NOTE

Plasma Human Growth Hormone Levels 4 Hours after Breakfast in Adolescent Twins and Adults*

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Synopsis

Plasma Human Growth Hormone (HGH) levels were determined in 176 healthy school children, 74 monozygotic and 14 dizygotic twins of 13- to 18-year-old, and in 34 healthy adult subjects 4 hrs. after the test breakfast. There was a considerable variation in plasma HGH concentrations, but most samples showed the values of 0.25 \(\mu g/ml\) to 40 \(\mu g/ml\). The wide distribution of plasma HGH was especially noted in 13- and 14-year-old subjects in both sexes. In the male subjects, a definite difference in the distribution was noted between the 13- to 14-year-old school children and the 16-year-old or older subjects. In the female subjects, the difference was not so noticeable as in the male subjects. No correlation was noted between the plasma HGH levels and physical size of the subjects, nor between the values of plasma HGH in individual twins.

Human Growth Hormone (HGH) levels in plasma were shown to be elevated 4 – 5 hrs. after the subjects were given 100 g. of glucose orally (Roth et al., 1963b; Roth et al., 1964) or 3 – 4 hrs. after having mixed meals (Hunter et al., 1966a). It was observed that plasma taken from children and adolescents 2 – 3 hrs. (Greenwood et al., 1964) or 3 – 4 hrs. (Hunter and Rigal, 1966b) after the meals contained a larger dose of HGH than that taken from adults under the same conditions. This communication deals with our study in which the plasma HGH levels were determined 4 hrs. after the groups of young twins and adults were given the test breakfast and the determined values were considered in correlation with the age, sex, and body height and weight of each subject. A comparison between individual twins was also made.

Materials and Methods

The twins used in this experiment were 176 healthy school children, including 74 monozygotic and 14 dizygotic twins (90 boys and 86 girls) of the junior and senior high schools attached to the University of Tokyo, and their ages ranged from 13 to 18. They were subjected to the test on the occasion of the annual physical check-up conducted regularly. The adult subjects used in this experiment consisted of 34 healthy persons and they were physicians, laboratory workers, and nurses of the university hospital, aged from 23 to 40. They were subjected to the test while they were in their routine works. Blood was drawn from the antecubital vein into a heparinized syringe 4 hrs. after the subjects had finished the test breakfast containing 90 g carbohydrate, 27 g protein, and 40 g...
fat. The plasma was obtained by means of immediate centrifugation and was stored at -20°C until the time of measurement. The plasma HGH concentrations were determined by the method of Roth, Glick, Yalow and Berson (1963a). Raben HGH was used as an antigen, for radioiodination, and as a standard. The minimum detectable amount of plasma HGH was 0.25 mµg/ml, using a 10-fold dilution of plasma sample.

**Results**

The results are shown in Figure 1. Although a considerable variation is noted in plasma HGH concentrations, the values of most samples are between 0.25 mµg/ml and 40 mµg/ml.

The wide distribution of plasma HGH is especially noted in the group of the 13- and 14-year-old subjects of both sexes; namely, four 13-year-old and six 14-year-old subjects showed the plasma HGH concentration of more than 40 mµg/ml, whereas the older age group did not show such high values. In the male subjects, a definite difference in the distribution is noted between the group of the 13- to 14-year-old students and that of the 16-year-old or older subjects, and the 15-year-old group lay between them. In the female subjects, however, the difference was not so apparent as that in the male subjects. Thus, in the 16- to 18-year-old female group a wider distribution is seen than in the group of the male subjects. Five adult subjects show the plasma HGH values below 0.25 mµg/ml, whereas only 2 (one 14-year-old male and one 16-year-old female) show such low values.

There was no correlation between plasma HGH concentrations and body height or weight, as well as between the values of plasma HGH of
Discussion

Because many factors are known to stimulate HGH secretion (Glick et al., 1965), it is difficult to obtain a proper interpretation of the results. However; the wide distribution of plasma HGH values suggests that a rise in plasma HGH 4 hours after the breakfast does not always occur. As practice of exercise is known to elevate the level of plasma HGH concentration (Roth et al., 1963b; Hunter et al., 1965; Schalch, 1967), our subjects were not permitted to perform any particular exercises except intermittent little walk.

Hunter and Rigal (1966b) found that the diurnal pattern of HGH secretion is essentially similar in children and adults, but an increased secretion occurs more frequently and peak values are higher in children. Because the secretion of HGH is known to appear in bursts (Hunter et al., 1966a; Hunter and Rigal, 1966b; Quabbe et al., 1966), it is possible that the distribution of plasma HGH levels may represent the frequency and magnitude of the rise of plasma HGH. Thus the wider distribution of plasma HGH in the younger age group is particularly interesting in view of the growth-promoting effect of the hormone, although there is no correlation between plasma HGH and body height and weight. Frantz and Rabkin (1965) reported the sex difference and effect of estrogen on the secretion of HGH. They have noted higher values of plasma HGH in ambulatory women. Our results, which showed a wider distribution in females than in males of the 16- to 18-year-old group, may be consistent with their finding.

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References

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