

Serum Butyrylcholinesterase Activity in Leprosy¹

TO THE EDITOR:

Butyrylcholinesterase (BuChE) is a multifunctional enzyme (^{1,8}) mainly regulating cholinergic transmission, and is involved in growth, differentiation, and degeneration of nervous tissue (⁹). BuChE in the serum is a 90 kDa glycoprotein with three major subunits of approximately 50 kDa, 21 kDa and 20 kDa. The 50 kDa subunit has zinc-dependent peptidase activity at the carboxy terminus, and the 20 kDa subunit has distinct sites of butyrylcholinesterase and amine sensitive aryl acylamidase activities (^{2, 13, 14}). BuChE in the skin, serum, and cerebrospinal fluid (CSF) are isoforms having similar peptidase and esteratic sites (^{5, 12, 15}).

Plasma BuChE is found to be altered in chronic diseases like breast cancer and in Alzheimer's disease (^{16, 17}). Our earlier work has shown that there is an increased BuChE level in the nerves of leprosy-affected individuals (¹⁸). The present study was done to learn the pattern of BuChE in the serum of leprosy patients and compare it to normal controls.

Twenty-nine leprosy patients were included in the study; they included 8 borderline tuberculoid (BT) leprosy, 5 borderline lepromatous (BL), 5 lepromatous (LL), 4 pure neuritic leprosy (PNL), and 24 normal controls. Additionally 26 HIV-infected individuals were also studied. After informed consent, 2 ml of blood was collected from each patient. The serum was separated and stored at -20°C until the enzyme assay was carried out. The enzyme assay kit used was obtained from SPINREACT, S.A. Ctra. Santa Coloma, Spain. BuChE in serum was estimated by the method of Ellman, *et al.* (⁶) using butyrylcholine as substrate. In brief, 50 mmol/L phosphate buffer pH 7.7

containing 7 mmol/L butyrylthiocholine substrate and 0.25 mmol/L 5,5 dithio bis (2-nitrobenzoic acid) in a total volume of 500 µl was the reaction mixture, which was incubated with 4 µl of serum at 26°C. The optical density was measured at intervals of one minute spectrophotometrically at 405 nm. The calculation of BuChE activity in serum was according to instructions provided in the kit, where one unit of cholinesterase activity was defined as $\Delta E/60 \text{ sec} \times 11,355 = \text{units/litre}$ under the standard assay conditions (at 26°C). Statistical analysis was carried out using students "t" test.

The BuChE activity obtained in different categories of samples is presented in The Table. The mean values in all forms of leprosy, as well as HIV, were lower than the in normal sera. However, when each group was compared with the normal mean, the *t* value was not significant for any of the group except for PNL ($p < 0.1$). When individual BuChE activity units were plotted in a scatter graph, each of the groups had quite a few patients showing a value less than the lowest normal value.

A decrease of serum cholinesterase has been suggested to be associated with susceptibility to leprosy and particularly to the tuberculoid and lepromatous forms of the disease (^{3, 11, 19}). In the present study, however, there were no statistically significant differences observed between the different forms of disease (Genetic variation BuChE has not been taken into consideration in this investigation). The scatter of values observed in each group indicate that it may not be a specific marker for any particular form of leprosy. Other studies have found that during exacerbations of leprosy there is an abrupt decrease in serum cholinesterase levels, which could be attributed to liver-specific granulomatous change and parenchymal cell damage (⁴).

Leprosy is an infectious disease that primarily affects the nerves. Nerve damage is an important and dreaded complication of the disease. In our earlier report an increase of BuChE levels in the nerves of leprosy

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THE TABLE. *Butyrylcholinesterase in serum.*

Category	No. of samples	Mean	S.D.	p value
Normal	24	7.04	1.43	—
BT leprosy	8	5.92	3.42	NS*
BL leprosy	5	4.50	0.92	NS
LL	12	5.30	1.76	NS
PNL	4	5.03	0.36	<0.1
Long standing leprosy	7	6.11	0.95	NS
HIV	26	6.02	1.53	NS

* Not significant

patients was observed (¹⁸), whereas an insignificant alteration was observed in serum BuChE levels. This suggests that an increase in the nerve could be due to the highly localized nature of the nerve destruction in leprosy and predilection of the *M. leprae* to peripheral nerve.

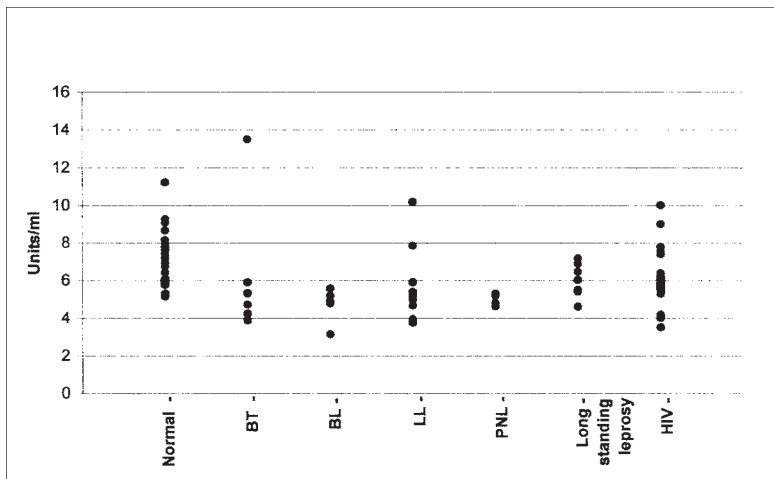
The reported BuChE decrease in skin tissue (⁷), increase in nerve BuChE (¹⁸), and the present observation of plasma BuChE indicates that it is a multifunctional enzyme with different expressions in different tissues (^{12, 15}). Cholinesterase activity has been found to be altered in cerebrospinal fluid and erythrocytes of patients with Alzheimer's disease (¹⁷). Altered cholinesterase activity and glycosylation of AchE have also been found in human breast cancer (¹⁶).

In this study, besides leprosy, the BuChE levels were not significantly altered in HIV

infection. HIV infection also runs a chronic course with neuropathy as a complication in about 30% of the patients (¹⁰). In the present study, all the patients had a duration of disease of up to 3 yrs, since the diagnosis of their infection. The decreased value of cholinesterase in a few may be an indicator of disease progression (chronicity) or of neuropathy.

Whether BuChE has a specific relationship to nerve damage is an area to be further investigated. A concomitant study of nerve, skin, and serum BuChE activity in leprosy and HIV patients with demonstrable nerve function impairment will throw light on this association.

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THE FIGURE. Scatter graph of individual Butyrylcholinesterase values in serum.

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