วารสารเทคนิคการแพทย์ เชียงใหม่
BULLETIN OF CHIANG MAI MEDICAL TECHNOLOGY
Vol. 6 No. 2
May 1973

DEFECTIVE CELL-MEDIATED IMMUNE MECHANISM IN LEPROMATOUS LEPROSY

by

Phensri Chavapradith, B. Sc., (Med. Tech.) *
Tawat Tositaratana, B. Sc. (Med. Tech.) **
Panja Kulapongs, M D., Dip. Amer. Bd. Ped. ***

INTRODUCTION.

Failure of host resistance frequently results from a defect in cell-mediated immunity (CMI). However, hypersensitivity reactions resulting in tissue damage can occur as readily from CMI as from the deposition of immune complexes involving humoral antibody. Such an interaction between immune procedures and a given microorganism can display a wide spectrum of pathological process, which, in turn, leads to markedly different clinical manifestations. Such a spectrum is particularly well demonstrated by the recent elaboration of the varied clinical patterns in leprosy. Lepromatous and tuberculoid leprosy represent polar forms of an infection caused by Mycobacterium leprae. The former is a severe and progressive where as the latter type is more benign and often self-limiting. Various defective immune mechanism are observed more often and are of greater degree in lepromatous type.

Our first part of the study is to establish the prevalence of leprosy patients with evidence of defective CMI and located them for further studies. The responsiveness of the circulating lymphocytes to phytohemagglutinin (PHA) is used as a guide of their immunologic capability.

MATERIAL AND METHODS.

Heparinized venous blood samples were obtained from 10 male patients with lepromatous leprosy being treated at Mc. Kean Leprosarium. The responsets of the circulating lymphocytes to PHA stimulation were evaluated by the morphological study

* *School of Medical Technology, Chiang Mai University.*
** *Anemia and Malnutrition Research Center, Chiang Mai University.*
*** *Department of Pediatrics, Faculty of Medicine, Chiang Mai University.*

and H^3-TDR incorporation as previously described. (1)

RESULTS

There is a markedly reduced percentage of lymphocyte transformation in 10 lepromatous leprosy patients as compared to 10 normal adults.

TABLE I: PERCENT LYMPHOCYTE TRANSFORMATION FROM PHA STIMULATION

No.	Sample	with PHA	Control
10	Leprosy	7.0 ± 5.83	2.8 ± 2.62
10	Normal	89.7 ± 5.25	7.9 ± 5.24

COMMENTS

A moderately lowered capacity to develop allergic responses of the delayed type is often noted in lepromatous leprosy. Several investigators have demonstrated that lepromatous patients have a greater severity of a defect in the ability to develop delayed sensitivity to contact allergen and DNCB (2-4). The capacity of peripheral lymphocytes from leprosy patients to undergo blastic transformation on exposure to either PHA or specific antigens of Mycobacterium leprae, M. tuberculosis, PPD and streptolysin 0 is depressed (4-9). The depression of the response is considerably less in drug-treated lepromatous patients and those with tuberculoid leprosy. The low level of response to specific antigenic stimulation by lymphocytes from certain leprosy patients appear to be partially related to a depressive effect of autologous plasma. (9) This depressor factor as found by Bullock et al (9) was non-dialyzable, stable after prolonged storage at -20°C, and resistant to heating at 56°C. and its activity was lost at relatively low dilutions. In 1968 Cooperband et al (10) had found that the alpha globulin factor is highly depressed to PHA induced DNA synthesis. It is postulated that the plasma of certain patients with leprosy might contain anti-immunoglobulin antibodies that partially block antigen receptor side on lymphocyte surface (11, 12). Experimental work in support of this concept has been demonstrated by Greaves et al (13) who were able to suppress the response to PPD almost totally in vitro when sensitized human lymphocyte were cultured in the presence of Fab. fragment of anti-light chain antibodies. Regardless of the exact nature of the plasma depressor factor, it is accepted that this factor must be present in low-

concentration, since its effect is lost at low dilution in normal plasma, with very low binding affinity since part of the activity can be washed from leukocytes with relative ease. On the other hand, the failure of the normal plasma to restore the "normal" response by lepromatous lymphocytes to specific antigen indicated that the defect in immune response may be predominantly if not completely due to cellular dysfunction. It is of interest in this regard that lymph nodes from some patients with lepromatous leprosy appear to be deficient of lymphocytes in the paracortical areas. (13) Hypergammaglobulinemia (esp. IgG.) with lowering of serum albumin level (14) with arise in immunoglobulin-bearing lymphocytes (15) suggested the depletion of T-cells as well as a non-specific activation of the humoral immune response.

It is thus still uncertain whether the depressed CMI in leprosy relect a primary cellular defect, qualitatively, the depressive effect of a humoral factor, or both, to the varying degrees.

SUMMARY.

The in vitro response of peripheral lymphocytes from 10 patients with lepromatous leprosy to phytohemagglutinin stimulation was measured. All patients showed markedly depressed lymphocyte transformation which indirectly indicated the defective CMI mechanism. The various postulated mechanism were considered but the most important may be due to T-cells depletion.

ACKNOWLEDGEMENT.

This part of work is done at the Anemia and Malnutrition Research Center. The kind cooperation of Dr. Trevor Smith, Miss Wendy Lewis and Miss Helen Bayliss of the Leprosy Mission, Mc. Kean Rehabititation Institute is greatly appreciated.

REFERENCES

1. Tositarat, T., Nitimanop, K., and Kulapongs, P: Phytohemagglutinin-induced lymphoblastic transformation of the lymphocyte culture. Bull. Chiang Mai Med. Tech. 5:151, 1972.
2. Waldorf, D. S., Sheagren, J. N., Trautman, J. R., and Block, J. B.: Impaired delayed hypersensitivity in patients with lepromatous leprosy. Lancet II: 773, 1966.
3. Bullock, W. E.: Studies of immune mechanism in leprosy I. Depression of delayed allergic response to skin test antigens New Eng. J. Med. 278: 298, 1966.
4. Saha, K., and Mittal, M.M.: A study of cell mediated immunity in leprosy: changing trends in immunological spectrum of the disease. Clin. Exp. Immunol. 8: 901, 1971.
5. Dierks, R. E., and Shepard, C. C.: Effect of phytohemagglutinin and various mycobacterial antigens on lymphocyte cultures from leprosy patients. Proc. Soc. Exp. Biol. Med. 127: 391, 1968.
6. Paradisi, E. R., de Bonaparte, Y. P., and Morgenfeld, M. C.: Blasts in lepromatous leprosy. Lancet I: 308, 1968.
7. Bullock, W. E. Jr.: Impairment of phytohemagglutinin (PHA) and antigen-induced DNA synthesis in leukocytes culture from patients with leprosy. (Abstr.) Clin. Res. 16: 328, 1968.
8. Godal, T., Myklestad, B., Samuel, D.R., and Myrvang, B.: Characterization of the cellular immune defect in lepromatous leprosy: a specific lack of circulating Myeobacterium leprae-responsive lymphocytes. Clin. Exp. Immunol. 9: 821, 1971.
9. Bullock, W. E. Jr., and Fasal, P.: Studies of immune mechanism in leprosy. III. The role of cellular and humoral factor in impairment of the in vitro immune response. J. Immunol. 106: 888, 1971.
10. Cooperband, S. R., Bondevik, H., Schmid, R., and Mannick, J. A.: Transformation of human lymphocytes: Inhibition by homologous alpha globulin. Science 159: 1243, 1968.
11. Paul, W.E., Siskind, G W., and Benacerraf, B.: Specificty of immune responses. J. Exp. Med. 127: 25, 1968.
12. Coombs, R.R.A., Feinstein, A, and Wilson, A.B.: Immunoglobulin determinants on the surface of human lymphocytes. Lancet II: 1157, 1969.
13. Tusk, J. L., and Waters, M. F. R.: Immunological basis for depression of cellular immunity and the delayed allergic response in patients with lepromatous leprosy. Lancet II: 436, 1968.
14. Jha, P., Balakrishnan, K., Talwar, G.P., and Bhutani, L.K.: Status of humoral immune response in leprosy. Int. J. Lepr. 39: 14, 1971.
15. Verna, R.C., Balakrishnan, K., Vasudevan, D. M., and Talwar, G. P.: Lymphocytes bearing immunolobulin determinants in normal human lymph-nodes and in patients with lepromatous leprosy. Int. J. Lepr. 39: 20, 1971.