100 ml. when estimated by the Hagedorn-Jensen method. In over 300 estimations, only once was there a widely differing result which could have caused an error in treatment. The B.S.K. revealed 110 mg./100 ml. whilst the Hagedorn-Jensen method showed 212 mg./100 ml. The worker questioned the blue-grey colour of the B.S.K. reaction, and this estimation should have been repeated.

The accuracy of results depends on the appreciation of a range of colours. In a few estimations this was difficult, particularly when a muddy or grey tinge appeared in the final sample. Worker X was able to distinguish a muddy blue from an orange-grey with reasonable accuracy in all shades, whilst workers Y and Z had difficulty. This problem was resolved by repeating all estimations when an unreliable colour was obtained. Usually a pure colour was finally produced. No explanation has been found for this "muddy" colour, and it occurred 22 times out of 300 estimations.

There is no doubt that ideal conditions and laboratory experience improve the accuracy of this method. Nevertheless, with a little practice, proficiency is attained whereby blood-sugar estimations can be done that are of inestimable value in the correct treatment of emergency medical patients.

It was felt that further refinement of the test was not essential since the B.S.K. was not designed to usurp the established blood-sugar methods. In emergency practice the question is usually not the actual level of blood sugar but whether the level is low or whether it is high. The B.S.K. would appear to be capable of giving this information speedily and accurately enough for clinical purposes. A further extensive trial is under way to test these laboratory findings under emergency conditions.

Summary

A new simple and quick blood-sugar estimation is described. Results when compared with the Hagedorn-Jensen method are in remarkable agreement. Varying conditions and experience of the workers are shown to influence the results. The new blood-sugar method would appear to be helpful in medical emergencies.

We thank all the patients for their kind co-operation in this study; Professor R. E. Tunbridge for permission to study his patients and helpful criticism of the MS.; and Mr. J. Bunce, Director, Ames Company (London) Ltd., for the supply of B.S.K. and his help at all times.

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The John Horniman Home is a home for children with severe physical handicaps such as cerebral palsy, muscular dystrophies, paralysis due to poliomyelitis, or severe heart disease. The home, situated in Worthing, is run by the Invalid Children's Aid Association, and can accommodate 24 children. It takes both boys and girls between the ages of 7 and 16. They are usually admitted for periods of two to eight weeks, either as a holiday to give their parents a respite or for convalescence after illness. The first object of the home is to help families in carrying the burden of a severely handicapped child. In special cases a long stay with education can be arranged. A serious difficulty in running the home, which has now been open for nearly three years, is that there is a peak demand during the summer holidays but vacancies at other times of year. With the skilled staff needed for such work this makes for uneconomic operation, and a more even flow of admissions, especially during the winter months, is wanted. Full details may be obtained from the Invalid Children's Aid Association, 4, Palace Gate, London, W.8.

A RAPID METHOD FOR THE ESTIMATION OF BLOOD SUGAR

BY

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A number of rapid and simple methods for the estimation of the blood sugar have been described (Hall, 1950; Lee, 1954). Although the results obtained by these methods agree with those in routine laboratories, they are not really suitable for performance by a busy house-physician at the bedside or in a ward side-room. A very simple procedure involving the use of tablets has recently been developed, and its use has been studied in the wards and the Diabetic Clinic of the Middlesex Hospital.

Method

The equipment is contained in a small box and consists of two test-tubes each with three graduations (at 1, 2, and 3 ml.), a test-tube stand, a dropper, a box of filter cones, and two bottles of tablets (A and B). Tablet A is dissolved in 2 ml. of water in one of the tubes and blood is added to the 3-ml. mark. The proteins are rapidly precipitated and the mixture is allowed to filter through one of the filter cones into the second tube until 1 ml. of filtrate has collected. Tablet B is then added, and after the contents of the tube have boiled the froth is shaken down and 30 seconds later the colour is compared with that on a chart provided: blue or blue-green = 100 mg./100 ml. or less, green = 150 mg./100 ml., and orange = 200 mg./100 ml. or more.

Blood samples were obtained by venepuncture and a fluoride-oxalate anticoagulant mixture was used. If for any reason the estimation could not be performed immediately the specimen was stored, but not frozen, in a refrigerator. In practice it was found preferable to measure the volumes of blood and water with an ordinary 2-ml. insulin syringe. If the result was more than 200 mg./100 ml. the estimation was repeated, using 2.5 ml. of water with tablet A and adding 0.5 ml. of blood. If this still gave maximum reduction the test was repeated, using 2.75 ml. of water and 0.25 ml. of blood. For higher dilutions the blood was diluted with water first. No attempt has been made to perform the estimations under set conditions of lighting; so far as possible, the method has been studied as it would be used in practice—artificial or daylight being used as circumstances required.

Duplicate samples of each specimen were sent to the Courtauld Institute of Biochemistry at the Middlesex Hospital, where blood sugars were estimated by the method of Kingsley and Reinhold (1949), using sodium tungstate and sulphuric acid as protein precipitant. The error of this method is ± 6 mg./100 ml.

Results

The results obtained by the tablet method and the Kingsley-Reinhold method are compared in the Chart. The

Comparison of blood-sugar determinations by the method of Kingsley and Reinhold with the new blood-sugar kit.

correlation coefficient is 0.84, but there is a slight overall tendency for the tablets to give a high reading. In practice it was found that the mid-point between 100 and 150 mg./100 ml. gave a colour that could be recognized quite satisfactorily, and some readings of 125 mg./100 ml. are therefore shown. The mid-point 150–200 mg./100 ml. proved less easy to detect. Occasionally an impure colour was obtained and it was found necessary to repeat the test.

Discussion

A rapid and simple method for the performance of blood-sugar estimations in the out-patient clinic, consulting-room, or ward side-room would help the control of treatment of diabetes and in the management of diabetic emergencies.

This method cannot be recommended even as a screening procedure for the diagnosis or exclusion of diabetes. Definite diagnosis of this condition is of great significance to the patient and only methods of proved accuracy should be used. The tablet method is not really suitable for control of treatment in hospital diabetic clinics, where arrangements can usually be made for blood-sugar estimations by routine methods. It may be helpful for practitioners supervising the treatment of diabetics in their surgeries, an occasional check on the blood being desirable in all cases.

The method has proved very useful in the management of diabetic emergencies in hospital. In post-operative patients, in cases of ketosis, and in cases of suspected hypoglycaemia a rapid guide to treatment has been obtained. At night and at week-ends its use has often made it unnecessary to call on the services of the resident biochemist. In hospitals without a 24-hour biochemistry service this equipment would be very valuable.

I am indebted to the staff of the routine laboratories of the Courtauld Institute of Biochemistry of the Middlesex Hospital, where the control estimations of the blood sugar were made. I thank Dr. J. D. N. Nabarro, under whose guidance this paper was written, for allowing me to perform these tests on his patients, and the Ames Company (London) Ltd. for the provision of the blood-sugar kit.

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Medical Memoranda

Treatment of Ammoniacal Dermatitis with Folic Acid and Soya-bean Milk

The oral administration of either folic acid or soya-bean flour encourages the growth of lactobacilli and possibly inhibits the growth of ammonia-producing organisms in the stools. It would seem rational to try to cure ammoniacal dermatitis in infants by the oral administration of these substances.

The following report concerning the treatment of chronic napkin rash by the administration of (a) folic acid and (b) soya-bean milk may prove of value to others faced with a similar problem.

Five infants aged between 3 and 16 months, who had suffered from severe ammoniacal dermatitis in which there was desquamation and exudation for periods ranging from 1 to 12 months, and who failed to respond to routine methods of treatment, were given folic acid by mouth. The dosage was 10 mg. daily as an elixir. Routine treatment to napkins and buttocks continued unchanged, while in each case the infant's diet remained similar to that in use immediately before the start of folic acid therapy. After a month three patients showed slight improvement, but the other two were no better. In view of this unsatisfactory response to treatment folic acid was withheld and soya-bean

milk was given. The milk consisted of 1½ oz. (42 g.) of soya-bean flour added to a pint (570 ml.) of water. This was used to replace half the quantity of cow's milk normally taken daily, so that patients consumed 10 to 20 oz. (285 to 570 ml.) of soya-bean milk each day. The routine treatment of the napkins and buttocks continued as before and the infants' diets were not altered. Within five days of starting the treatment all the patients had shown some improvement in the condition of the buttocks, while four of them had become more contented. Within two weeks the appearance of the skin was normal in all cases. During the third and fourth weeks of treatment there was no deterioration, though very transitory erythema of the skin in the napkin area was sometimes noted.

In view of these findings further observations on the effect of treatment with soya-bean milk in cases of ammoniacal dermatitis would be useful, and it should be given a trial in all resistant cases of this condition. Soya-bean flour can be obtained from Soya Foods, Ltd., London, E.C.3, and possibly from grocers. Its food value compares favourably with cow's milk, so that it is possible to rear infants from birth on this food. The cost of soya-bean milk is approximately twopence a pint. It is possible that treatment with larger doses of folic acid than were used in these few cases might prove more satisfactory, and it may be that cases resistant to soya-bean therapy might respond to large doses of folic acid.

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Pregnancy in Addison's Disease

Adrenocortical insufficiency is not necessarily incompatible with fertility. In earlier days the hazards of pregnancy in such circumstances were well known and were such as to make conception inadvisable or therapeutic abortion necessary. Now with modern complete substitution therapy the prognosis of pregnancy in Addisonian patients is much better. Approximately 60 such cases are on record, and in 14 of these pregnancy has occurred in the past five years when potent adrenocortical hormones have been available (Hendon and Melick, 1955). Only 7 cases appear to have been reported since cortisone has been used for maintenance. Below is a further case in which pregnancy occurring during treatment of Addison's disease was brought to a successful conclusion.

CASE REPORT

A nulliparous 23-year-old woman who had been married for four years presented with generalized weakness, tiredness, loss of weight, oligomenorrhoea, and skin pigmentation. There was no gastro-intestinal upset and no past history of tuberculosis. She was dehydrated, the skin was inelastic, the tongue dry, and the oral mucous membrane pigmented. Her blood pressure was 70/50 mm. Hg. Serum electrolyte values were compatible with Addison's disease: sodium 130, potassium 5.7, chlorides 69 mEq. per litre. Blood urea 93 mg. per 100 ml.; haemoglobin 85% (Haldane). Urinary 17-ketosteroid excretion 2.9 mg. in 24 hours. Radiographs of chest and abdomen normal. On a standard water load a diuresis of only 50% was recorded in the first four hours.

Initial therapy consisted of deoxycortone acetate (D.C.A.) 10 mg. daily by injection, together with 6 g. of salt a day and an adequate fluid intake. Her general condition improved on this treatment; the blood pressure rose to 110/70 mm. Hg, the electrolytes returned to normal values, and she gained 10 lb. (4.54 kg.) in weight, thus confirming the diagnosis of Addison's disease. A month later it was decided to institute maintenance therapy consisting of an implant of 200 mg. D.C.A. and 3 g. of salt a day. After about six months additional salt was given to overcome increased weakness and lethargy. Her blood pressure and serum electrolytes continued normal. It was decided to