amine) at 60°, colorless needles melting at 215° were obtained.

Anal. Calcd. for $C_9H_{10}SO_3N_2$: C, 47.77; H, 4.46. Found: C, 47.70; H, 4.55.

Polymerization of Acrylamide in Pyridine.—Acrylamide (10 g.) was added with stirring at 100° to a solution of 0.02 g. of phenyl-β-naphthylamine in 100 ml. of pyridine (dried over barium oxide). When the acrylamide had dissolved, a solution of 0.1 g. of sodium in 10 ml. of *t*-butyl alcohol was added. Polymer began to form on the walls in 4 minutes. After heating for 16 hr., the polymer was removed by filtration, extracted with boiling water for an hr. and dried *in vacuo* at 80° (4.8 g.). After neutralization with acetic acid, the aqueous extract was evaporated to dryness. The residue (3.6 g.) was purified by pouring an aqueous solution into methanol; 2.6 g. of polymer was isolated.

After the addition of phenyl-β-naphthylamine (0.02 g.) the mother liquor was evaporated to dryness *in vacuo*. On sublimation of the residue at 0.1 mm., acrylamide (0.4 g., m.p. 81–83°) was obtained, leaving behind 1.2 g. of solid.

Anal. Calcd. for $C_6H_{10}O_2N_2$: H_2 absorption, 1.42; NH_3, 12.0. Found: H_2 absorption, 1.18; NH_3, 12.5.

Application of the above polymerization procedure to this dimer fraction converted it into a mixture of polymer fractions similar to the one described.

Bulk Polymerization of Acrylamide.—To a solution of 0.4 g. of sodium in 15 ml. of *t*-butyl alcohol was added 40 g. of acrylamide and 0.04 g. of hydroquinone. The alcohol was removed *in vacuo* at 40°, and the residue was cautiously heated (while being stirred with a thermometer) to form a homogeneous melt. In a short time the temperature began to rise rapidly as a vigorous exothermic reaction set in. After polymerization was complete (three minutes), the solid foam was extracted with boiling water for 1 hr., yielding 26 g. of water-insoluble polymer with a specific viscosity of 0.23 (1% in anhydrous formic acid).

β-Alanine.—A solution of 30 g. of crude polymer prepared by bulk polymerization (before water extraction) in 120 ml. of 50% sulfuric acid was refluxed for 4 hr. The cooled solution was diluted with water and adjusted to *p*H 7 with hot aqueous barium hydroxide. After removal of the barium sulfate by filtration, the filtrate was evaporated to dryness. The residue (34 g., 90.5% yield based on acrylamide) melted at 191–193°. One recrystallization from aqueous methanol raised the melting point to 195–196°; a mixed melting point with authentic β-alanine showed no depression. The compound was further identified by conversion to the β-naphthalenesulfonamide derivative, m.p. 136–137° (lit.[22] m.p. 135.5–136.5°).

Polymerization of 2-Propene-1-sulfonamide.—A mixture of 2-propene-1-sulfonamide (1.30 g.), phenyl-β-naphthylamine (0.01 g.) and sodium (0.03 g.) was heated overnight at 100°. The product, a brittle resin, was extracted with 2% acetic acid, taken up in acetone and poured into ether. After drying overnight *in vacuo* the polymer weighed 0.50 g.

(22) H. H. Weinstock, H. K. Mitchell, E. F. Pratt and R. J. Williams, THIS JOURNAL, **61**, 1421 (1939).

WILMINGTON, DELAWARE

[CONTRIBUTION FROM THE RESEARCH DIVISION, RIKER LABORATORIES, INC.]

Alkaloids of *Rauwolfia Canescens* Linn. IV.[1] The Structure of Pseudoreserpine

BY M. W. KLOHS, F. KELLER, R. E. WILLIAMS AND G. W. KUSSEROW

RECEIVED MARCH 20, 1957

The isolation and characterization of pseudoreserpine ($C_{32}H_{38}O_9N_2$), a new alkaloid possessing hypotensive and sedative activity, is reported. On methanolysis pseudoreserpine yielded methyl 3,4,5-trimethoxybenzoate and a new alkamine designated methyl pseudoreserpate, which has been shown to be methyl 17-nor-reserpate by conversion to the 17,18-diacetyl derivative of methyl 17-nor-3-isoreserpate and through the conversion of reserpine to methyl pseudoreserpate.

A continuation of our investigation of the crude reserpine fraction obtained from the roots of *Rauwolfia canescens* Linn. has resulted in the isolation of **pseudoreserpine,** a new reserpine-like alkaloid, possessing hypotensive and sedative activity.

Further development of the chromatogram which had previously yielded deserpidine and reserpine[2] afforded an additional fraction from which crystalline pseudoreserpine was obtained. As a test for homogeneity, this compound was submitted to a 24-plate countercurrent distribution between 5% acetic acid and chloroform–methylchloroform (60:40) and gave a single peak which corresponded well with the theoretical curve for a single substance.

The analyses of pseudoreserpine and its derivatives, as well as equivalent weight determinations, were in accord with the empirical formula $C_{32}H_{38}O_9N_2$. The infrared spectrum of pseudoreserpine showed certain similarities to the spectrum of reserpine in exhibiting ester carbonyl absorption at 5.86 μ and a band at 6.13 μ, attributed to polarization of an indole nucleus by a methoxyl group in the 6-position.[3] The region of >NH, –OH absorption showed two discrete bands at 2.81 and 2.90 μ, one of which could be attributed to an indole >NH, and the other to the possible presence of a hydroxyl group. The existence of the latter group was further demonstrated by the formation of an O-acetyl derivative. The ultraviolet spectrum of pseudoreserpine was identical to that of reserpine and indicated that it also contained the 3,4,5-trimethoxybenzoyl and 6-methoxyindole chromophores.

On treatment with sodium methoxide, pseudoreserpine yielded methyl 3,4,5-trimethoxybenzoate and a new alkamine, methyl pseudoreserpate. The analysis of this new base was in agreement with the empirical formula $C_{22}H_{28}O_5N_2$ and showed the presence of two methoxyl groups. The infrared spectrum of methyl pseudoreserpate revealed a single strong broad band in the >NH, –OH region (2.95 μ) indicative of hydrogen bonding, ester carbonyl absorption at 5.74 μ, and the 6-methoxyindole band at 6.10 μ. The ultraviolet spectrum was identical to that of methyl reserpate, the alkamine of reserpine.

Lithium aluminum hydride reduction of pseudoreserpine afforded the corresponding triol which

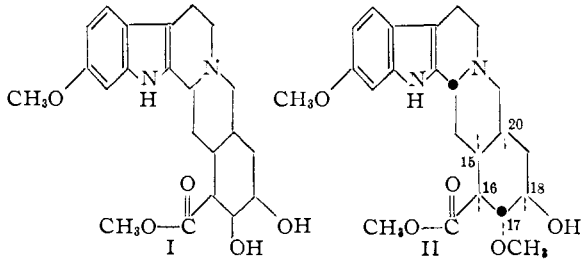
(1) A preliminary report of this investigation appeared in a previous communication; *cf.* M. W. Klohs, F. Keller, R. E. Williams and G. W. Kusserow, *Chemistry & Industry*, 187 (1956).

(2) M. W. Klohs, F. Keller, R. E. Williams and G. W. Kusserow, THIS JOURNAL, **77**, 4084 (1955).

(3) N. Neuss, H. E. Boaz and J. W. Forbes, *ibid.*, **76**, 2463 (1954).

was transparent in the carbonyl region of the infrared spectrum.

The above data and biogenetic considerations suggested that the basic structure of methyl pseudoreserpate was closely related to that of methyl reserpate (II) and differed by the presence of a hydroxyl, rather than a methoxyl group at the C-17 position in ring E, as shown in structure I.



Since the structure of methyl reserpate has been proven conclusively by degradation[4] and synthesis[5] it was desirable, in order to obtain experimental evidence in support of the above hypothesis, to attempt the conversion of these two compounds to a common degradation product. The 17,18-diacetyl derivative of methyl 17-nor-3-isoreserpate was chosen as the intermediate for this purpose, since its formation would appear to follow a straight forward path and permit the bulk of the work to be carried out on the more abundant starting material, reserpine. The first step toward this objective was the preparation of methyl 17-nor-3-isoreserpate (IV) through the demethylation and concomitant C-3 epimerization[6] of reserpine (III) with aqueous hydrobromic acid followed by methylation with diazomethane.

A comparison of the physical and spectral properties of methyl pseudoreserpate and methyl 17-nor-3-isoreserpate showed them to be dissimilar[7] which was not unexpected; however, since it was presumed, in view of the biological activity of pseudoreserpine,[8] that methyl pseudoreserpate possessed the less stable β-oriented hydrogen at C-3. For this reason, methyl pseudoreserpate was treated under conditions known to effect epimerization at C-3, *i.e.*, by extended refluxing in acetic anhydride[6] to yield the epimeric diacetyl derivative. A comparison of this compound with the diacetyl derivative of methyl 17-nor-3-isoreserpate showed them to be identical on the basis of their physical and spectral properties. Conclusive evidence was thus available for the assignment of the basic ring system in methyl pseudoreserpate, as well as the location of its functional groups as shown in structure I.

After establishing this portion of the structure for methyl pseudoreserpate, the stereochemical implications of the above transformations on the six asymmetric centers at C-3, C-15, C-16, C-17, C-18 and C-20 remained to be considered. The assignment of a *cis* relationship for the hydrogen atoms at C-15, C-16 and C-20 as in methyl reserpate seemed unambiguous, but the chemical evidence in favor of the β-configuration at C-3 could not be considered conclusive in view of the possibility that inversion at C-17 and C-18 by epoxide formation and opening, rather than a simple isomerization at C-3, might have occurred during the prolonged treatment of methyl pseudoreserpate with acetic anhydride. It was, therefore, deemed advisable to obtain additional experimental evidence prior to the definite assignment of configuration at these centers.

Further work by direct chemical methods was hindered at this stage by the exhaustion of our supply of pseudoreserpine; however, the opportune report of the conversion of 3-isoreserpine to reserpine[9] by oxidation with mercuric acetate followed by reduction with zinc in aqueous acetic acid afforded a facile route through which methyl 17-nor-3-isoreserpate could be converted to methyl pseudoreserpate and thereby clarify the stereochemical ambiguities in question. By this procedure, methyl 17-nor-3-isoreserpate (IV) was converted to methyl pseudoreserpate which was identified by comparison with an authentic sample prepared through the methanolysis of pseudoreserpine. The lithium aluminum hydride reduction product of VII was also identical with that obtained through the reduction of pseudoreserpine. With these data at hand, it is now possible to assign configurations to the asymmetric centers of methyl pseudoreserpate and thus postulate its complete structure as VII.

Conclusive evidence is not available to place the site of attachment of the 3,4,5-trimethoxybenzoyl linkage on methyl pseudoreserpate in forming pseudoreserpine; however, by analogy with the other members of this series, reserpine, rescinnamine and deserpidine, we favor C-18 VI.

Pharmacology.—Pharmacological studies show that the cardiovascular and sedative effects of pseudoreserpine are very similar to, but weaker than, those of reserpine.[10]

Experimental[11]

The Isolation of Pseudoreserpine.—The crude reserpine fraction (100 g.) obtained from the roots of *Rauwolfia canescens* Linn. as previously described,[12] was chromatographed on a 3-inch column, using Merck acid-washed alumina (3 kg.) as the adsorbent. The column was developed with benzene–chloroform (3:1) and the percentage of chloroform was increased until straight chloroform and finally mixtures of chloroform–methanol were used as eluting solvents, the progress of the column being followed by spot testing the

(4) (a) C. F. Huebner, H. B. MacPhilliamy, E. Schlitter and A. F. St. André, *Experientia*, II, 303 (1955); (b) E. E. van Tamelen and P. D. Hance, THIS JOURNAL, **77**, 4692 (1955), and references cited therein.

(5) R. B. Woodward, F. E. Bader, H. Bickel, A. J. Frey and R. W. Kierstead, *ibid.*, **78**, 2023 (1956).

(6) H. B. MacPhillamy, C. F. Huebner, E. Schlitter, A. F. St. André and P. R. Ulshafer, *ibid.*, **77**, 4335 (1955).

(7) In our previous communication[1] we noted the more negative molecular rotation of methyl pseudoreserpate as compared to methyl 17-nor-3-isoreserpate and made mention of this as being contrary to that observed for C-3 isomers of reserpine and its derivatives. Dr. C. F. Huebner has kindly pointed out, in a private communication, that while there is a negative shift in going from reserpine to 3-isoreserpine, the opposite holds true for methyl reserpate and its C-3 isomer; thus the change in rotation observed for methyl 17-nor-3 isoreserpate was to be expected for this derivative.

(8) It has been shown previously[6] that reserpine loses its characteristic physiological activity upon epimerization at the C-3 center.

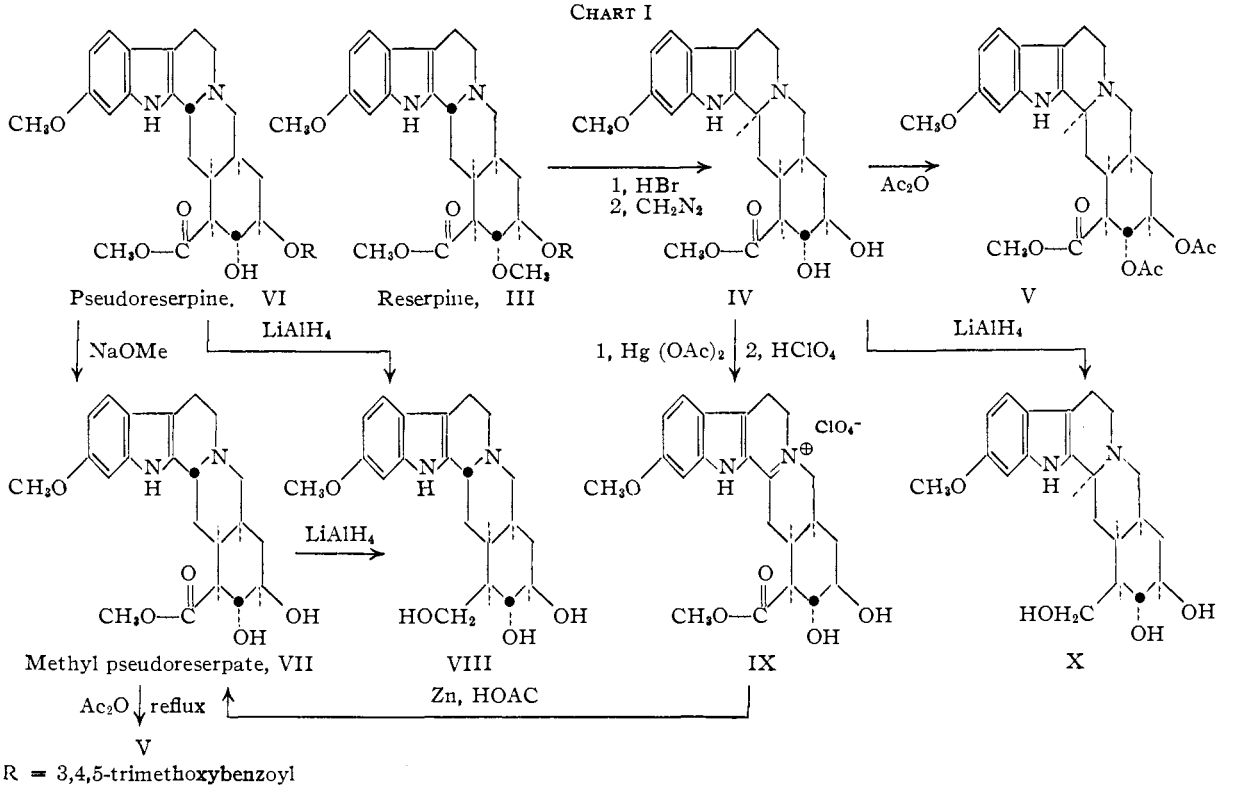
(9) Frank L. Weisenborn and Patrick A. Diassi, THIS JOURNAL, **78**, 2022 (1956).

(10) S. Rothman and I. M. Toekes, to be published.

(11) All melting points were taken in evacuated capillaries, unless otherwise noted.

(12) M. W. Klohs, M. D. Draper, F. Keller and F. J. Petracek, THIS JOURNAL, **76**, 138 (1954).

CHART I



R = 3,4,5-trimethoxybenzoyl

eluents with Frohde reagent and by the use of infrared spectra. Deserpidine was obtained from the fraction eluted with benzene–chloroform (1:1); on reaching the solvent system chloroform–methanol (99:1) a new alkaloid was encountered in trace amounts, m.p. 152–154°, $[\alpha]^{24}D$ −187° in $CHCl_3$. Further elution of the column with chloroform–methanol (95:5) yielded reserpine, followed by a fraction which behaved like reserpine on crystallization and spot tests, but showed differences in its infrared spectrum. This compound was further purified as described below.

Pseudoreserpine.—The crude resin fraction obtained above (1.2 g.) on dissolving in methanol (10 ml.) yielded crystalline pseudoreserpine; after several recrystallizations from dilute acetone, pseudoreserpine melted at 257–258°, $[\alpha]^{24}D$ −65 ± 2° (*c* 1.0 in $CHCl_3$). A 24-plate countercurrent distribution in a Craig glass apparatus between 5% aqueous acetic acid and chloroform–methylchloroform (60:40), gave a single band (K = 0.85) which corresponded with the theoretical curve for a single substance. The ultraviolet spectrum showed: λ_{max}^{alc} (log ϵ) 218 mμ (4.76), 268 mμ (4.22), 296 mμ (4.02); λ_{min}^{alc} (log ϵ) 246 mμ (3.98), 288 mμ (3.99). The infrared spectrum (Nujol) showed well defined and characteristic bands at 2.81 μ, 2.90 μ (>NH, OH); 5.86 μ (ester carbonyl); 6.13 μ (6-methoxyindole); 6.26 and 6.63 μ (aromatic). For analysis the sample was dried to constant weight at room temperature (2 mm.).

Anal.[13] Calcd. for $C_{32}H_{38}O_9N_2$: C, 64.63; H, 6.44; N, 4.71; 5-OCH_3, 26.10; mol. wt., 594.64. Found: C, 64.36; H, 6.44; N, 4.63; -OCH_3, 26.34; equiv. wt.,[14] 598.

On diluting the methanol mother liquors obtained above with water, an additional crystalline alkaloid was obtained which was purified further by recrystallization from dilute methanol. On the basis of its physical constants and spectral data, the compound appeared to be identical with raunescine.[15]

Pseudoreserpine Nitrate.—Pseudoreserpine (50 mg.) was suspended in methanol (2 ml.) and the solution was made acid with concentrated nitric acid. The addition of acid solubilized the suspended pseudoreserpine; however, on standing, fine needles separated. The crystals (35 mg.) were collected by filtration, washed with water and dried to constant weight at room temperature (2 mm.), m.p. 253–255°.

Anal. Calcd. for $C_{32}H_{38}O_9N_2 \cdot HNO_3$: C, 58.44; H, 5.97; N, 6.39. Found: C, 58.32; H, 6.03; N, 6.16.

Acetylpseudoreserpine.—Pseudoreserpine (100 mg.) was dissolved in anhydrous pyridine and acetic anhydride (1 ml.) was added; the solution, after standing overnight under anhydrous conditions, was concentrated to dryness under vacuum. The resulting light colored residue was dissolved in chloroform (25 ml.) and extracted with equal portions of dilute sodium carbonate and then water. The chloroform solution was filtered through anhydrous sodium sulfate and concentrated to dryness *in vacuo*. The product was crystallized first from dilute methanol and then from dilute acetone as clusters of platelets (80 mg.), m.p. 150–154°. The infrared spectrum (Nujol) showed well defined bands at 3.0 (>NH), 5.78, 5.81 (ester carbonyl), 6.18 (6-methoxyindole) and 6.30 and 6.70 μ (aromatic). For analysis the sample was dried to constant weight at room temperature (2 mm.)

Anal. Calcd. for $C_{34}H_{40}O_{10}N_2$: C, 64.14; H, 6.33; N, 4.40; acetyl, 6.83. Found: C, 64.12; H, 6.46; N, 4.48; acetyl, 6.80.

Methanolysis of Pseudoreserpine to Methyl 3,4,5-Trimethoxybenzoate and Methyl Pseudoreserpate.—Pseudoreserpine (0.85 g.) was suspended in anhydrous methanol (50 ml.) to which sodium (0.15 g.) had previously been added. The mixture was refluxed for two hours. At the end of this time, the clear solution was concentrated *in vacuo* to a volume of approximately 5 ml. and water was added (50 ml.). The solution was made acid to congo red paper by the addition of concentrated hydrochloric acid and was then extracted two times with ether (50-ml. portions.) The dried ether extracts (sodium sulfate) yielded crystals of methyl 3;4,5-trimethoxybenzoate upon being taken to dryness *in vacuo* (identified by comparison with an authentic sample).

The aqueous layer obtained above was made basic with ammonium hydroxide and extracted three times with chloroform (50-ml. portions). The combined chloroform extracts were dried over anhydrous sodium sulfate and upon removal of the solvent *in vacuo*, a fluffy resin was obtained. This material was quite difficult to crystallize and only yielded a small quantity of needles upon treatment with

(13) All microanalyses by H. V. Tashinian, Microchemical Specialties Co., Berkeley 3, Calif.

(14) By titration with perchloric acid in glacial acetic acid solution.

(15) N. Hosansky and E. Smith, *J. Am. Pharm. Assn., Sci. Ed.*, **44**, 639 (1955).

ether; m.p. 234–237°, $[\alpha]^{24}D$ −102 ± 3° (*c* 0.5 in pyridine). The ultraviolet spectrum showed: λ_{max}^{alc} (log ε) 228 mμ (4.54), 270 mμ (3.68), 298 mμ (3.79); λ_{min}^{alc} (log ε) 252 mμ (3.56), 282 mμ (3.60). The infrared spectrum (Nujol) showed characteristic bands at 2.95 (>NH, –OH), 5.74 (ester carbonyl) and 6.20 μ (6-methoxyindole). For analysis the sample was dried to constant weight at 100° (2 mm.).

Anal. Calcd. for $C_{22}H_{28}O_5N_2$: C, 65.98; H, 7.05; OMe, 15.5. Found: C, 65.67; H, 7.31; OMe, 15.7.

Pseudoreserpinediol (VIII).—Pseudoreserpine (0.244 g.) in tetrahydrofuran (25 ml.) was added slowly to a refluxing solution of lithium aluminum hydride (0.25 g.) in tetrahydrofuran (35 ml.). Refluxing was continued for four hours, after which the solution was cooled to room temperature and the excess hydride was decomposed by the addition of a few drops of water. The solution was then filtered through Celite to remove the suspended aluminum salts and the filtrate was concentrated to dryness *in vacuo*. The resulting glass was taken up in hot isopropyl alcohol, whereupon crystals formed, m.p. 230–231°, $[\alpha]^{24}D$ 0.0° (*c* 0.5 in pyridine).

Anal. Calcd. for $C_{21}H_{28}O_4N_2$: C, 67.72; H, 7.58; OCH_3, 8.33. Found: C, 68.0; H, 7.9; $-OCH_3$, 8.4.

Methyl 17-Nor-3-isoreserpate (IV).—Reserpine (III) (18 g.) was suspended in 48% aqueous hydrobromic acid (100 ml.) and the mixture was heated on the steam-bath for four hours under an atmosphere of nitrogen. The resulting light brown solution was then taken to dryness *in vacuo*, yielding a fluffy tan resin. This material was dissolved in methanol (100 ml.) and treated with an excess of ethereal diazomethane (approximately one mole in 1.5 l. of ether), followed by the addition of chloroform (100 ml.) to effect solution of a light precipitate which had settled out. The mixture was allowed to stand overnight and then was taken to dryness *in vacuo*. The resulting fluffy resin was taken up in 5% methanol in chloroform and applied to a chromatographic column containing 500 g. of Merck acid-washed alumina. The initial eluates consisted mainly of methyl 3,4,5-trimethoxybenzoate identified by comparison with an authentic sample. The fractions immediately following this, and those eluted with 10% methanol in chloroform, yielded a light fluffy resin which crystallized from methanol yielding needles (2.75 g.), m.p. 265–266°, $[\alpha]^{24}D$ −69° (*c* 0.5 in pyridine). For analysis the sample was dried to constant weight at 100° (2 mm.).

Anal. Calcd. for $C_{22}H_{28}O_5N_2$: C, 65.98; H, 7.05; $-OCH_3$, 15.50. Found: C, 65.82; H, 7.10; $-OCH_3$, 15.54.

17,18-Diacetyl Methyl-17-nor-3-isoreserpate (V).—Methyl 17-nor-3-isoreserpate (IV) (200 mg.) was dissolved in anhydrous pyridine (20 ml.) and acetic anhydride (6 ml.) was added. The mixture was refluxed for one hour under anhydrous conditions and then concentrated to dryness *in vacuo*. The amorphous residue was dissolved in chloroform (25 ml.) and the solution was extracted with equal portions of dilute ammonium hydroxide and then with water; the chloroform layer was dried over anhydrous sodium sulfate and then evaporated to dryness *in vacuo*. On addition of methanol to the residue, a white powder (191 mg.) was obtained which was recrystallized from dilute acetone, m.p. 290–291°, $[\alpha]^{24}D$ −88.2° (*c* 0.5 in $CHCl_3$). For analysis the sample was dried to constant weight at 100° (2 mm.).

Anal. Calcd. for $C_{26}H_{32}O_7N_2$: C, 64.45; H, 6.66; O-acetyl, 17.8. Found: C, 64.62; H, 6.57; O-acetyl, 17.4.

Acetylation and Epimerization of Methyl Pseudoreserpate.—Methyl pseudoreserpate (VII) (275 mg.) was refluxed for six hours with acetic anhydride (10 ml.) under anhydrous conditions. The reaction mixture was then worked up as described above for V to yield an amorphous residue. On addition of methanol, a white powder was obtained (57 mg.) which on recrystallization from dilute acetone, melted at 292–293°, $[\alpha]^{24}D$ −86.9° (*c* 0.5 in $CHCl_3$). A mixture melting point with the diacetyl derivative of methyl 17-nor-3-isoreserpate obtained above gave no depression; a comparison of their infrared and ultraviolet spectra showed them to be identical.

Methyl 17-Nor-$\Delta^{3,4}$-dehydroreserpate Perchlorate (IX).—Methyl 17-nor-3-isoreserpate (IV) (1.2 g.), dissolved in glacial acetic acid (10 ml.), was added to a solution composed of mercuric acetate (1.3 g.) and glacial acetic acid (10 ml.). The resulting mixture was warmed on the steam-bath for two hours and after allowing it to come to room temperature, the flaky white crystals of mercurous acetate were filtered off. The resulting filtrate was saturated with hydrogen sulfide, centrifuged, and filtered through Celite, finally yielding a clear yellow solution. This was concentrated to a volume of approximately 2 ml. *in vacuo*, and methanol (10 ml.), perchloric acid (0.6 ml.) and ether (30 ml.) were added in that order. An oil separated which soon crystallized as small yellow platelets (1.48 g.). On recrystallization from methanol, platelets were obtained, m.p. 258°. For analysis, the sample was dried to constant weight at 60° (2 mm.).

Anal. Calcd. for $C_{22}H_{27}O_9N_2Cl$: C, 52.96; H, 5.46; Cl, 7.11; $-OCH_3$, 12.44. Found: C, 52.66; H, 5.65; Cl, 6.98; $-OCH_3$, 12.35.

Zinc–Acetic Acid Reduction of Methyl 17-Nor-$\Delta^{3,4}$-dehydroreserpate Perchlorate (IX) to Methyl Pseudoreserpate (VII).—Methyl 17-nor-$\Delta^{3,4}$-dehydroreserpate perchlorate (IX) (285 mg.) was dissolved in 50% aqueous acetic acid (20 ml.), and granulated zinc (1 g.) was added. The mixture was allowed to stand overnight and then was diluted with water (50 ml.) and filtered free of the unreacted zinc. The filtrate was made basic with dilute sodium hydroxide and then extracted three times with chloroform. The combined chloroform extracts were washed with a small volume of water and dried with anhydrous sodium sulfate. The solvent was then removed *in vacuo*, yielding a fluffy white resin which crystallized upon the addition of ether as white needles (70 mg.), m.p. 228°, $[\alpha]^{26}D$ −100° (*c* 0.29 in pyridine). A comparison of the physical and spectral properties of this compound with those of an authentic sample of methyl pseudoreserpate showed them to be identical. For analysis the material was dried to constant weight at 100° (2 mm.).

Anal. Calcd. for $C_{22}H_{28}O_5N_2$: C, 65.98; H, 7.05. Found: C, 65.82; H, 7.29.

Lithium aluminum hydride reduction of this compound was carried out as reported above for pseudoreserpinediol and yielded needles, m.p. 233°. A mixture melting point with pseudoreserpinediol obtained by reduction of pseudoreserpine gave no depression and the infrared spectra of the two preparations were identical. The optical rotations also agreed, $[\alpha]^{26}D$ 0.0° (*c* 0.3 in pyridine).

3-Isopseudoreserpinediol (X).—Methyl 17-nor-3-isoreserpate (IV) (107 mg.) was dissolved in tetrahydrofuran (25 ml.) and added to a refluxing solution of lithium aluminum hydride (100 mg.) in tetrahydrofuran (25 ml.). The solution was kept at reflux for four hours and then the reaction mixture was worked up as for pseudoreserpinediol. White needles (46 mg.) were obtained, which were recrystallized several times from isopropyl alcohol, m.p. 286–287°, $[\alpha]^{27}D$ −107° (*c* 0.2 in pyridine). This material easily formed solvates and did not lose all of its solvent of crystallization even when dried at 120° (2 mm.).

Anal. Calcd. for $C_{21}H_{28}O_4N_2 \cdot {}^1/_2H_2O$: C, 66.12; H, 7.66. Found: C, 65.43; H, 7.82.

Treatment of Pseudoreserpine with Mercuric Acetate.—Pseudoreserpine (50 mg.) was dissolved in glacial acetic acid (4 ml.), and mercuric acetate (50 mg.) in glacial acetic acid (4 ml.) was added. The mixture was heated on the steam-bath for 0.5 hour and at the end of this time the solution remained clear. In contrast 3-isoreserpine gave a copious precipitate of mercurous acetate within three to five minutes. Reserpine itself gave a precipitate only on prolonged warming, presumably because of isomerization occurring at C-3.

Acknowledgment.—We wish to express our thanks to Messrs. C. H. Stimmel and A. Shimamura and Miss M. Roper in the Analytical Section, Research Division, Riker Laboratories, for the optical rotations, spectral data and equivalent weight determinations.

LOS ANGELES, CALIFORNIA