

Serum Lipase in Leprosy¹

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The presence of lipase in blood was a controversial subject until Comfort and Osterberg (4) demonstrated the presence of an enzyme in human serum capable of splitting glycerides of olive oil. The levels of serum lipase have been found to be affected in certain diseases and this change may be attributed to an altered fat metabolism in these states. Friesz and Hallay (8) always encountered this enzyme in the serum in acute diffuse pathologic conditions of liver cells; Fiessinger and Gajdos (7), who considered the serum lipase to be identical with the liver lipase, found that the former was decreased especially in liver cirrhosis. There are reports showing a fall in serum esterase activity and a rise in serum lipid content in rats and mice infected with cancer cells (10, 11).

Extensive work has been done on the serum lipase activity in tuberculosis. Porter (15) postulated that cats are very resistant to tuberculosis because they have high levels of serum lipase whereas guinea pigs, having very low serum lipase, are highly susceptible. Consantini and Tose (5) found that the immunity of certain animals to tuberculosis depends on the intensity of the lipolytic activity of blood. Wolf (19) suggested that the increase in the lipase titer might be the manifestation of the immunity status of the tuberculous host. This concept between the serum lipase activity and the immunity is very confusing. As pointed out by Long (13), most of these studies were made with simple ester substrates and the results applied to the complex lipids of the tubercle bacillus. Moncalvo and Piazza (14) suggested that plasma lipase determination might be useful as a prognostic index for tuberculosis of the

lungs. Similar findings have also been reported by Seabra (16).

The diagnosis of leprosy is solely based on clinical evidence and microscopic examination. These criteria may not be adequate in establishing the diagnosis in doubtful cases. It has been shown that the leprosy bacillus has a lipoid membrane. Only a few scanty reports are available concerning low serum lipase levels in leprosy (9, 18). It may be that a person having low serum lipase may not be able to dissolve the lipoid covering of leprosy bacilli and thus be susceptible to leprosy. Therefore it was thought worthwhile to undertake an estimation of serum lipase levels in various types of leprosy cases for the purpose of determining whether or not any significant relationships would be established between these determinations and factors such as the type of the disease, duration of the disease, dietary conditions, etc.

MATERIALS AND METHODS

Sera from one hundred and fifty-three persons were examined during the entire course of this investigation. These included 11 normal, healthy persons working at Central Leprosy Teaching and Research Institute, Chingleput; all from low-income groups. The other subjects were all leprosy patients from the Sanatorium of the above Institute. These included 25 bacteriologically negative cases, 84 bacteriologically positive cases, 17 cases with lepra reaction (sera from these patients were analyzed during the reaction and after subsidence of the reaction), and 16 cases from the chronic ward (these patients were all bacteriologically negative and had been hospitalized in the sanatorium for many years after becoming bacteriologically negative because of their disabilities). Bacteriologic examinations were done on skin smears of the patients and the criteria for evaluating the bacteriological index was the one recommended by Dharmendra (6). Sera from venous blood specimens, collected during fasting, were used for the determination of

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TABLE 1. Lipase Activity of serum and Bacteriologic Index.

	No. of cases	Mean lipase activity	Range
Normal healthy controls	11	1.51	1.02-1.85
Leprosy cases, B.I. negative	25	1.39	0.95-1.87
Leprosy cases, B.I. 0.10-0.99	18	1.20	0.71-1.65
Leprosy cases, B.I. 1.00-1.99	22	0.99	0.59-1.54
Leprosy cases, B.I. 2.00-2.99	25	0.56	0.30-0.91
Leprosy cases, B.I. 3.00 & above	19	0.33	0.10-0.51

lipase levels. The method of Cherry and Crandall (³) was followed for the estimation of serum lipase. This method is based on the fact that blood serum has the property of accelerating the hydrolysis of certain simple esters so that fatty acids are set free. The fatty acids, split off from an olive oil emulsion by incubating with serum at 37° C overnight, were titrated against standard sodium hydroxide and the titer value was used as an index of the lipase content in the serum.

RESULTS

The results of this study were correlated with various factors as presented in Tables 1-4. Table 1 gives the values for the serum lipase levels in normal healthy controls and in the leprosy patients divided into five groups based on the bacteriologic examination. It seems evident that serum lipase activity is definitely diminished in active leprosy cases (bacteriologically positive) as compared to that in bacteriologically negative cases and normal healthy controls. There is no significant difference in the titer values between normal healthy in-

dividuals and bacteriologically negative cases. It is further noted that the higher the Bacteriologic Index the lower is the serum lipase activity. Table 2 gives the relationship between the serum lipase activity and the duration of the disease in bacteriologically positive leprosy patients. The longer the duration of the disease, the lower are the values of lipase activity of serum. Further, in bacteriologically positive leprosy cases serum lipase activity is inversely proportional to the age of the patients; i.e. lipase activity decreases with increase in the age (Table 3). No significant correlation could be established between diet and the serum lipase activity as almost all the cases investigated (114 out of a total of 121) were on a non-vegetarian diet and the seven, who were on vegetarian diet were all bacteriologically positive cases.

Table 4 gives the serum lipase levels in leprosy patients with miscellaneous other conditions. Serum specimens from 17 cases during lepra reaction were examined and it was found that during lepra reaction serum lipase activity diminishes and on subsidence of the reaction the values are ele-

TABLE 2. Lipase activity and duration of disease.^a

Duration	No. of cases	Mean lipase activity	Range
Up to 5 years	42	0.80	0.13-1.65
Above 5 years and up to 10 years	23	0.85	0.31-1.61
Above 10 years and up to 15 years	10	0.52	0.24-0.87
Above 15 years and up to 20 years	4	0.50	0.10-0.91
Above 20 years	5	1.04	0.19-1.03

^a Only bacteriologically positive leprosy cases are included in this table.

TABLE 3. *Lipase activity and age.*^a

Age Group	No. of cases	Mean lipase activity	Range
11-20 years	31	0.96	0.34-1.65
21-30 years	23	0.69	0.23-1.43
31-40 years	19	0.63	0.10-1.45
41 years and above	10	0.60	0.16-1.61

^a Only bacteriologically positive leprosy cases are included in this table.

vated though they are much lower than those in normal healthy controls thus showing that in bacteriologically positive cases serum lipase levels decrease still further when such patients have lepra reaction. There was not any significant deviation in the serum lipase levels of patients from the chronic ward as compared to those in normal healthy controls.

DISCUSSION

From the results obtained in the present investigation it is evident that the serum lipase levels in leprosy vary according to the bacteriologic status of the individual. Seabra (17) has shown that tuberculosis reduces serum lipase activity, as does leprosy, and has suggested that the virulent acid-fast bacilli produce a lipase-inactivating substance named antilechithinase. This may perhaps provide an explanation for the findings in the present study relative to the relationship between the serum lipase activity and the Bacteriologic Index.

It is not clear whether the blood lipase comes from individual tissues, e.g. pancreas, liver, thyroid, lung, or from leucocytes. The origin may be different in pathologic as compared to normal physiologic conditions. The presence of lipase has been demonstrated in leucocytes, especially eosinophils (12), as well as in lympho-

cytes (2). By utilizing as substrate a true fat extracted from the tubercle bacillus, it has been found that the blood hydrolyzes this fat not by the pancreatic lipase but only by the leucocytic lipase (17). Barnes (1), working with cats, claimed that the lymphocyte is the leucocyte that produces lipase. If the membrane surrounding neutrophil granulation has a lipid nature, as has the surrounding membrane of the acid-fast bacilli, the lipase produced by the lymphocytes may hydrolyse the granulation membranes that are in the neutrophil periphery. But to accept this hypothesis, it would be necessary to prove first that the surrounding membrane of the neutrophil granulation is acid-fast, because the acid-fastness is concerned with the lipidic membrane. This proof was made possible by Seabra (17) through the simple adaptation of the Ziehl-Heelson staining procedure when he stained a slide half covered by the sputum smear of a tuberculous patient and half by a blood smear and shown that only the bacilli and the neutrophil granulation take the stain. It must be recognized here the fact that there is a functional correlation in the blood between different types of cells: the neutrophils supply the erythrocytes with oxidase but, to do so, they need lymphocytic lipase. This physiologic correlation is upset by the virulent acid-fast infections that inhibit the

TABLE 4. *Lipase activity and miscellaneous conditions in leprosy.*

Condition	No. of cases	Mean lipase activity	Range
During lepra reaction	17	0.42	0.18-0.70
After lepra reaction	17	0.76	0.32-1.28
Chronic ward cases	16	1.37	1.08-1.52

lipase activity. From this activity, according to Seabra, (¹⁷), a diagnostic possibility may be visualized.

The data obtained in the present study suggests that even in the early stages of leprosy, where B.I. is less than 1.0, there is an appreciable lowering of serum lipase activity. Thus serum lipase determination may be of help in diagnosing the presence or absence of leprosy, even though it is not specifically diagnostic. It will be interesting to examine the contacts of the active leprosy patients for their serum lipase activity and follow them for the evolution of the disease. This determination may give some indication concerning the evolution of leprosy in contacts before the clinical symptoms become detectable. Also, the present study suggests the value of serum lipase determination as a prognostic index for leprosy.

SUMMARY

Serum lipase levels were estimated from 142 cases of various types of leprosy and 11 normal healthy individuals.

It was observed that serum lipase activity was diminished in bacteriologically positive cases as compared to that in bacteriologically negative cases and normal healthy individuals. Further, the higher the bacteriologic index, the lower was the serum lipase activity. The lipase activity still decreased further during the reactive episodes. No significance could be drawn regarding the serum lipase activity and the age, duration of the disease and dietary habits of the individuals investigated. The importance of serum lipase determination as a prognostic index for leprosy is discussed.

RESUMEN

Se determinaron los niveles de lipasa sérica de 142 casos de varios tipos de lepra y 11 individuos normales.

Se observó que la actividad de lipasa sérica estaba disminuída en casos bacteriológicamente positivos en comparación con casos bacteriológicamente negativos y con individuos normales sanos. Más aún, mientras más alto era el índice bacteriológico, más baja era la actividad de lipasa sérica. La actividad de lipasa disminuyó aún más durante los episodios reaccionales. No se estableció ninguna significación con respecto a la actividad de lipasa sérica y la edad, duración de la enfermedad o hábitos

alimenticios de los individuos que se investigaron. Se discute la importancia de la determinación de la lipasa sérica como índice pronóstico para la lepra.

RÉSUMÉ

Chez 142 malades atteints de divers types de lèpre, et chez 11 individus normaux en bonne santé, on a estimé les taux de la lipase sérique.

On a observé que l'activité du sérum en lipase était diminuée chez les cas bactériologiquement positifs, lorsqu'on la comparait aux résultats obtenus chez des cas bactériologiquement négatifs et chez des individus normaux en bonne santé. De plus, l'activité du sérum en lipase est d'autant plus basse que l'index bactériologique est plus élevé. L'activité en lipase décroît encore davantage au cours des épisodes réactionnels. On n'a trouvé aucune relation significative entre l'activité du sérum en lipase d'une part, et l'âge, la durée de la maladie, et les habitudes diététiques des individus étudiés, d'autre part. On discute de l'importance de la détermination de l'activité du sérum en lipase, comme index pour le pronostic de la lèpre.

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