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Relation of Serum Hexosamine to Various Blood Components.* (29011)

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Elevation of serum hexosamines has been reported in a wide variety of clinical conditions(1-6). Several attempts have been made to correlate hexosamine concentrations with other serum components. Shetlar *et al*(3) found an interrelationship between non-glucosamine polysaccharides and glucosamines. West and Clark(1) found no relationship between glucosamine concentrations and serum protein fractions. They did however, observe correlation between high glucosamine content and increased sedimentation rate. Others have noted a relation between protein fractions and blood polysaccharides(7), and between albumin and alpha globulin and glucosamine(8). The present paper presents a comparison of serum hexosamine content with a number of parameters including electrolytes, protein content and leucocyte counts.

Material and methods. Blood samples were obtained from 70 patients at Georgetown University Hospital. History and diagnosis were readily available. Normal blood was obtained from 10 clinically well individuals. Serum hexosamine was determined by Rosenlund's modification of the Elson and Morgan method(9). Glucosamine hydrochloride was used as the standard. Two samples of blood were taken in each case and the hy-

drolysates of each sample were analyzed in duplicate. The mean of the 4 determinations was used for comparison, the differences among the 4 values was less than 3%. The following blood constituents were determined by the methods indicated, total protein(10), sodium(11), potassium(12), and chlorides (13). Hematocrit, total leucocyte and differential counts were obtained from the hospital laboratory.

Results. Table I gives the hexosamine values in the normals and during various diseases. The normal range is small while the range of values for the pathological conditions is greater. However, the lower values are within the normal range, or even below. For purposes of comparison the blood samples were divided into 2 groups, those with hexosamine values above or below 150 mg per cent. Table II gives the comparison of a number of parameters for these 2 groups. No correlation was found between serum hexosamine content and any of the parameters examined. Comparison of total leucocyte count with hexosamine content, Table III,

TABLE I. Serum Hexosamine Levels.

Diagnosis	No. of patients	Mean values (mg/100 ml)	Range of values
Normal	10	123	117-130
Diabetes mellitus	10	173	128-295
Rheumatism	12	155	122-176
Malignancy	8	156	103-172

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TABLE II. Comparison of Serum Hexosamines with Other Blood Parameters.

Parameter	No. of patients	Hexosamine	
		Under 150 mg %	Over 150 mg %
Hematocrit, %			
(a) Male	32	40.3 $\pm$ 5 *	37.4 $\pm$ 6 *
(b) Female	16	37.1 $\pm$ 7	36.1 $\pm$ 6
Total protein, g/100 ml	40	6.9 $\pm$.8	7.2 $\pm$.9
Sodium, meq/l	19	132 $\pm$ 9	133 $\pm$ 6
Potassium, meq/l	22	4.2 $\pm$.5	4.3 $\pm$.8
Chloride, meq/l	19	94 $\pm$ 13	93 $\pm$ 6

* Standard deviation.

TABLE III. Comparison of Serum Hexosamines with Total Leucocytes.

Leucocyte count	No. of patients	Hexosamine (mg/100 ml)
Under 7,000	17	151 $\pm$ 20*
7,001-11,000	23	158 $\pm$ 25
Over 11,000	14	186 $\pm$ 35

* Standard deviation.

TABLE IV. Comparison of Serum Hexosamines with Segmented Neutrophils.

Neutrophil count	No. of patients	Hexosamine (mg/100 ml)
Under 6,000	12	146 $\pm$ 26*
6,001-7,000	5	170 $\pm$ 32
Over 7,000	15	226 $\pm$ 31

* Standard deviation.

TABLE V. Comparison of Serum Hexosamines with Small Lymphocytes.

Lymphocyte count	No. of patients	Hexosamine (mg/100 ml)
Under 2,000	11	198 $\pm$ 46*
2,001-4,000	12	142 $\pm$ 27
Over 4,000	6	132 $\pm$ 17

* Standard deviation.

suggested that a relationship existed between the two. There was a positive correlation, significant at the one per cent level, between the highest hexosamine values and total leucocyte count. Tables IV and V attempt to relate the hexosamine values with specific types of leucocytes. A significant positive relationship was observed between the mature

or segmented neutrophils and hexosamine values. The reverse situation was obtained with the small lymphocytes. An increase in serum hexosamine content concomitant with an increase in leucocyte count may reflect the fact that Kerby(14) has shown that acid mucopolysaccharides are found in leucocytes. The parallel increase in total leucocyte count and hexosamine content suggests a reflection of the bodies' reaction to injury.

Summary. Serum hexosamine levels were determined in a number of normal individuals and also in several series of hospital patients. Serum, protein, sodium, potassium and chloride contents were determined on the same patients together with hematocrit, total and differential leucocyte counts. The only correlations observed included a concomitant increase in total leucocyte, and segmented neutrophils with hexosamines. The hexosamine content increased when there was a decrease in the small lymphocytes in blood.

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