The corrected melting points and the analytical data of the ten semicarbazones are to be found in Table II.

Summary

1. Ten disubstituted aminoacetones, CH_3COCH_2NRR', have been prepared from mixed secondary amines, this being the initial report of the synthesis of six of the amino ketones.

2. Catalytic hydrogenation of seven Schiff bases, derived from benzaldehyde, by the use of Raney nickel and hydrogen under pressure afforded an easy and convenient method of preparing the corresponding mixed secondary amines in good yield.

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[CONTRIBUTION NO. 187 FROM THE DEPARTMENT OF CHEMISTRY AND CHEMICAL ENGINEERING, THE UNIVERSITY OF TEXAS]

5,5-Dimethylhydantoins Containing a —NRR′ Substituent[1]

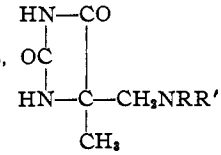
BY HENRY R. HENZE AND J. WM. MAGEE[2]

Recently we reported[3] the synthesis of ten 5,5-dimethylhydantoins containing a dialkylamino constituent. This synthesis was accomplished by adaptation of Bucherer's[4] procedure to the utilization of aminoacetone derivatives of the type $CH_3COCH_2NR_2$. In this manner, for example, we were able to convert dimethylaminoacetone into 5-dimethylamino-5-methylhydantoin despite the fact that this conversion had not been obtained by other investigators[5] using the closely related method of Bergs.[6]

It has been possible now to extend our investigation to the preparation of hydantoins from substituted aminoacetones of the type CH_3COCH_2NRR' in which R— and R′— represent different groupings. Further, since phenyl and benzyl groups are present in the structure of many anticonvulsants[7] and antispasmodics, one or both of these are present in all but one of the mixed secondary amines from which the substituted aminoacetones were prepared.

TABLE I

DISUBSTITUTED AMINODIMETHYLHYDANTOINS,



—R	—R′	Yield, %	M. p., °C. (cor.)	Nitrogen, % Calcd.	Nitrogen, % Found	Carbon, % Calcd.	Carbon, % Found	Hydrogen, % Calcd.	Hydrogen, % Found
—C_6H_5	—CH_3	90	190	18.02	17.96	61.78	61.94	6.49	6.55
—C_6H_5	—C_2H_5	80	171	16.99	17.02	63.14	63.35	6.93	6.99
—$CH_2C_6H_5$	—C_6H_5	91	213	13.85	13.90	69.88	70.07	6.19	6.65
—$CH_2C_6H_5$	—CH_3	77	204	16.99	17.08	63.14	63.37	6.93	7.17
—$CH_2C_6H_5$	—C_2H_5	92	165	16.08	16.22	64.34	64.51	7.33	7.61
—$CH_2C_6H_5$	—C_3H_7-*n*	91	157	15.26	15.40	65.43	65.59	7.69	7.86
—$CH_2C_6H_5$	—C_4H_9-*n*	96	169	14.46	14.61	66.40	66.61	8.01	8.14
—$CH_2C_6H_4CH_3$(*o*)	—CH_3	90	177	16.08	16.19	64.34	64.51	7.33	7.59
—$CH_2C_6H_4CH_3$(*p*)	—CH_3	91	178	16.08	16.19	64.34	64.48	7.33	7.62
—C_6H_{11}	—CH_3	68	199	16.96	17.09	58.18	58.30	10.92	10.98

Experimental

For the preparation of the ten hydantoins included in this investigation, 0.1 mole of the appropriate substituted aminoacetone, whose synthesis has been reported previously,[8] 0.15 mole of potassium cyanide, 0.3 mole of ammonium carbonate and 7–8 volumes of 50% alcohol were warmed under a reflux condenser for about ten hours at 55–65°. After concentration of the solution to about one-half volume, cooling in an ice-bath caused separation of most of the hydantoin and only an additional small quantity was obtained upon neutralization of the filtrate with con-

(1) From the Ph.D. dissertation of J. Wm. Magee, June, 1938.

(2) Present address, Federal Bureau of Investigation, United States Department of Justice, Washington, D. C.

(3) Magee with Henze, THIS JOURNAL, **60**, 2148 (1938).

(4) Bucherer and Lieb, *J. prakt. Chem.*, [2] **141**, 5 (1934).

(5) Slotta, Behnisch and Szyszka, *Ber.*, **67B**, 1529 (1934).

(6) Bergs, German Patent 566,094 (1932).

(7) Through the courtesy of Eli Lilly and Company the 5-(di-*n*-butylaminomethyl)-5-methylhydantoin and the 5-(diethylaminomethyl)-5-methylhydantoin have been shown to possess approximately 50% and 40%, respectively, of the anticonvulsant value of 5,5-diphenylhydantoin.

(8) Magee with Henze, THIS JOURNAL, **62**, 910 (1940).

centrated hydrochloric acid. Because of their amino substituent, these hydantoins possess solubility in acid as well as the usual solubility in alkali.

The hydantoins were recrystallized readily from dilute alcohol, and are soluble in the ordinary organic solvents, and are insoluble in water. The compounds are stable, white, crystalline solids which melt without decomposition to clear straw-colored liquids. Analytical data and corrected melting points for the hydantoins are reported in Table I.

Summary

1. Ten examples have been prepared of a new type of disubstituted aminohydantoin in which the two substituents are not alike.

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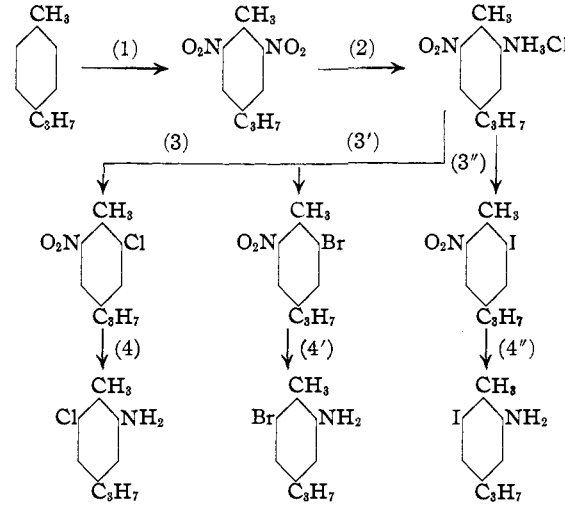
[CONTRIBUTION FROM THE VENABLE CHEMICAL LABORATORY OF THE UNIVERSITY OF NORTH CAROLINA]

The Preparation and Properties of 6-Halogenated Carvacrylamines from *p*-Cymene

BY R. W. BOST AND GRANVIL C. KYKER[1]

The preparation of 6-halogenated carvacrylamines by a method which locates the position of the halogen has not been reported. Wheeler and Early[2] and Inoue and Horiguchi[3] independently obtained a product by the direct chlorination of 2-nitro-*p*-cymene from which a chloronitro-*p*-cymene was separated. In each case the substance was taken to be 2-chloro-6-nitro-*p*-cymene and the subsequent reduction product to be 6-chlorocarvacrylamine. The chlorination is accompanied by low yields and a mixture of difficultly separable products since positions 3, 5 and 6 are open to substitution and other chlorination products were recognized.[2] The method of these investigators[2,3] is not applicable to the preparation of analogous bromine and iodine compounds. A method for preparing 6-halogenated carvacrylamines from *p*-cymene which is equally applicable to chloro, bromo, and iodocarvacrylamines has been investigated. The steps in the process are shown in the diagram.



Steps (1) and (2) have been reported in a previous paper.[4]

Since the position of the substituents in 2,6-dinitro-*p*-cymene and 6-nitrocarvacrylamine have been established[5] an orientation of the substituent groups in 6-halogenated carvacrylamines is obtained.

Diazotized 6-nitrocarvacrylamine gave 2-chloro-6-nitro-*p*-cymene when treated with cuprous chloride according to the procedure of Marvel and McElvain.[6] An azo dye, 2-nitro-5(?)-(6-nitrocarvacrylazo)-6-hydroxy-*p*-cymene was isolated from the reaction product; its occurrence is explained by the formation of 6-nitrocarvacrol, through a side reaction, which served as a coupler with the diazo compound. The reduction of 2-chloro-6-nitro-*p*-cymene with either tin or a mixture of tin and zinc in hydrochloric acid yielded 6-chlorocarvacrylamine.

Various derivatives of 6-chlorocarvacrylamine were studied. The amine produced crystalline salts with hydrochloric, hydrobromic, nitric, sulfuric, phenylsulfonic, *p*-tolylsulfonic, dichloroacetic, trichloroacetic, oxalic, 3,5-dinitrobenzoic, 2,4,6-trinitrobenzoic and picric acids. These salts are soluble in alcohol, insoluble in water, easily hydrolyzed, and stable in the dry state. The amine has been characterized by its acetyl, benzoyl, 3,5-dinitrobenzoyl, benzenesulfonyl, *p*-tolyl-

(1) This paper is an abstract of part of the dissertation submitted by Granvil C. Kyker to the Graduate Faculty of the University of North Carolina in partial fulfillment of the requirements for the degree of Doctor of Philosophy, in June, 1938.

(2) Wheeler and Early, unpublished thesis by Early, "The Chlorination of 2-Nitro-*p*-cymene," Department of Chemistry, University of North Carolina, 1933.

(3) Inoue and Horiguchi, *J. Soc. Chem. Ind., Japan*, **36**, Suppl. binding 189–190 (1933).

(4) Kyker and Bost, THIS JOURNAL, **61**, 2469 (1939).

(5) Wheeler and Harris, *ibid.*, **49**, 494 (1927).

(6) Marvel and McElvain, "Org. Syntheses," John Wiley and Sons, Inc., New York, N. Y., 1932, Coll. Vol. I, p. 163.