

## The Change of Blood Picture of Patients with Onchocerciasis following Administration of Diethylcarbamazine

Makoto SAKAMOTO

*Department of Parasitology, Institute for Tropical Medicine,  
Nagasaki University*

Guillermo Zea FLORES

*Departamento de Oncocercosis, Servicio Nacional de  
Erradicacion de la Malaria, Guatemala*

**Abstract:** The change of blood picture at the 3rd day of Diethylcarbamazine (DEC) administration was studied in thirty-two Guatemalan patients with onchocerciasis. They were administered DEC tablets daily seven consecutive days at the dosage of 5mg/kg body weight.

The increase of total white blood cell counts was statistically significant between before and the day 3 of administration. The increase of total white blood cell counts was due to that of neutrophil counts. The changes of eosinophil and lymphocyte counts were not statistically significant. The relation between the change of blood picture and the number of microfilariae in the skin snip was not seen.

*Key Words:* Onchocerciasis, Diethylcarbamazine, Haematology.

Diethylcarbamazine (DEC) is widely used in chemotherapy of human filariasis, being particularly effective against microfilariae. Administration of DEC causes severe local and systemic reactions in the patients with onchocerciasis, which are scarcely encountered during the treatment of malayan and bancroftian filariasis. This type of reaction observed in onchocerciasis (Mazzotti, 1948) has been referred as "Mazzotti test", and has been extensively used in some areas as a diagnostic measure.

The clinical and histological feature of inflammatory reaction shown in DEC administration has been intensively studied (Hawking, 1952; Fulgsang and Anderson, 1974; Fazen et al., 1976; Bryceson et al., 1977; Tada et al., 1981). However, little is known about haematology during DEC treatment (Money, 1980; Guerra-Caceres et al., 1980).

In Amatitlan General Hospital, Guatemala, we treated 32 patients with onchocer-

ciasis by DEC. Before treatment, two skin snips were taken from shoulder and iliac regions of each patient using a corneo-scleral punch. The patients were then given DEC (Hetrazan) orally at the dosage of 5 mg/kg body weight for 7 consecutive days. Before and 3 days after the initiation of treatment, haematological examination was carried out. Total number of white blood cell (WBC) per cubic millimeter of blood was counted by conventional method and differential cell count was assessed under Giemsa staining. The blood examination was made between 9:00 and 10:00 am.

The result was summarized in Table 1. The patients were classified into following three groups according to microfilariae density (MFD), expressed as a total count of microfilariae emerged from two snips; low (less than 10 mf), moderate (10 to 49 mf), and high density (50 and more mf) groups.

On day 3 of treatment, the total WBC count was found to be raised in all of 6 patients with low MFD, in 12 of 15 of those with moderate MFD, and in 10 of 11 of those with high MFD. The rate of increase varied from 2 to 183 per cent of the initial count. Although in 3 out of 32 patients, a reduction of total WBC count was observed, the decrease was slight, 2 to 18 per cent of the initial count. Using Student's t test, difference in total WBC count between before and 3 days after the initiation of treatment was significant in low MFD group ( $p < 0.02$ ), in moderate MFD group ( $p < 0.01$ ) and high MFD group ( $P < 0.01$ ). However, there was no clear difference in the increase of total WBC count among the three groups.

Differential count study showed that neutrophils increased in 27 of 32 cases with the range from 3 to 268 % of initial count. In two thirds of these cases, the increase in neutrophil count exceeded more than 30 % of initial count. The difference in neutrophil count before and 3 days after the initiation of treatment with DEC was statistically significant in all groups. The change in eosinophil count was quite variable. Of 32 cases, 14 showed increase in count exceeding 40 % of initial count, 8 ranged between +40 % and -40%, and 10 showed reduction under 40 % of the initial count. In lymphocyte count, an increase was more frequent (21 cases) than a reduction (11 cases). Of 28 cases with the increase of total WBC, the increase of neutrophil, eosinophil and lymphocyte was observed in 25, 17, and 19 cases respectively. The

Table 1. Changes of blood picture following DEC administration

Group due to MFD	No. exam.	Haematological data							
		Count before treatment*				Count on day 3 of treatment			
		WBC	Neutrophil	Eosinophil	Lymphocyte	WBC	Neutrophil	Eosinophil	Lymphocyte
Low	6	6651±1538	3993±903	1245±591	1347±579	9903±1415	6463±836	1308±978	1907±1066
Moderate	15	6613±1956	3591±1493	1504±859	1385±756	8061±2161	4691±1508	1549±844	1549±667
High	11	7439±3259	4896±2639	1150±1081	1330±503	11059±3264	6605±2745	2057±2243	2179±1220

\*Number of cells/mm<sup>3</sup>

increase of total WBC is more likely related with the increase of the neutrophil.

It is generally considered that inflammatory reaction caused by DEC administration is the result of speedy killing of microfilariae. The histological studies of reaction showed that neutrophils, eosinophils and lymphocytes appeared in close proximity to damaged microfilariae (Hawking, 1952; Gibson et al., 1976). Although we did not examine blood picture of patients on consecutive days following administration of DEC, our study showed that the marked increase of total WBC was observed on day 3 of treatment and it was mainly due to the increase of neutrophils. This confirms DEC-induced inflammatory reaction in host. Henson et al. (1979) emphasized that neutrophils were also seen in *Onchocerca volvulus* reaction, and described a suspected involvement of neutrophils in killing microfilariae. Neutrophils probably play an important role in exacerbation caused by DEC.

The particular role of eosinophils have been discussed in inflammatory reaction (Bryceson, 1976; Henson et al., 1979; Guerra-Caceres et al., 1980). Regarding the changes of eosinophils during the treatment of onchocerciasis, Money (1960) reported that the change was 43 % (0-99 %) depression of basal count and that the depression exceeded 40 % of initial count in 9 of 12 cases.

Guerra-Caceres et al. (1980) also observed that eosinophil counts fell to well below the initial level at 12 hours after DEC treatment and they returned to the previous level at 24 hours. Our present study showed 1 to 84 % decrease of the initial count in 14 cases among the subjects. The statistical analysis indicated that the eosinophil reducing effect of DEC was not significant in our cases. As our observation was made on day 3 of treatment, the discrepancy will be seen.

Further haematological studies, including the serial measurement of differential cell count, will be helpful to understand the generation of adverse reaction caused by administration of DEC to patients with onchocerciasis.

The authors are indebted to Dr. H. A. Godoy, Director de Servicio Nacional de Erradicacion de la Malaria, Ministerio de Salud Publica, Guatemala, and his colleagues for their cooperation. The authors wish to express special appreciation to Dr. Y. Aoki and Dr. I. Tada for their helpful criticism and suggestions in the preparation of the manuscript. This study was supported by the Ministry of Public Health, Guatemala and Japan International Cooperation Agency, Japan (ORCOP series No. 71).

#### REFERENCES

- 1) Bryceson, A. D. M. (1976): What happens when microfilariae die? *Tras. Roy. Soc. Trop. Med. Hyg.*, 70, 397-399.

- 2) Bryceson, A. D. M., Warrell, D. A. & Pope, H. M. (1977): Dangerous reaction to treatment of onchocerciasis with diethylcarbamazine. *Br. Med. i.* 742-744.
- 3) Fuglsang, H. & Anderson, J. (1974): Collapse during treatment of onchocerciasis with diethylcarbamazine. *Tras. Roy. Soc. Trop. Med. Hyg.*, 68, 72-73.
- 4) Fazen, L. E., Anderson, R. I. & Figueroa, M. H. (1976): Clinical and laboratory changes consequent to diethylcarbamazine in patients with onchocerciasis. *Am. J. Trop. Med. Hyg.*, 25, 250-256.
- 5) Gibson, D. W., Conner, D. H., Brown, H. L., Fuglsang, H., Anderson, J., Duke, B. O. L. & Buck, A. A. (1976): Onchocercal dermatitis: Ultrastructural studies of microfilariae and host tissues, before and after treatment with diethylcarbamazine (Hetrazan). *Am. J. Trop. Med. Hyg.*, 25, 74-87.
- 6) Guerra-Caceres, J. G., Bryceson A. D. M., Quakyi, I. & Spry, C. J. F. (1980): Studies on the mechanisms of adverse reactions produced by diethylcarbamazine in patients with onchocerciasis-Mazzotti reaction. *Para. Immu.* 2, 121-131.
- 7) Hawking, F. (1952): A histological study of onchocerciasis treated with Hetrazan. *Br. Med.*, i, 992-994
- 8) Henson, P. M., Mackenzie, C. D. & Spector, W. G. (1979): Inflammatory reactions in onchocerciasis: A report on current knowledge and recommendation for further study. *Bull. WHO.*, 57, 667-682.
- 9) Mazzotti, L. (1948): Posibilidad de utilizar como medio diagnostico en la oncocercosis las reacciones alergicas consecutivas a la administracion de 'Hetrazan'. *Rev. Inst. Salubr. Enferm. Trop.*, 9, 235-237.
- 10) Money, G. L. (1960): 'Hetrazan' eosinopenia in onchocerciasis. A preliminary communication. *J. Trop. Med. Hyg.*, 63, 238-241.
- 11) Tada, I., Mimori, T., Nonaka, S. & Figueroa, H. M. (1981): Mazzotti reaction: Clinical and histological observation of onchocerciasis cases tested in Guatemala. *Jap. J. Parasit.*, 30, 501-507.

---

オンコセルカ症に於る Diethylcarbamazine の末梢血液像に与える影響  
坂本 信, G. Z. Flores

オンコセル症の治療目的で Diethylcarbamazine (DEC) を経口投与した時の末梢血液像の変化を32名の患者について観察した。DEC の投与により総白血球は有意に上昇し、その原因は血球分画における好中球の増加によるものと考えられる。好酸球、リンパ球の変動に有意差はみられなかった。仔虫密度の DEC 投与時における末梢血液像に与える影響はあまりみられなかった。

熱帯医学 第25巻 第1号, 47-50頁, 1983年3月