## Physiological Chemistry.

**Surface Reactions in Living Cells.** O. WARBURG (*Z. Elektrochem.*, 1922, **28**, 70—75).—The processes of breathing and assimilation by living cells has been investigated in the case of red blood-corpuscles, and bacterial and plant cells in various circumstances. The rate of oxidation of cystine, and that of assimilation, in the presence of narcotics has been investigated, and the quantity of narcotic determined, in the case of alcohols, urethanes, ketones, nitriles, and substituted carbamides, which is necessary to reduce the assimilation by 50%. The quantity of narcotic decreases rapidly from member to member in an homologous series, thus a solution of methyl alcohol containing 5 mols. per litre cuts down the breathing and assimilation by 50%, whilst 0·045 mol. per litre of amyl alcohol has the same effect. The following hypothesis of the surface action of living cells is put forward. The surface of the solid cell constituents is to be regarded as a mosaic of regions poor in iron and rich in iron, of which those poor in iron are the most abundant. Both the metal-containing and metal-free areas adsorb dissolved substances from the cell fluids, and in general to the same extent. Hydrocyanic acid, on account of its affinity for the heavy metals, is mainly adsorbed on the metal-containing areas. Consequently the seat of the chemical processes, breathing and assimilation, is the iron-containing surface. When hydrocyanic acid is brought into a

living cell, its effect is to displace the reacting substances from the iron-containing regions and so stop assimilation and breathing. Very little hydrocyanic acid is sufficient to achieve this, since the metal-containing areas constitute only a small fraction of the whole surface. For the same reason, the displacement from the metal-containing areas leads to no noticeable reduction in the total amount of adsorbed substance. Consequently, the action of hydrocyanic acid depends on specific adsorption and displacement. Narcotics displace the reacting substances from both regions and to the same extent, and so stop breathing and assimilation, but in this case the whole surface must be covered with the displacing substance. The quantity of narcotic necessary to produce the same effect on assimilation and breathing is therefore extremely large in comparison with the amount of hydrocyanic acid. Hence it may be stated that the cause of the acceleration of reactions in living cells is the adsorption in iron-containing parts of the surface. J. F. S.

**The Rôle of Vitamins in the Chemistry of the Cell.** W. R. Hess (*Z. physiol. Chem.*, 1922, **120**, 277—280).—Polemical in reply to Abderhalden (this vol., i, 607).

**The Action of Whole Blood on Acids.** Ernest Laurence Kennaway and James McIntosh (*Biochem. J.*, 1922, **16**, 380—386).—If sulphuric acid (0·01*N*) containing 0·9% of sodium chloride be shaken with whole blood, and the mixture centrifuged, about 80% of the acid is removed, so that it is no longer titrable in the fluid. If acid be added to plasma, the amount neutralised is approximately constant for a given amount of plasma, and does not vary with the amount of acid used. On the other hand, the resulting $P_H$ in the two cases is approximately the same for a given ratio of acid to blood, the plasma showing a rather greater acidity. Laked blood does not appear to neutralise so efficiently as whole blood, and so the action of the latter seems to be due to some form of adsorption, dependent on the structure of the corpuscles. W. O. K.

**Carbonic Acid Compounds and Hydrogen-ion Activities in Blood and Salt Solutions.** Erik Johan Warburg (*Biochem. J.*, 1922, **16**, 153—340).—This comprehensive paper deals with the equilibrium of dissolved substances in homogeneous and heterogeneous media, with particular reference to the theories of Bjerrum and of Donnan. The general theoretical results are applied to elucidate the carbon dioxide equilibrium and the hydrogen-ion concentration in blood and also the development of a modified Henderson-Hasselbach equation. For the mathematical and experimental investigations and results, the original must be consulted. The paper includes valuable reviews of previous work. W. O. K.

**Calcium in the Blood of various Species of Animals.** P. Mazzocco (*Anal. Asoc. Quím. Argentina*, 1921, **9**, 313—325).—The method of Halverson and Bergeim (A., 1918, i, 50) is modified

by using trichloroacetic acid (cf. Lyman, A., 1917, ii, 271) instead of sodium picrate to precipitate albumins. An improved method of washing the precipitate of calcium oxalate by decantation is described. Data are given for the calcium content of entire blood, plasma, corpuscles, and serum for different species of animals. The calcium content of the blood constituents of the same animal species is very constant. Calcium occurs, although in small amounts, equally in nucleated and non-nucleated red corpuscles. The calcium content of plasma is practically identical with that of serum. G. W. R.

**Does Cyanic Acid Exist in the Blood ?** Maurice Nicloux and Georges Welter (*Compt. rend.*, 1922, **174**, 1733—1735).—The authors find no indication of the presence of cyanic acid either in blood or lymph in the normal state. W. G.

**Blood Sugar. II. Alimentary Hyperglycæmia under Normal and Pathological Conditions.** Max Rosenberg (*Arch. expt. Path. Pharm.*, 1922, **93**, 208—240).—A comparative analysis of the type of curves obtained by estimating the sugar of the blood at intervals after the oral administration of 100 grams of dextrose in normal individuals, in diabetes and in hyperthyroidism. C. R. H.

**Creatine and Creatinine Metabolism. IV. The Question of the Occurrence of Creatinine and Creatine in Blood.** Jeanette Allen Behre and Stanley R. Benedict (*J. Biol. Chem.*, 1922, **52**, 11—33).—In the estimation of creatinine in blood filtrates by Folin's method (A., 1914, ii, 505) the coloration produced with picric acid is due to a substance which differs from creatinine in two respects; it is not adsorbed by kaolin from acid solutions, neither is it destroyed by boiling with alkalis. The amount of chromogenic substance present in the blood increases when the kidney function is impaired, and, in this case, it is to some extent adsorbed by kaolin and destroyed by alkalis. Nevertheless, it was found impossible to isolate creatinine from such bloods, although small quantities of added creatinine were recovered almost quantitatively in the form of the zinc chloride compound. It is thus improbable that creatinine is present in blood in more than minute amounts.

The creatine content of blood is best estimated by a method similar to that used for urine (A., 1914, ii, 688). The preliminary conversion into creatinine must not be effected by heating with picric acid, since, under these conditions, picric acid reacts with blood to give a product yielding colour on addition of alkali. The blood of dogs with impaired kidney function showed a high creatine content; this suggests that blood creatine is a waste product which is eliminated by the kidney in the form of creatinine or of some other substance. E. S.

**The Relation of Salivary to Gastric Secretion.** Tomoichi Nakagawa (*Biochem. J.*, 1922, **16**, 390—393).—Boiled potato

starch inhibits the action of the pepsin and accelerates the action of the rennin of the natural gastric juice, but not after being acted on by fresh human saliva. Saliva has a delaying action of its own on the clotting of milk. W. O. K.

**Intestinal Intoxication. I. The Presence and Significance of Histamine in an Obstructed Bowel.** R. W. GERARD (*J. Biol. Chem.*, 1922, **52**, 111—124).—The presence of histamine in the fluid contained in closed loops of the large and small intestine of dogs was indicated qualitatively by its depressant action when injected intravenously in dogs, and by its action on strips of the intestine of a guinea pig. Estimations by the method of Hanke and Koessler (A., 1920, ii, 784) gave average values corresponding with 2 to 3 mg. of the dihydrochloride per 100 c.c. of fluid. Evidence was also obtained of the presence of a histamine derivative of a peptide nature. No histamine was found in the sterile secretion of jejunum, although it was present in the sterile mucosa. Loop fluid and mucosa also contain histidine. E. S.

**The Oxidising Enzymes in the Phenomena of Life in its Normal and Pathological States.** G. MARINESCO (*Bul. Soc. Chim. Romania*, 1922, **4**, 3—12).—A more detailed account of work already published (A., 1920, i, 130). W. G.

**Decomposition of Proteins of Organs.** K. THOMAS (*Festschr. K. Wilhelm Ges. Förd. Wiss. Zehnjahrigen Jubilaum.*, 1921, 205—207; from *Physiol. Abstr.*, 1922, **7**, 187).—Organ protein undergoes in the body changes which are different from those undergone by protein introduced in the food. For example, arginine is regularly formed from organ protein during minimum nitrogen excretion, whereas it is not formed from food protein. The amino-acids in the organ protein can apparently undergo chemical changes without cleavage of the peptide linking. W. O. K.

**Origin and Destiny of Cholesterol in the Animal Organism. XIII. The Autolysis of Liver and Spleen.** JOHN ADDYMAN GARDNER and WILLIAM FOX (*Proc. Roy. Soc.*, 1922, [*B*], **93**, 486—492).—The autolysis under aseptic conditions of liver and spleen is not accompanied by increase in the amount of cholesterol present. It is unlikely therefore that either of these organs is concerned with the synthesis of cholesterol in the body. C. R. H.

**The Permeability of the Glomerulus Membrane for Stereoisomeric Sugars.** H. J. HAMBURGER (*Berlin Klin. Woch.*, 1922, **1**, 418; from *Physiol. Abstr.*, 1922, **7**, 192).—The permeability of the membrane is not related to the size of molecule of the sugar, but to its configuration; thus lactose goes through although its molecule is twice the size of that of dextrose, which does not; *d*-galactose consists of α- and β-modifications, one of which passes; the other does not. The same is true for α- and β-xylose. W .O. K.

**The Influence of Adrenaline on the Permeability of the Limiting Membrane of Muscle Fibres.** HERMANN LANGE (*Z. physiol. Chem.*, 1922, **120**, 249—266).—It has been ascertained by chemical and physiological methods that adrenaline possesses the property of diminishing the permeability of the limiting membrane of the muscle fibres of the frog. S. S. Z.

**Continuous Current and Permeability (in Muscle). II. Effect of Alkaloidal Salts and Other Organic Electrolytes.** JOSEPH VORSCHÜTZ (*Pflüger's Archiv*, 1921, **190**, 54—65; from *Chem. Zentr.*, 1922, i, 3).—A continuation of work on the electrical effect of substances on muscle. Strychnine, pilocarpine, codeine, and brucine salts are electrically indifferent: atropine, cocaine, and morphine salts react electronegatively. Quinine, optochin, and caffeine salts, and to a lesser degree cinchonine salts, develop a strong continuous current. These alkaloids, which are muscle poisons, probably exert their effect on muscle by means of the free bases liberated by hydrolysis. Salts of quaternary ammonium bases, sodium salts of the lower fatty acids, sodium salicylate, and sodium benzoate are almost without effect or react slightly electronegatively. The effect is independent of the length of the carbon chain. G. W. R.

**The Physiology of Creatine.** OTTO RIESSER (*Z. physiol. Chem.*, 1922, **120**, 189—206).—Although the total creatine-content of the mixed skeletal muscles of the rabbit is always the same, those of the various muscles differ from one another by amounts depending on the rate of contraction. Parallelism exists between the creatine and the lactacidogen contents of the various muscles. This parallelism does not persist when the condition of the muscles is altered by various factors. The author cannot confirm R. Kahn's observations (*Pfluger's Archiv*, 1919, **177**, 294). S. S. Z.

**The Effect of Cold Storage on the Carnosine Content of Muscle.** WINIFRED MARY CLIFFORD (*Biochem. J.*, 1922, **16**, 341—343).—Using the colorimetric method previously described (Clifford, A., 1921, ii, 604), it has been found that the carnosine content of meat decreases during cold storage. W. O. K.

**Influence of Minute Concentrations of Acid and Alkali on the Blood-vessels and other Smooth Muscle.** PAUL HEYMANN (*Arch. expt. Path. Pharm.*, 1922, **90**, 27—76).—The existing literature dealing with the physiological action of acid and alkali on smooth muscle is reviewed at some length. A long series of experiments, performed for the most part by the perfusion of the blood-vessels of frogs or of surviving rabbits' ears, is described. The effect on the rate of flow of the perfusion fluid caused by the addition of small amounts of acid and alkali was investigated, and some experiments were also carried out on isolated strips of smooth muscle. It was found that concentrations

of acid or alkali of the order of $N/1000$ cause marked vaso-constriction; this is antagonised by sodium nitrite and by hypertonic salt and sugar solutions. The effect was obtained both with Ringer's solution and with serum as the original perfusion fluid. Simultaneously with the vaso-constriction, there appears marked œdema, the formation of which is, however, apparently dependent on the particular acid employed; those acids (sulphuric and phosphoric) which have the weakest vaso-constrictor effect produce the greatest œdema.

The constrictor effect of adrenaline is abolished or reversed during perfusion with acid fluids; it is unaffected by alkalis.

In physiological salt solution (free from calcium), lactic acid and carbon dioxide cause vaso-dilatation. Isolated smooth muscle is stimulated by small and inhibited by large concentrations of acid and alkali. Alkalis act directly on the muscle alone; acids also act on the nervous apparatus, which they first stimulate and then inhibit. C. R. H.

**Action of Muscle Tissue on Fumaric, Maleic, Glutaconic, and Malic Acids.** H. D. Dakin (*J. Biol. Chem.*, 1922, **52**, 183—189).—By the action of muscle enzymes, fumaric acid is converted into *l*-malic acid and not into *i*-malic acid, as stated by Einbeck (A., 1919, i, 467). Maleic acid, under the same conditions, gives no trace of malic acid; glutaconic acid, however, is to a small extent converted into β-hydroxyglutamic acid. When *i*-malic acid is submitted to the action of muscle tissue, the lævo-component is preferentially consumed and is converted, to some extent, into fumaric acid. The *bisphenylhydrazide* of *i*-malic acid, colourless prisms, m. p. 221—224° (uncorr.), has been prepared. E. S.

**Spontaneous Reducing Effect of Muscle on Methylene-blue. Physiology of Dehydrogenases.** Gunnar Ahlgren (*Skand. Arch. Physiol.*, 1921, **41**, 1—30; from *Chem. Zentr.*, 1922, i, 58; cf. Widmark, A., i, 600).—By the agency of dehydrogenases occurring in muscle, hydrogen is abstracted from certain substances, called hydrogen "donators," and added to methylene-blue, which is changed thereby to the leuco-base. Methylene-blue, acting as hydrogen acceptor, thus plays the same physiological rôle as oxygen. Substances which can act as hydrogen donators have specific dehydrogenases. The reducing power of muscle is estimated by determining the time required for decolorisation of known amounts of methylene-blue. The red muscle of rabbits and doves has greater reducing power than white muscle. Heart muscle has greater reducing power than skeletal muscle. Seasonal variation in reducing power of frog muscle was observed with a summer maximum and a winter minimum. Reducing power is greatest in mammalian muscle. The lowest reducing power is shown by the muscle of worms. G. W. R.

**Alligator and Crocodile Oils.** Shûmei Kobayashi (*J. Chem. Ind., Japan*, 1922, **25**, 691—703).—An alligator oil

obtained from *Alligator mississipiensis* from North America is a light yellow liquid of peculiar fishy odour ($d_4^{15}$ 0·9285 and $n^{20}$ 1·4795). Arachidonic, clupanodonic, oleic, and palmitic acids, and a new acid of the $C_nH_{2n-8}O_2$ series were detected in the saponification product of the oil. The new acid, $C_{22}H_{36}O_2$, has $n^{20}$ 1·4888 and iodine value 308·0, and on hydrogenation gives an acid of m. p. 76—76·5°. A crocodile oil obtained from *Crocodilus niloticus* from Africa is a solid fat at room temperature ($d_4^{40}$ 0·8989, $n^{40}$ 1·4602, iodine value 60·3). It is mainly composed of almost equal amounts of oleic and stearic esters, a small amount of highly unsaturated acid esters being also present. K. K.

**The Dyes from *Purpura aperta* and *Purpura lapillus*.** P. Friedländer (*Ber.*, 1922, **55**, [*B*], 1655—1658).—The dye obtained from *Purpura aperta* appears to be identical with 6 : 6′-dibromoindigotin in so far as elementary analysis, solubility, dyeing capacity, and absorption spectrum allow a judgment to be formed. A more complete comparison of the natural and synthetic products was impossible by reason of the limited amount of dye available. The dye from *Purpura lapillus* appears to be identical with dibromoindigotin, but the amount of material was too small to permit an elementary analysis. H. W.

**Comparative Spectroscopic Study of the Green Pigment of the *Chetoptera* and of the Chlorophyll of the *Ulva*.** Marc Romieu and Fernand Obaton (*Compt. rend.*, 1922, **175**, 51—54).—The spectra of chetopterin, the green pigment of *Chetoptera* and of the chlorophyll of *Ulva* coincide almost exactly, and thus indicate the relationship of the two pigments. Chetopterin is thus a pigment of extrinsic origin, which must be placed in the group of enterochlorophylls. W. G.

**The Origin of Creatine and Creatinine.** H. Steudel and R. Freise (*Z. physiol. Chem.*, 1922, **120**, 244—248).—The intravenous injection of the sodium salt of nucleic acid and of histidine in the dog did not alter the creatinine content of the urine. It was, however, observed in some of these experiments that the injection influenced the metabolic process. S. S. Z.

**Sulphohæmoglobinæmia.** A. A. Hijmans van den Bergh (*Proc. K. Akad. Wetensch. Amsterdam*, 1922, **23**, 1392—1398).—In the blood of a certain percentage of healthy rabbits and in that of human beings suffering from intestinal stasis, spectroscopic evidence is obtained of the presence of sulphohæmoglobin. Combined estimations of the available hæmoglobin by Barcroft's method and of the iron-content by the titanium method show that as much as 20% of the total hæmoglobin may be in the form of the sulphur compound. Sulphohæmoglobinæmia is not associated with the presence of demonstrable amounts of hydrogen sulphide in the blood serum. C. R. H.

**The Composition of the Scales in Psoriasis.** EMIL ABDERHALDEN and BERNHARD ZORN (*Z. physiol. Chem.*, 1922, **120**, 214—219).—On extracting 9·2742 grams of the dry scales with carbon tetrachloride in a Soxhlet apparatus 0·6894 gram was obtained of a fraction containing 0·00075 of phosphorus. The extracted residue contained 0·0233 of phosphorus. The moisture varied from 7·45 to 9·5%. The average ash content of dry scales was found to be 1·185%. The following amino-acids were established in the substance :—Alanine 4·5%, serine 0·78%, cystine 1·85%, valine 3·25%, leucine 5·25%, glutamic acid 6·5%, phenylalanine 2·32%, tyrosine 3·25%, and proline 3·05%. S. S. Z.

**The [Physiological] Action of Mercury.** WILLIAM SALANT and NATHANIEL KLEITMAN (*J. Pharm. Expt. Ther.*, 1922, **19**, 315—330).—Mercury salts produce in animals a sudden fall of blood-pressure and depression and paralysis of respiration, and in some cases profound cardiac disturbances. W. O. K.

**Pharmacological Studies on Acetone.** WILLIAM SALANT and NATHANIEL KLEITMAN (*J. Pharm. Expt. Ther.*, 1922, **19**, 293—306).—The pharmacological action of acetone is considerable, especially in inhibiting the respiration and heart-beat, and in producing fall of blood-pressure. It is particularly potent when a number of just active doses are given. W. O. K.

**Toxicity of Scatole.** WILLIAM SALANT and NATHANIEL KLEITMAN (*J. Pharm. Expt. Ther.*, 1922, **19**, 307—313).—Scatole is a toxic substance, causing depression of the circulation and of the central nervous system. W. O. K.