Vitamin B.

ASSAY AND VITAMIN B_1.

THE separation of vitamin B into two factors, antineuritic and antipellagrous, a few years ago, led to considerable attention being devoted to the properties of this vitamin, with the result that it is now possible to distinguish at least four B factors, quite apart from any grouped under the name 'Bios', which may be necessary for the growth of lower organisms. The factors are distinguished by differences in their chemical properties and physiological effects: their differentiation has necessitated a revision of the methods of assay, since it is possible that a failure to respond to an addition to the diet is an indication of the absence of a factor other than that for which the test was designed. In this type of research a preventive test is less delicate than a curative, whilst the growth test may be considered still cruder: a single factor should cure the specific symptoms due to its absence, preventive tests may test for more than one, whilst it is clear that a positive growth response can only be obtained when every factor is adequately supplied; and our knowledge of all the factors required for growth is still incomplete, as the recent work on vitamin B has shown.

H. W. Kinnersley, R. A. Peters, and V. Reader (*Biochem. Jour.*, vol. 22, p. 276; 1928) have analysed the pigeon curative test for vitamin B_1, or the antineuritic factor. By adherence to certain principles, the test can be made reasonably accurate and has been successfully used in following the vitamin in its concentration from a yeast extract. The birds should be in the laboratory for a month on a mixed grain diet before being placed on the diet of polished rice, and only those developing symptoms within 30 days should be used. As soon as signs of head retraction appear, the bird should be transferred to a warm room for 2 hours and given 50 mgm. glucose in water by stomach tube: this procedure eliminates birds showing false cures. The dose of extract must be given within 6-12 hours of the onset of symptoms and, provided the cure lasts more than 1 and less than 10 days, the amount of active principle present can be considered as directly proportional to the length of the cure. After the test is over, the bird is given marmite and kept warm for a few days. It is then placed on the stock diet again for about a month, when it is ready for another period of polished rice feeding. Individual birds show a remarkable constancy in the time symptoms appear after commencement of the experimental diet, but there is no correlation between this interval and the duration of the subsequent cure, or between it and the colour or weight of the bird.

H. Chick and M. H. Roscoe (*ibid.*, vol. 23, p. 498; 1929) have used the growth of young rats as a criterion for the presence of vitamin B_1. It is difficult to carry out a curative test with this animal, since there is only a very short interval between the onset of acute symptoms and death: Reader has, however, been successful and has found that the adult rat requires about one pigeon day dose each day (quoted by Peters, the Harben Lectures, 1929). Chick and Roscoe used synthetic diets free from vitamin B_1: vitamin B_2 was supplied as autoclaved yeast or as fresh egg-white. After 2-3 weeks the animals began to lose weight: growth was resumed if Peters' antineuritic concentrate was then administered. The egg-white diet, however, did not maintain growth to maturity. B. C. Guha and J. C. Drummond (*ibid.*, vol. 23, p. 880; 1929) have used both the pigeon curative and the rat growth tests: in the latter, vitamin B_2 was supplied as marmite autoclaved at an alkaline reaction.

Chick and Roscoe (*ibid.*, vol. 22, p. 790; 1928) have used a similar method for the assay of vitamin B_2, young rats being placed on a diet complete except for this vitamin, and the B_1 factor being supplied as Peters' concentrate. It was found that the caseinogen used contained traces of vitamin B_2 unless it was reprecipitated with acetic acid and thoroughly extracted with alcohol before being heated at 120°. Animals on this diet fail to grow but respond to a supplement containing vitamin B_2. If the supplement is not given, after about six weeks a generalised dermatitis appears, which can be cured by administration of the vitamin.

B. C. P. Jansen and W. F. Donath (*Mededeelingen van den Dienst der Volksgezondheid in Ned.-Indië*, Anno 1927, Part 1) obtained highly active preparations of vitamin B_1 from rice polishings by a process involving extraction with acid water, adsorption on fuller's earth, elution with baryta, and fractionation of the extract with silver sulphate and baryta. The activity was precipitated with phosphotungstic acid, the precipitate decomposed with baryta, and after removal of barium the concentrated solution was treated with platinic chloride, which precipitated the vitamin. Further purification was effected by acetone precipitation from alcoholic solution and by treatment with picrolonic acid or gold chloride. 0·012 mgm. of the final fraction a day was sufficient to maintain pigeons in health over six weeks: C. Eykman (*Kon. Akad. van Wetensch. Amsterdam*, vol. 30, p. 376; 1927) confirmed the activity with both pigeons and cocks. The final product was obtained in crystalline form, as a hydrochloride, a picrolonate, or a double salt with gold chloride.

Kinnersley and Peters (*Biochem. Jour.*, vol. 22, p. 419; 1928) have continued their work on antineuritic yeast concentrates (see NATURE, vol. 121, p. 516; 1928). It is not yet certain whether the curative substance is the same as that obtained from rice polishings by Jansen and Donath: the activity of the final product does not appear to be quite so great and its properties are not quite the same. In all work on the concentration of vitamin B_1, it has been found that the properties of the active fractions vary according to the nature of the accompanying impurities, so that methods developed for use with an extract of rice polishings may not be applicable without modification to an extract of yeast. The extract from the charcoal adsorption, after removal of metals, can be fractionated by successive additions of alcohol, the

vitamin passing into the portion soluble in 99 per cent ethyl alcohol. The authors failed to get consistently successful results with a silver fractionation, but were more successful with the use of phosphotungstic acid and platinic chloride. The most active preparations contained a day dose in 0·027 mgm., but more lately some have been obtained with a curative activity of 0·01 mgm. a day dose.

Guha and Drummond (*loc. cit.*) prepared active concentrates from wheat embryo. After extraction by means of acid alcohol, two different methods of concentration were employed: in the first, impurities were precipitated by lead acetate, and the activity adsorbed on norite charcoal at *p*H 4·5 and eleuted with acid alcohol: it was then precipitated by phosphotungstic acid, adsorbed on silver oxide, and the product fractionated with alcohol. Picrolonic acid then precipitated impurities from the material, which was soluble in alcohol. The first product had a pigeon day dose of 0·043 mgm. In the second method, Jansen and Donath's process was followed, namely, adsorption on fuller's earth at *p*H 4·5 and eleution with baryta, and fractionation with silver nitrate and baryta followed by precipitation with phosphotungstic acid. The product was then submitted to precipitation with platinic chloride, followed by gold chloride; at the last stage most of the activity passed into the precipitate, but it was observed that smaller doses of both precipitate and filtrate together restored growth in the rat or cured the pigeon than of either when given separately, suggesting that vitamin B_1 may itself be composed of more than one factor. The smallest pigeon day dose was 0·0025 mgm., and 0·015 mgm. promoted good growth in rats. These figures indicate that the preparations were more active than the crystals obtained by Jansen and Donath.

Although formulæ have been assigned to vitamin B_1 preparations, it does not appear that a pure substance has yet been isolated. A certain amount is, however, known about its properties. It appears to be a tertiary base: it is soluble in water and alcohol, but is unstable in the latter solvent when highly purified: it is insoluble in the other common organic solvents. It is destroyed by alkali, but is stable to oxidising and reducing reagents and to nitrous acid. Cruder preparations give a definite Pauly reaction, but as purification proceeds the reaction becomes very weak. Sulphur is absent, and the purer preparations do not give the xanthoproteic, purine, or Millon's reactions. In extracts from rice polishings, after treatment with lead acetate and concentration of the filtrate, vitamin B_1 is destroyed by fermentation and by heating to 95°, and is removed by filtration through a Berkefeld filter (J. L. Rosedale and C. J. Oliveiro, *Biochem. Jour.*, vol. 22, p. 1362; 1928), although it will dialyse through cellophane.

The isolation from contentrates of supposedly pure substances and the fact that false positives may be given by the pigeon test have led to claims that different pure compounds are the vitamin. J. M. Gulland and Peters (*ibid.*, vol. 23, p. 1122; 1929) have examined the claims that certain quinoline and glyoxaline derivatives have curative properties. Without exception all those examined, including 4 (or 5) glyoxaline methylethyl carbinol hydrochloride and 2:6-dihydroxyquinoline, were quite inactive when tested on pigeons by Peters' technique.

The Adler Planetarium of Chicago.

THE Adler Planetarium is a new and striking feature on the shore between a small lagoon and Lake Michigan. In plan it is dodecagonal: the walls are faced with large slabs of red granite and it is surmounted by a dome. The principal object of this new institution is explained on the dedication plaque that confronts the visitor when he crosses the threshold of the entrance lobby. Eight sculptured figures by Vannelli, symbolising the eight principal planets, are disposed around a circular disc representing the sun, upon which is set the inscription: "*The Astronomical Museum and Planetarium of Chicago—Gift of Max Adler—To further the Progress of Science—To guide to an Understanding of the Majesty of the Heavens—To emphasise that under the Great Celestial Firmament there is Order, Interdependence and Unity—1930.*"

For this purpose the principal instrument is a large projection apparatus built by the firm of Zeiss on lines similar to those of the one described in NATURE for Dec. 27, 1924, p. 937, and by which large audiences can watch the movements of the starry firmament as projected upon the inside of the great dome of 68 feet in diameter. On the north and south sides of the dome are two spacious exhibition halls, while to the east of it are library, lecture- and work-rooms, and also the office of the director, Dr. Philip Fox.

The Adler Planetarium is, however, designed on broader lines than those of a public hall for planetary demonstrations. It includes a collection of important historical instruments used by astronomers in past centuries. Among the more modern instruments are one of Sir William Herschel's reflecting telescopes, given by Sir Frank Dyson with the authorisation of the British Admiralty; Burnham's 6-inch telescope, loaned by the University of Wisconsin, with various mementoes of him; Nichol's star heat radiometer from the Yerkes Observatory; refractors loaned by Carl Zeiss and by Richard E. Schmidt; a large model of an observatory with movable dome, telescope, and floor, based on the U.S. Naval Observatory. An appropriate exhibit is an orrery by Isenbroeck, of 1737; while in wall-cases are displayed that important series of instruments of earlier date, known as the Mensing Collection, which was purchased *en bloc* in January last by Mr. Adler from the firm of Messrs. Frederik Muller and Co., of Amsterdam.

While keenly regretting the loss to Europe of so many astrolabes, armillary spheres, sundials,