uronic acids[3] has made possible the synthesis not only of conjugated uronides but of aldobionic acids as well.

The synthesis of the β-heptacetyl methyl ester of the aldobionic acid, glucose-6-β-glucuronide, has been accomplished by condensing 1, 2, 3, 4-tetracetyl-β-glucose[4] with 1-bromo-triacetyl-glucuronic acid methyl ester in chloroform solution in the presence of silver oxide. The derivative is obtained in yields of 30 per cent. as a crystalline substance melting at 198–199° (uncorrected) and having a specific rotation in chloroform of $[\alpha]_D^{23} = -11.0°$ (C = one per cent.). (Found: C, 48.40; H, 5.48; OCH_3, 4.64; $COCH_3$, 46.1).

The β-heptacetyl methyl ester was converted into the α isomer by the action of zinc chloride in acetic anhydride solution. The α-heptacetyl methyl ester melts at 201–202° (uncorrected) and has a specific rotation in chloroform of $[\alpha]_D^{23} = +48.4°$ (C = 0.7 per cent.). (Found: C, 48.78; H, 5.58; OCH_3, 4.62; $COCH_3$, 45.4). The difference in molecular rotation of the α and β isomers is equal to 39,500 degrees, a value which is in good agreement with the known differences in molecular rotation of the α and β sugar acetates.

Since the aldobionic acid, glucose-6-β-glucuronide, can be regarded as the uronic acid derived from gentiobiose, the synthetic product described above may be designated as the heptacetyl methyl ester of gentiobiuronic acid. The latter substance is isomeric with the heptacetyl methyl ester of the aldobionic acid derived from the specific polysaccharide of Type III Pneumococcus. The application of analogous synthetic procedures should eventually make possible the preparation in the laboratory of aldobionic acids identical with those elaborated by encapsulated microorganisms in the production of their type-specific polysaccharides.

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[3] W. F. Goebel and F. H. Babers, *Jour. Biol. Chem.*, 111: 347, 1935; S. Morell, L. Baur and K. P. Link, *Jour. Biol. Chem.*, 110: 719, 1935.

[4] B. Helferich and W. Klein, *Ann. Chem.*, 450: 219, 1926.

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EXOGASTRULATION IN AMPHIBIA AFTER X-RAY EXPOSURE

THE following observations were made in the course of our studies upon regeneration and development as affected by irradiation. These investigations have been in progress for some years assisted by the Committee on Radiation of the National Research Council. In view of their general interest and because we have found no record of exogastrulation produced by x-rays, either in Amphibia or other groups, this note seems justifiable before histological study of the extensive series in hand and before completion of the further experiments now being conducted.

The exogastrulae, which are similar to those described by Holtfreter,[1] have been obtained by exposing blastulae to 1000 r, no filter, and allowing them to develop in tap water. Almost 100 per cent. exogastrulation has been observed after 1000 r, with about 50 per cent. exogastrulation following 500 r. Four series of Amblystoma, two of Rana and one of Bufo have given the same results. These exogastrulae live for only a few days and do not undergo extreme constriction at the blastopore region, as described by Holtfreter. Further experiments with reduced exposures are under way, and it is hoped that viable exogastrulae can be produced.

Control series in tap water included no exogastrulae. Other controls were placed inside the x-ray chamber under lead plates to test the effects of high concentrations of ozone generated by the x-ray machine. No abnormalities have been noted in the subsequent stages of blastulae thus exposed to ozone but protected from x-rays.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A PHOTOKYMOGRAPHIC METHOD WITH CONTINUOUS CATHODE RAY OSCILLOGRAMS[1]

THE method presented was developed during studies of action potentials from the nervous system. It gives photokymographic records of the cathode ray oscillogram, black, and other signals, white, on a gray background with coordinates of time and amplitude.

These have been obtained (4/10 actual size) on bromide paper moving vertically in a recording camera, fitted with a photographic lens of large aperture (F/1.2–5 cm focal length), set (11.5 cm) in front of the screen of the cathode ray oscillograph. On this the fluorescent spot moves horizontally in response to potentials impressed on the corresponding plates.

In the same focal plane tangent to the screen, just below the spot, is mounted a flat, horizontal strip of white, unglazed paper, illuminated by a washlight to

[1] J. Holtfreter, *Biol. Zentralblatt*, 53: 404–431, 1933.