mEq/l.; chloride 107 mEq/l.; CO_2CP 26.7 mEq/l.; BUN 14.7 mg/100 ml. She became much upset over the genetic implications and we acceded to the request of her family not to carry investigations further.

Discussion

Investigation of Case 3 has confirmed that a female carrier of congenital nephrogenic diabetes insipidus may not be detectable by some currently accepted criteria. On the basis of her normal urinary concentration she was initially reassured that the disease would not recur in any subsequent children and it was concluded that Case 1 had resulted from a mutation. Subsequently the appearance of the disease in Case 2 and the discovery of the concentrating defects in Cases 4 and 5 led to a rapid reappraisal, and counselling appropriate to the assumption of X-linked inheritance has now been given.

The family tree (Fig.) emphasizes that genetic counselling in congenital nephrogenic diabetes insipidus with respect to suspected carriers should depend not only on the results of an overnight thirst, but also on a wider investigation of the immediate family. Such investigation may result in the discovery of hitherto unrecognized patients who are carriers and appropriate advice may be given. These cases are similar to previously reported families in that males have been severely affected while female 'carriers' show a marked variability of affliction. Such variability may result from the randomization of the X chromosome according to the Lyon hypothesis, but is equally in keeping with the views of Cannon (1955) and Robinson and Kaplan (1960) as mentioned above.

Summary

A further example of a family containing several cases of congenital nephrogenic diabetes insipidus is described. It appears that currently accepted

methods of carrier detection are not wholly satisfactory and recourse must always be had to examination of the whole family before appropriate genetic advice is given.

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Hyperlipidaemia During Persistent Peritoneal Dialysis

The technique of peritoneal dialysis is well established as the dialytic method of choice in children. In the present case an infant with anuria survived for 99 days by peritoneal dialysis alone: an unusual finding of hyperlipidaemia was observed during her clinical course.

Case Report

A 10-month-old girl of Japanese extraction was referred to us because of anuria after nephrectomy of the left side was performed in another hospital for a severe congenital hydronephrosis. On admission, clinical and laboratory findings were those of uraemia, and therefore peritoneal dialysis was performed immediately. No artificial kidney suitable for the infant was available, so peritoneal dialysis was conducted every day except on Sunday for 99 days, while awaiting cadaver transplantation. On the 5th day after admission the right kidney was found to be non-functional and multicystic after an open renal biopsy. During the treatment serum urea varied from 60 to 99 mg/100 ml, serum sodium from 125 to 140 mEq/l., potassium from 3.6 to 5.8 mEq/l., chloride from 89 to 101 mEq/l., calcium from 7.2 to 8.7 mg/100 ml, and phosphorus from 8.6 to 9.7 mg/100 ml. Several antihypertensive drugs were used to maintain the blood pressure within

FIG.—Pedigree of affected family showing urinary concentration (mOsm/kg) average after thirsting.

a normal range, but in the last two weeks of the course of the disease the response to such drugs appeared reduced. She died of peritonitis at the age of 12 1/2 months.

Investigation on the 35th day of the dialysis revealed: serum cholesterol 399 mg/100 ml, triglyceride 192.5 mg/100 ml, and serum total protein 5.2 g/100 ml (albumin 48.1%, α_1 globulin 7.6%, α_2 globulin 22.8%, β globulin 10.1%, γ globulin 11.4%). Serum post-heparin lipoprotein lipase activity was reduced to 0.01 μ mol/ml per min (normal range 0.083 ± 0.010), as determined by the method by Yamada and Matsuda (1970). The amount of protein removed by peritoneal dialysis ranged from 2.0 g to 2.5 g/day. Peritoneal protein clearance calculated by the same method of glomerular protein clearance (Cameron and White, 1965) suggested that removal of individual plasma protein such as albumin, transferrin, IgA, IgG, IgM, and α_2 macroglobulin through the peritoneal membrane depended upon the concentration and molecular weight of each fraction (Fig.). Consequently a larger part of the protein removed during the peritoneal dialysis was albumin, as occurs in the nephrotic syndrome.

Plasma infusion of 100 ml/day was continued for 4 days to correct the hypoproteinaemia. Ten days after this treatment serum cholesterol and triglyceride concentrations were reduced to 284 mg/100 ml and 69.4 mg/100 ml, respectively, with a now normalized serum albumin of 5.6 g/100 ml. The activity of serum lipoprotein lipase was raised to 0.5 μ mol/min per ml at this time, but was still lower than that of the control. One month after the treatment serum cholesterol and albumin levels were 338 mg/100 ml and 3.8 g/100 ml, respectively.

Comment

Hyperlipidaemia was observed in a dog with hypoalbuminaemia induced by plasmaphoresis (Sellers, Hubbard, and Marmorston, 1957). Infusion of albumin into rats with the nephrotic syndrome resulted in a significant fall of serum lipid

concentration (Rosenman, Friedman, and Byers, 1956). In connexion with these findings, our observations suggest that there is a direct relation between hypoalbuminaemia and hyperlipidaemia, though several reports (Tracy and Wissler, 1962; Heymann and Hackel, 1955) concerned with nephrotic lipidaemia present opposing data. In the literature (Hyman, Wong, and Grossman, 1969) and in our previous observations (Yamada and Matsuda, 1970), the activity of serum lipoprotein lipase was reduced in clinical and experimental nephrotic syndrome. Furthermore, there was a significant negative correlation between serum lipoprotein lipase and serum triglyceride (Yamada and Matsuda, 1970).

The replacement of serum albumin in our case resulted in an increase in lipoprotein lipase activity and a reduction of serum triglyceride and cholesterol. The present observation might suggest that hypoalbuminaemia due to persistent peritoneal protein loss by dialysis has a possible role in producing hyperlipidaemia in the presence of reduced lipoprotein lipase activity. However, such an interpretation must be viewed with caution, because the patient was uraemic and had poor food intake.

Summary

Peritoneal dialysis was carried out on 6 days each week for 99 days in a 10-month-old girl with anuria associated with congenital hydronephrosis, and resulted in a hyperlipidaemia developing.

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FIG.—Peritoneal individual plasma protein clearance. 1: albumin, 2: transferrin, 3: IgG, 4: IgA, 5: IgM, 6: α_2 -macroglobulin.