V.—dl-*β-Phenyl*iso*propylamine and Related Compounds.*

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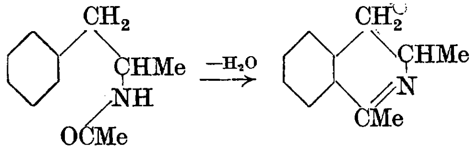
β-PHENYL*iso*PROPYLAMINE has been obtained by Edeleano (*Ber.*, 1887, **20**, 618) by the action of bromine and aqueous potash on phenyl*iso*butyramide and its chloroplatinate also is described. The hydrochloride of the *d*-form was obtained by Jones and Wallis (*J. Amer. Chem. Soc.*, 1926, **48**, 180) by the hydrolysis of *d*-α-benzylethylcarbimide with concentrated hydrochloric acid. In the present investigation the racemic base was readily obtained by the reduction of *benzyl methyl ketoxime* by means of sodium amalgam in dilute acetic acid solution. Benzyl methyl ketoxime, previously described as a thick oil by Dollfus (*Ber.*, 1892, **25**, 1918; 1893, **26**, 1971), has now been obtained in a pure crystalline form, melting at 70°.

The *acetyl* derivative (I) of the base, on treatment with phosphoric oxide in boiling toluene (compare Pictet and Kay, *Ber.*, 1909, **42**, 1973), gave 1 : 3-dimethyl-3 : 4-dihydro*iso*quinoline (II), which was isolated in the form of its *picrate*.



(I.) (II.)

The reduction of *iso*nitrosopropiophenone under various conditions gives rise to a variety of products, generally in poor yield (Gudeman, *Ber.*, 1889, **22**, 562; Behr-Bregowski, *Ber.*, 1897, **30**, 1521; Gabriel, *Ber.*, 1908, **41**, 1127; Rabe, *Ber.*, 1912, **45**, 2166; Calliess, *Arch. Pharm.*, 1912, **250**, 141), but the only instance of its direct reduction to *dl*-β-hydroxy-β-phenyl*iso*propylamine (norephedrine), OH·CHPh·CHMe·NH_2 (compare the reduction of benzil monoxime to β-hydroxy-αβ-diphenylethylamine; Polonowska, *Ber.*, 1888, **21**, 488), has been reported by Rabe, who obtained the base in small yield by using colloidal palladium. Since the inception of this work, however, Hartung and Munch (*J. Amer. Chem. Soc.*, 1929, **51**, 2262) have obtained β-hydroxy-β-phenyl*iso*propylamine (phenylpropanolamine) in good yield from *iso*nitrosopropiophenone by catalytic reduction with palladised charcoal. In the present investigation, although a number of reducing agents were employed under various conditions, the desired result was not effected, since the *iso*nitrosopropiophenone exhibited a very marked stability [compare the relatively facile reduction of benzyl methyl ketoxime (see experimental part) and of propiophenone oxime (Billon, *Compt. rend.*, 1926, **182**, 470)], and much of it was recovered unchanged. The great stability of this oximino-ketone has been the subject of comment by Coles, Manske, and Johnson (*J. Amer. Chem. Soc.*, 1929, **51**, 2269).

Melting points of *iso*nitrosopropiophenone varying from 108° to 115° are recorded in Beilstein's "Handbuch der organischen Chemie." The specimen prepared by Hartung and Munch (*loc. cit.*) and crystallised from toluene, melted at 106—106·5°, whereas the preparation used in this investigation was crystallised from water, melted at 114·5°, and gave rise to metallic complex formation with iron, cobalt, and copper (compare α- and β-benzil monoximes, Tschugaev, *Z. anorg. Chem.*, 1905, **46**, 148; Taylor and Ewbank, J., 1926, 2818; Pfeiffer and Richarz, *Ber.*, 1928, **61**, 103).

EXPERIMENTAL.

Benzyl Methyl Ketoxime.—Solutions of 18 g. of benzyl methyl ketone in 40 c.c. of alcohol and of 10 g. of hydroxylamine hydrochloride in 20 c.c. of water were mixed and, after addition of 6 g. of sodium hydroxide in the minimum quantity of water, heated on a boiling water-bath for 1½—2 hours. The solution was then diluted considerably, acidified, and extracted with ether. After being washed with a concentrated solution of calcium chloride and dried, the ether was evaporated; the residual thick red oil, which solidified, after several recrystallisations from light petroleum (b. p. 60—80°), gave the *oxime* in white prismatic crystals, m. p. 70° (Found : C, 72·8; H, 7·4; N, 9·5. $C_9H_{11}ON$ requires C, 72·5; H, 7·4; N, 9·4%).

Reduction of Benzyl Methyl Ketoxime.—To a well-stirred solution of 10 g. of benzyl methyl ketoxime in glacial acetic acid, diluted with water, 300 g. of 3% sodium amalgam were gradually added. After 6 hours the solution was made alkaline and extracted with ether and the base was extracted from the ethereal solution with dilute hydrochloric acid; or alternatively the alkaline solution was steam-distilled, the base being collected in dilute hydrochloric acid. The free base, liberated by the addition of alkali, was extracted with ether and dried over solid caustic potash. Evaporation of the ether left a yellowish oil with an ammoniacal odour, which on distillation gave pure *dl*-β-phenyl*iso*propylamine as a colourless oil, b. p. 205° (Edeleano, *loc. cit.*, recorded 203°). The base readily combines with carbon dioxide.

The *acetyl* derivative, formed in the usual manner, crystallised from aqueous alcohol in fine white needles. These melted initially at 64°, but at 93° after being kept for some time in a vacuum (Found: C, 74·7; H, 8·6; N, 8·1. $C_{11}H_{15}ON$ requires C, 74·6; H, 8·5; N, 7·9%).

The *picrate*, prepared from picric acid and the base in concentrated solution and recrystallised from alcohol, gave yellow transparent prisms, containing one molecule of alcohol, which melted at 143° (Found: C, 49·9; H, 5·5; N, 13·8. $C_{15}H_{16}O_7N_4,C_2H_5{\cdot}OH$ requires C, 49·8; H, 5·4; N, 13·7%).

The *hydrochloride*, prepared from hydrogen chloride and the base in dry ether, was rapidly collected, washed with pure dry ether, and transferred to a desiccator evacuated over solid caustic potash. It is extremely hygroscopic and melts at 145—147° (Found: C, 63·3; H, 8·6; N, 8·1; Cl, 20·8. $C_9H_{13}N,HCl$ requires C, 63·0; H, 8·2; N, 8·2; Cl, 20·7%).

Action of Phosphoric Oxide on Aceto-dl-β-*phenyl*iso*propylamide.*—A solution of 2 g. of the acetyl compound in toluene was boiled for 3 hours with 4 g. of phosphoric oxide (compare Pictet and Kay, *loc. cit.*). The solution was then made alkaline, the base extracted with ether, the toluene and ether evaporated, and the small residue of oil converted into picrate in concentrated alcoholic solution. Recrystallisation from alcohol gave 1 : 3-*dimethyl*-3 : 4-*dihydro*iso-*quinoline picrate* in yellow fern-like crystals, m. p. 136° (Found: C, 52·9; H, 4·4; N, 14·35. $C_{17}H_{16}O_7N_4$ requires C, 52·6; H, 4·1; N, 14·4%).

iso*Nitrosopropiophenone.*—This was prepared from propiophenone and amyl nitrite by Claisen and Manasse's method (*Ber.*, 1889, **22**, 529); it crystallised from water in fine needles, m. p. 114·5°.

Complex formation. (a) *With iron.* When aqueous ferrous sulphate solution was shaken with *iso*nitrosopropiophenone and dilute caustic soda solution added, a blue colour was produced which, on shaking with benzene, passed into this solvent.

(b) *With cobalt.* To a solution of 3 g. of *iso*nitrosopropiophenone in very dilute alcohol was added an aqueous solution containing 4·5 g. of cobalt acetate. A dense yellowish-brown precipitate formed almost immediately, which was collected after a while and washed with water, dilute alcohol, and finally with a little ether [Found : Co, 10·9; C, 59·9; H, 4·5; N, 7·8. $Co(C_9H_8O_2N)_3$ requires Co, 10·8; C, 59·45; H, 4·4; N, 7·7%].

(c) *With copper.* In a similar way, from 3 g. of copper acetate and 2 g. of *iso*nitrosopropiophenone, a dense dark bluish-green precipitate was obtained, which was washed with water, dilute alcohol, and ether [Found : Cu, 25·9; C, 44·7; H, 3·8; N, 5·75. $CuOH(C_9H_8O_2N)$ requires Cu, 26·2; C, 44·5; H, 3·7; N, 5·8%].

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