TABLE II

INFRARED ANALYSES OF MIXTURES OF PHENOLS V, II AND VIII OBTAINED FROM THE REARRANGEMENT OF ETHERS I AND II[a]

	Transmission, %					
Ether	812 cm.$^{-1}$	820 cm.$^{-1}$	% of VII	Av. % VII	% VIII	Av. % VIII
I	67.6	59.2	58.5 54.4	55.9 ± 3	45.6 42.5	44.0
I	66.9	59.9	56.3 53.3	54.8 ± 2	46.7 43.7	45.2
I	61.7	63.2	48.3 49.3	48.8 ± 3	50.7 51.7	51.2
I	60.5	55.9	53.7 52.6	53.1 ± 2	47.4 46.3	46.9
I	70.7	67.5	51.0 52.3	51.7 ± 2	47.7 48.0	48.4
I	66.4	60.8	54.5 51.2	52.8 ± 3	48.8 45.5	47.2
II	53.9	60.0	41.7 40.6	41.0 ± 2	59.4 58.3	58.9
II	..	..	Estimated visually			
II	52.5	66.2	35.2 32.8	33.6 ± 2	67.1 64.8	66.1
II	54.9	69.4	35.5 32.3	33.9 ± 2	67.7 64.5	66.1
	34.8	77.5	Pure phenol VII			
	91.2	38.8	Pure phenol VIII			

[a] On each line are data for the reaction described on the corresponding line of Table I.

Application of this method to a known mixture containing 48.5% of the phenol IV and 51.5% of phenol VII gave values of 49 ± 2% of IV and 52 ± 2% of VII. Probable errors were calculated from the usual equation.[14] The data are recorded in Table II.

TABLE III

INFRARED ANALYSES OF THE RECOVERED ETHERS FROM THE CLAISEN REARRANGEMENT OF ETHERS I AND II[a]

Starting ether	925 cm.$^{-1}$	1050 cm.$^{-1}$	2920 cm.$^{-1}$	% of I	Av. % of I	% of II	Av. % of II
I	47.5	93.4	43.6	99.5	..	0.6	..
I	41.3	85.5	42.4	84.8 82.7	83.2	17.3 15.2	16.5
I	..	..	..	..	..	..	..
I	40.4	88.7	42.6	89.2 87.9	88.5	12.1 10.8	11.5
I	49.4	72.7	41.2	52.9 49.8	51.3	50.2 47.1	48.7
I	47.2	74.5	42.1	56.7 54.8	55.8	45.2 43.3	44.2
II	..	..	..	..	..	..	..
II	62.3	46.4	43.4	7.1 6.0	6.5	94.0 92.9	93.5
II	66.1	58.4	43.3	10.4 6.2	8.3	93.8 89.6	91.7
	37.5	85.0	42.4	Pure ether I			
	64.1	50.0	47.1	Pure ether II			

[a] On each line are data for the reactions described on the corresponding lines of Tables I and II.

Computation of the Compositions of the Recovered Ether Fractions.—The spectra for this purpose were obtained in a 10% solution in carbon tetrachloride with the Perkin-Elmer model 21 spectrophotometer. Again simultaneous equations were solved using the log per cent. transmissions at the frequencies 925 and 1050 cm.$^{-1}$. Analysis of a known mixture containing 19.5% of the ether II and 80.5% of the ether I gave by this method the calculated values of 23 ± 3% of II and 77 ± 3% of I. Data are recorded in Table III.

(14) L. P. Hammett, "Introduction to the Study of Physical Chemistry," McGraw-Hill Book Co., Inc., New York, N. Y., 1952, p. 404.

URBANA, ILLINOIS

[CONTRIBUTION FROM THE SCHOOL OF PHARMACY, UNIVERSITY OF CALIFORNIA]

Synthesis of Some 1-Phenyl-2-amino-3-substituted-amino-1-propanols from α-Oximino Mannich Bases

BY MANFRED E. WOLFF[1] AND J. F. ONETO

RECEIVED DECEMBER 6, 1955

The synthesis of ten new 1-phenyl-2,3-diamino-1-propanol derivatives together with some previously unreported intermediates is described. The treatment of β-substituted-aminopropiophenone derivatives with isobutyl nitrite in anhydrous methanol saturated with hydrogen chloride has furnished the corresponding α-oximino ketones in good yield. A method for the reduction of α-oximino ketones to the corresponding amino alcohols utilizing lithium aluminum hydride has been developed.

In order to study the pharmacological effects of structural changes in 1-phenyl-2-amino-1-propanol, the preparation of a series of 1-phenyl-2,3-diamino-1-propanol salts having a primary 2-amino group and a tertiary 3-amino function was required. Such molecules are of interest since they are structurally related to compounds possessing sympathomimetic, antihistaminic and antispasmodic activities.

(1) This paper represents part of a dissertation submitted by M. E. Wolff in partial fulfillment of the requirements for the Ph.D. degree in pharmaceutical chemistry, 1955.

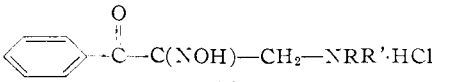
(2) A. L. Williams and A. R. Day, THIS JOURNAL, **74**, 3875 (1952).

Williams and Day[2] have previously reported the preparation of 1-phenyl-2-amino-3-(4-morpholinyl)-1-propanol *via* the interaction of dibenzylamine with α-bromo-β-(4-morpholinyl)-propiophenone hydrobromide followed by catalytic debenzylation and reduction. An alternate synthesis of this type of compound, involving the reduction of α-oximino Mannich base hydrochlorides to the corresponding amino alcohols was undertaken.

The intermediate Mannich base hydrochlorides employed in the investigation were prepared according to published procedures. The melting

TABLE I

α-OXIMINO-β-SUBSTITUTED-AMINOPROPIOPHENONE HYDROCHLORIDE DERIVATIVES



Compound no.[a]	RR'N-	M.p., °C.	Yield, %	Formula	Nitrogen, % Calcd.	Found
1	$(CH_3)_2N$-	169–170[b]	38	$C_{11}H_{15}N_2O_2Cl$	11.55	11.81
2	$(CH_3)(C_2H_5)N$-	127–128[b]	47	$C_{12}H_{17}N_2O_2Cl$	10.91	10.95
3	$(C_2H_5)_2N$-	157–158[c]	58	$C_{13}H_{19}N_2O_2Cl$	10.35	10.58
4	$(C_3H_7)_2N$-	144–145	65	$C_{15}H_{23}N_2O_2Cl$	9.38	9.46
5	$(C_4H_9)_2N$-	114–115[b]	..	$C_{17}H_{27}N_2O_2Cl$	8.57	8.70
6	$(i\text{-}C_5H_{11})_2N$-	[d]	..			
7	$C_8H_{10}N$-[e]	164–166[f]	79	$C_{17}H_{19}N_2O_2Cl$	8.79	9.02
8	C_4H_8N-[g]	180–181[f]	60	$C_{13}H_{17}N_2O_2Cl$	10.43	10.43
9	$C_5H_{10}N$-[h]	197–198	78	$C_{14}H_{19}N_2O_2Cl$	9.91	9.69
10	$(CH_3)C_5H_9N$-[i]	190–191[f]	78	$C_{15}H_{21}N_2O_2Cl$	9.44	9.60
11	C_4H_8ON-[j]	186–187[b,k]	79	$C_{13}H_{17}N_2O_3Cl$	9.84	9.95
12	C_4H_8ON-[j,l]	117–119[b]	..	$C_{13}H_{16}N_2O_3$	11.29	11.14

[a] Compounds 1 and 7 were recrystallized from absolute ethanol; 2, 4 and 5 from acetone–ether; 3 and 8 from absolute ethanol–acetone; 9, 10 and 11 from absolute ethanol–ether; 12 from hot water or benzene. [b] The compound melted with decomposition. [c] Reported[3] 154–155° when prepared by a different method. [d] The hydrochloride was obtained as an oil. [e] N-Methylbenzylamino. [f] The compound melted with decomposition and effervescence. [g] 1-Pyrrolidyl. [h] 1-Piperidyl. [i] 2-Methyl-1-piperidyl. [j] 4-Morpolinyl. [k] Reported[3] 182–182.5° when prepared by a different method. [l] Obtained as the free base.

points of β-diisoamylaminopropiophenone hydrochloride and β-(2-methyl-1-piperidyl)-propiophenone hydrochloride were found to be at considerable variance with those appearing in the literature. The preparation of these two products as well as the hitherto undescribed hydrochlorides of β-methylethylaminopropiophenone and β-dipropylaminopropiophenone is included in the Experimental part.

Two methods for the preparation of the required intermediate α-oximino-β-amino-substituted propiophenone hydrochlorides were utilized. The first method involved the interaction of the appropriate secondary amine with α-oximino-β-chloropropiophenone following the procedure of Parikh and Oneto.[3] The second and most satisfactory approach consisted in nitrosation of suitable Mannich bases with isobutyl nitrite in anhydrous methanol.

Although Hartung and Chang[4] have reported that the catalytic reduction of α-oximino ketones to the corresponding amino alcohols using hydrogen and palladium-on-charcoal has been accepted as a general procedure, they found that the character and yield of products obtained from such reductions were influenced by both the presence of impurities in the palladium chloride and the type of charcoal employed. In view of these observations it appeared advantageous to explore other methods for the reduction of the α-oximino Mannich bases to the corresponding amino alcohols.

The reduction of α-oximinopropiophenone and a series of α-oximino-β-amino-substituted propiophenone hydrochloride derivatives utilizing lithium aluminum hydride in dilute ether solution is described in this paper. The resulting substituted 1-phenyl-2,3-diamino-1-propanols were isolated as the dihydrochlorides only in two instances since the majority of the members of the series formed dihydrochlorides which were inconveniently hygroscopic. In the latter case, the products were isolated as the stable dioxalates or dimaleates.

The lithium aluminum hydride reduction of α-oximinopropiophenone afforded a 61% yield of DL-*erythro*-1-phenyl-2-amino-1-propanol hydrochloride (Propadrine Hydrochloride).

In the case of 1-phenyl-2-amino-3-(N-methylbenzylamino)-1-propanol, two different products were isolated after the reduction procedure as dimaleate salts. The yield of the first product was 40%; m.p. 156–157°. The second product was obtained in 6% yield; m.p. 139–140°. Since the *erythro* amino alcohol salts usually exhibit higher melting points than the *threo* forms, it is probable that in this instance the majority of the product formed was of the *erythro* configuration, while the product obtained in lower yield was of the *threo* configuration.

The isolation of the two apparent stereoisomers indicates that lithium aluminum hydride reduction of α-oximino ketones is not stereospecific. It is possible that the application of more refined techniques in the isolation of the amino alcohols would have resulted in obtaining additional pairs of stereoisomers.

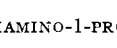
In the course of preparing the series of amino alcohol salts (Table II), no isolable products were obtained from the lithium aluminum hydride reduction of α-oximino-β-cyanoacetophenone. The reduction of α-oximino-β-(4-morpholinyl)-propiophenone hydrochloride yielded the corresponding oximino alcohol.

That steric effects could be responsible for the anomalous outcome of the latter reduction seems unlikely since the corresponding piperidyl analog was readily reduced through the normal procedure. Again, the heterocyclic oxygen atom of the morpholinyl moiety is so far removed from the oxime group that it would be irrational to attribute the difference to an inductive effect. Lithium aluminum hy-

(3) J. R. Parikh and J. F. Oneto, *J. Am. Pharm. Assoc.*, **45**, 219 (1956).

(4) W. H. Hartung and Y. T. Chang, THIS JOURNAL, **74**, 3027 (1952).

TABLE II

SALTS OF 1-PHENYL-2,3-DIAMINO-1-PROPANOL DERIVATIVES  —CH(OH)—CH(NH_2)—CH_2—NRR'

Compound no.[a]	RR'N–	Salt	M.p., °C.	Yield, %	Formula	Nitrogen, % Calcd.	Found
1	$(CH_3)_2N$–	$2(CHCO_2H)_2$	155–156[b]	14	$C_{19}H_{26}N_2O_9$	6.57	6.60
2	$(CH_3)(C_2H_5)N$–	$2(CHCO_2H)_2$	156–157[c]	44	$C_{20}H_{28}N_2O_9$	6.36	6.16
3	$(C_2H_5)_2N$–	$2(CHCO_2H)_2$	152–153[c]	42	$C_{21}H_{30}N_2O_9$	6.17	6.22
4	$(C_2H_5)_2N$–	$2(CO_2H)_2$	182–183[b]	30	$C_{17}H_{26}N_2O_9$	6.96	6.95
5	$(C_3H_7)_2N$–	$2(CHCO_2H)_2$	157–158	33	$C_{23}H_{34}N_2O_9$	5.81	6.00
6	$(C_4H_9)_2N$–	$2(CHCO_2H)_2$	150–151[b]	35	$C_{25}H_{38}N_2O_9$	5.49	5.29
7	$(i\text{-}C_5H_{11})_2N$–	$2(CHCO_2H)_2$	156–157	22	$C_{27}H_{42}N_2O_9$	5.20	5.43
8	$C_8H_{10}N$–[d,e]	$2(CHCO_2H)_2$	156–157	40	$C_{25}H_{20}N_2O_9$	5.58	5.77
9	$C_8H_{10}N$–[d,e]	$2(CHCO_2H)_2$	139–140	6	$C_{25}H_{30}N_2O_9$	5.58	5.65
10	C_4H_8N–[f]	2HCl	212–214[g]	55	$C_{18}H_{22}N_2OCl_2$	[h]	
11	$C_5H_{10}N$–[i]	2HCl	219–220	61	$C_{14}H_{24}N_2OCl_2$[j]	[k]	
12	$C_5H_{10}N$–[i]	$2(CO_2H)_2$	171–172	..	$C_{18}H_{26}N_2O_9$	6.76	7.07
13	$(CH_3)C_5H_9N$–[l]	$2(CHCO_2H)_2$	155–156[b]	..	$C_{23}H_{32}N_2O_9$	5.83	5.89

[a] Compounds 1 and 7 were recrystallized from absolute ethanol–ether; 2, 3, 5, 6, 8, 9, 10, 12 and 13 from absolute ethanol–ethyl acetate; 4 from ethanol; 11 from ethyl acetate–ether. [b] The compound melted with effervescence. [c] The compound melted with decomposition and effervescence. [d] N-Methylbenzylamino. [e] Obtained as diastereoisomers. [f] 1-Pyrrolidyl. [g] The compound melted with decomposition. [h] Calcd.: Cl, 24.18. Found: Cl, 23.99. [i] 1-Piperidyl. [j] Phenylthiourea derivative, m.p. 160–161°. *Anal.* Calcd. for $C_{21}H_{27}ON_3S$: C, 68.25; H, 7.37; N, 11.37. Found: C, 68.48; H, 7.38; N, 11.27. [k] Calcd.: Cl, 23.08. Found: Cl, 22.89. [l] 2-Methyl-1-piperidyl.

dride strongly binds ether[5] and it appears reasonable to assume that a similar coördination may occur involving the ether oxygen of the morpholine ring. The decreased ether solubility of the intermediate oximino alcohol as a result of this association may well account for the abnormal results of the reduction.

Experimental[6]

β-Methylethylaminopropiophenone Hydrochloride.—The product was prepared according to the procedure described in Organic Syntheses[7] for β-dimethylaminopropiophenone hydrochloride from 30.0 g. (0.314 mole) of methylethylamine hydrochloride, 48.2 g. (0.4 mole) of acetophenone and 13.5 g. (0.15 mole) of paraformaldehyde. The crude product (28.5 g. 40%) melted at 131–132°; m.p. 132–133° after recrystallization from absolute ethanol–ether.

Anal. Calcd. for $C_{12}H_{18}ONCl$: N, 6.15. Found: N, 6.05.

β-Dipropylaminopropiophenone Hydrochloride.—A solution of dipropylamine hydrochloride (prepared from 40.4 g. (0.4 mole) of dipropylamine by the addition of the calculated amount of 20% alcoholic hydrogen chloride), 48.2 g. (0.4 mole) of acetophenone and 24.0 g. (0.264 mole) of paraformaldehyde in 100 ml. of absolute ethanol was refluxed for 4 hours. The product was isolated in the manner described by Peak and Watkins[8] for the preparation of β-diethylaminopropiophenone hydrochloride; yield 40.5 g. (37.5%); m.p. 104–106° after recrystallization from acetone–ether.

The salt decomposed when heated at 100° for a short time as evidenced by the odor of acrylophenone. Repeated recrystallization of the product failed to improve the analysis.

Anal. Calcd. for $C_{15}H_{24}ONCl$: N, 5.19. Found: N, 6.02.

β-Diisoamylaminopropiophenone Hydrochloride.—A solution of diisoamylamine hydrochloride (prepared by addition of the calculated amount of 20% alcoholic hydrogen chloride to 28.3 g. (0.18 mole) of diisoamylamine), 24.2 g. (0.201 mole) of acetophenone and 12.0 g. (0.133 mole) of paraformaldehyde in 50 ml. of absolute ethanol was refluxed for two hours. An additional 4.0 g. (0.045 mole) of paraformaldehyde was added, the mixture was refluxed for two hours, cooled and diluted with 300 ml. of dry ether. The precipitate obtained from the chilled solution was dissolved in 50 ml. of hot absolute ethanol. After the addition of 300 ml. of dry ether the precipitated diisoamylamine hydrochloride was removed, 300 ml. of dry ether was added to the filtrate and the precipitate was recrystallized from ethanol–ether; yield 12.0 g. (20.5%); m.p. 91–93° (lit.[9] 269–270°).

Anal. Calcd. for $C_{19}H_{32}ONCl$: C, 70.02; H, 9.90; N, 4.30; Cl, 10.88. Found: C, 69.91; H, 9.94; N, 4.54; Cl, 10.87.

β-(2-Methyl-1-piperidyl)-propiophenone Hydrochloride.—The product, obtained by the process described immediately above from 37 g. (0.37 mole) of 2-methylpiperidine, 45.0 g. (0.37 mole) of acetophenone and 16.8 g. (0.19 mole) of paraformaldehyde, was partially purified by the method of Peak and Watkins[8] and recrystallized from absolute ethanol–ether. The crude product (29 g., 29%) melted at 126.5–128°; m.p. 128–130° (lit.[10] 206–207°) after recrystallization from the same solvents.

Anal. Calcd. for $C_{15}H_{22}ONCl$: C, 67.27; H, 8.28; N, 5.24; Cl, 13.24. Found: C, 67.09; H, 8.07; N, 5.49; Cl, 13.04.

General Procedure for the Preparation of α-Oximino-β-substituted-aminopropiophenone Hydrochlorides.—A stirred solution of 0.1 mole of the appropriate Mannich base hydrochloride in 100 ml. of absolute methanol, cooled in an ice-bath and protected from atmospheric moisture by calcium chloride tubes, was saturated with anhydrous hydrogen chloride. After one hour of gassing, the addition of a drop of the isobutylnitrite to the reaction mixture resulted in the production of a brown red color which slowly changed to yellow and finally disappeared. At this point, gassing was discontinued and 10.3 g. (0.1 mole) of the nitrite was added in 0.5-ml. portions, each addition being made only after the color from the preceding addition had discharged. The reaction mixture was allowed to stand at room temperature for four hours. The solvent was removed under reduced pressure at 40° and the product was recrystallized.

Oximino compounds which were synthesized by different procedures are described below.

α-Oximino-β-dimethylaminopropiophenone Hydrochloride (Table I, 2).—A solution of 23.7 g. (0.12 mole) of α-oximino-β-chloropropiophenone[3] and 40.0 g. (0.89 mole) of dimethylamine in 200 ml. of absolute alcohol was shaken in a pressure vessel overnight. After removal of the solvent *in vacuo*, the residue was dissolved in 300 ml. of dry ether. The precipitated dimethylamine hydrochloride was removed and the filtrate was acidified to *p*H 1 with 20% ethereal hy-

(5) W. G. Brown in R. Adams, "Organic Reactions," Vol. 6, Chapter 10, John Wiley and Sons, Inc., New York, N. Y., 1951, p. 484.

(6) All analyses were performed at the Microanalytical Laboratory, Department of Chemistry, University of California. All melting points are uncorrected.

(7) C. E. Maxwell in E. C. Horning, "Organic Syntheses," Coll. Vol. 3, John Wiley and Sons, Inc., New York, N. Y., 1955, p. 305.

(8) D. A. Peak and T. I. Watkins, *J. Chem. Soc.*, 445 (1950).

(9) F. F. Blicke and C. E. Maxwell, THIS JOURNAL, **64**, 931 (1942).

(10) S. B. Britton, H. C. Caldwell and W. L. Nobles, *J. Am. Pharm. Assoc.*, **43**, 642 (1954).

drogen chloride. The tan powder which precipitated was recrystallized repeatedly from absolute ethanol–ether and absolute ethanol–ethyl acetate–ether mixtures to furnish 11.1 g. (41%) of colorless crystals.

α-Oximino-α-cyanoacetophenone.—A solution of 26.0 g. (0.18 mole) of α-cyanoacetophenone in 180 ml. of dry ether was treated with 18.5 g. (0.18 mole) of isobutyl nitrite according to the method described by Levin and Hartung[11] for the preparation of α-oximinoacetophenone. The dark oil obtained on removal of the reaction solvent was crystallized from benzene–carbon tetrachloride and then recrystallized from the same solvents: yield 19.5 g. (62%). The pale yellow needles sintered at 115° and melted at 118–119°.

Anal. Calcd. for $C_9H_6O_2N_2$: N, 16.09. Found: N, 16.04.

General Procedure for the Reduction of α-Oximino Mannich Base Hydrochlorides to 1-Phenyl-2,3-diamino-1-propanol Derivatives Employing Lithium Aluminum Hydride.—In a flask equipped with a ground glass sleeve stirrer, a double surface condenser attached to a soda lime tube and a 125-ml. erlenmeyer flask attached with one-inch rubber tubing was placed 300 ml. of approximately one molar ethereal lithium aluminum hydride solution[12] diluted with 370 ml. of anhydrous ether. The appropriate finely powdered oximino Mannich base hydrochloride (0.05 mole) was placed in the erlenmeyer flask and slowly added to the stirred solution at such a rate as to maintain gentle refluxing. The resulting milky suspension was stirred and refluxed for five hours. A dropping funnel was then inserted in place of the rubber sleeve attachment and 50 ml. of water was cautiously added dropwise to the stirred, ice-cold mixture.

After the addition of 100 g. of potassium sodium tartrate, dissolved in 300 ml. of water, the aqueous phase was removed and extracted three times with 100-ml. portions of ether. The combined ether phases were then washed twice with 25 ml. of water. Most of the ether was distilled off through a short column and a salt was prepared from the residue.

The dihydrochlorides were prepared by dissolving the residual base in 100 ml. of chloroform followed by the addition of sufficient 20% alcoholic hydrogen chloride to reduce the *p*H to 3. After the resulting solutions had been diluted to turbidity with ether, chilling and scratching the walls of the vessel afforded the crystalline salts.

The dimaleates and dioxalates were obtained by dissolving the concentrated ethereal solution of the residual base obtained from the reduction in an equal volume of absolute ethanol. To the resulting solution was added a solution of 2.2 mole equivalents of the appropriate acid dissolved in two volumes of warm absolute ethanol. The resulting precipitate was recrystallized.

When 4.9 g. (0.03 mole) of α-oximinopropiophenone was subjected to the above procedure, 3.43 g. (61%) of DL-*erythro*-1-phenyl-2-amino-1-propanol hydrochloride[13] was obtained after recrystallization from absolute ethanol; m.p. 187–190° (lit. 191,[14] 192,[15] 194[16]). A commercial sample of Propadrine Hydrochloride showed a m.p. of 187–190°; mixed m.p. 185–188°. The m.p. of *dl-pseudo*-Propadrine Hydrochloride (presumably the DL-*threo*-racemate) has been reported as 169[15] and 170.5–171.5°.[16] Thus the m.p. data and lack of optical activity indicated the product to be DL-racemate of the *erythro* configuration.

Compounds 6 and 7, Table II, were prepared by a modification of the reduction procedure. The crude oils resulting from the nitrosation of the respective Mannich bases were dissolved in 100 ml. of dry, purified tetrahydrofuran. The resulting solutions were added dropwise to stirred ethereal lithium aluminum hydride solutions. The subsequent procedure was the same as that previously described.

1-Phenyl-2-oximino-3-(4-morpholinyl)-1-propanol.—When 28.5 g. (0.1 mole) of α-oximino-β-(4-morpholinyl)-propiophenone hydrochloride was treated with lithium aluminum hydride in the originally described manner, hydrolysis of the reaction mixture resulted in the formation of a yellow suspension. After removal of the ether phase, the aqueous suspension was freed of solids by decantation after centrifugation. The *p*H of the alkaline aqueous solution was adjusted to eight with concentrated hydrochloric acid to yield 9.0 g. (36%) of colorless crystals, m.p. 118–119°. A portion of the material was recrystallized three times from benzene to yield colorless needles, m.p. 125.5–128° with sintering at 124°. The product dissolved in alkali with the development of a yellow color.

Anal. Calcd. for $C_{13}H_{18}O_3N_2$: N, 11.20. Found: N, 11.11.

The hydrochloride salt was obtained when ethereal hydrogen chloride was added to a solution of 1-phenyl-2-oximino-3-morpholinyl-1-propanol in ether to *p*H 1. The salt occurred as fine, colorless needles, m.p. 179.5–180°, after recrystallization from absolute ethanol–ether.

Anal. Calcd. for $C_{13}H_{19}O_3N_2Cl$: N, 9.77. Found: N, 9.88.

(11) N. Levin and W. H. Hartung in E. C. Horning, "Organic Syntheses," Coll. Vol. 3, John Wiley and Sons, Inc., New York, N. Y., 1955, p. 191.

(12) Reference,[5] p. 484.

(13) Y. T. Chang and W. H. Hartung, THIS JOURNAL, **75**, 89 (1953), for pertinent references to configurational correlation studies.

(14) W. H. Hartung and J. C. Munch, *ibid.*, **51**, 2262 (1929).

(15) F. W. Hoover and H. B. Hass, *J. Org. Chem.*, **12**, 506 (1947).

(16) C. Jarowski and W. H. Hartung, *ibid.*, **8**, 564 (1943).

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