A fatal *Plasmodium reichenowi* infection in a chimpanzee?

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**Introduction**

*Plasmodium reichenowi* is a chimpanzee malarial parasite [1] closely related to *Plasmodium falciparum* [6], which presents very similar blood stages [2-3, 7]. However, they are distinct parasites that are non-transferable outside of the original host species [1, 9]. Except for these notes, no information was found in the literature concerning pathogenesis due to *P. reichenowi* in naturally infected chimpanzees. Today, more than ever, veterinarians are asked to visit primates. Consequently, the incidence of having to face primate malarias may become a frequent veterinary practice, due to the increase in both legal and illegal trade in such animals. This study reports the clinical signs and blood anomalies observed in a chimpanzee found infected by *P. reichenowi* in Kuwait.

**Clinic case**

A 1-year-old male chimpanzee imported to Kuwait from Africa 6 months earlier, displayed a 2-day history of poor appetite, exhaustion, diarrhoea, and sleepiness. Body temperature was low and the animal could not stand. The chimpanzee had been forced to have a bath in the swimming pool every day during the last 2 weeks and in the owner’s opinion this may have caused a cold and the subsequent disease.

Examination of Wright-stained blood smears revealed the presence of a large number of trophozoites (Figures 1-2), some developing schizonts (Figure 3), a few mature schizonts (Figure 4), and one young adult macrogametocyte (Figure 5). Consequently, on the basis of their morphological appearance, a presumptive diagnosis of *Plasmodium reichenowi* infection was made. However, very similar blood stages also occur in *Plasmodium falciparum* infection and cytological differentiation is difficult. Definitive diagnosis can only be done by PCR [6]. Intensity of parasitemia was not recorded.

Despite oral treatment with mefloquine (Lariam, Roche) the chimpanzee died 5 hours later.

**Discussion**

The present author discovered no reports of clinical signs associated with *P. reichenowi* infection in chimpanzees during a search in the French and English literature. In clinical practice, this may produce an underestimation of its pathogenesis and misdiagnosis with other primate malarias. Chimpanzees are also receptive to human malarias, such as *P. vivax* [7] and *P. ovale* [8]. *P. falciparum*, which shares a common ancestor with *P. reichenowi* [6], can be transferred to chimpanzees as well, mainly with sporozoits [4].

It was thus worth reporting this case of signs partially comparable to those produced by *P. falciparum* in human beings, e.g., anorexia, diarrhoea and exhaustion, which were followed by a lack of response to mefloquine and death.

*P. reichenowi* is difficult to eradicate and can persist for years in the specific host [7]. The sporogonic cycle takes place in several species of *Anopheles* mosquitoes [5].

In the chimpanzee of this study, young and mature trophozoites were observed in large numbers within the circulating red blood cells (Figures 1-2).

Developing schizonts (Figure 3), mature schizonts (Figure 4) and one young adult macrogametocyte (Figure 5) were also detected. The young trophozoites appear as small rings and crescents with a prominent nucleus, which can contain up to four small chromatin dots [2]. Under stressful conditions [2] they develop into mature trophozoites. In this case,
stress may be attributed to the mandatory daily immersion in the swimming pool.

In mature trophozoites the pigment appears in discrete clumps while the cytoplasm increases and appears blue-stained. The nucleus stains a bluish-purple to a wine colour (Figure 2) [2].

With the beginning of schizogony the pigment comes together as a yellowish-black mass, vacuoles appear in the cytoplasm and the host cell tends to lose colour (Figure 3) [3]. Mature schizonts contain 10 to 12 merozoites (Figure 4) [3, 7].

According to Bray [3] young gametocytes very rarely appear in the peripheral blood of non-splenectomized animals, because these latter forms have difficulty in maturing properly. However, one young adult macrogametocyte was detected in the reported case (Figure 5) confirming the evolution of the infection. The oval body of a young adult macrogametocyte is rigid on one side and the other side bends around it in an arc. Cytoplasm collects along the border opposite the nucleus and the pigment [3, 7].

The only constant difference with *P. falciparum* is that mature gametocytes of *reichenowi* malaria are shorter and slenderer than *falciparum* parasites [2, 7]. This stage was not observed.

The virulence of malaria is the result of complex genetic and ecological interactions between the host and the parasite [6] and this case of a fatal presumptive *Plasmodium reichenowi* infection in a stressed chimpanzee seems to confirm it.

### References

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**FIGURE 1.** — Young trophozoites in the blood of the reported chimpanzee (x100; Wright stain; Leica DMLS; camera Leica DC 180).

**FIGURE 2.** — Mature trophozoite (x100).

**FIGURE 3.** — Developing schizont (x100).

**FIGURE 4.** — Mature schizont (x100; Wright stain).

**FIGURE 5.** — Young adult macrogametocyte (x100; Wright stain).