CHROMATOGRAPHIC SEPARATION OF REDUCING SUGARS IN THE URINES OF NEWBORN BABIES

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The application of paper chromatography to the qualitative analysis of reducing sugars by Partridge (1946) has greatly simplified the detection of these substances in biological fluids. In particular it has provided an accurate and comparatively easy method of separating reducing sugars in the urine. This has proved of great value in the investigation of such a condition as congenital galactosaemia, about which disease there has been much recent interest (Bray, Isaac and Watkins, 1952; Hudson, Ireland, Ockenden and White-Jones, 1954; Cox and Pugh, 1954). It is now almost a routine procedure for the urine of a baby becoming ill with jaundice in the first few days of life and not thriving to be tested for reducing substances. Hudson and Ireland (1954) have, however, warned against reaching a hasty diagnosis of galactosaemia if galactose is found in the urine of such a baby.

There is little information in the literature about the physiological excretion of reducing sugars by newborn babies. Woolf (1951) said that small amounts of galactose and lactose are found in the urines of milk-fed infants, but he gave no figures. He also said that xylose is frequently present in normal urines, but rarely exceeds 3 mg./100 ml. Rubin (1954) stated that sugars may be found in small amounts in the urines of healthy infants in the early months of life, but he gave no details. Flynn, Harper and de Mayo (1953) found lactose in the urines of 9% of normal men and women.

This paper is a report of our findings of the examination by paper chromatography of the urines of 50 normal male babies.

Method

Specimens of urine were collected from an unselected group of 50 male babies born at full term at the Jessop Hospital for Women, Sheffield. All urines were collected within the first seven days of life.

The chromatographic technique employed was that described by Williams (1954), using triangular-shaped filter paper, a butanol-pyridine solvent and a benzidine reagent developer.

A standard solution containing known amounts of

glucose, galactose, lactose and xylose was put up with each set of urines and an approximate quantitative estimation of the reducing sugars in the urines was made by comparing the depth of colour produced on the filter paper after it had been developed with that produced by the known concentrations of the sugars. If a urine specimen could not be chromatographed on the day on which it was collected, thymol was added and it was stored at -20°C . Each urine was also tested with Benedict's qualitative reagent.

All 50 babies were breast fed. For the first two days of life they were put to the breast at approximately six-hour intervals, and after that feeding was 'by demand'. Occasionally glucose water was given in the first two days if a baby seemed thirsty. It was not possible to correlate the times of feeding with the times that the urines were collected.

Results

Eighty-one urines were collected from the 50 babies.

Twenty-two babies (from whom 34 urines were collected) showed no reducing sugar in any specimen. Four babies (five urines) showed an unidentified reducing substance only. Twenty-four babies (42 urines) showed one or more reducing sugar in 25 specimens.

Six urines contained less than 50 mg. lactose/100 ml., five contained 50-100 mg. lactose/100 ml. and four 100-250 mg. lactose/100 ml. Seven urines contained less than 50 mg. galactose/100 ml., and six 50-100 mg. galactose/100 ml. Three urines contained less than 50 mg. xylose/100 ml. and one 50-100 mg. xylose/100 ml. Seven urines contained two sugars each. Nine urines contained an unidentified reducing substance. Glucose was not identified in any of the urines examined. Four urines reduced Benedict's reagent to yellow or orange and three of these were specimens containing 100-250 mg./100 ml. of lactose, the other contained less than 50 mg./100 ml. of xylose and an unidentified reducing substance.

Table 1 shows the number of babies who excreted lactose, galactose and xylose or combinations of the sugars. Table 2 shows the ages of the babies when the urines were examined.