The Plasma Hexosamine Level in Healthy Infants and Children

By

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Under physiological conditions in adults the plasma hexosamine values are relatively constant [2]. It seemed, however, probable that because of the particular biological conditions prevailing during infancy and childhood, the situation is different in the young age group and that in the single phases of childhood the level must undergo significant fluctuations in consequence of growth and development. The question has a certain importance and in recent years numerous papers have dealt with the alterations of the plasma polysaccharide and hexosamine levels taking place under different pathological conditions (collagenosis, tuberculosis, etc.), in adults as well as in children, and with the prognostic significance of these levels. Disregarding the physiological fluctuations might eventually evoke the suspicion of a pathological process. Bergstermann in 1956 [2] was the first to call attention to the clinical significance of plasma hexosamine; soon thereafter were reported its pathophysiological [1] and hormonal [4] connections. Interrelations of the changes in the serum aminopolysaccharide and glycoprotein levels were also examined [4, 10, 12]. Electrophoresis of serum shows the glycoproteins to be bound mostly to alpha and beta globulins; the amount of $alpha_2$ globulin usually increases simultaneously with the elevation of the glycoprotein level. The change taking place in the electrophoretic pattern is known to be related to the erythrocyte sedimentation rate. In pathological conditions some high hexosamine levels have been observed by us in spite of a normal sedimentation rate, though in most cases these values underwent a parallel shift.

Numerous literary data are available concerning normal serum mucoprotein values in childhood but only one paper discussing plasma hexosamine is known to us [13]. According to Shetlar, Foster and Everett, its value is 48 mg per 100 ml in childhood; in adults it is said to show a progressive elevation with age.

It seemed therefore interesting to establish the normal plasma hexosamine level in healthy infants and children and thus to provide a basis for the comparison of changes taking place under pathological conditions.

Material and Methods

A total of 111 healthy infants and children was examined. The subjects were regarded healthy if the family and individual history was negative, physical and X-ray examinations showed no changes, the erythrocyte sedimentation rate was normal and the tuberculin test was negative.

Blood was taken on an empty stomach and centrifuged for 60 minutes. Estimation of the hexosamine value was carried out in 0.3 ml of plasma, according to Winzler's method [17] based on Morgan and Elson's procedure and modified by Szabolcs and Tankó [15].

Results

The data obtained are shown in Fig. 1. It is seen that the plasma hexosamine value of 48 mg per 100 ml reported by Shetlar et al. [13] agreed mostly with the average obtained by us for the age group of 3 to 4 years; in both the younger and the older children the values were higher.

In contrast to the comparatively high plasma hexosamine level in infancy, a significant drop was observed to occur at the age from 2 to 6 years, to increase anew between 6 and 8 years of age to nearly the level found in adults; a slight decrease was again observed before the age of 12 years. The few determinations carried out between the ages of 12 and 14 years (which have therefore been omitted from the figures) showed that in this period of life the plasma hexosamine level is ranging from 70 to 75 mg per 100 ml.

Fig 1

No significant differences in the plasma hexosamine level were observed between males and females.

Discussion

The origin of the relatively high plasma hexosamine level found in infancy is unknown. In the first weeks of life, the possibility of the hexosamine's maternal origin must be taken into consideration, but some connection with the fast protein anabolism characteristic of infancy seems more probable. Further investigations into protein and carbohydrate metabolism are needed to settle this problem.

The peak around the 8th year of life is connected probably with the hormonal changes occurring during prepuberty [16].

To establish pathological values, it seems necessary to register in the single age groups the lowest as well as the highest plasma hexosamine levels. The normal lower and upper limits have namely found to vary in the single phases of life (Fig. 2). In comparison with that in adults, the scattering of the values is wide in infancy and childhood, due probably

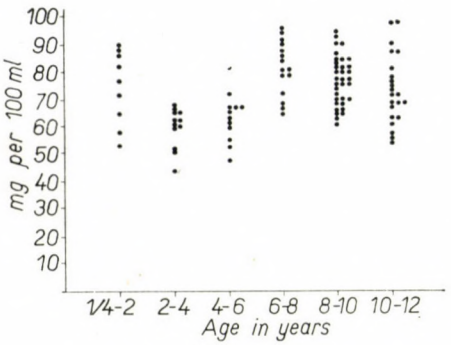

FIG. 2.

to the lability of metabolism characteristic of this period of life.

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SUMMARY

A total of 111 healthy subjects ranging in age from 3 months to 12 years has been investigated for the plasma hexosamine level.

The age curve of the plasma hexosamine level showed, in contrast to literary data, an undulating course.

The early average value of 76 mg per 100 ml was found to decrease around 3 years of age to below 60 mg per 100 ml, to take a progressive upward course to a peak of about 80 mg per 100 ml around the 8th year of life. Subsequently, a slight decrease set in until the age of 12 years when the value was between 70 and 75 mg per 100 ml. In view of its wide variations in healthy children according to the single phases of life, the plasma hexosamine level should be considered pathological only after its comparison to the normal values for the corresponding age.

The high plasma hexosamine level in infancy and prepuberty is probably due partly to the increased protein and carbohydrate anabolism characteristic of these phases of life and partly to the changes in metabolism taking place in prepuberty.

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