

EVALUATION OF THE WHOLE BLOOD FILARIASIS ICT TEST FOR SHORT-TERM MONITORING AFTER ANTIFILARIAL TREATMENT

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Abstract. The immunochromatographic (ICT) filariasis test is a rapid screening tool that will be useful for defining the prevalence and distribution of *Wuchereria bancrofti* as part of the global program to eliminate lymphatic filariasis. To address questions about its usefulness for monitoring control programs, we used the ICT filariasis test to assess residual antigen levels following antifilarial treatment. Our results demonstrate that antigen levels persist in microfilaria-negative persons for up to three years after treatment. Different strategies for monitoring control programs may have to be considered.

Lymphatic filariasis is a major physical and social burden for millions of affected people worldwide. Recently, global interest in eliminating this disease has increased with the development of new tools for diagnosis and treatment. Several control programs are underway, but reliable and efficient methods to monitor the success of antifilarial treatment have not yet been validated. The whole blood immunochromatographic (ICT) filariasis test, a rapid-format card test for detection of *Wuchereria bancrofti* antigen, shows promise as a field-ready diagnostic tool (AMRAD ICT, New South Wales, Australia).¹ Since use of the whole blood ICT card test for post-treatment surveillance had not yet been examined, we evaluated the ICT test results in groups of drug-treated persons in Haiti.

The ICT test was performed on banked plasma samples from previous drug studies, during which microfilarial density and antigen levels were assessed by nuclepore filtration and the Og4C3 ELISA, respectively.² Participants were treated with either high-dose ivermectin (IVM) (n = 10), low-dose ivermectin and diethylcarbamazine (IVM plus DEC) (n = 12), single-dose diethylcarbamazine (DEC) (n = 8), or 12 weekly doses of DEC (DEC-w) (n = 14). Post-treatment plasma samples were collected 6, 12, and 24 months after treatment for each group, except for the DEC-weekly group, from which samples were collected 6 and 36 months after conclusion of treatment. To approximate the volume of plasma comprising 100 μ L of whole blood (the amount recommended by the manufacturer), we used 50 μ L of plasma per ICT test.

Before treatment, all 44 persons were microfilaria-positive (mean, 1061 parasites per mL, range 12–8,840), and all plasma specimens were antigen-positive by both ICT and Og4C3 ELISA (Table 1). At the final sample collection (24 or 36 months) post-treatment, only 5 persons were antigen-negative by ICT, 3 of these in the DEC-weekly group. These 5 persons had lower pretreatment mean microfilarial densities (222 per mL, range 43–440) than did persons who remained antigen-positive by ICT (1,168 per mL, range 12–8,840; $P < 0.0021$ by *t*-test). Of 10 persons who tested microfilaria-negative 3 years post-treatment, 70% remained antigen-positive by ICT.

These data suggest that although the ICT card test may be useful for initial assessment of the distribution and prevalence of *W. bancrofti* infection, its use in monitoring infection within 3 years after treatment may be limited, particularly in areas of intense parasite transmission. Microfilaremia remains the most feasible short-term method for post-treatment surveillance in these settings. Our findings are consistent with other data that suggest that post-treatment conversion to antigen-negative status (using the Og4C3 ELISA) is related to pretreatment microfilarial density.^{3,4} Thus, it is possible that in areas of very low infection intensity, the ICT test may be useful for post-treatment monitoring. The test has also been recommended for assessing infection status in children born after the initiation of filariasis-elimination programs to certify interruption of transmission.⁵ We suggest that further research on the ICT card test be done with other drug combinations (e.g., diethylcarbamazine and albenda-

TABLE 1
 Post-treatment results based on detection of microfilaria (mf) in filtered blood, the ICT card test (ICT), and the Og4C3 ELISA*

Drug†	12 months post-treatment testing method			24 months post-treatment testing method		
	Mf‡	ICT	ELISA§	MF	ICT	ELISA
IVM	4/10 (40)	6/6 (100)	10/10 (100)	2/4 (50)	3/4 (75)	4/4 (100)
IVM + DEC	5/10 (50)	10/10 (100)	12/12 (100)	6/10 (60)	9/10 (90)	10/10 (100)
DEC	7/8 (88)	No data	8/8 (100)	8/8 (100)	8/8 (100)	8/8 (100)
DEC-w	6 months post-treatment testing method			36 months post-treatment testing method		
	Mf	ICT	ELISA	MF	ICT	ELISA
DEC-w	3/14 (21)	14/14 (100)	14/14 (100)	4/14 (29)	11/14 (79)	14/14 (100)

* Values are the number of serum samples positive/total number tested, and (%) positive.
 † The drug groups are IVM (a 20 μ g/kg dose of ivermectin followed 5 days later with a 400 μ g/kg dose); IVM + DEC (20 μ g/kg clearing dose of ivermectin followed 5 days later with a 6 mg/kg dose of diethylcarbamazine); DEC (single 6 mg/kg dose of DEC); DEC-w (12 weekly doses of 6 mg/kg of DEC).
 ‡ One or more mf detected by nuclepore (Pleasanton, CA) filtration of 1 mL of venous blood.
 § Og4C3 antigen detection ELISA in a 1:4 dilution.
 IVM = ivermectin
 DEC = diethylcarbamazine

zole) that are likely to be used in filariasis-elimination programs.

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REFERENCES

1. Weil GJ, Lammie PJ, Weiss N, 1997. The ICT filariasis test: a rapid-format antigen test for diagnosis of bancroftian filariasis. *Parasitology Today* 13: 401–404.
2. Eberhard ML, Hightower AW, Addiss DG, Lammie PJ, 1997. Clearance of *Wuchereria bancrofti* antigen after treatment with diethylcarbamazine or ivermectin. *Am J Trop Med Hyg* 57: 483–486.
3. McCarthy JS, Guinea A, Weil GJ, Ottesen EA, 1995. Clearance of circulating filarial antigen as a measure of the macrofilaricidal activity of diethylcarbamazine in *Wuchereria bancrofti* infection. *J Infect Dis* 172: 521–526.
4. Nicolas L, Plichart C, Nguyen LN, Moulia-Pelat JP, 1997. Reduction of *Wuchereria bancrofti* adult worm circulating antigen after annual treatments of diethylcarbamazine combined with ivermectin in French Polynesia. *J Infect Dis* 175: 489–492.
5. WHO. Report of a WHO informal consultation on epidemiologic approaches to lymphatic filariasis elimination: initial assessment, monitoring, and certification. WHO/FIL/00.195, Geneva.