Screening for Cystic Fibrosis by Measurement of Unstimulated Parotid Saliva Sodium Levels

DAVID LAWSON, B. A. SAGGERS, and M. J. CHAPMAN

From Queen Mary's Hospital for Children, Carshalton, Surrey

The prognosis of cystic fibrosis depends very largely upon the earliest possible diagnosis, and the institution of a careful régime of management, including physiotherapy, pancreatin replacement, and antibiotics, before lung damage has been caused by respiratory obstruction and infection. The ideal method of doing this would be by a screening test in early infancy which could be applied to the whole population of an area, thus enabling automatic diagnosis of the 1 in 2500 babies who are affected.

The use of the E.I.L. microdual sodium-sensitive electrode for the diagnosis of cystic fibrosis by measurement of the sodium concentration of unstimulated parotid saliva in children and adults has been reported (Saggers, Lawson, Stern, and Edgson, 1967). The normal range of sodium concentration in parotid saliva at various ages was established, with the object of finding the earliest age at which this range is narrow enough for our purposes. The next stage has been to confirm, by an adequate number of investigations, that proven cases of cystic fibrosis in this age-group show sodium levels in a higher range, distinct from the normal.

Materials and Methods

Normals. 50 neonates aged 1–7 days (mean 5.2 days); 50 infants at 6 weeks (the majority of these had previously been tested as neonates); and 50 infants at 3–4 months who were a random selection of those attending London Borough of Sutton Clinics.

Cystic fibrosis homozygotes. The age range of this group of 5 cases was 3–4 months. In all of them it was requested that no acid food be given before the test, as the sodium electrode system is pH sensitive. Babies who showed recent evidence of vomiting were not included in the trial.

The technique for the measurement of the unstimulated parotid saliva sodium concentration was that previously reported by Saggers et al. (1967). In some babies fluctuating pNa readings caused by sucking the electrode were a problem; when this happened the average pNa reading for the last 30 seconds of the test was taken.

Results

The Figure shows the unstimulated parotid saliva sodium levels in the groups tested. The normal neonatal range of parotid saliva sodium concentration was 6.2–30.0 mEq/l, with a mean value of 19.3±18.3 mEq/l (SD). In the 6-week age-group the level dropped to 5.0–18.0 mEq/l, with a mean value of 10.5±9.6 mEq/l. At 3–4 months the levels were within the previously reported adult normal range of 3–12 mEq/l; the range in this group was 5.0–11.5 mEq/l, with a mean value of 7.8±3.1 mEq/l.

The 5 proven cystic fibrosis cases studied, aged 3–4 months, gave saliva sodium levels between 16.5 and 49.5 mEq/l, with a mean value of 25.5.

Comment

The technique previously described proved suitable for the majority of babies tested, apart from the occasional difficulties caused by sucking the electrode. A smaller electrode would have been easier to handle, but design studies for this suggested that it would have been undesirably fragile.

In the first week of life the scatter of results is wide; by 6 weeks the range has narrowed considerably, but is still undesirably wide. By the age of 3–4 months, however, the range has narrowed to adult values, and the great majority of observations are clustered closely around the mean. It appears, therefore, as though it will be feasible to screen in Infant Welfare Clinics at the age of 3–4 months, but further observations are necessary to confirm the reliability of the method, particularly on known cases of cystic fibrosis*.

* The authors would welcome the opportunity to make further observations on cases of cystic fibrosis at the age of 3–4 months, and on sibs of known cases.
It has been reported by Chapman, Donoghue, Saggers, and Stern (1967) that patients with Down's syndrome also have raised unstimulated parotid saliva sodium content, but these can be excluded by other means. In all cases picked out by screening, the diagnosis should also be confirmed by other techniques.

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