

ABSTRACTS

(Papers read before the Institute but not published in the Proceedings.)

THE SOURCE AND PROPERTIES OF THE ENTEROLIPOMICRON. C. B. WELD, Dalhousie University. (Read November 10, 1958). These minute particles that appear in the secretions of the small intestine have been shown to be different from chylomicrons which they resemble in appearance. They have a considerably lower lipid content and they are produced when the intestine is stimulated to activity and bear no relation to the chylomicron concentration in the blood.

The intestinal particles are separated from debris by centrifuging. The debris contains desquamated cells in varying states of degeneration and a considerable amount of mucus. The yield of the enterolipomicron particle does not parallel the yield of debris; at times there may be considerable debris and little particles fraction, whereas at other times there may be a considerable enterolipomicron yield with very little debris. Neither appear in quantity unless the loop is stimulated. The particles show a considerable sucrase activity and alkaline phosphatase activity, but negligible cytochrome oxidase and succinic dehydrogenase. On the other hand the debris shows a very slight sucrase and alkaline phosphatase activity but a definite cytochrome oxidase and succinic dehydrogenase content. Both fractions show catalase and proteinase activity. Microscope slide smears of the particles stained with methyl green and thionin suggest a high concentration within the particle of ribonucleic acid.

Sections of the mucous membrane taken before and after stimulation are now under study. Preliminary indications show that the number of goblet cells in the mucosa is reduced after a period of activity. Special staining for cytoplasmic granules and electron microscopic studies of the particles are now in progress. It is suggested that the particles are of the nature of secretory granules, secreted by the intestinal mucosa, and that they are cytoplasmic in origin.

SLIDE-RULE FOR CONVERTING PERCENTAGES TO MOLE FRACTIONS, By C. R. MASSON, Maritime Regional Laboratory. (Read November 10, 1958). A slide-rule is described for converting percentages by weight to mole fractions in multi-component systems. The slide-rule has been designed so that it may be constructed from any existing slide-rule which has an L scale and an inverted D scale on the body, a separate slide being required for each system of interest. Suitable scales are given for the components of basic open-hearth slags.

THE KRAMER PHENOMENON: THE ACTION OF A CELL-FREE EXTRACT ON THE BIOSYNTHESIS OF PENICILLINASE IN THE ABSENCE OF SPECIFIC INDUCER. By J. G. KAPLAN and M. R. POLLOCK, Dalhousie University. (Read November 8, 1958). When traces of penicillin are added to the growth medium of cells of *B. cereus*, strain 569, the culture responds by producing enormous quantities of the enzyme penicillinase whose function is the hydrolytic degradation of penicillin (Pollock). If penicillin is omitted from the medium, the basal level of this enzyme is so low as to be practically undetectable. On the other hand, cells of *B. cereus* 569H, a so-called constitutive mutant, produce maximal levels of this enzyme in absence of penicillin; addition of this substance has no effect whatever on penicillinase biosynthesis. Kramer showed that it was possible to extract from the constitutive mutant 569H a substance, or substances, which could, under certain conditions, cause the cells of 569 to produce penicillinase in the absence of the usual inducer, penicillin: this is the

Kramer phenomenon. Our experiments bear on the question of the chemical nature of the active material in the extract and on the nature of the phenomenon itself. Considerable indirect evidence, from the action of crystalline ribonuclease and the effect of purine analogues, suggest that the active principle is a specific ribonucleic acid; evidence from the incorporation of radioisotopes into the enzyme formed during treatment with the extract suggests that the phenomenon itself is a protein synthesis, and not reactivation of enzyme present in the extract, although many more data on this last question are necessary to establish total synthesis of the molecule of enzyme.

COLLAGEN OF COD SKIN. By E. G. YOUNG and J. W. LORIMER, Maritime Regional Laboratory. (Read December 8, 1958). Cod skin has been found to contain 75% collagen, 10% other protein, 2.5% peptides and amino acids, 0.5% mucopolysaccharide, 0.5% lipid, and 12% ash. After repeated extraction with mild aqueous solvents of pH 3.5-8.7 at 3 - 80°C, about 95% passed into solution. The collagen has been extracted with 0.1 M solutions of various hydroxy acids and their sodium salts at pH 3.6. It was recovered as microscopic needle-like fibrils, about $30 \times 1 \mu$, with characteristic banding. It contained 18.2% N, 0.1% hexosamine, and a distribution of amino acids identical with the collagen of cod swim bladder. The content of hydroxyproline was 8.0%. Minimum solubility occurred at pH 5.0 - 5.2. The optical rotation changed and the mutarotation was partially reversible with time and temperature. The value for S_{20}^{20} was 3.17 ± 0.10 S, measured at 6 - 9°C, and for (η) 12.9 dl. g⁻¹ at 1.4°C. From these values a particle weight of 330,000 was calculated and dimensions of 13 Å diameter and 3,000 Å length for an elongated rod of some flexibility. An irreversible decomposition into two components occurred sharply at $13^\circ \pm 0.5^\circ$.

A HIGH INTENSITY GENERATOR. By J. D. MACPHERSON, Naval Research Establishment. (Read December 8, 1958). During the course of the construction of a H St.Clair high intensity ultrasonic generator at Imperial College, considerable difficulty was met with the condenser pickup system. It was suggested that some type of simpler self maintaining oscillatory system could be used and the method described in this paper was the result of this investigation.

MICROBIAL OXIDATION OF HYDROCARBONS. By J. E. STEWART, Fisheries Experimental Station. (Read December 8, 1958). Biological oxidation of hydrocarbons has interested microbiologist for over seventy-five years. Despite this long standing interest, definitive information on this process is scarce, and the explanations of microbial hydrocarbon oxidation are inadequate today as they were during the earliest studies.

The study with which this discussion is involved was carried out at the State University of Iowa, Iowa City, Iowa. A series of enrichment cultures was set up using aliphatic paraffins as the sole carbon source. Two bacterial isolates from these cultures were selected for intensive study. One strain, when grown in the presence of decane, dodecane, tetradecane, hexadecene-1, hexadecane, hexadecanol-1, 1, 2-hexadecanediol, and octadecane, produced non-volatile esters.

The structure of some of these esters, their production, their significance and a speculative mechanism deduced from features of this work will be presented and discussed.

α -TOCOPHEROL PHOSPHATE AS A BLOOD ANTICOAGULANT AND ANTI-LIPAEMIC AGENT. By W. W. HAWKINS and S. MOOKERJEA, Maritime Regional Laboratory. (Read January 12, 1959). α -Tocopherol phosphate showed an anticoagulant effect on the blood of dogs and rabbits when given intravenously at a dosage level of 70 to 100 mg. per Kg. of body weight. The effect was of short duration. The dosage level was toxic and sometimes lethal to rabbits.

Rabbits were made hyperlipaemic by feeding them a diet of chow with added fat and cholesterol. If 100 mg. of α -tocopherol phosphate per Kg. of body weight were given one-half hour before, or if doses of 50 mg. per Kg. were given 24 hr., 17 hr., and one-half hr. before a blood sample was taken for analysis, it was found that the level of free cholesterol in the serum was lowered, and there was increased electrophoretic mobility and apparent breakdown of the β -lipoprotein. No other lipid fraction of the serum was affected.

For 20 days adult rats were fed a diet containing about 27% fat, including 0.5% cholesterol. During the last 5 days some were given twice daily intraperitoneal injections of 0.25 to 1 mg. of α -tocopherol phosphate per 100 g. of body weight, and on the 21st day, one-half hr. after another dose, blood was taken for analysis. None of the serum lipid fractions differed from those of control animals.

CORROSION OF MAGNESIUM ALLOYS CONTAINING IRON AND NICKEL. By J. H. GREENBLATT, Naval Research Establishment. (Read January 12, 1959). Magnesium alloys containing iron and nickel showed high rates of self corrosion but when these alloys were used as soluble plugs in steel structures the corrosion rate decreased markedly. Investigation of this anomaly showed that it was due to the formation of a passivating oxide film over the magnesium alloy surface. For such films to form, a certain critical anode current density must be exceeded and the electrolyte should not contain any film disrupting components. The critical anode current density for the alloys investigated appeared to be of the order of 55 ma/cm².

THE VARRENTRAPP REACTION. By R. G. ACKMAN, Fisheries Experimental Station. (Read January 12, 1959). This reaction, the conversion of oleic acid into palmitic acid by simple fusion with potassium hydroxide, was first noted in 1840. Since then several mechanisms have been proposed. It is now possible to demonstrate that this reaction takes place by a reversible prototropic reaction involving stepwise movement of the double bond, eventually to conjugation with the carboxyl group. This is the structure actually undergoing scission of the chain. Similar reactions take place on the alkali fusion of other types of unsaturated long-chain fatty acids.

MICROWAVE BREAKDOWN IN AIR AT HIGH ALTITUDES. By A. D. MACDONALD, Dalhousie University. (Read February 9, 1959). The problem of microwave breakdown near antennas of high flying craft is considered with a view to finding optimum transmission conditions. The fundamental processes of electrical breakdown in gases are described briefly. On the basis of available data in atmospheric composition, breakdown electric fields are computed for various frequencies between 100 mc/sec and 35 kmc/sec. Pulse transmission is considered and it is shown that more power may be transmitted at the higher frequencies. Values of power which may be transmitted for various pulse lengths and frequencies are calculated.

CHANGES OCCURRING IN THE FUNGAL FLORAS OF SLIME ACCUMULATIONS IN PULP AND PAPER MILLS. By D. BREWER, Maritime Regional Laboratory. (Read February 9, 1959). The accumulation of slime in pulp and paper mills is a matter of no little importance and has been the subject of numerous investigations as to the causes and the methods of control. These slimes are composed of fibres, debris, fungi, and bacteria in various proportions and vary greatly in appearance and consistency. Reports of the organisms isolated from such slimes indicate the presence of a large number of fungal and bacterial species. The predominance of either bacteria or fungi and the species present vary from mill to mill and from location to location in the same mill. This report shows that the species of fungi present in a slime at a given location can vary from sampling to sampling. In many instances the changes observed were associated with a change either in the temperature at the point of accumulation or in the fungicide used in the mill. However, sometimes under apparently the same conditions with little or no alteration in temperature, changes in the fungal floras have been observed to occur.

EFFICIENCY OF CERTAIN SIMPLE ELECTRICAL FILTER CIRCUITS. By P. G. KENNEDY, Nova Scotia Technical College. (Read February 9, 1959). This paper relates to the detection of a pulsed signal received upon a background of noise. In a paper presented to the Nova Scotian Institute of Science in 1957 by M. R. McKay and H. S. Heaps it was shown that a theoretical analysis could predict the value of the greatest signal-to-noise ratio obtainable by the use of any linear filter. By signal-to-noise ratio was meant the ratio of signal energy to noise energy present in a finite time sample of the filter output.

The present paper describes three simple types of electrical filter, namely the third-order Butterworth, Tehebycheff, and Bessel filters. The properties of each may be described in terms of a single parameter. It is shown that in each case there is a proper choice of filter parameter that leads to signal-to-noise ratios within a few percent of the theoretical maximum.

DEGRADITIVE STUDIES ON λ -CARRAGEENIN. By K. MORGAN, Atlantic Regional Laboratory. (Read March 9, 1959). Carrageenin, the commercially important mucilage present in some red algae, is now known to contain two main components. One of these, K-carrageenin, is responsible for the gelling properties of the mucilage, and its principal structural features have previously been determined.

Up to the present, the nature of the other component, λ -carrageenin, has been rather obscure. In a recent re-examination, λ -carrageenin was subjected to partial acetolysis. A new disaccharide, identified as 3-O- α -D-galactopyranosyl-D-galactose, and a new trisaccharide, provisionally identified as O- α -D-galactopyranosyl-(1 \rightarrow 3)-O- α -D-galactopyranosyl-(1 \rightarrow 3)-D-galactose, were isolated. Periodate oxidation studies were also carried out, and showed the presence of more than one type of linkage in the polymer.

The structure of the polysaccharide is discussed in the light of this new evidence.

SOME ASPECTS OF WOOD CHEMISTRY. By T. J. PAINTER, Atlantic Regional Laboratory. (Read March 9, 1959). About 150 years ago, wood was believed to be a homogeneous chemical substance, but since

that time it has come to be recognized as a very complex system of high-polymeric substances. The development of the concepts of cellulose, hemicellulose, lignin, and pectic material is traced from the early discoveries of Braconnot, Payen, and Schulze up to the present time. The distribution of these components in and around the cells is described, and some modern views of their chemical structure are presented. The question whether cellulose is uniform throughout Nature is discussed in the light of recent research into the origin of mannose residues in softwoods.

SPECTROFLUORIMETRIC ANALYSIS OF SKIN IN VIVO. By J. A. McCARTER, Dalhousie University. (Read April 6, 1959). A method has been developed which permits the determination of the emission spectrum of fluorescence of minute quantities of carcinogenic hydrocarbons in the skin of the living mouse. The method makes use of the spectrofluorimeter previously described by McCarter, and the Beckman ratio recording Spectrophotometer. Applications of the method will be described.

MICROWAVE BREAKDOWN IN XENON AND KRYPTON. By G. F. O. LANGSTROTH and A. D. MACDONALD, Dalhousie University. (Read May 11, 1959). The electric fields required to initiate an electrical discharge through pure xenon and pure krypton have been measured at 2300 Mc/sec in a pressure range from 0.1 to 100 mm. of mercury. The experimental method is outlined and the details of an ultrahigh vacuum system are presented. Pressure measurements are discussed. The electric fields for breakdown have been observed to vary with pressure from 200 to 1000 volts/cm. and conclusions are drawn regarding the effects of traces of impurities upon the breakdown fields.

INTERACTION BETWEEN KINETIN AND INDOLE ACETIC ACID IN THE CONTROL OF BUD REACTIVATION IN *Splachnum ampullaceum* (L.) Hedw. By K. E. VON MALTZAHN, Dalhousie University. (Read May 11, 1959). Apical dominance in lateral bud reactivation and basal regeneration have been found in the gametophore of this moss. These effects of the apical region can be replaced by means of the application of proper concentrations of Indoleacetic acid to the tips of decapitated gametophores. Simultaneous application of Kinetin and Indoleacetic acid to the tips of decapitated plants shows that Kinetin counteracts the inhibitory effects of auxin on bud reactivation while it does not counteract the effects of auxin on basal regeneration. It appears, therefore, that these two systems of correlation are not mediated by the same mechanism.

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