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Value of PCR in the diagnosis of malaria in a time of migration

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Background: Currently Europe experiences a massive immigration of individuals escaping conflicts and natural disasters. These immigrants may carry infections that are non-detectable by methods routinely used for analyses of European residents. We wished to evaluate the value of PCR in diagnosing malaria in patients suspected of suffering from malaria with negative microscopy in a Danish regional hospital.

Material/methods: Eight hundred and twenty microscopy negative blood film from patients admitted to the hospital between May 2014 and November 2016, were analysed by two trained microscopists according to accredited standards of the laboratory. Corresponding EDTA-blood samples were analysed by rapid antigen test. Retrospectively EDTA-blood samples were screened by real time pan-Plasmodium PCR assay and positive samples were further tested for *P. falciparum* (Pf), *P. vivax* (Pv), *P. ovale* (Po) and *P. malariae* (Pm), using in house versions of previously published species-specific real time PCR protocols.

Results: Fifty-three samples from 25 patients were positive by pan-Plasmodium PCR. Fifty of these samples from 24 patients were positive by one or more species-specific assays. In 17 of the 25 patients a diagnosis of malaria had been made from previous samples. Four samples that were positive in pan-Plasmodium PCR, but negative in the species-specific assays were from patients with previous positive species-specific PCR. Discordant results from microscopy and PCR were found in eight patients (table1).

Table 1: Discordant results

Patient nr:	Microscopy	PCR	RDT	Conclusion
3	Positive Pm on day nine	Positive Pm on day one	Negative	Unrecognised Pm infection for nine

				days
10	Negative	Positive Pv	Negative	Unrecognised Pv infection
11	Negative	Positive Pv	Negative	Unrecognised Pv infection
14	Positive Pv on day one	Positive Pv and Pf on day one	Pan - pos Pf - neg	Unrecognised double infection with Pf
16	Negative	Positive Pf	Negative	Unrecognised Pf infection
19	Positive Pv on day one Positive Pf on day four	Positive Pv and Pf on day one	Pan - pos Pf - neg	Unrecognised double infection with Pf for four days
23	Negative in first event in 3 out of 3 samples. Positive Pv seventeen days later in second event in 2 out of 3 samples	Positive Pv in first event in 2 out of 3 samples Positive Pv in second event in 3 out of 3 samples	1 st event Negative 2 nd event Pan - pos Pf - neg	Unrecognised Pv infection for seventeen days
24	Negative	Positive Po	Negative	Unrecognised Po infection

RDT = rapid antigen test (First response ®)

Conclusions: PCR detected DNA from plasmodium species not seen by microscopy in eight samples from patients suspected to suffer from malaria. Seven of these patients were refugees recently arrived in Denmark. PCR is strongly recommended as a supplementary test for diagnosing malaria.