production of the four merozoites. The parasite of *T. graeca* cannot be placed in the Piroplasmida<sup>7</sup> because of the absence of a distinct schizogony and a clear differentiation of a nucleus and cytoplasm with a whitish vacuole. It is probable that they belong to the Rickettsia-like organisms which include *Aegyptianella* and the psittacosis-lymphogranuloma-trachoma<sup>1</sup> group. There was no evidence to suggest that the organisms caused any clinical symptoms. As the highest parasitaemia was observed when the *H. aegyptium* were feeding, it is possible that these ticks were the vectors of the parasite, although they were not examined.

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