in practice it was readily detected by careful analysis of the nitrous oxide disappearance curve.

Our technique has advantages. It is technically fairly simple, the apparatus required is likely to be widely available in departments of anaesthesia and respiratory medicine, and in the concentrations used nitrous oxide is less toxic than 'Freon'.

Serial lactic acid measurements in respiratory distress syndrome. J. P. Beca (*introduced by J. W. Scopes*) (*Hammersmith Hospital, London*). Blood lactic acid was measured 4-hourly in 21 newborn infants with respiratory distress syndrome (RDS). 13 survived and 8 died. In general lactic acid levels were higher in babies who died than in survivors, but there were inconsistencies which were uninterpretable if a single estimation was made in a given baby. Analysis of serial determinations done in each baby showed that all patients whose highest lactic acid was always below 35 mg/100 ml survived, and babies with high values but decreasing curves also had a good outcome. Only those who had increasing lactic acid curves, even if initially normal, died.

In most cases a high or normal P_{aO_2} was associated with normal or decreasing lactic acid; but babies with P_{aO_2} below 60 mmHg had often also normal or decreasing lactic acid.

If one intends to use lactic acid levels for prognostication of outcome in RDS, serial determinations are needed and single measurements are of limited value. Furthermore these data support the concept that there may be a wide range of hypoxaemia without oxygen deficit in body tissues and that it is therefore impossible to define a 'lower acceptable P_{aO_2} ' enough to achieve adequate tissue oxygenation.

Adrenal response to tetracosactrin in newborn infants. Hugh Price, Theresa Cowley, and E. H. D. Cameron (*Welsh National School of Medicine and Tenor Institute for Cancer Research*). Current belief holds that the fetal pituitary-adrenal axis is intimately involved in the initiation of labour, and indeed recent studies have shown that antenatal corticosteroid therapy may diminish the incidence of respiratory distress syndrome in prematurely born infants. Our studies were undertaken to provide basic data on the human newborn adrenal response to tetracosactrin (β^{1-24} corticotrophin, Ciba) stimulation.

Four types of study were performed.

(a) Standard 30-minute tetracosactrin tests on 50 infants admitted to a neonatal special care baby unit.

(b) Tetracosactrin tests in 12 normal infants; 6 on day 1 and 6 on day 5 after birth, cortisol and glucose levels being measured at 0, 30, 60, 120, and 180 minutes after intramuscular injections.

(c) Deposynacthen (tetracosactrin zinc complex, Ciba) responses were measured serially to give dose response curves.

(d) Cortisol plasma clearance rates were calculated on 6 newborn infants after intramuscular injection of

cortisol. All infants in groups (c) and (d) had been admitted to the special care baby unit.

Plasma cortisol was measured by 'micro'—Mattingly (50 μ l—venous plasma/assay) or by competitive protein-binding methods (10 μ l peripheral plasma/assay). Correlation curves for these two methods were presented.

The results showed that the newborn infant adrenal responds well to stimulation by tetracosactrin in terms of plasma cortisol concentration, but that the time of maximum response is somewhat delayed compared with that of the adult. No significant difference was observed in the response to tetracosactrin at day 1 and day 5. With Deposynacthen, the peak response time was variable but again was later than that reported for adults which may reflect either a slower absorption of the depot in the infant or a slower adrenal response to stimulation. With all infants receiving Deposynacthen, the maximum cortisol concentration exceeded 100 μ g/100 ml plasma. In general, basal levels were not reached until 3 to 5 days after administration of the depot.

Effect of glucose on plasma glucagon, insulin, and growth hormone levels in exchange transfusions. R. D. G. Milner, M. Fekete, R. Assan, and J. S. Hodge (*Departments of Child Health and Chemical Pathology, University of Manchester, and Hotel Dieu, Paris*)

Insulin excretion in cystic fibrosis. M. C. Goodchild and G. A. Brown (*introduced by P. H. W. Rayner*) (*Institute of Child Health, Francis Road, Birmingham B16 8ET*). Reduced tolerance to oral glucose with insulinopenia has been shown in 42% of cystic fibrosis (CF) subjects investigated by Handwerker *et al.* (1969). Abnormal results have also been reported after intravenous glucose loads. Histological investigation of pancreatic islet tissue has shown it to be substantially normal and reduced tolerance may therefore be a primary feature of cystic fibrosis and not secondary to the fibrotic process.

Significant positive correlation has been demonstrated between plasma insulin levels and urinary insulin excretion. To assess overall insulin secretion in cystic fibrosis therefore, 24-hour urinary insulin excretions were measured on 28 CF children using a double antibody radioimmunoassay. Excretion was also measured in the parents of the CF children. Results were assessed by comparison with results of similar investigations in non-CF families. Mean insulin excretion in the CF children was 257 μ U/kg body weight per 24 hours, and was lower than the control children's mean of 323 μ U/kg body weight per 24 hours. Mean insulin excretion in the parents of the CF children was 158 μ U/kg body weight per 24 hours, and in the control adults 215 μ U/kg body weight per 24 hours. The difference between the means of the CF parents and the control adults was significant ($P < 0.01$).

The tendency to lower insulin excretion in CF children was not unexpected in view of the results of plasma

investigations of other workers. Significantly reduced results in the parents suggest a genetic aetiology for the CF insulinopenia. A factor inhibiting sugar transport has been demonstrated in the plasma in CF children and their parents. The *in vivo* effect of this factor at gut or islet cell level may be responsible for decreased insulin secretion in CF.

REFERENCE

Handwerger, S., Roth, J., Gorden, P. *et al.* (1969). Glucose intolerance in cystic fibrosis. *New England Journal of Medicine*, **281**, 451.

Familial insulin resistant diabetes mellitus.

R. J. West, H. Z. Borin, W. M. L. Turner, and June K. Lloyd. Primary resistance to insulin without ketosis occurs in total lipodystrophy and in lipoatrophic diabetes. This paper reports two sibs with a syndrome comprising hyperinsulinism with insulin resistant hyperglycaemia in association with multiple somatic abnormalities and the development of severe, and ultimately fatal, ketoacidosis in the older, more severely affected child.

Both children had unusual facies, an enlarged and fissured tongue, markedly advanced dentition with dental dysplasia, acanthosis nigricans, thickened nails, and enlarged external genitalia. The elder, a girl, had glycosuria and ketonuria at the age of 5 years. She did not respond to insulin 400 units/day, chlorpropamide, or metformin. Slow deterioration, with episodes of severe ketoacidosis and recurrent infection occurred over the next 2 years. Insulin up to 1000 units/day was again ineffective in controlling hyperglycaemia or ketosis, and she died at 7.8 years. At necropsy the pineal gland was enlarged ($\times 5$) and the ovaries cystic. Her brother, investigated at 3.8 years, had intermittent glycosuria and ketonuria but was not acidotic and had not received exogenous insulin. Fasting serum insulin was very high at 556 $\mu\text{U/ml}$ and rose to 3208 $\mu\text{U/ml}$ after oral glucose; no insulin antibodies were detected. The mother, clinically normal, had abnormally high serum insulin after oral glucose (maximum 300 $\mu\text{U/ml}$).

The relation of the insulin resistant diabetes to the somatic abnormalities is not clear. A few patients who probably have the same disorder are reported on, but such very high endogenous serum insulin levels have not been recorded. Three sibs described by Rabson and Mendenhall (1956) also had hyperplasia of the pineal gland and defective production of a pineal hormone was postulated.

REFERENCE

Rabson, S. M., and Mendenhall, E. N. (1956). Familial hyper trophy of pineal body, hyperplasia of adrenal cortex and diabetes mellitus: report of 3 cases. *American Journal of Clinical Pathology*, **26**, 283.

Energy expenditure of obese children: technique for measuring energy expenditure over periods up to 24 hours. J. M. Court (*introduced by June K. Lloyd*). A number of studies suggested that obese children were less physically active than non-obese children. These studies, however, are open to criticism

for a number of reasons: (1) unreliable indices of activity such as the Pedometer have been used; (2) the studies have been carried out on a short-term basis and in abnormal conditions, for example during supervised activities in a summer camp; (3) physical activity may be a poor indicator of energy expenditure, especially in an overweight child who, because of his excess weight, may exert considerably more energy for a given task than a non-obese child.

In the present study heart rate has been used as an index of energy expenditure. For each child, a series of graded exercise tests was first carried out to establish the relation between heart rate and work expenditure. The tests consisted of stair climbing at varying rates, and work expenditure was expressed as the product of the child's weight and the vertical height climbed per unit time. The heart rate was measured using a SAMI (socially acceptable monitoring instrument) heart rate integrator. A linear relation between heart rate and work expenditure was confirmed, and stair climbing tests have proved a practicable technique for studying children of all ages provided they are ambulatory. Average heart rates during periods of up to 24 hours, while the child was carrying out normal activities at home or in hospital, were also measured and extrapolation of the graph expressing relation of heart rate and work expenditure (on the stairs test) allowed assessment of energy expenditure from heart rate measurements made over 24 hours. Preliminary investigations on a small number of obese and non-obese children suggest that some obese children have a substantially lower daily rate of energy expenditure compared with non-obese children. This study may provide evidence to support the suggestion that diminished energy expenditure is a factor in the maintenance or development of some forms of obesity in childhood.

Effects of bile acids on small intestinal absorption of glucose, water, and sodium. J. T. Harries and G. E. Sladen (*Department of Gastroenterology, St. Bartholomew's Hospital, London E.C.1*). Unconjugated dihydroxy bile acids inhibit colonic absorption of water and sodium in several species (e.g. Mekhjian and Phillips, 1970), but no detailed information is available about comparable effects in the small intestine.

In this study, the effects of bile acids on absorption by the rat small intestine were investigated, using an *in vivo* closed-loop technique. Isotonic solutions, containing mainly NaCl and (in jejunum) 20 mM glucose, were placed in loops of jejunum and ileum for short absorption periods. A weighing technique was used to calculate absorption rates.

In the jejunum, deoxycholate (1 mM) impaired absorption of both sodium and water ($p = 0.002$) but not glucose. At higher concentrations (2.5 and 5 mM) secretion of fluid occurred, whereas glucose absorption was only slightly impaired ($p = 0.05$). By contrast in the ileum, 5 mM deoxycholate produced only partial ($p = 0.002$) inhibition of fluid absorption and 10 mM was needed to cause complete inhibition. In both jejunum and ileum, chenodeoxycholate behaved in a