a few moments of refluxing, 5 ml. more of acid and 10 ml. of acetone were added and heating was continued for one hour. Then 1 ml. of 5 *N* sulfuric acid and 24 ml. of acetone were added and the solution refluxed for one and one-half hours. The acid was then removed with barium carbonate, and the solution evaporated to dryness *in vacuo*. The residue crystallized and after recrystallization from absolute ether 670 mg. of crystals was obtained; m. p. 93–94°, sp. rot. −39° (*c* 1, chloroform); −31° (*c* 1, water).

Anal. Calcd. for $C_{14}H_{20}O_6$ (284.3): C, 59.14; H, 7.09; OCH_3, 21.83. Found: C, 59.08, 59.19; H, 7.15, 7.19; OCH_3, 22.2.

The position of the methyl groups in this substance (and from this the position of the benzylidene group in the parent substance) was established by hydrolyzing and oxidizing 100 mg. of the substance for four hours at 70–75° with 2 ml. of concentrated nitric acid and 2 ml. of water. Most of the nitric acid was removed by repeated evaporation *in vacuo* with added water. A mixture of nitrophenols was removed by dissolving the sirupy residue in water and extracting with ether. After evaporating the aqueous solution to dryness the residue was esterified by heating in a sealed tube with 1 ml. of hydrogen chloride in methanol (1.25 *N*). The acid was removed with ethereal diazomethane, the solution was evaporated in a current of air, and the residue was distilled in a micro-distillation outfit at 0.2 mm. with a bath temperature of 90–120°. The ester lactone would not crystallize but on treatment with 2 ml. of methylamine in methanol (1 *N*) for two days at roo temperature it yielded the crystalline bismethylamide of 2,3-dimethylmucic acid. The yield of amide after recrystallization from ether was 10 mg., its m. p. was 182–183° not depressed by mixing with an authentic sample. Its specific rotation was −8° (*c* 0.5, water).

An authentic sample of the bismethylamide for comparison with the above substance was prepared from 318 mg. of methyl 2,3-dimethyl-4,6-benzylidene-*β*-D-galactoside[6] by hydrolyzing and oxidizing with nitric acid in the manner described above. In this instance crystalline methyl 2,3-dimethylmucate lactone (1,4) was obtained from the distillate. Recrystallization from ether gave 56 mg. of substance of m. p. 72–74° (capillary tube or Fisher–Johns) not changed by recrystallization from a mixture of ethyl acetate, ether, and petroleum ether; sp. rot. −54° changing slowly to −7° in water twenty-nine days; bismethylamide, m. p. 184°, sp. rot. −8° (water).

Luckett and Smith[7] have reported a melting point of 92° for methyl 2,3-dimethylmucate lactone (1,4). The present compound may represent a different crystal modification for its melt, on inoculation with an authentic specimen supplied by Professor Fred Smith, crystallized immediately and remelted at the higher temperature. The melting point and rotation of the bismethylamide and the rotation of the lactone ester are in good agreement with the values reported by Luckett and Smith.

Phenyl 2,3-di-N-phenylcarbamyl-4,6-benzylidene-*β*-D-galactoside was prepared from 9 g. of phenyl benzylidene-*β*-D-galactoside dissolved in 40 ml. of dry pyridine. Eight ml. of freshly distilled phenyl isocyanate was added; and after the solution had refluxed for one-half hour another 8 ml. of phenyl isocyanate was added and refluxing was continued for one and one-half hours. The volatile material was removed *in vacuo*, finally at a temperature of 100°. The residue crystallized from alcohol and after recrystallization melted at 209°, sp. rot. +47° (*c* 0.67, acetone).

Anal. Calcd. $C_{33}H_{30}O_8N_2$ (582.59): C, 68.03; H, 5.19; N, 4.81. Found: C, 68.22, 67.87; H, 5.20, 5.33; N, 5.26 (av. of 3 Dumas), 5.07 (av. of 4 micro Kjeldahls).

Phenyl 2,3-dibenzyl-4,6-benzylidene-*β*-D-galactoside was prepared by stirring 12 g. of phenyl diacetylbenzylidene-*β*-D-galactoside in 180 ml. of xylene with 18 ml. of benzyl chloride and 90 g. of powdered potassium hydroxide on the steam-bath for four hours. The product was recovered by pouring into water and steam distilling until free of volatile materials. The water insoluble residue was rebenzylated as before. The product from the second benzylation crystallized poorly from alcohol, isopropanol, or acetone–petroleum ether. It melted not sharply at about 185–195°, sp. rot. −10° (*c* 1.8, chloroform) and numerous analyses were slightly low in carbon and high in hydrogen. A typical analysis is given.

Anal. Calcd. $C_{33}H_{32}O_6$ (524.59): C, 75.55; H, 6.15. Found: C, 74.64; H, 6.32.

Phenyl 2,3-dibenzyl-*β*-D-galactopyranoside was prepared by hydrolysis of 4.4 g. of the preceding compound in 85 ml. of acetone and 5 ml. of *N* hydrochloric acid under reflux. After one hour 10 ml. more acid was added and heating continued another hour. The solution was neutralized with aqueous ammonia and evaporated to dryness *in vacuo*. The residue was fractionally crystallized from alcohol and, after removal of a small amount of high-melting material, 1.4 g. of product was obtained. Recrystallization from aqueous acetone yielded a substance melting at 115–117°, sp. rot. −7° (*c* 1.9, pyridine).

Anal. Calcd. $C_{26}H_{28}O_6$ (436.48): C, 71.54; H, 6.47. Found: C, 70.87, 70.85, 70.95; H, 6.46, 6.44, 6.56.

The writer is indebted to Lawrence E. Brown for micro carbon–hydrogen and Dumas nitrogen analyses; to L. W. Mazzeno, Jr., for methoxyl analyses; and to Mrs. V. O. Cirino for micro-Kjeldahl nitrogen analyses.

SOUTHERN REGIONAL RESEARCH LABORATORY
NEW ORLEANS, LOUISIANA RICHARD E. REEVES

RECEIVED JUNE 25, 1948

New Compounds for Cancer Research

The following new fluorene derivatives were among others prepared for testing at the Sloan–Kettering Institute under a grant from that foundation.

2-Dimethylaminofluorene.—Eighty grams of 2-aminofluorene, 300 cc. of benzene and 130 cc. of dimethyl sulfate were heated with mechanical stirring on an oil-bath maintained at 140–160° for four hours. After dilution of the mixture with 100 cc. of benzene, the excess dimethyl sulfate was decomposed by the slow addition of 60 g. of sodium hydroxide in 200 cc. of water followed by heating for half an hour. The benzene layer was boiled with Darco, filtered, evaporated to half its volume and cooled. Forty grams of crude 2-dimethylaminofluorene was obtained. This was recrystallized from ethanol (Darco) yielding 20 g. of a faint pinkish-white compound melting at 176°. A sample recrystallized several times from benzene melted at 176–178°.

Anal. Calcd. for $C_{15}H_{15}N$: N, 6.69. Found: N, 6.63.

Diethyl Fluorene-2,7-dicarbamate.—To a mechanically stirred boiling suspension of 9.8 g. of 2,7-diaminofluorene and 6 g. of sodium carbonate in 250 cc. of benzene, 10 cc. of ethyl chlorocarbonate was added dropwise. A white precipitate began forming immediately. Stirring was continued for a short time after all the ethyl chlorocarbonate had been added. After cooling the solid was filtered, washed several times with ether and dried. After recrystallization from xylene 5.2 g. of fluffy, cream-white crystals, m. p. 220–221.5°, was obtained.

Anal. Calcd. for $C_{19}H_{20}O_4N_2$: N, 8.23. Found: N, 8.08.

LABORATORY OF RADIOCHEMISTRY
UNIVERSITY OF CINCINNATI ELIZABETH K. WEISBURGER
CINCINNATI 21, OHIO PATRICIA M. QUINLIN

RECEIVED AUGUST 5, 1948

---

[6] J. W. H. Oldham and D. J. Bell, THIS JOURNAL, **60**, 323 (1938).

[7] S. Luckett and F. Smith, *J. Chem. Soc.*, 1106–1114 (1940).