Rectal Alimentation.

THE difficulty of securing adequate nourishment in certain conditions in which the taking of food by mouth is impossible or inadvisable, such as coma or following operations on the gastro-intestinal tract, is well known; the attempt is usually made to supply a certain amount of food and drink by means of nutrient enemata, but there are very few substances which are with certainty absorbed through the mucous membrane of the rectum and large intestine. The knowledge that this part of the bowel in man acts mainly as an absorber of water, and contains none of the digestive enzymes which are found in the upper parts of the gastro-intestinal tract, would suggest that only the ultimate products of digestion of the food-stuffs would stand any chance of being absorbed: such, in fact, appears to be the conclusion to be drawn from many researches on this subject. Dextrose, lævulose, amino-acids, saline solutions, and alcohol are absorbed and thus become available for metabolic processes, but the proof of their actual utilisation has not been so easy to obtain. A recent study by T. M. Carpenter brings forward some new evidence on this question (Carnegie Institution of Washington, Publication No. 369, December 1925).

The experiments were conducted on four healthy medical students; the test substances used were alcohol, dextrose, and lævulose, and their utilisation was studied by observing their absorption when introduced rectally, their excretion in the urine, and their influence upon the respiratory exchange, the pulse rate, and the composition of the urine. The amounts absorbed were obtained by analysing a wash-out enema, which followed the introduction of the nutrient solution: the spirometer or respiration chamber was used for the determination of the respiratory exchange and the pulse rate was recorded by means of a pneumograph placed over the thigh. Among the details to which attention must be directed, so as to ensure the comfort of the subject, are the temperature of the solution and the rate of administration and the total volume given: it was found that the most comfortable posture was the supine, and that the enema should enter the rectum at body temperature, and slowly, preferably by drops: 250 to 500 c.c. can be given in the course of two hours.

The experiments were generally carried out in the afternoon and evening, and the subjects had previously fasted for several hours, but not for the twelve hours usual before an estimation of the 'basal' metabolism. In the majority, one or more preliminary periods were run before the injection was made. The general course of events in a normal subject was studied in a series of control experiments, in which a solution of sodium chloride alone was injected. The changes observed were only slight. The respiratory quotient remained steady, the pulse rate and oxygen consumption fell somewhat, the latter after a slight rise, and the urine, although showing a slightly increased output of fluid, yet had less sodium chloride present: presumably the greater salt excretion in the preliminary period should be related to the intake of this substance in the food. When the experiment continued all night, records of sleep and wakefulness were obtained by the response of the subject to an electrical signal: the pulse rate remained steady, except for periods of wakefulness, and the respiratory quotient, oxygen consumption, and carbon dioxide production showed a tendency to increase slightly. The course of events after the injection of a test substance must be interpreted in the light of those occurring under similar conditions in a control subject at a similar period of the day.

The absorption of alcohol, injected in a 5 to 10 per cent. solution in 0·6 per cent. sodium chloride, was almost complete, in most of the experiments a total of 25 gm. being given. Signs of alcoholic intoxication could be produced by administration by this route. Small amounts of alcohol were excreted in the urine, the concentration being of the order of 0·5 per cent. and reaching a maximum in about two hours. The amount excreted and the time of the maximum output depended on the quantity of alcohol injected and also on its concentration. Similar results were obtained following the ingestion of alcohol by mouth: but owing to the quicker absorption, a higher maximum excretion was observed. After five or more hours the excretion ceased. If the subject slept during the experiment, more alcohol appeared in the urine, suggesting a lessened utilisation. It is of interest to note that sometimes the alcohol appeared in the urine in a conjugated condition, distillation following treatment with an inorganic acid yielding slightly higher figures for alcohol than simple distillation alone. The excretion of only small quantities of alcohol after oral ingestion has been confirmed more recently by H. W. Southgate (*Biochem. Jour.*, vol. 19, p. 737, 1925). Apart from its presence in the urine, the rectal administration of alcohol led to a marked diuresis, with a decrease in the nitrogen and sodium chloride eliminated.

The effect of alcohol on the general metabolism was shown by the fall in the respiratory quotient, with a rise in the pulse rate and the oxygen consumption. When adequate amounts were given, the changes began in about an hour and lasted for six or seven hours. With oral ingestion the respiratory quotient fell still more promptly.

The administration of dextrose or lævulose by the rectal route produced similar effects, except that the respiratory quotient rose, instead of falling, as after the alcohol. Only 60 to 90 per cent. of the dextrose and 50 to 100 per cent. of the lævulose was absorbed in the different experiments; absorption was most rapid in the first two hours. The lævulose solution was the most difficult of all to retain. The changes in the urine were slight in the case of dextrose, there occurring a fall in the nitrogen and sodium chloride output: but this fall was very marked following the injection of lævulose. In both cases the respiratory quotient and the pulse rate increased, with little alteration in the oxygen consumption.

Perhaps the most interesting part of the monograph are the deductions made by the author from the experimental data. He considers that there is sufficient evidence to show that alcohol, dextrose, and lævulose, when introduced rectally, are metabolised by the body. Calculations suggest that alcohol replaces in metabolism all the foodstuffs in the proportions in which they are being utilised at the moment; this replacement may take place to the extent of 50 per cent. By the oxidation of the dextrose absorbed enough carbohydrate would be supplied for the metabolic needs of the body for two to three hours. Lævulose, on the other hand, appears to be mostly retained in the body without oxidation, perhaps as glycogen.

Comparison of the effects of rectal administration with those following oral ingestion showed in a few cases certain discrepancies. Thus alcohol *per os* lowered the respiratory quotient more promptly than after administration by the alternative route, but the peak of the alcohol concentration in the urine was reached in about the same time in either case, so that it may be assumed that the difference is not due to the

earlier appearance of an increased concentration in the blood following oral ingestion. Again, lævulose *per os* had a greater effect on the respiratory quotient than when given *per rectum*, whilst with dextrose the reverse appeared to be true, although it was less readily absorbed from the rectum than the former.

The author considers that the differences in the metabolic effects between oral and rectal administration cannot be explained by the absorption of the materials into the systemic venous system alone as distinct from an absorption into the portal system, since the former drains only the extreme lower end of the large bowel. He therefore suggests that the immediate fate of these materials may depend in part upon whether the liver is in an active condition or not. This condition is presupposed following oral ingestion, but if the rectal administration occurs sufficiently long after the previous meal, it may be expected that this organ is in a state of relative quiescence. The idea that the liver may give off to the blood-stream a substance of the nature of an internal secretion has already been envisaged by some experiments of Cannon's on the existence of a substance causing acceleration of the denervated heart, which was only clearly demonstrated in animals digesting meat.

The work suggests lines for future research and at the same time indicates that if resort has to be made to rectal alimentation in a patient, alcohol and dextrose are the substances which should be chosen for this purpose.

The Russian Geographical Society.

WE have received from the Russian State Geographical Society twelve parts of its *Izvestiya*, forming vols. 52-57, for the years 1916–1925. They contain a series of valuable contributions to the geography of the Russian dominions, and British geographers will gladly welcome the renewed activity of that important Society. The word 'Imperial' in the title of the Society was omitted in 1916 and has now been replaced by 'State.' That the conditions of publication in Russia are difficult are indicated by the poverty of the paper, the sparseness and inferior quality of the illustrations and the maps. In these respects the later volumes show a marked improvement, which encourages the hope that the journal will reach its former excellence. The volumes contain many important contributions, but they are rigidly confined to the Russian language, the only exception being that one paper has a title and a short summary in French. If the titles of the papers and the lists of contents were repeated in some western language, the accessibility of its contributions would be much increased. Some of the work has been delayed in publication; thus volume 57, pt. 1 (pp. 3-60), includes papers by Conradi, Kell, and Ghulten on the geological and geographical results of an expedition to Kamchatka in 1908–1910, and a discussion by Prof. Karakash of *Eoanthropus dawsoni* (vol. 52, 1916, pp. 673-714) has been generally overlooked in Great Britain.

Among the papers on physical geography are the discussion by S. C. Bergh (vol. 52, pt. 8, 1916, pp. 579-648) of the origin of loess; many contributions to glacial geography, including a study of the movements of glaciers in the Caucasus by P. Tzirulnikov (vol. 53, 1917, pp. 45-56, 5 pls.), two papers by Belyaev and Besedin (vol. 55, pt. 1, 1919, pp. 1-124) on glaciers in Darvaz from observations during an excursion by the Russian Geographical Society in 1919, and a catalogue by Tronov of the glaciers of the Altai (vol. 57, pt. 2, pp. 107-159). General problems connected with glaciation are discussed by Sobolov (vol. 56, pt. 1, 1924, pp. 101-140, and pt. 2, pp. 5-36) on the glacial formation of northern Europe with reference to the geo-morphology of the Russian plain. The evidence from the Caucasus as to the succession of glacial periods is adduced by Renngarten from the Valley of Assa in the northern Caucasus (vol. 57, pt. 2, 1925, pp. 53-106). I. N. Shamkov describes the climate of Abas-Fuman and its value as a health resort.

The papers on European geography are relatively few, but Alyabev (vol. 56, pt. 1, 1924, pp. 5-54) contributes an account of the Kurghalov Peninsula and the south coast of Finland, and their geographical relationship. Yakovlev (vol. 57, pt. 2, 1925, pp. 3-22) describes the relief of Leningrad and its effect on the inundations.

Shokalskii in a short paper discusses the acceptance of republics by the north-western Russian States (vol. 56, pt. 1, 1924, pp. 154-161), and A. Petrov discusses the physical geography of the Murmansk area (vol. 55, pt. 2, 1924, pp. 3-13).

Studies of the Siberian rivers are given by Sapozhnikov and Nitikin, dealing especially with the plant distribution on the lower valley of the Obi (vol. 55, pt. 1, 1923, pp. 135-180); and by Ghromov, who describes his work at the mouth of the Yenisei (vol. 56, pt. 2, 1925, pp. 107-118).

Contributions on Russian Turkestan include the papers by Spiridonov on the natural history of parts of the Kizil-Kuma (vol. 56, pt. 2, 1924, pp. 145-173), and Smirnova describes the western parts of the Kirghiz Territories (vol. 55, pt. 2, pp. 103-112); Pavlov describes the North Gobi Desert and a traverse of Mongolia (vol. 57, pt. 1, 1925, pp. 111-168).

Mushketov describes the eastern Ferghana and the Alai (vol. 53, 1917, pp. 83-137, 8 pls.), and also a journey in Narjensk and Kashgar (*ibid.*, pp. 138-166). There are some obituaries, including one of P. O. Rovinskii, dealing especially with his work in Serbia (vol. 52, 1916, pp. 515-542), and an appreciation by Sokolovskii of the geographical work of Philip Avril (vol. 57, pt. 1, 1925, pp. 67-98).

Peat Investigation in Canada.

ABOUT eight years ago a Peat Committee was appointed by the Government of Ontario and the Federal Government of Canada, and was directed to find, if possible, a practical commercial method for converting raw peat into fuel. The Committee considered carefully all the more important processes for winning peat fuel which had been previously proposed, and concluded that the only practical commercial method of winning peat fuel is by excavating, mixing, spreading and forming the raw peat by automatic machines. The peat blocks thus formed and spread are then to be dried in the air. Since this process decreases considerably the number of labourers required per ton of fuel, it is well adapted for countries such as Canada, where the cost of labour is high.

The Committee made a careful and exhaustive examination of the efficiencies of two large-scale excavating and spreading plants. One of these had been devised in Sweden by Anrep, and the other in