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Mucoviscidosis: Total amylase activity of serum and mixed saliva in homozygous and heterozygous subjects

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Total amylase activity of serum and mixed saliva was studied in homozygotes and heterozygotes for mucoviscidosis and in healthy subjects. Mean serum total activity was 269.0 ± 113.7 U/l in the homozygotes, exceeding in nearly 50% of the cases the values given in the literature and those observed in the normal controls. The difference against the control group was significant ($P < 0.05$).

Mean serum total amylase activity of heterozygotes agreed with the mean value for the healthy group (203.5 ± 79.5 U/l) without a significant difference.

Total amylase activity in the saliva of homozygotes (148.700 ± 65.700 U/l) was higher than in the heterozygotes (118.300 ± 74.200 U/l) of the healthy children (51.700 ± 26.500 U/l). The difference between the homozygous and healthy groups was strongly significant ($P < 0.01$), and that between the heterozygous group and the combined healthy children and adult groups was also significant ($P < 0.05$).

In the heterozygotes, salivary amylase activity was slightly elevated but not significantly different from the control group and did not result in a change in serum total amylase activity.

Salivary and serum amylase activity has amply been studied in healthy subjects of various ages [5, 9, 15]. At birth the salivary amylase level is low, the higher activity observed in adults being attained only at the age of about one year [8].

Rossiter et al. [14] found normal salivary amylase activities in children with coeliac disease and mucoviscidosis (MV), but observed a 50% decrease in marasmus. The level became normal after recovery. Other authors reported different results for MV homozygotes while no such studies have been carried out in subjects heterozygous for MV. We have therefore studied the total amylase activity in serum and saliva of MV patients and heterozygotes.

Material and Method

Total amylase activity of serum was determined with the Phadebas amylase test [1a, b, c; 13] in 12 MV homozygous children, 30 heterozygotes (7 children and 23 parents) and 20 healthy individuals (in part relatives). The disease was confirmed by the modified sweat bromide test [6, 16]. The Phadebas test was used also for estimating the amylase activity of mixed salive samples obtained from 5 MV homozygous children, 20 heterozygotes (3 children and 17 parents) and 14 MV-free individuals

(10 children and 4 adults). The first abundant saliva was drawn off before a meal, and then the saliva obtained after one drop of lemon juice had been placed on the tongue was used for the test. The sample was stored at −20 °C until examined, and diluted 500-fold before the test.

Results

Results are shown in Figs 1 and 2. In the homozygous children serum amylase activity ranged from 62 to 450 U/l (mean, 269.0 ± 113.7 U/l). In the heterozygous group the mean was 203.5 ± 79.5 U/l, and in the healthy group 201.8 ± 62.3 U/l; both were comparable to the normal values reported in the literature.

Salivary amylase activity in the MV patients was 148 700 ± 65.7 U/l; in the heterozygotes, 118 200 ± 74.2 U/l; in the healthy children, 51 700 ± 26.5 U/l; and in the healthy adults, 92 000 ± 47.3 U/l.

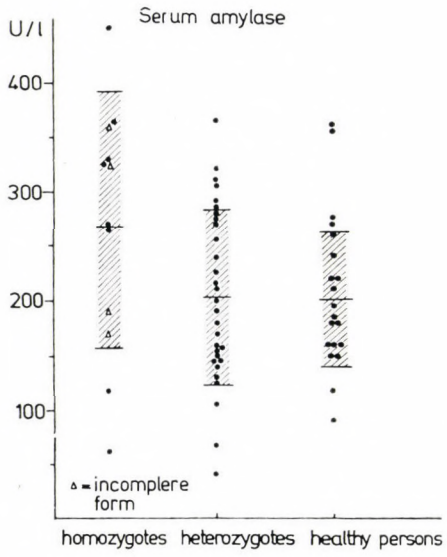

Fig. 1. Serum total amylase activity of homozygotes and heterozygotes and of healthy individuals

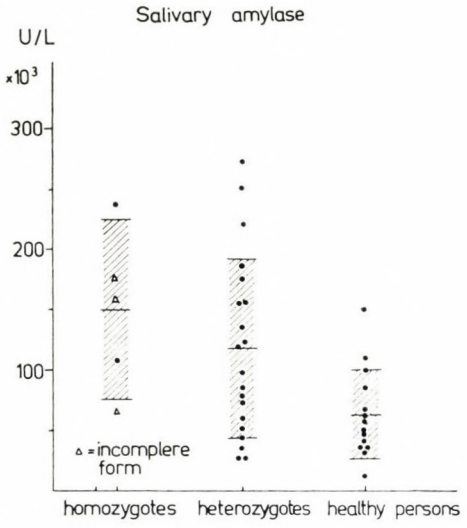

Fig. 2. Total amylase activity of mixed saliva of homozygotes and heterozygotes and of healthy individuals

Serum amylase activity showed no significant difference between the healthy and MV heterozygous groups, but between the homozygous and healthy groups the difference was significant ($P < 0.05$). There was no significant difference between the healthy adult and heterozygous groups, but a strongly significant one ($P < 0.01$) between the healthy and the homozygous children. If the combined healthy children and adult groups were compared with the group of heterozygotes, the difference was again significant ($P < 0.05$).

Discussion

In MV homozygotes, amylase activity in duodenal juice is low [4, 7] and the same may be expected in the saliva. At the same time, in salivary amylase activity an increase of compensatory nature could also be assumed under the effect of some regulatory mechanism initiated to balance the decrease in pancreatic amylase activity.

Chernick et al. [2] reported considerably elevated amylase and ribonuclease levels in the stimulated submaxillary saliva of MV homozygotes, whereas normal amylase levels were observed by Di Sant'Agnese et al. [3] in both mixed and isolated parotid saliva. Mandel et al. [10] reported on increased amylase levels in the submaxillary secretion, and normal levels in parotid secretion.

The present tests revealed an increased serum amylase activity in MV homozygotes. This was attributed to the elevated activity in the saliva. In the case of heterozygotes, the salivary amylase activity was elevated only moderately and this failed to increase the activity in serum. Thus, total amylase activity of the heterozygotes agreed with the mean for the healthy group and with the normal mean values in the literature.

Our studies indicate that MV heterozygotes cannot be distinguished from healthy subjects on the basis of serum amylase activity. They could be distinguished by their salivary total amylase level if the heterozygotes would be compared with the combined average for healthy adults and children. It must therefore be emphasized that total amylase activity is not suitable for differentiating heterozygotes. Only the slight increase in salivary total amylase activity would provide some information on the heterozygosity, but this exhibits a significant difference from the healthy control group only when compared to the mean for the combined children and adult groups.

Finally, it should be stressed that a serum total amylase activity in excess of the mean normal value was observed in 13.3% of the heterozygotes and in 50% of the homozygotes.

With a view to establishing the type of serum amylase, isoenzyme determinations were also carried out in the present material. The results will be reported elsewhere.

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