

From Medical Department II, St. Göran's Hospital, Stockholm, Sweden.

SERUM ENZYMES IN PATIENTS WITH ASTHMA AND EMPHYSEMA

III. *The Prognosis of Asthma Patients with Elevated Blood Enzyme Values in Connection with their Asthma.*

By

HELGE COLLEDAHL

In earlier papers (2, 3, 4, 5, 6) it has been shown that elevation of different blood enzyme values appears in asthma patients, probably as a result of tissue damage caused by changed tensions of oxygen and carbondioxide in the tissues. Liver necrosis has been shown to exist in severe cases (2, 9).

In this paper an elevation of blood enzyme values is correlated with the time the patients have lived after the highest blood enzyme value. Elevated values of S-GOT, S-GPT, S-OCT in connection with asthma were first observed in 1957 (2, 3). Most determinations have been performed 1959-61. The patients were studied at least up to 1967.

METHODS

The different enzymes were determined according to *Norberg & Senning* (7) and *Reichard* (8).

The following enzymes were determined: aldolase (ALD), glutamic oxalacetic transaminase (GOT), glutamic pyruvic transaminase (GPT), isocitric dehydrogenase (ICD), lactic dehydrogenase (LD), malic dehydrogenase (MD), ornithine carbamyltransferase (OCT). The concentrations of these enzymes in serum are abbreviated as S-GOT etc.

Samples for enzyme determinations were as a rule taken on the first, third and fifth day of the hospital stay, and thereafter about once a week.

The upper normal limit for the different enzymes was arbitrarily put at 100 (since the regular units of enzyme activity differ considerably numerically).

Normal values, as regular units, for the different enzymes were as follows with the methods used (relative units in brackets): S-ALD 3-8 (37-100); S-GOT 8-30 (27-100); S-GPT 5-35 (14-100); S-LD 140-290 (48-100); S-MD 30-80 (37-100); S-OCT 0-6 (0-100); S-ICD < 265 (< 100).

In the tables relative units are used.

RESULTS

A series of 134 patients with asthma who had their blood enzyme values determined 1959-1961 have been followed up till 1967. The results are seen in Tables 1-4.

Table 1 and 2 show the number of asthma patients who died from asthma within 8 years of the highest enzyme value. Table 3 and 4 show the number of asthma patients who died from other causes than asthma. It is seen from Tables 1-4 that of 134 asthma patients 30 patients died from asthma, while 21 died from other causes, within 8 years. For both groups the largest number of patients that died in any one year died within 12 months of the date of the highest blood enzyme value.

TABLE 1.
Figures in Brackets Express the Values per cent.

Blood enzyme value, per cent of normal upper limit	Total number of patients	Av. age of all patients	Av. age of patients who have died from asthma	Total number of patients who have died from asthma within 8 years of the date of the highest enzyme value	The av. period of survival after the date of the highest enzyme value (years - months - days)
> 1.000 %	2	57	57	2 (100,0)	0- 0- 6
500- 1.000 %	8	61	61	2 (25,0)	0- 9- 6
300- 500 %	19	60	56	4 (21,1)	0-11-17
200- 300 %	33	59	60	9 (27,3)	2- 3-17
100- 200 %	51	61	71	13 (25,5)	2- 6-18
< 100 %	21	56	-	-	-
	134	60	64	30 (22,4)	

TABLE 2.

30 Out of 134 Asthma Patients have Died from Asthma Within the Following Number of Years from the Time of the Highest Enzyme Value.

Serum enzyme value	1	2	3	4	5	6	7	8	Total
> 1.000 %	2	—	—	—	—	—	—	—	2
500-1.000 %	2	—	—	—	—	—	—	—	2
300- 500 %	2	2	—	—	—	—	—	—	4
200- 300 %	3	2	1	1	1	1	—	1	9
100- 200 %	4	2	4	1	—	1	—	1	13
< 100 %	—	—	—	—	—	—	—	—	—
	13	6	5	2	1	2	—	1	30

TABLE 3.

Figures in Brackets Express the Value per cent.

Blood enzyme values, per cent of normal upper limit	Total number of patients	Av. age of all patients	Av. age of asthma patients who have died from other diseases than asthma	Total number of asthma patients who have died from other diseases than asthma within 8 years of the date of the highest enzyme value	The av. period of survival after the date of the highest enzyme value (years — months — days).
1.000 %	2	57	—	—	—
500-1.000 %	8	61	65	3 (37,5)	0- 4- 5
300- 500 %	19	60	68	3 (15,8)	1-11-20
200- 300 %	33	59	59	5 (15,2)	3-16-28
100- 200 %	51	61	64	7 (13,7)	2-11- 7
< 100 %	21	56	48	3 (14,3)	4-10-29
	134	60	61	21 (15,7)	—

Tables 1-4 present further information concerning these patients, both for those who died from asthma (Tables 1 and 2), and those who died from other causes (Tables 3 and 4). From Tables 1 and 2, it appears that for asthma patients, who died from asthma, the average period of survival after

TABLE 4.

21 Out of 134 Asthma Patients have Died from other Diseases than Asthma Within the Following Number of Years from the Time of the Highest Enzyme Value.

Serum enzyme value	1	2	3	4	5	6	7	8	Total
1.000 %	—	—	—	—	—	—	—	—	—
500-1.000 %	3	—	—	—	—	—	—	—	3
300- 500 %	2	—	—	—	—	1	—	—	3
200- 300 %	—	2	—	—	1	—	1	1	5
100- 200 %	2	—	2	1	1	1	—	—	7
100 %	—	—	1	—	—	1	1	—	3
	7	2	3	1	2	3	2	1	21

the date of the highest enzyme value becomes shorter, as the maximum enzyme value increases. Those patients who had no other disease than asthma and who had not had any elevated enzyme values, were all alive after an observation period of 8 years.

In the group of asthma patients without any elevated enzyme values who died from other causes than asthma 3 (14 per cent) had died after 8 years.

Table 5 shows the full diagnosis concerning lung and heart complications in the asthma patients investigated.

DISCUSSION

Studies in animals have shown (1) that the lowered tissue respiration after insufficient gas exchange measured in vitro depends on some enzyme systems being damaged, while others are undamaged. The animals were generally exposed to the changed gas tension for about 1½-3 hours. This fact indicates that some enzyme systems are more easily damaged than others. The histology of the liver was normal under these experimental conditions, even if the tissue respiration was largely lowered. After 1½ to 3 hours of insufficient gas

TABLE 5.
Figures in Brackets Express the Value per cent.

Diagnosis	Patients who have died from asthma	Total number of patients who have died within 7 years	Total number of patients
Bronchial Asthma			63 (47,2)
Bronchial Asthma + Cor Pulmonale	7 (5,3)	12 (9,0)	1 (0,7)
Bronchial Asthma + Emphysema	1 (0,7)	1 (0,7)	6 (4,4)
Bronchial Asthma + Emphysema + Cor Pulmonale	1 (0,7)	4 (3,0)	2 (1,5)
Bronchial Asthma + Emphysema + Bronchiectasis	2 (1,5)	2 (1,5)	2 (1,5)
Bronchial Asthma + Emphysema + Bronchiectasis + Chronic Bronchitis	—	1 (0,8)	1 (0,7)
Bronchial Asthma + Emphysema + other diseases not mentioned	—	—	12 (8,9)
Bronchial Asthma + other diseases not mentioned	9 (6,7)	10 (7,4)	47 (35,1)
	10 (7,5)	21 (15,7)	
	30 (22,4)	51 (38,1)	134 (100,0)

exchange, therefore, no anatomical damage exists in spite of patho-physiological changes.

This is in accordance with the findings reported in 1964 (4), that not only the degree of breathing difficulty but also the duration of respiratory insufficiency is of importance for the enzyme pattern in asthmatic patients. One patient who had a sudden and very severe attack of asthma and died very early after start of the asthmatic attack had no elevated enzyme values. Patients with severe emphysema need only slight aggravation of breathing difficulty to obtain a pathological enzyme pattern.

In the present study an elevation of blood enzymes in connection with asthma indicates that the prognosis of the patient is worse than when such changes in the blood enzymes are not present.

SUMMARY

During the period 1957-1961 (especially 1959-61) determinations of different blood enzyme values were performed on 134 patients with asthma of varying severity. In the present paper the elevation of the blood enzyme values was compared with the average period of survival after the date of the highest enzyme value. It was found that

1. the larger the highest enzyme value the shorter the survival period,
2. patients who had normal enzyme values in connection with their asthma were all alive after 8 years, if they had no other disease than asthma,
3. blood enzyme values in connection with asthma give information about the prognosis.

REFERENCES

1. *Colldahl, H.*: Acta Med. Scand., 82, 378, 1949.
2. *Colldahl, H.*: Enzyme regulations in clinical medicine. Proceedings of the 6th International Congress of Internal Medicine, Basel, 99, 1960.
3. *Colldahl, H.*: Acta Med. Scand., 166, 399, 1960.

4. *Colldahl, H.*: Reported at Vth International Congress of Allergology, Madrid, 216, 1964. (Editorial Paz Montalvo, Madrid - 14).
5. *Colldahl, H.*: *Acta Allergol.* 19, 97, 1964.
6. *El-Shaboury, A. H., Thomas, A. J. & Williams, D. A.*: *Brit. Med. J.* i, 1220-1223, 1964.
7. *Norberg, B. & Senning, Å.*: *Acta Chir. Scand.*, Suppl. 245, 275, 1959.
8. *Reichard, H.*: *J. Lab. Clin. Med.*, 56, 218, 1960.
9. *Resare, D., Colldahl, H., Lindgren, Å. & Pegelow, K. O.*: To be published in *Svenska Läkartidningen*, 1971.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.