

Physiological Chemistry.

Blood as a Physico-chemical System. L. J. HENDERSON (*J. Biol. Chem.*, 1921, **46**, 411—419).—In the respiratory changes of blood, six simultaneous variables are involved, viz. the free and the combined oxygen of the whole blood, $[O_2]$ and $[HbO_2]$; the free and combined carbonic acid of the serum, $[H_2CO_3]$ and $[BHCO_3]$; the hydrogen-ion concentration of the serum, P_H , and its chloride concentration $[BCl]$. Any two of these six variables determine the whole equilibrium. The author describes the construction of a "nomogram," in which, by superposition of six systems of graphs, six co-ordinates may be read off for any given point, representing any given state of equilibrium of *defibrinated* blood. The nomogram thus represents the results for $[H^+]$, $[H_2CO_3]$ and $[BHCO_3]$ (Henderson, A., 1908, ii, 467), as well as for $[O_2]$, $[HbO_2]$ and $[H_2CO_3]$ (Barcroft, for instance, A., 1909, ii, 815) and for $[H_2CO_3]$, $[BHCO_3]$ and $[HbO_2]$ (Christiansen, Douglas, and Haldane, A., 1914, i, 1012), and, in addition, it shows the relationships of the seventeen other combinations, in which the six variables can be taken, three at a time. The paper should have considerable didactic value. G. B.

Blood Sugar Regulation and the Origin of the Hyperglycæmias. I. Glycogen Formation and Glycogenolysis. II. Conditions of Action of Liver Diastases. III. Theory. EINAR LANGFELDT (*J. Biol. Chem.*, 1921, **46**, 381—390, 391—402, 403—409).—I. A review of the problem, from Bernard onwards; some of the later work leads to the supposition that glycogenolysis is favoured by acidity of the liver cells. II. In accordance with this, the author finds experimentally, *in vitro*, that the optimum for liver diastase in the presence of phosphate anions is at P_H 6·2, and with chlorine ions 6·8. When adrenaline is added, it is shifted to P_H 7·73. Thyroidine alone has no influence, but in the presence of adrenaline (even 1 : 5,000,000) it causes increased glycogenolysis. III. The theory is illustrated by means of a diagram. The acidic optimum for liver diastase is a safety arrangement, securing a slow constant output of sugar and a fixed concentration of 0·09—0·1% in the blood. Part of the sugar is burnt, part stored in the muscles, the rest is recondensed to glycogen in the liver. The glycogen synthesis in the liver depends on the pancreatic hormone, and if the latter is inadequate, chronic hyperglycæmia and diabetes result. A different type of hyperglycæmia arises from increased breakdown

of glycogen in the liver owing to acidity or to a change in the optimum P_H (adrenaline). This type is transitory. G. B.

Relationship between Cholesterol and Cholesterol Esters in the Blood during their Absorption. ARTHUR KNUDSON (*J. Biol. Chem.*, 1921, **45**, 255—262).—A series of experiments on dogs shows that during the absorption of cholesterol and cholesterol esters the amount of cholesterol in the blood increases considerably, but that the amount of esters does not appreciably change.

J. C. D.

Distribution of Carbon Dioxide between Cells and Plasma. L. W. SMITH, J. H. MEANS, and M. N. WOODWELL (*J. Biol. Chem.*, 1921, **45**, 245—253).—As the blood passes from the arterial to the venous side of the circulation in normal man its cells gain from 4—11 vol. % of carbon dioxide. At the same time, the corresponding gain in the plasma is only 0 to 1.8 vol. %. It is concluded that the carbon dioxide is transported mainly by the cells.

J. C. D.

Permeability of the Red Corpuscles for Amino-acids. SHUZO KOZAWA and NOBU MIYAMOTO (*Biochem. J.*, 1921, **15**, 167—170).—On the addition of isotonic solutions of glycine and histidine to whole blood, the amino-acid nitrogen of the corpuscles (estimated by van Slyke's method) shows a large increase.

This result was obtained with the blood of the ox, goat, and man, and confirms the result previously found by Costantino (*A.*, 1913, i, 1259) for ox blood.

C. R. H.

Nephelometric Estimation of Quinine in Blood. HUGH WILLIAM ACTON and HAROLD KING (*Biochem. J.*, 1921, **15**, 53—59).—The method of Ramsden and Lipkin (*A.*, 1918, ii, 251; 1919, i, 106) is criticised. It is impossible to recover the whole of quinine from blood, but with elaborate care as regards manipulation and purity of reagents a fairly constant proportion (70—80%) may be recovered and estimated. In this way it is found that serum contains about as much quinine as an equal volume of corpuscles, in opposition to the conclusion of Morgenroth, that it is preferentially fixed on the corpuscles; hence the latter's theory of the action of quinine in malaria is unfounded. One hour after taking 1 gram of quinine by the mouth, the blood of one of the authors contained 33 mg., or 3.3%, of the dose taken. This is a concentration of 1 in 150,000 or 20 millions of quinine molecules per blood corpuscle. In the following hours the concentration fell somewhat. G. B.

Calcium Metabolism. W. P. WHEELER (*New York Agric. Expt. Sta.*, Bull. 468, 1919).—Experiments with common fowls and ducks showed that magnesium does not replace calcium in the bones from which it is withdrawn for shell material, but when strontium salts are fed with rations of low calcium content, strontium replaces calcium in the bones of the mature birds.

W. P. S.

Enzyme Formation [in the Organism]. H. STAUB (*Helv. Chim. Acta*, 1921, 4, 281—287).—In order to obtain information regarding carbohydrate metabolism, the author makes use of the "blood sugar curve," obtained by determining the percentages of sugar in the blood at frequent intervals and plotting the results as ordinates against times as abscissæ. It is found that ingestion of carbohydrate is followed by enhanced assimilation of dextrose, whereas, if carbohydrate food is stopped for some time, the capacity for assimilating dextrose is depressed. These results, which are regarded as due to sufficiency or lack of what are named "assimilation enzymes," are discussed in their relation to the formation of enzymes in the human organism. T. H. P.

Comparative Metabolism of Proteins of Unlike Composition. WALTER G. KARR [with EDWARD TOLSTOI] (*J. Biol. Chem.*, 1921, 45, 289—295).—As far as is indicated by the urinary nitrogenous end-products, the metabolism of two proteins, caseinogen and wheat gluten, widely different in their chemical composition, is essentially the same. In experiment with yeast as a sole source of protein 80% of the nitrogen was assimilated, but no abnormality of the partition of urinary nitrogen was observed. J. C. D.

Effects of Heat and Aeration on Vitamin-A. FREDERICK GOWLAND HOPKINS (*Biochem. J.*, 1920, 14, 725—733).—No appreciable difference was observed in the amount of vitamin-A in samples of ground-nut oil and palm kernel oil before and after the usual refining processes. The amount present in all cases was very small. The vitamin-A displays marked resistance to heat alone at temperatures up to 120°, but is readily destroyed when heated with simultaneous aeration. This vitamin appears to be a substance prone to oxidation with resulting inactivation. J. C. D.

Vitamin-A. VI. Effect of Heat and Oxygen on the Nutritive Value of Butter. JACK CECIL DRUMMOND and KATHARINE HOPE COWARD (*Biochem. J.*, 1920, 14, 734—739).—Destruction of vitamin-A in butter occurs on heating in the presence of air. It is therefore probable that the loss is due to changes of an oxidative nature. The destruction is rapid at high temperatures, but may also occur with readiness at temperatures as low as 37°, if contact with air or oxygen is extensive (see preceding abstract). J. C. D.

The Action of Ozone on Vitamin-A in Fats. SYLVESTER SOLOMON ZILVA (*Biochem. J.*, 1920, 14, 740—741).—Exposure of butter or cod-liver oil to ozone rapidly destroys the vitamin present. This confirms the destruction by air or oxygen reported by Hopkins and Drummond and Coward (see preceding abstracts). J. C. D.

Accessory Food Factors. I. Special Nutrition Values of Different Fats. HANS ARON and RICHARD GRALKA (*Biochem. Zeitsch.*, 1921, 115, 188—203).—Feeding experiments on rats are described which confirm the presence of vitamin-A in cod-liver oil, butter, and egg-yolk and its absence in margarine. E. S.

Dielectric Constants of Biochemical Substances. RUDOLF KELLER (*Biochem. Zeitsch.*, 1921, **115**, 134—158).—A vigorous criticism of the too extensive application of the ionic theory to biology and colloid chemistry. Statical electricity has been neglected, although it is quite as important to biology as galvanic. Almost all technical insulators are of animal or vegetable origin and more attention should be paid to the dielectric constant of biologically important substances. The dependence of the sign of the electric charge on the dielectric constant of substance and medium, discovered by Coehn, is of prime importance to biology. Protein molecules and others of similar size scarcely ever react chemically, but chiefly form compounds through their electrostatic surface charge. The only experimental material contained in this paper is a table of the dielectric constants of eighteen substances. G. B.

Lecithin. IV. Lecithin of the Brain. P. A. LEVENE and IDA P. ROLF (*J. Biol. Chem.*, 1921, **46**, 353—365).—The ethereal extract of 200 ox brains yielded 400 grams of crude lecithin; part of the cerebroside was precipitated by dissolving the sample in glacial acetic acid, and addition of 10 volumes of 95% alcohol threw down kephalin from the filtrate. The final separation from kephalin is effected with cadmium chloride, and on reduction crystalline hydrolecithin is obtained. A pure product is more easily got from the acetone extract of brain.

The lecithin of brain seems to be very similar to that of egg yolk (this vol., i, 382) and contains palmitic, stearic, and oleic acids.

G. B.

Pentose Mononucleotides of the Pancreas of the Dogfish (*Squalus Sucklii*). C. BERKELEY (*J. Biol. Chem.*, 1921, **45**, 263—275).—The β -nucleoprotein of the pancreas of the dogfish contains both adenine and guanine in pentose mononucleotide combination. This β -nucleoprotein is readily broken down to its constituent mononucleotides and protein by the action of cold 1% sodium hydroxide.

The mononucleotides thus obtained are not precipitated from either neutral or acetic acid solution. The guanine mononucleotide differs in this respect from the guanylic acid previously isolated from mammalian material.

J. C. D.

Rigor Mortis in Smooth Muscle and a Chemical Analysis of Fibromyoma Tissue. EDWIN F. HIRSCH (*J. Biol. Chem.*, 1921, **45**, 297—306).—The post-operative rigor of smooth muscle is manifested by changes similar to those known in skeletal muscle as rigor mortis. The increase in acidity is accompanied by a decrease in reducing carbohydrates and of alkaline reserve. A chemical analysis of fibromyoma tissue is given.

J. C. D.

Bromine Normally Present in Animal Tissues. A. DAMIENS (*Bull. Soc. Chim. Biol.*, 1921, **3**, 95—104).—The estimations were made by Denigès's colorimetric method (A., 1912, ii, 1208). A scheme for the separation and estimation of chlorine, bromine, and

iodine is given. All normal organs contain bromine; the amount in the human lung is about 0.30 mg. per 100 grams. That of chlorine is about 260 mg. and the ratio $\text{Br}:\text{Cl}=0.00140$ obtained does not vary greatly in a large number of other human and animal organs. In dogs poisoned with benzyl bromide, bromoacetone, etc., the amount in the organs rises to 1 or even 2 mg. per 100 grams as compared with 0.40 mg. normally present, and the method has been applied in human toxicology to ascertain whether death was due to a brominated substance. In such cases the highest $\text{Br}:\text{Cl}$ ratio observed was 0.00386.

G. B.

Constituents of the Japanese Common Earth-worm. YOSHIMURU MURAYAMA and SHINJIRO AOYAMA (*J. Pharm. Soc. Japan*, 1921, 221—240).—Dried earth-worm (*Lumbricus spenceri*), now used as an antipyretic in Japan, was finely powdered and extracted with cold ether. The syrup (2.3%) left on evaporation contained free acids, esters, and 31.2% of unsaponifiable matter. The acids, both free and as esters, were stearic and palmitic acids, together with a mixture of highly unsaturated fatty acids, from which bromine compounds containing 62.67%, 63.7%, and 65.13% of bromine were prepared. The unsaponifiable matter on hydrolysis with alcoholic potassium hydroxide yielded cholesterol. The residue contained a lipoid (P 3.96%), and a mixture of amino-acids, from which leucine and valine were isolated. From another sample tyrosine was isolated, and its presence was also proved in the warm water extract from the fresh earth-worm.

K. K.

Vitamin Content of Milk. FREDERICK GOWLAND HOPKINS (*Biochem. J.*, 1920, 14, 721—724).—Confirmation is given of the author's original observations regarding the minute supplement of milk necessary to make good the vitamin deficiency of an artificial diet of pure proteins, carbohydrates, fats, and salts (*J. Physiol.*, 1912, 44, 425). The possibility of there being a seasonal variation in the vitamin content of milk, or of the growth energy of the test animals must be borne in mind.

J. C. D.

Presence in Urine of Nitrogen Not Determined by the Kjeldahl Method. W. MESTREZAT and (Mlle) MARTHE PAUL JANET (*Bull. Soc. Chim. Biol.*, 1921, 3, 88—94).—The Dumas method indicates a somewhat larger amount than the Kjeldahl-Foerster method (6.2—9.7% in the urine after purgation, 1.5—4.9% in more normal urines). This may be due to the presence of pyridine or pyrazole nuclei (compare Dakin and Dudley, A., 1914, ii, 381).

G. B.

A Human Enterolith containing Choleic Acid. HENRY STANLEY RAPER (*Biochem. J.*, 1921, 15, 49—52).—A "stone" from the jejunum, removed in a case of intestinal obstruction, weighed 6.8 grams and contained fatty acids 10.85%, neutral fat and unsaponifiable substances 5.52%, unconjugated bile acids (almost wholly choleic acid) 72.5%, food residues 8.4%, ash 1.19%.

G. B.

Glyoxalase in Avian Beriberi. GEORGE MARSHALL FINDLAY (*Biochem. J.*, 1921, **15**, 104—106).—Confirmation of the results of Dutcher (A., 1918, i, 561) that the glyoxalase content of the liver in pigeons with beriberi is less than that in control pigeons, or in pigeons cured by administration of vitamin-B. The vitamin does not act as a co-enzyme of glyoxalase. G. B.

Narcotic Action of Light Petroleum (Pentane, Hexane, Heptane, Octane). HERMANN FÜHNER (*Biochem. Zeitsch.*, 1921, **115**, 235—261).—In contradistinction to ether and chloroform, the above hydrocarbons when inhaled (by mice and rats) often cause great excitement and they soon affect the respiration adversely; benzene is an even more powerful excitant. In equimolecular concentration, benzene is a somewhat less powerful anæsthetic than chloroform; ether has only one-quarter of its activity. Hexane and ether are about equally powerful; so are heptane and benzene, octane and chloroform. In the series pentane to octane each member is about three times as active as its lower homologue and is about one-third as soluble in water. G. B.

Physiological Action of Oxalates, Citrates, and Tartrates. SHOHEI HARA (*Acta Schol. Med. Univ. Imperial Kyoto*, 1919, **3**, 213—232. See also A., 1910, ii, 434; A., 1911, ii, 1016; A., 1914, i, 1189).—The sodium salts of oxalic, citric, and tartaric acids exert a specific action in addition to their precipitation of calcium, since their toxicity is not in the ratio of their ability to precipitate calcium salts. Neither is the detoxicating action of calcium chloride measurable by the solubility of the calcium salts formed. The power of these acids to intensify the action of magnesium corresponds with their power to precipitate calcium, and is probably due to a change produced by them in the equilibrium between the ions of calcium and those of magnesium.

CHEMICAL ABSTRACTS.

The Behaviour of Formaldehyde in the Animal Body. E. SALKOWSKI (*Biochem. Zeitsch.*, 1921, **115**, 159—167).—Experiments described show that the rapid disappearance of formaldehyde from the blood after intravenous injection is due neither to combination with blood-proteins nor to the action of alkali in the blood. It is therefore concluded that it is absorbed by the organs, in the cells of which it is slowly oxidised.

Incidentally it is shown that formaldehyde will not distil from aqueous solutions containing 1% of sodium carbonate, but it passes over on acidification. Further, by boiling aqueous formaldehyde solutions containing 0.5% or 0.25% of sodium carbonate for two hours, a portion is converted into formose. E. S.

Natural Immunity of the Rabbit to Atropine. H. C. VAN DER HEYDE (*Arch. Néerl. physiol.*, 1921, **5**, 380—433).—Atropine is first bound physically by the serum of rabbits, cats, etc., is then rendered physiologically inert, and destroyed chemically. Organ press juices of the rabbit destroy atropine much more rapidly than

do those of the cat; on this the natural (cellular) immunity of the rabbit seems to depend. The substance destroying atropine is probably formed by the leucocytes. The method of analysis employed was precipitation by Mayer's reagent. G. B.
