ABSTRACTS

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

THE SPONGE FISHERIES OF THE WEST INDIES. H. H. Brown, Director of the Sponge Fisheries Investigation of the Bahamas. (Read October 23, 1941). The Sponge Fisheries, the main staple industry of the Bahamas had progressively fallen from a £150,000 to a £60,000 annual business. The oceanographic and biologic investigations undertaken are described. Sponge culture methods and relief from overfishing seemed to be well on the way to improve the industry when a sudden, quite unexpected, fungus epidemic destroyed some 90% of the sponges not only of the Bahamas but also of Cuba, the Honduras, and to a less extent of Florida. It will be many years before the few remaining, resistant sponges, can multiply to commercial numbers.

POTASSIUM CHLORIDE HAEMOLYSIS. H. Davson, Dept. of Physiology, Dalhousie University, Halifax, N. S. (Read November 10, 1941). The haemolysis of the dog erythrocyte in isotonic solutions of potassium salts has been investigated to see whether the destructive action of the salts is a chemical effect on the cell membrane similar to that of other haemolytic agents such as saponin, or whether it is due to the osmosis of water into the cell following the penetration of potassium. An excellent correlation between the permeability of the cells to potassium and the rate of haemolysis in different solutions of potassium salts suggested that the latter hypothesis was correct. It was shown, however, that although potassium enters the cells, sodium leaves them at about the same rate so that the postulated osmotic pressure difference required to cause haemolysis is apparently not established. This contradiction was resolved by showing that in potassium chloride solution the cells fall into two classes; about half of which are virtually impermeable to sodium but permeable to potassium, and it is these cells which haemolyse in potassium chloride solution; the remaining half is permeable to potassium and impermeable to sodium, and hence these cells shrink and therefore do not haemolyse. Thus, although the average osmotic pressure of the cell contents remains unchanged, half the cells undergo an increase in this osmotic pressure sufficient to cause haemolysis, whilst the remaining half show a corresponding decrease.

The division of the cells into these two classes is brought about by the following circumstances: swelling of the cells causes them to become impermeable to sodium; shrinking of the cells causes them to become impermeable to potassium. (Submitted for publication in full to Am. J. Physiol.).

ON THE CARBOHYDRATE METABOLISM OF CERTAIN BACTERIA CAUSING DECOMPOSITION OF FISH. G. J. Sigurdsson, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read November 10, 1941). The fermentation of glucose and lactate by "resting" cells of trimethylamine oxide reducing bacteria has been studied. The principal products of glucose fermentation are in general lactic acid, acetic acid, formic acid, ethyl alcohol and carbon dioxide. The proportons of these vary, and sometimes carbon dioxide is absent. Most of the cultures produce small amounts of acetyl-methyl carbinol from glucose. Much more lactic acid is produced when the reaction of the medium is acid, and there is a corresponding variation in the other products.

The chief metabolic product of lactate is carbon dioxide, but in a few cases some acetic or formic acid is also formed. 2.6 to 5.8 millimoles of trimethylamine oxide are reduced for every millimole of lactate fermented. In the fermentation of glucose reduction of the oxide is much less. (Published in full in J. Fish. Res. Board Canada, **VI**:(1). 1942).

STEROIDS IX. THE METABOLISM OF THE CORPUS LUTEUM HORMONE, PROGESTERONE. R. D. H. Heard and M. M. Hoffman, Dept. of Biochemistry, Dalhousie University, Halifax, N. S. (Read December 8, 1941). To gain insight into the course of metabolism of progesterone, a chemical study has been made of the fate in the rabbit of this luteoid, administered alone and concomitantly with the ovarian follicular hormone, L-estradiol. (Submitted for publication in full to J. Biol. Chem.)

THE PHOSPHORUS CONTENT OF LOBSTER BLOOD AND MUSCLE. A. Hollett, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read December 8, 1941). Estimates of inorganic and organic phosphorus were made on the blood and muscle of lobster during the pre-molt, intermolt and post-molt periods. The concentration of phosphorus in the blood was highest immediately preceding the molt, and lowest following it. No corresponding changes were observed in the phosphorus content of the muscle.

OBSERVATIONS ON STERILE COD LIVERS. W. W. Johnston and A. J. Wood, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read December 8, 1941). The slow development of free fatty acids in the oil from sterile cod livers has been observed. In the absence of bacteria the origin of these fatty acids must be sought in enzymatic activity. Any agent devised to suppress the development of free fatty acid in cod livers must combine the qualities of an enzyme paralytic and a bactericide.

FOOD PREFERENCES AND CONSUMPTION OF FAMILIES WITH LOW INCOMES IN HALIFAX, N. S. E. G. Young, Dept. of Biochemistry, Dalhousie University, Halifax, N. S. (Read January 19, 1942). The data obtained in the dietary survey of the Canadian Council of Nutrition carried out in Halifax in 1939-40 have been re-examined to determine the consumption per person per week of the most important foodstuffs as purchased. These results have been compared with similar data available from studies in The United States and Great Britain and in relation to total income and food expenditure. The consumption of butter, eggs, milk, cheese, fish and meat were most notably contracted by falling expenditure. Bread and potatoes were independent and relatively constant. Other dietary items with the exception of sugar did not show a consistent relationship. (Published in full in Can. Pub. Health Journal 33: (10): 180-5. 1942).

THE PENETRATION OF SUGARS INTO THE AQUEOUS HUMOUR OF THE EYE. C. B. Weld and W. H. Feindel, Dept. of Physiology, Dalhousie University, Halifax, N. S. (Read January 19, 1942). In a study of the permeability of the membranes separating the aqueous humour of the eye from the blood, xylose, glucose, sucrose, and raffinose were injected intravenously into dogs to maintain the blood sugar level at two or three

times the normal value. The sugars were determined by the Hagedorn and Jensen method on specimens of aqueous and blood taken before and at a desired time after injection. Raffinose and sucrose were determined by taking the difference between the reducing values of the hydrolyzed and non-hydrolyzed samples. When the ratios of the increase of the concentration of a sugar in aqueous humour to the increase in serum are plotted against the time, the resulting curves indicate that the initial time of penetration and the subsequent increase of the four sugars in the aqueous humour are inversely related to their molecular size.

Xylose showed the most rapid rate of penetration with an increase in the concentration ratio of 25% at three minutes. Glucose, reaching a value of 25% at ten minutes, was slightly slower. Sucrose gave a value of 6% for the concentration ratio at thirty minutes, and over a period of six hours rose to no higher than 35%. Raffinose showed the slowest rate of penetration with a possible increase of 2% (within the limit of the experimental error) at one hour and of 4% at the end of three hours, hence representing about the limit of the size of molecule able to pass through the blood-aqueous membranes.

The relative impermeability of the blood-aqueous barrier to raffinose, with a molecular weight of 504, provides a structural basis for the validation of some secretory activity being imposed upon the primary process of filtration in the formation of the aqueous humour, since the intercellular pores are indicated to be of sufficiently small size to prevent back-diffusion of the secreted substances. (Published in full in Am. J. Physiol., (in press)).

STEROIDS X. THE METABOLISM OF THE OVARIAN FOLLICULAR HORMONE. W. S. Bauld and R. D. H. Heard, Dept. of Biochemistry, Dalhousie University, Halifax, N. S. (Read January 19, 1942). Based on biological and colorimetric assays of the "weakly" and "strongly" phenolic fractions of the urine of normal and hysterectomized rabbits and women, Pincus, and Smith and Smith have elaborated the widely accepted hypothesis that the conversion of the follicular hormone, α-estradiol, to the urinary excretory product, estriol, takes place in the uterus under the influence of progesterone.

To test the hypothesis, a study has been made of the fate in the normal and hysterectomized rabbit of α-estradiol, administered alone and concomitantly with progesterone. In all cases, β-estradiol and estrone were found to be the main excretory products, which occur in the proportion of 4-5 to 1. Thorough exploration of the urine by systematic fractionation and chromotographic analysis failed to reveal the presence of estriol. That the conditions of processing of the urine permit of the isolation of estriol was shown by the recovery of 29.6 mg. after injection of 300 mg. The question of the metabolism of the estrogens is discussed in the light of this confliction of clinical and chemical findings. (Submitted for publication in full to J. Biol. Chem.)

STEROIDS XI. THE ISOLATION OF A WATER SOLUBLE, ETHER INSOLUBLE CONJUGATED ESTROGEN FROM THE URINE OF α-ESTRADIOL-INJECTED RABBITS. W. S. Bauld, R. D. H. Heard, and M. M. Hoffman, Dept. of Biochemistry, Dalhousie University, Halifax, N. S. (Read February 16, 1942). In part IX of this series, it was demonstrated that, in the rabbit as in the human, pregnane-3(α), 20(α)-diol represents the urinary excretory product of the corpus luteum hormone progesterone.

In an effort to ascertain the nature of conjugated pregnanediol excreted, the Venning and Browne procedure for the isolation of sodium pregnanediol glucuronidate was applied to the urine of adult estrous rabbits receiving α-estradiol and progesterone. No pregnanediol glucuronide was obtained, but rather a water soluble, combined estrogen.

The conjugate, m.p. 270°, C-56.8%, H-7.27%, was non-phenolic but gave all colour reactions characteristic of β-estradiol. It failed to reduce Benedict's solution, and to exhibit the naphthoresorcinol test for glucuronides; the presence of sodium and the absence of nitrogen, sulphur and phosphorus was established. On acid hydrolysis, a reducing sugar which showed a positive naphothoresorcinol reaction was set free together with the steroid moiety, m.p. 223°, which proved to be non-phenolic. It is therefore tentatively suggested that the conjugate is the sodium salt of a 3-ether of β-estradiol-17-glycuronide. (Submitted for publication in full to J. Biol. Chem.)

"Putty" Spoilage of Salt Fish. W. J. Dyer, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read February 16, 1942). It has been shown that this type of spoilage is the result of holding fish at high temperatures for a time sufficient to allow penetration of bacteria into the deep tissues. These bacteria initiate decay before the salt reaches that area in a concentration high enough to stop bacterial action.

The Origin and Histology of Bordeaux Spray Russeting on the Apple. Hugh P. Bell, Dept. of Biology, Dalhousie University, Halifax, N. S. (Read February 16, 1942). Apple trees of the McIntosh Red variety were sprayed at about the time of full bloom in 1939 and 1940. The origin and structure of the resultant russet tissue is described. The first apparent injury is a browning of the epidermal cells at the base of the hairs. The growth of these browned cells is inhibited and, owing to this, cracks occur as the fruit enlarges. Adjacent hypodermal and cortical tissue is exposed and killed. Cork cambiums and cork are formed in the cortex. This cork is different in origin from normal russet cork, which originates in the epidermis. The further enlargement of the fruit causes the cracks to multiply, extend tangentially, and deepen. All tissues external to the innermost point of fissure penetration become killed. The final scurf-like patches of scar tissue are a mixture of dead epidermis, hypodermis, cortex, cork, and cork cambiums. This scar tissue is not true cork. (Published in full in Can. J. Research, C, 9: 493-499. 1941).

The Mouse Adrenal Gland I. Observations on Early Development, Degeneration and Regeneration of the X-zone. M. K. McPhail and H. C. Read, Dept. of Pharmacology, Dalhousie University, Halifax, N. S. (Read March 18, 1942). A histological study of the late pre-natal and early post-natal life of the X-zone has been made. The effect of pregnancy and lactation on the involution of the zone has been examined as well as its regeneration following pregnancy. Regeneration of the gland following enucleation and transplantation has also been studied in the immature animal. (Submitted for publication in full to Anat. Record).

A Form of Membrane Catalysis. Hugh Davson, Dept. of Physiology, Dalhousie University, Halifax, N. S. (Read March 18, 1942).

The erythrocyte of the cat is permeable to both sodium and potassium; in accordance with the general theory of permeability of lipoid membranes the permeability of the cell membrane to sodium should be less than that to potassium; however this is not the case in the present instance since the membrane permeability to sodium is on the average five times greater than that to potassium. Moreover it has been found that the effects of a large number of environmental influences on permeability are markedly different according as sodium or potassium permeability is being studied; thus narcotics inhibit sodium permeability but accelerate potassium permeability. The clue to the interpretation of these findings is given by the effects of pH and temperature on the two permeability processes; it is found that sodium permeability is optimal over the physiological pH and temperature ranges (pH 7.4-7.6 and 35-40° C.), whereas potassium permeability shows no such phenomenon. It is concluded that there is present in the membrane an enzyme-like factor which reduces the activation energy necessary for a sodium ion to possess before it can penetrate the membrane; this factor is apparently specific for sodium so that the penetration of potassium is not catalysed and is therefore much slower than that of sodium.

THE RELATIVE RATE OF REDUCTION OF TRIMETHYLAMINE OXIDE AND SODIUM NITRATE BY CERTAIN FRESH FISH SPOILAGE BACTERIA. G. J. Sigurdsson, W. J. Dyer and A. J. Wood, Atlantic Fisheries Experimental Station, Halifax, N. S. (Read April 13, 1942). Trimethylamine oxide and the nitrate ion are both activated by certain bacteria as hydrogen acceptors with consequent reduction to trimethylamine and to nitrite. It has been found, that with certain bacteria, when both compounds are present in the growth medium, the nitrate is reduced without any measurable activation of the trimethylamine oxide despite the fact that the same cultures are known to activate both compounds when they occur singly in the substratum. With other cultures the opposite is true. That is, the trimethylamine oxide is reduced without activation of the nitrate. This sparing action of one compound on the reduction of the other is difficult to interpret on the basis of the normal concept of oxido-reduction. (Submitted for publication in full to J. Fish. Res. Bd. Can.)

THE MOUSE ADRENAL GLAND II. SENSITIVITY OF THE X-ZONE TO VARIOUS HORMONAL SUBSTANCES. M. K. McPhail and H. C. Read, Dept. of Pharmacology, Dalhousie University, Halifax, N. S. (Read April 13, 1942). A.P.L. and P.M.S. hormones caused degeneration of the X-zone of the adrenal gland in intact immature male and female mice. That they act via the gonads is shown by their complete inactivity in the castrate. Similar results were obtained with urine of pregnancy (human). A.P.L. in the few tests made, caused degeneration of the X-zone in adult females.

Oestrone administration in the immature male and female was followed by a disappearance of the X-zone. In the adult female it produced a ring of degeneration in the cortex between the X-zone and the zona fasiculata, the latter being predominately involved. In the adult male the ring of degeneration borders the medulla (the X-zone being absent). Administration of progesterone and desoxycorticosterone acetate were without effect. Gradual regeneration of the X-zone occurred following its destruction by A.P.L. and testosterone propionate. (Submitted for publication in full to Anat. Record).