VOLUME 12 NO I PP 123-129 JANUARY 2007

Evaluation of the diethylcarbamazine patch to evaluate onchocerciasis endemicity in Central Africa

Gladys Ozoh¹, Michel Boussinesq², Anne-Cécile Zoung-Kanyi Bissek³, Léon Kobangue⁴, Maryvonne Kombila⁵, Jean-Romain Mourou Mbina⁵, Peter Enyong⁶, Mounkaïla Noma⁷, Azodoga Sékétéli⁷ and Grace Fobi⁸

1 Department of Dermatology, College of Medicine, University of Nigeria, Enugu, Nigeria

2 Département Sociétés et Santé, Institut de Recherche pour le Développement, Paris, UR24, France

3 Département de Médecine interne, Faculté de Médecine et des Sciences biomédicales, Université de Yaoundé I, Yaounde, Cameroon

4 Service de Dermatologie, Centre National Hospitalier Universitaire, Bangui, Central African Republic

6 Tropical Medicine Research Station, Kumba, Cameroon

7 World Health Organization/African Programme for Onchocerciasis Control, Ouagadougou, Burkina Faso

8 World Health Organization/Special Intervention Zones, Kara, Togo

OBJECTIVE As part of a baseline data collection for assessing the impact of the African Programme for Onchocerciasis Control, to evaluate the diethylcarbamazine (DEC) patch test in determining the endemicity of onchocerciasis.

METHOD A total of 226 untreated children aged 3–5, living in four selected endemic foci, in Cameroon, Gabon and Central African Republic, were tested. Observed graded skin reactions to the patch were analysed and compared with the prevalence of onchocercal nodules and reactive skin disease in the corresponding community.

RESULTS The proportion of children who tested positive ranged from 25.0% to 77.1%. The values were closely correlated with the prevalence of nodules, i.e. the level of endemicity for onchocerciasis. CONCLUSION The DEC patch test, which has been so far used only in West African foci of onchocerciasis, can also constitute a valuable tool to evaluate the levels of endemicity of onchocerciasis in Central Africa, and to follow-up the intensity of transmission of *Onchocerca volvulus*.

keywords onchocerciasis, diethylcarbamazine patch test, epidemiology, diagnosis, Central Africa, African Programme for Onchocerciasis Control

Introduction

Summary

The main objective of the African Programme for Onchocerciasis Control (APOC) is to reduce the enormous burden of onchocerciasis in endemic countries of sub-Saharan Africa, so that the disease will no longer be an important public health problem and a developmental and socioeconomic constraint on the continent. In order to do this effectively, APOC developed a new strategy, based on the implementation of mass community-directed treatment with ivermectin (CDTI) in all the foci where onchocerciasis is meso- or hyperendemic.

In 1998, APOC decided to launch a study aimed at evaluating the impact of these control activities. The general principle of the study was to measure and follow-up, at 5-year intervals, a number of indicators related to the level of endemicity for onchocerciasis, a baseline assessment being organized before the implementation of the CDTI project in the selected areas. A total of 13 sites located in nine APOC countries were selected, and four types of indicators were considered: dermatological, ophthalmological, sociological and entomological. Among the dermatological indicators, in some of the sites, the results of a specific test were included: the diethylcarbamazine (DEC) patch test, whose outcome, at an individual level, is strongly related to the presence of microfilariae (mfs) in the skin of the subjects examined.

For some 30 years, DEC and suramin were the drugs of choice for the chemotherapy of onchocerciasis. However, treatment with DEC provokes, in patients infected with *Onchocerca volvulus*, a complex of manifestations, which has been named after the investigator who first described them, the Mazzotti reaction (Mazzotti 1948). These reactions, which occur within a few hours after the oral dose, include itching, dermal oedema, maculopapular eruptions, lymphadenopathy, fever, but also more severe

⁵ Département de Parasitologie-Mycologie, Faculté de Médecine, Université des Sciences de la Santé, Libreville, Gabon

manifestations such as meningism, arthropathy, tachycardia, hypotension, severe prostration and even death (Fuglsang & Anderson 1974; Duke *et al.* 1976; Bryceson *et al.* 1977). The mechanism of action is believed to be due to inflammatory reactions, involving particularly eosinophils, associated with the exposure and killing of the mfs (Ackerman *et al.* 1990).

In order to limit the severity of these reactions, some studies evaluated the use of topical application of DEC lotion as an alternative treatment modality. Langham et al. (1978) applied DEC cream over a large area of the skin of patients lightly infected with O. volvulus and found that it brought about an almost complete clearance of the mfs from the skin. Hutchinson et al. (1979) were unable to confirm these findings in heavily infected patients, and reported that the adverse effects were even more marked with topical application than after oral treatment. Another study by Taylor et al. (1980a) among Liberian males showed that treatment with DEC lotion had a lesser effect on the skin microfilarial loads than oral DEC (the counts decreased to 20% and 2% of initial levels, respectively). but the topical application was followed by commoner reactions. Another study performed in Guatemala suggested that the severe reactions after topical DEC were almost as frequent in patients with light infection as in those with moderate or heavy ones (Taylor et al. 1980b).

All these results showed that DEC, either administered orally or applied topically, was inappropriate for mass treatment of onchocerciasis. However, as the reactions were related to the infection, it has been suggested that topical application of the drug could be used as a simple and non-invasive provocative test for the diagnostic of onchocerciasis, especially in patients with low microfilaridermias, such that no parasite can be found in their skin biopsy (Langham & Richardson 1981). Following the same principle, Stingl et al. (1984) then proposed to apply the DEC on a very limited skin area, a procedure that would give localized cutaneous reactions, but prevent the occurrence of severe systemic and ocular reactions. These authors, who were the first to use the term of 'patch test' to describe the method, applied it on 75 Sudanese patients infected with O. volvulus and found that 92% of them were positive for the test. But a second evaluation performed by Newland et al. (1987) was much less encouraging: these authors found in Liberia that only 8 of 26 patients with skin mfs developed a reaction at the site at which the DEC patch was placed; the sensitivity of the test being thus only 30.8%. These discrepancies prompted the Onchocerciasis Control Programme in West Africa (OCP) to carry out further studies in order to define the parameters that influence the performances of the test, especially the concentration of DEC in the cream, and the interval

between the application of the patch and the reading of the results. The sensitivity was fairly low (44%) when a 10% DEC solution was used and the results read after 24 h, but much better when the concentration of DEC was raised at 20% and when the evaluation was carried out 48 h after the application (Toè *et al.* 2000). Lastly, a study in a forest area of Cameroon assessed the responses to the DEC patch test in patients infected with another filarial parasite highly endemic in Central Africa: *Loa loa*. This study revealed that the proportion of positive results after 48 h was higher in children presenting a *Loa* microfilaraemia than in those who were amicrofilaraemic (20% *vs.* 5.3%), but that only 9.5% of the microfilaraemics developed a reaction graded as ≥ 2 (see definitions below) (Boussinesq *et al.* 1998).

As a result of the satisfactory results obtained, it was decided to include the DEC patch test as a means to followup the intensity of transmission of *O. volvulus* in the OCP area, and especially to detect a possible recrudescence of transmission in areas where the latter had been interrupted by the long-lasting vector-control activities. Antifilarial treatment also influences the level of infection in the skin and thus the results of the test. Thus, to avoid any confusion in the interpretation of results, the test was restricted to a subpopulation usually excluded from the ongoing mass ivermectin treatment: children under 5 years, for whom the drug is contra–indicated.

This article presents the results obtained, before any large-scale ivermectin treatment in those four sites selected for the APOC impact study where the DEC patch test method was applied. Following the principles used in the OCP area, samples of children aged 3–5 and residing in the selected villages underwent the test. Our objective was to evaluate whether the results of the DEC patch tests were significantly correlated, in these sites located in Central Africa, with the level of endemicity for onchocerciasis. Should such a close correlation be demonstrated, one may think that the DEC patch test would be a useful tool for following up the possible decrease in the intensity of transmission in the areas where CDTI projects are developed.

Patients and methods

Selection of study sites

The impact study of APOC was performed in a number of sites selected according to several inclusion criteria. Clearly, the only way to evaluate the impact of APOC activities is to measure epidemiological data at baseline, and then to follow-up the situation as the treatments are implemented and repeated. In order to standardize the procedure between sites, it was decided that the sites would

have not yet benefited from the activities of any CDTI project, or from other mass treatments that would have covered more than 25% of the population. The second criterion used to select the impact study sites was that the villages had to be meso- or hyperendemic for onchocerciasis (i.e. with a prevalence of nodules $\geq 20\%$ in the individuals ≥ 20 years), and that within a given site, the different study villages would have similar levels of endemicity for onchocerciasis.

According to these criteria, we selected two sites in Cameroon, one site in Gabon and one site in Central African Republic (CAR). One of the sites of Cameroon was constituted of six small villages located near Ngambe, on the right bank of the Sanaga River, in the Littoral Province. These localities were Ibaikak, Kan I, Kan II, Ndjock Nkong, Onna and Pendjock. The second Cameroonian site included four villages near the town of Kumba in the Mongo River valley, in the southwest province of the country: Baduma, Bolo, Ediki Mbonge and Weme. In Gabon, six villages were selected near the small town of Lastourville, in the Ogooué River valley, some 50 km northeast of Koulamoutou: Bamboro, Bassegha, Doumé, Mahouya, Malende and Pahon. Lastly, the site selected in CAR was located in the Lobave region, near the town of Moungoumba, and three localities were included in the study: Mongo I, Mongo II and the large village of Zinga.

Selection of patients

Before the medical team arrived, the population of each selected village was censused by a specific team directed by two sociologists. The objective was that the total population would exceed 1500 persons, of whom one half would be drawn at random for the medical examinations. All consenting individuals over 5 years of age participated in a dermatological examination. The presence or absence of onchocercal nodules and of the various cutaneous lesions related to the disease, defined following the method of Murdoch *et al.* (1993), were noted on a standardized form. For the DEC patch test, the study population was restricted to those 3- to 5-year-old children.

The exclusion criteria included positive history of atopy or family history of atopy, allergic reactions to either elastoplast or Nivea products and the presence of eruptions, excoriations or ulcerations on the site for DEC patch application.

Application of the diethylcarbamazine patch test and reading of the results

The ingredients were made of Nivea lotion and DEC powder. When the present study was implemented, the

results of Toè et al. (2000) – who showed that the DEC patch test was more sensitive when using a 20% DEC solution – were not available. Thus, the test was conducted with the method used until then, i.e. with a 10% DEC solution. A measure of 10 g of the DEC powder and 100 ml of Nivea milk or lotion were mixed thoroughly to obtain a homogenous mixture.

Prior to the application, verbal informed consent was first obtained from the parent of each child. All consenting parents were instructed to explain the procedure to their children. Only those children who accepted to take part were included, while those who refused were excluded. A 5×10 cm portion of the skin on the left iliac crest was cleaned with methylated spirit. Using a calibrated pipette, 0.5 ml of 10% DEC lotion was spread on an alreadyprepared filter paper measuring 3×2 cm. This filter paper was then applied on the swabbed skin over the left iliac crest. It was covered with a piece of hypoallergenic elastoplast measuring 8×5 cm labelled with the subject's identity number, date and time of application. Parents were instructed to keep the patch in place until the child was brought back at the same time on the next day and the second day.

Reactions to the patch test were read by two independent observers and the results recorded on a standard format. The reactions were graded as follows: 0 = no reaction; 1 = 1-3 papules; 2 = 4-8 papules; 3 = more than 8 papules; 4 = presence of dermal oedema (vesiculation or ulceration).

Results

A total of 242 untreated children, aged 3–5 were selected randomly as follows: Kumba, 90 children; Ngambe, 44 children; Lastourville, 45 children; Zinga, 63 children. However, in Kumba, only 83 of 90 completed the tests and presented themselves at the 24th and 48th hour for reading of the reaction, while seven defaulted. In Lastourville, 9 of the children could not report for the reading and only 36 completed the test.

Table 1 shows that the proportion of children who reacted positively with the DEC patch test varied widely between the four sites. The highest values were recorded in Kumba and Ngambe, with values of 77.1% and 70.5%, respectively, whereas only 25.0% of the children developed a reaction in Lastourville. Marked differences were also demonstrated in the severity of the reactions shown by the children, and in Kumba, 60.9% of those who reacted had a reaction graded 4, i.e. associated with an oedema of the skin. In all the three other sites, the proportions of children who developed such severe reactions were much lower.

Table I Number and proportion of children who reacted positively with the DEC patch test in the different sites. The reactions were graded as follows: 0 = no reaction; 1 = 1-3 papules; 2 = 4-8 papules; 3 = more than 8 papules; 4 = presence of dermal oedema (vesiculation or ulceration)

	Kumba (n =	83)	Ngambe (<i>n</i> =	= 44)	Zinga ($n = 6$	3)	Lastourville (n = 36)
Reaction code	24 h	48 h	24 h	48 h	24 h	48 h	24 h	48 h
0	19 (22.9%)	19 (22.9%)	13 (29.5%)	13 (29.5%)	29 (46.0%)	24 (38.1%)	27 (75.0%)	27 (75%)
1	6 (7.2%)	6 (7.2%)	5 (11.4%)	5 (11.4%)	9 (14.3%)	12 (19.0%)	2 (5.6%)	2 (5.6%)
2	5 (6.0%)	5 (6.0%)	7 (15.9%)	7 (15.9%)	15 (23.8%)	16 (25.4%)	2 (5.6%)	2 (5.6%)
3	14 (16.9%)	14 (16.9%)	14 (31.8%)	14 (31.8%)	7 (11.1%)	7 (11.1%)	2 (5.6%)	2 (5.6%)
4	39 (47.0%)	39 (47.0%)	5 (11.4%)	5 (11.4%)	3 (4.8%)	4 (6.3%)	3 (8.3%)	3 (8.3%)
1–4	64 (77.1%)	64 (77.1%)	31 (70.5%)	31 (70.5%)	34 (54.0%)	39 (61.9%)	9 (25.0%)	9 (25.0%)
2–4	58 (69.9%)	58 (69.9%)	26 (59.1%)	26 (59.1%)	25 (39.7%)	27 (42.9%)	7 (19.4%)	7 (19.4%)

As noticed in the Introduction section, patients presenting a *L. loa* microfilaraemia may develop a reaction to the DEC patch test. However, in most cases, the latter is mild and usually graded 1 following the standard grading system. To take this into account, we calculated the proportion of children who developed more severe reactions (graded ≥ 2), and the results given in Table 1 show that, using this restricted definition, the global differences between the sites were similar to those observed when all the reactions were included in the analysis.

The results presented in Table 1 also show that in three of the four sites, the proportion of children showing a reaction was the same at 24 and at 48 h. In Zinga, conversely, the proportion of positive children was a little higher after 48 h than after 24 h.

Table 2 shows the relationship between the results of the DEC patch test and the prevalence of the nodules in the subjects aged 5 and above who participated in the rest of the medical examinations. It clearly shows that both indicators are closely correlated, and in the three sites where the levels of endemicity were the highest, the proportion of children who reacted corresponded to the prevalence of nodules plus about 30%. A relationship seems also to exist between the proportion of children with a positive DEC patch test and the prevalence of reactive

skin lesions, although for the latter indicator, the high value recorded in Lastourville was unexpected.

Discussion

Several studies have been performed in the OCP area to evaluate the performances of the DEC patch test as a tool for the individual diagnosis of O. volvulus infection, as a mean to evaluate the level of endemicity in a community and as a method to detect early reappearance of O. volvulus transmission in areas where it had been interrupted by control activities. The most detailed study was performed by Toè et al. (2000) and Boatin et al. (2002). The former evaluated, on 1887 individuals in Côte d'Ivoire and Burkina Faso (West Africa), the sensitivity and the specificity of the DEC patch test when compared with the standard diagnostic method used so far, i.e. the microscopic examination of skin biopsies of standardized weights (skin snips). They found that when reading of the patch test was performed after 48 h, the sensitivity values were 80% in the Sassandra focus of Côte d'Ivoire and 64% in the Bougouriba focus of Burkina Faso; the values for specificity in these two sites being 80% and 92%, respectively. In addition, they demonstrated that the prevalence given by the two methods were fairly similar.

Table 2 Comparison of results of the DEC patch test in the children aged 3–5 (reading at 48 h) and the prevalence of onchocerciasis nodules and of the reactive skin lesions among subjects aged 5 and above

Study site	Positive DEC patch test in children aged $3-5$ [% (<i>n</i>)]	Prevalence of nodules in the subjects aged ≥ 5 [% (<i>n</i>)]	Prevalence of reactive skin lesions in the subjects aged ≥ 5 [% (<i>n</i>)]		
Kumba	77.1 (83)	44.4 (764)	28.3 (764)		
Ngambe	70.5 (44)	41.5 (739)	19.6 (739)		
Zinga	61.6 (63)	32.1 (784)	9.9 (784)		
Lastourville	25.0 (36)	7.7 (886)	19.9 (886)		

n, number of individuals examined.

Boatin *et al.* (2002) compared the sensitivity and the specificity of the DEC patch test and of a polymerase chain reaction (PCR) test able to detect parasite DNA in pieces or scrapings of skin, when compared with skin snips. They found that in low prevalence areas, PCR and DEC patch tests were more sensitive than skin snips.

These findings underscore the value of the DEC patch test as a diagnostic tool. Besides this, it is obvious that the test has other benefits: (1) simplicity, both of the method of preparation of the DEC lotion and of the method of application; a standardized DEC can easily be applied by health assistants in primary health centres, making this easily integratable into primary health care services; (2) a very low cost (US\$0.12 per person treated) and (3) the noninvasiveness of the procedure, which induces high acceptability. Conversely, the newer diagnostic techniques, such as the test using a three recombinant antigens cocktail, and PCR assay are quite sensitive and specific (Boatin et al. 1998). Other tests, based on the detection of parasite antigens, have also been developed to identify infection at a very early stage - a major advantage if one wants to control early, and thus efficiently a recrudescence of transmission -(Vincent et al. 2000; Ayong et al. 2005). However, these immunoassays and molecular-biology-based assays are still expensive, require highly trained technical staff and cannot be easily afforded by the poor rural communities where onchocerciasis is endemic. Skin snipping is fairly cheap but needs a well-trained technician who knows how to handle microscopes properly. In addition, the procedure is invasive and may cause secondary bacterial or viral infections. Even rural people are well informed about the dangers of human immunodeficiency virus transmission resulting from invasive procedures and are now likely to reject skin snipping.

Our study demonstrated that the results of the DEC patch test applied in children were closely correlated with the levels of endemicity for onchocerciasis in the four selected sites. This finding is all the more important, because the DEC patch test had, so far, been applied only in onchocerciasis foci of West Africa, where the parasite strain might be different from the ones from Central Africa. In addition, there was a need to evaluate whether the co-endemicity with loiasis, another filarial disease that is endemic in Central Africa, influences the performances of the test. It is well known that L. loa is present in large areas where APOC has implemented control activities against onchocerciasis (Boussinesq & Gardon 1997), and indeed loiasis is highly prevalent in the two sites that we have selected in Cameroon (Thomson et al. 2004) and in the Lastourville area (Richard-Lenoble et al. 1985). The levels of endemicity for loiasis have not been assessed in the Zinga region, but the forest environment suggests that

the disease is also present there. A preliminary study involving patients infected with L. loa, but not O. volvulus, has shown that the presence of a Loa microfilaraemia may lead to a positive reaction to the DEC patch test (Boussinesq et al. 1998). However, in this study, less than 10% of the microfilaraemic individuals had developed a reaction graded 2 or more (similar results were obtained in children and adults). Thus, the prevalence of onchocerciasis can be assessed using the DEC patch test, even if the areas are co-endemic for loiasis, simply by increasing the threshold of positivity to the DEC patch test (i.e. by evaluating the proportion of patients with a reaction graded 2 or above). The mildness of the reactions recorded in Loa-infected patients is probably because of the fact that Loa mfs are located in the blood stream, and are thus less exposed to the action of topical DEC than the mfs of O. volvulus, which are more or less 'blocked' into the lymphatic capillaries of the dermis. In the present study, the fact that the correlations between the prevalence of nodules and the prevalence measured using the DEC patch test showed similar patterns, whatever the threshold used to define positivity for the latter confirms that the DEC patch test can be used to assess and follow-up the onchocerciasis endemicity levels, even in areas where loiasis is co-endemic.

The fact that the correlation between the DEC patch test and the prevalence of reactive skin lesions is less satisfactory is due to the high prevalence of reactive lesions in Lastourville. This may be due to the involvement of two non-dermatologists in the skin examination at the site. In other sites, skin examinations were carried out by two dermatologists and this may have limited over-reporting of onchocercal skin lesions.

In conclusion, the DEC patch test seems to be an appropriate tool to evaluate the level of endemicity for onchocerciasis, and thus the intensity of transmission of *O. volvulus* in Central Africa. If the therapeutic coverages are high enough, the mass treatments with ivermectin will probably, as in other areas (Boussinesq *et al.* 1997; Pion *et al.* 2004), bring about a decrease in the intensity of transmission, and thus reduce the force-of-infection of the parasite in the population. This would have an impact even on the levels of infection in the subpopulation left untreated, especially the children for whom the drug is contraindicated. This will be evaluated through the results of the DEC patch tests that will be applied in the same areas on samples of children of similar age than those who participated in the baseline surveys.

Acknowledgements

We are grateful to the APOC for sponsoring this project. We are particularly indebted to the following for their

invaluable support: Drs B. A. Boatin, U. Amazigo and H. Zouré. We also thank Mr Olinga Olinga and Mrs Solange Ouédraogo for the secretarial work. We are also most grateful to the populations who accepted to participate in the surveys.

References

- Ackerman SJ, Kephart GM, Francis H, Awadzi K, Gleich GJ & Ottesen EA (1990) Eosinophil degranulation. An immunologic determinant in the pathogenesis of the Mazzotti reaction in human onchocerciasis. *Journal of Immunology* 144, 3961– 3969.
- Ayong LS, Tume CB, Wembe FE *et al.* (2005) Development and evaluation of an antigen detection dipstick assay for the diagnosis of human onchocerciasis. *Tropical Medicine and International Health* **10**, 228–233.
- Boatin BA, Toé L, Alley ES, Dembélé N, Weiss N & Dadzie KY (1998) Diagnostics in onchocerciasis: future challenges. Annals of Tropical Medicine and Parasitology 92 (Suppl. 1), S41–S45.
- Boatin BA, Toe L, Alley ES, Nagelkerke NJD, Borsboom G & Habbema JDF (2002) Detection of Onchocerca volvulus infection in low prevalence areas: a comparison of three diagnostic methods. Parasitology 125, 545–552.
- Boussinesq M & Gardon J (1997) Prevalences of *Loa loa* microfilaraemia throughout the area endemic for the infection. *Annals* of *Tropical Medicine and Parasitology* **91**, 573–589.
- Boussinesq M, Prod'hon J & Chippaux JP (1997) Onchocerca volvulus: striking decrease in transmission in the Vina valley (Cameroon) after eight annual large scale ivermectin treatments. Transactions of the Royal Society of Tropical Medicine and Hygiene 91, 82–86.
- Boussinesq M, Kamgno J, Eloundou Onomo P, Befidi R & Gardon J (1998) Evaluation du patch à la DEC chez les sujets infectés par Loa loa. Document du Laboratoire mixte CPC/ORSTOM d'Epidémiologie et de Santé publique no. 98-16. Centre Pasteur, Yaounde, Cameroon.
- Bryceson ADM, Warrell DA & Pope HM (1977) Dangerous reactions to treatment of onchocerciasis with diethylcarbamazine. *British Medical Journal* 1, 742–744.
- Duke BOL, Vincelette J & Moore PJ (1976) Microfilariae in the cerebrospinal fluid, and neurological complications during treatment of onchocerciasis with diethylcarbamazine. *Tropenmedizin und Parasitologie* 27, 123–132.
- Fuglsang H & Anderson J (1974) Collapse during treatment of onchocerciasis with diethylcarbamazine. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 68, 72–73.
- Hutchinson DBA, El-Sheikh H, Jones BR, Anderson J, Fuglsang H & Mackenzie CD (1979) Adverse reactions to cutaneous diethylcarbamazine in onchocerciasis. *Lancet* ii, 46.

- Langham ME & Richardson R (1981) Onchocerciasis: diagnosis and the probability of visual loss in patients with skin snips negative for *Onchocerca volvulus* microfilariae. *Tropenmedizin und Parasitologie* **32**, 171–180.
- Langham ME, Traub ZD & Richardson R (1978) A transepidermal chemotherapy of onchocerciasis. *Tropenmedizin und Parasitologie* 29, 156–162.
- Mazzotti L (1948) Possibilidad de utilizar como medico diagnostico en la oncocercosis, las reacciones alergicas consecutivas a la administracion de 'Hetrazan'. *Revista del Instituto de Salubridad y Enfermedades Tropicales (Mexico)* 9, 235–237.
- Murdoch ME, Hay RJ, Mackenzie CD *et al.* (1993) A clinical classification and grading system of the cutaneous changes in onchocerciasis. *The British Journal of Dermatology* **129**, 260–269.
- Newland HS, Kaiser A & Taylor HR (1987) The use of diethylcarbamazine cream in the diagnosis of onchocerciasis. *Tropical Medicine and Parasitology* **38**, 143–144.
- Pion SDS, Clément MCA & Boussinesq M (2004) Impact of four years of large-scale ivermectin treatment with low therapeutic coverage on the transmission of Onchocerca volvulus in the Mbam valley focus, central Cameroon. Transactions of the Royal Society of Tropical Medicine and Hygiene 98, 520– 528.
- Richard-Lenoble D, Kombila M, Burnier I & Maganga ML (1985) Filarioses au Gabon: traitement par le mébendazole des filarioses à M. perstans et Loa loa. Bulletin de la Société de Pathologie exotique 78, 485–491.
- Stingl P, Ross M, Gibson DW, Ribas J & Connor DH (1984) A diagnostic 'patch test' for onchocerciasis using topical diethylcarbamazine. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 78, 254–258.
- Taylor HR, Greene BM & Langham ME (1980a) Controlled clinical trial of oral and tropical diethylcarbamazine in treatment of onchocerciasis. *Lancet* i, 943–946.
- Taylor HR, Langham ME, De Stahl EM, Figueroa LM & Beltranena F (1980b) Chemotherapy of onchocerciasis: a controlled clinical trial of tropical diethylcarbamazine in Guatemala. *Tropenmedizin und Parasitologie* **31**, 357–364.
- Thomson MC, Obsomer V, Kamgno J et al. (2004) Mapping the distribution of Loa loa in Cameroon in support of the African Programme for Onchocerciasis Control. Filaria Journal 3, 7.
- Toè L, Adjami AG, Boatin BA et al. (2000) Topical application of diethylcarbamazine to detect onchocerciasis recrudescence in West Africa. Transactions of the Royal Society of Tropical Medicine and Hygiene 94, 519–525.
- Vincent JA, Lustigman S, Zhang S & Weil GJ (2000) A comparison of newer tests for the diagnosis of onchocerciasis. Annals of Tropical Medicine and Parasitology 94, 253–258.

Corresponding Author Azodoga Sékétéli, African Programme for Onchocerciasis Control, 01 BP 549, Ouagadougou 01, Burkina Faso. Tel.: +226 50 34 29 53; Fax: +226 50 34 28 75; E-mail: seketelia@oncho.oms.bf

Evaluation du pansement à la diéthylcarbamazine pour mesurer l'endémicité de l'onchocercose en Afrique centrale

OBJECTIFS Evaluation du pansement à la diéthylcarbamazine dans le cadre de la collecte de données de base pour l'évaluation de l'impact du Programme Africain de lutte contre l'Onchocercose.

MÉTHODES 226 enfants non traités de 3 à 5 ans, vivant dans quatre foyers endémiques sélectionnés au Cameroun, au Gabon en la République Centrafricaine ont été testés. Les degrés de réaction cutanée au patch ont été analysés et comparés à la prévalence des nodules onchocerquiens et des lésions cutanées réactives dans la communauté correspondante.

RÉSULTATS La proportion d'enfants testés positifs variait de 25,0% a 77,1%. Les valeurs étaient fortement corrélées avec la prévalence de nodules i.e. le niveau d'endémicité de l'onchocercose.

CONCLUSIONS Le test au patch DEC qui n'avait jusque là été utilisé que dans les foyers d'onchocercose ouest-africains, peut aussi constituer un outil utile pour évaluer les niveaux d'endémicité de l'onchocercose en Afrique centrale et pour le suivi de l'intensité de la transmission de *O. volvulus*.

mots clés onchocercose, test du pansement à la diéthylcarbamazine, épidémiologie, diagnostic, Afrique centrale, Programme Africain de lutte contre l'Onchocercose

Evaluación de la prueba del parche de dietilcarbamazina para valorar la endemicidad de la oncocercosis en África Central

OBJETIVO Como parte de la recolección de datos de base para valorar el impacto del Programa Africano para el Control de la Oncocercosis, se pretendía evaluar la prueba del parche de dietilcarbamazina como herramienta para estimar la endemicidad de la oncocercosis.

MÉTODO Se realizó la prueba a 226 niños no tratados, con edades comprendidas entre los 3 y 5 años, viviendo en cuatro focos endémicos seleccionados en Camerún, Gabón y la República Central Africana. Se analizaron las reacciones cutáneas observadas frente al parche y se compararon con la prevalencia de nódulos de oncocercosis y de piel reactiva en la comunidad correspondiente.

RESULTADOS La proporción de niños que dieron positivos estaba entre el 25.0% al 77.1%. Los valores estaban cercanamente correlacionados con la prevalencia de nódulos, es decir, el nivel de endemicidad para oncocercosis.

CONCLUSIÓN La prueba del parche de dietilcarbamazina, que hasta ahora solo se ha utilizado en focos de oncocercosis del África Occidental, también podría constituirse en una herramienta valiosa para evaluar los niveles de endemicidad de oncocercosis en África Central, así como para hacer un seguimiento de la intensidad de transmisión de *O. volvulus*.

palabras clave oncocercosis, prueba del parche de dietilcarbamazina, epidemiología, diagnóstico, África Central, Programa Africano para el Control de la Oncocercosis