Preparation of Methyl *d*-Galacturonide

A PRACTICAL method for the preparation of methyl *d*-galacturonide from the commercially available polygalacturonide derived from citrus pectin [1] has been developed in my laboratory by Mr. Sam Morell.

On heating this polygalacturonide $(C_6H_8O_6)_n$ with absolute methyl alcohol containing dry hydrogen chloride, the glycosidic linkages are partially severed and the simultaneous formation of the methyl ester of methyl *d*-galacturonide occurs. The latter crystallises as the monohydrate, $C_6H_{11}O_5COOCH_3 . H_2O$, m.p. 138-140°; $(\alpha)_D^{25} = +124{\cdot}1$ in water where *c* may vary from 1-4 per cent; no mutarotation. The methyl ester can be converted in excellent yields over the barium salt $(C_6H_{11}O_5COOBa\frac{1}{2})$ to methyl *d*-galacturonide which crystallises as the dihydrate $C_6H_{11}O_5COOH . 2H_2O$, m.p. 112-114°; $(\alpha)_D^{25} = +127{\cdot}6$ in water where *c* may vary from 2-3 per cent; no mutarotation. In a private communication, Prof. Felix Erlich, of Breslau, Germany, has informed me that the polygalacturonide used in these experiments is identical with the tetragalacturonide "– a" $C_{20}H_{28}O_{16}(COOH)_4$ that he isolated first from beet pectin and afterwards from the pectin of various fruits.[2] The details of this work will be published elsewhere.

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[1] Link, K. P., and Dickson, A. D., *J.B.C.*, **86**, 491; 1930. Link, K. P., and Nedden, R., *ibid.*, **94**, 307; 1931.
[2] Erlich, F., and Schubert, F., *Biochem. Z.*, **168**, 263; 1926: **169**, 13; 1926: **212**, 162; 1929. Also, *Ber.*, **62**, 1975; 1929.

Prolongation of Pregnancy

RECENT experiments upon rats demonstrate that pregnancy can be prolonged by 4-10 days by any of the following treatments: implantation of anterior pituitary tissue (cattle), the injection of an alkaline extract of that gland, and of extracts of human pregnancy urine prepared by precipitation with barium-alcohol and/or phosphotungstic acid. Judged by the maternal weight curve, full development of the fœtus was reached at normal term, but the birth mechanism failed. Where pregnancy was prolonged for more than $3\frac{1}{2}$ days, the fœtuses were invariably still-born; in several instances parturition was protracted for 12-70 hours. Since the ovaries of such animals were found, on biopsy, to be highly luteinised, prolongation was thought to be due to the persistence of the corpora lutea formed as the result of the treatment administered. Such was the view of Teel [1] and of Levin, Katzman, and Doisy.[2] There are, however, certain indications that another factor besides the corpus luteum is concerned in maintaining the conditions of pregnancy.

(1) Expulsion of a part of the uterine contents occurred in animals the ovaries of which were highly luteinised and in which no enlarged follicles were found on histological examination. The same ovarian structure was associated, in other cases, with a continuance of pregnancy.

(2) In 2 rats in which pregnancy had already been experimentally prolonged by 2 days, laparotomy showed the ovaries to be a mass of large follicles with no corpora lutea present; in one, 8 live fœtuses were *in utero*; in the other, parturition did not take place until 46 hours later. In a third rat in which this ovarian condition was observed at term, pregnancy continued for 5 days (until the 27th day) and the maximum weight of the mother was reached on the 26th day.

(3) Pregnancy continued for 3, 4, and 5 days respectively after both ovaries had been removed on the 22nd day of pregnancy (that is, normal term) in 3 rats which had been injected with a gonadotropic extract of human pregnancy urine; and underdeveloped fœtuses were born on the 21st and 23rd days in a rat similarly injected and bilaterally ovariectomised on the 16th day of pregnancy. Two others littered 46 hours and 55 hours respectively after ovariectomy.

The evidence suggests that a factor exists which may act upon the uterus independently of the ovaries, and preliminary experiments point to its origin in the anterior pituitary. An extract rich in growth hormone, prepared after the prescription of Van Dyke [3] and held by the latter to be free of gonadotropic hormone, caused pregnancy to be prolonged 4-6½ days when administered on or after the 11th day. It is to be noted that Schockaert [4] reports an effect on testicular development in the male duck and, in our own controls, when the growth hormone from as much as 2 grams of anterior lobe tissue was injected, numerous blood points formed in the ovaries of immature *mice*, but was without macroscopic effect on the ovaries of immature rats. This amount caused a prolongation of pregnancy in rats, as described. On the basis of the rat-unit being equivalent to 4 M.U. (Laqueur and de Jongh [5]), the effect on the pregnant rat was obtained at a lower level than that at which the immature mouse ovary reacted. The 4 : 1 ratio has, however, been disputed by d'Amour, Gustavson *et al.*[6] and by Coward and Burn [7]; it is, therefore, worthy of note that even 4 M.U. (taking a 'mouse unit' as the amount which produces blood points in the ovaries of immature mice weighing 8-10 gm.) of concentrated pregnancy urine extract did not prolong pregnancy in the rat. Yet further experiments are necessary before it can be stated that the factor responsible for the failure of the birth mechanism was not that which gave rise to the typical ovarian reaction; such experiments are being carried out. Since the existence of growth hormone in human pregnancy urine has been denied (Evans and Simpson [8]), this factor appears to be precluded.

At the present stage of the experiment, the indications are in favour of the existence of some substance, possibly in the anterior pituitary, and probably identical with neither gonadotropic nor growth hormone, which exerts an inhibiting effect upon uterine motility. That such may be the *modus operandi* of the unknown substance is indicated by Reynolds,[9] who induced a state approximating to complete quiescence in the œstrin-activated uterus of castrated rabbits by a single intravenous injection of pregnancy urine extract.

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[1] Teel, *Amer. J. Physiol.*, **79**, 170; 1926.
[2] Levin, Katzman, and Doisy, *Proc. Soc. Exp. Biol. and Med.*, **28**, 873; 1930–31.
[3] Van Dyke and Wallen-Lawrence, *J. Pharm.*, **40**, 413; 1930.
[4] Schockaert, *Anat. Rec.*, **50**, 389; 1931.
[5] Laqueur and de Jongh, *J. Amer. Med. Assoc.*, **91**, 1169; 1928.
[6] Becker, Mellish, d'Amour, and Gustavson, *J. Pharm. Exp. Ther.*, **43**, 693; 1931.
[7] Coward and Burn, *J. Physiol.*, **63**, 270; 1927.
[8] Evans and Simpson, *J. Amer. Med. Assoc.*, **101**, 1337; 1928.
[9] Reynolds, *Amer. J. Physiol.*, **100**, 545; 1932.

Nuclear Magnetic Moments

As a possible explanation of the anomalous $g(I)$ factors of nuclear magnetic moments found in heavy and in light elements respectively by McLennan, McLay, and Crawford,[1] and by me,[2] it was suggested in both these papers that an orbital motion of some of the nuclear protons might fit the observed facts.