



## CHAPTER IV

### DISCUSSION

This study evaluated a new formulation of OptiMAL called OptiMAL-IT (OptiMAL Individual Test). Global sensitivity and global specificity of OptiMAL-IT for *P.falciparum* was 88.1% and 91.8% respectively. Global sensitivity and global specificity of OptiMAL-IT for *non-P.falciparum* was 65.1% and 98.9% respectively. Global sensitivity and global specificity of Paracheck was 89.9% and 95.7% respectively.

The overall validity of pLDH detecting assay (OptiMAL-IT) and HRP-II detecting assay for *Plasmodium falciparum* detection was not significantly different (sensitivity ( $p = 0.76$ ), specificity ( $p = 0.10$ ), PPV ( $p = 0.15$ ), NPV ( $p = 0.71$ )). The sensitivity of both tests decreased dramatically when the parasitaemia level go down. As the results showed the sensitivity of OptiMAL-IT and Paracheck Pf were 100% when parasitaemia  $500 / \mu\text{L}$  of blood ( $0.01\%$ ) but at the parasitaemia level of  $100-500 / \mu\text{L}$  of blood ( $0.001-0.01\%$ ) the sensitivity of OptiMAL-IT and Paracheck Pf were 70% and 90% respectively. At the level of parasitaemia  $<100 / \mu\text{L}$  of blood ( $< 0.002\%$ ) the sensitivity of OptiMAL-IT and Paracheck Pf were only 20% when compared to microscopy.

To compare the effectiveness of these two rapid diagnostic tests with the conventional microscopy as considered as gold standard, the results demonstrated that at the high level of parasitaemia  $500 / \mu\text{L}$  of blood ( $0.01\%$ ) the both rapid tests perform as good as experienced microscopist but when the parasitaemia less than  $100 / \mu\text{L}$  of blood ( $< 0.002\%$ ) both tests cannot perform comparable with a microscopist.

When compared the results of this study with the results of previous OptiMAL studies (1,2,4,7,9) we found that sensitivity of OptiMAL-IT in this study is lower. The explanation would be in this Karen community living on the western border of Thailand is an area of low malaria transmission (approximate one infection per person per year), asymptomatic malaria is unusual (C Luxemburger et al., 1997). From this study, 33% (47/141) of positive samples by microscopy had parasitaemia  $< 500/\mu\text{L}$  of blood ( $0.01\%$ ), which may decrease a global sensitivity and global specificity of OptiMAL-IT and Paracheck.

Global sensitivity and global specificity of Paracheck in this study was not different from the study by Proux S et al., 2001. The sensitivity at various level of parasitaemia, the results from this study was not different from previous studies (2,4,5,6,8), for *P.falciparum* both tests were found less sensitive when parasitaemia  $< 500/\mu\text{L}$  of blood ( $< 0.01\%$ ). For *non-P.falciparum*, OptiMAL-IT sensitivity started to decrease when parasitaemia  $< 5,000/\mu\text{L}$  of blood ( $< 0.1\%$ ).

The results obtained from primary and secondary microscopy do not show the difference in species identification so the PCR result for tertiary confirmation at

DiaMed Switzerland is not necessary. In the future, to avoid bias from the company, I would like to suggest to use the laboratory facilities of the Department of Medical Science, Ministry of Health as the reference.

The OptiMAL-IT is designed in an individual device test, which has more advantages above the old OptiMAL because the new test can be kept from humidity for long time after result was read. The new test is also more suitable whether to perform single test or many tests together at the same time. The OptiMAL-IT is presented as a device individually packed in aluminium-coated packets containing a desiccant. Thus, the problem of loss of sensitivity under tropical conditions (temperature > 30°C and humidity > 70 %) reported with the OptiMAL first generation has been solved. The new plastic device is well designed: guides maintain the test strip at a fixed angle in the well and at the end of the procedure the test strip is inserted into a clear plastic cover for a safe storage and permanent record. Strong and intermediate reactive lines are still visible for weeks and allows quality control of the tests. Finally there is a 10 µl mark on the pipette for a calibrated blood collection and a clear schematic procedure is provided with each test. We found both tests, Paracheck and OptiMAL-IT, easy to perform and to teach, however Paracheck procedure has fewer steps.

In the areas of low transmission with multidrug resistant malaria, laboratory confirmation for malaria is necessary for disease management and control whereas in remote areas the health services are usually hardly possible for people to reach as well as reliable microscopy confirmation for malaria is also unavailable. Thus, rapid diagnostic tests (RDTs) for malaria offer the great alternative way to combat with

malaria though the sensitivity at the low parasitaemia level ( $<100$  parasites/ $\mu\text{L}$  of blood) is less than desirable level but RDTs can be performed and diagnosed by local health volunteer in the community then the patient can be treated immediately the incidence of severe malaria could be reduced.



## References

- A.H.Moody, S.M.John, A.Sudarsanam, U.Sitaram 1998. Evaluation of OptiMAL, a dipstick test for the diagnosis of malaria. *Annals of Tropical Medicine & Parasitology* 92, 5 : 621-622.
- C J Palmer, Lindo JF, Klaskala WI, Quesada JA, Kaminsky R, Baum MK, Ager AL. 1998 Evaluation of the OptiMAL test for rapid diagnosis of *Plasmodium vivax* and *Plasmodium falciparum* malaria. *Journal of Clinical Microbiology* 36,1 (Jan) : 203-206.
- C Luxemburger, F Ricci, F Nosten, D Raimond, Saw Bathet and N J. White 1997. The epidemiology of severe malaria in area of low transmission in Thailand. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 91: 256-262.
- David J. Fryauff, Purnomo, Mochammad A. Sutamihardja, Iqbal R.S. Elyazar, Ika Susanti, Krisin, Budi Subianto, and Harijani Marwoto (2000). Performance of the OptiMAL® assay for detection and identification of malaria infections in asymptomatic residents of Irian Jaya Indonesia. *American Journal of Tropical Medicine and Hygiene* 63, 3-4 : 139-145.
- Hunt Cooke A, P.L. Chiodini, T. Doherty, A.H. Moody, J Ries, M. Pinder 1999. Comparison of a Parasite Lactate Dehydrogenase-Based Immunochromatographic Antigen Detection Assay (OPTIMAL®) with Microscopy for the Detection of Malaria Parasites in Human Blood Samples. *American Journal of Tropical Medicine and Hygiene* 60, 2 : 173-176.
- Iqbal J., Ali Sher, P.R. Hira, and R. Al-Owaish 1999. Comparison of the OptiMAL Test with PCR for Diagnosis of Malaria in Immigrants. *Journal of Clinical Microbiology* 37, 11 (Nov) : 3644-3646.
- Jelinek T, Grobusch MP, Schwenke S, Steidl S, von Sonnenburg F, Nothdurft HD, Klein E, Loscher T. 1999 Sensitivity and specificity of dipstick tests for rapid

diagnosis of malaria in non-immune travelers. *Journal of Clinical Microbiology* 37, 3 (Mar) : 721-723.

Moody A, Hunt-Cooke A, E. Gabbet, P. Chiodini 2000. Performance of the OptiMAL malaria antigen capture dipstick for malaria diagnosis and treatment monitoring at the Hospital for Tropical Diseases, London 2000. *British Journal of Hematology* 109 : 891-894.

Quintana M., R. Piper, H-L Boling, M. Makler, C. Sherman, E. Gill, E. Fernandez, S. Martin 1998. Malaria Diagnosis by Dipstick Assay in a Honduran Population with coendemic *Plasmodium falciparum* and *Plasmodium vivax*. *American Journal of Tropical Medicine and Hygiene* 59, 6 : 868-871.

S. Proux, L. Hkirijaroen, C. Ngamngonkiri, S. Mc Connell and F. Nosten. 2001 Short communication: Paracheck-Pf®: a new, inexpensive and reliable rapid test for *P. falciparum* malaria. *Tropical Medicine and International Health* 6, 2 : 99-101.

Tjitra E, Suprianto S, Dyer M., B.J. Currie, and N.M. Anstey 1999. Field Evaluation of the ICT Malaria Pf/Pv Immunochromatographic Test for Detection of *Plasmodium falciparum* and *Plasmodium vivax* in Patients with a Presumptive Clinical Diagnosis of Malaria in Eastern Indonesia. *Journal of Clinical Microbiology* 37, 8 (Aug) : 2412-2417.

Warhurst DC, Williams JE, 1996. Laboratory diagnosis of malaria. *J Clin Path* 49: 533-538.