Studies on the Syntheses of Heterocyclic Compounds. Part CDLV (1). The Mass Spectral Investigation and Synthesis of the Ochotensinan Skeleton.

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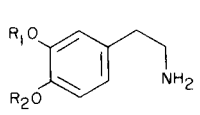
Syntheses of several 1-spiroisoquinoline derivatives (VIII, IX, X, XI, XII, XIII, and XIV) were carried out and their unique mass spectral fragmentations were reported. The presence of carbonyl groups at the C-9 and C-14 positions caused cleavage of the five membered ring through the elimination of one or two carbon monoxide groups. This led to the formation of the three membered ring system on the fragmentation pathway.

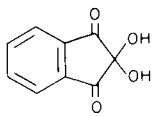
In the previous papers (2,3), we reported syntheses of various kinds of 1,1′-spiroisoquinolines including the ochotensine type compounds named ochotensinan. The mass spectrometric characterization of the composition of the ochotensine type compounds and their behavior under electron-impact is one of the important subjects in this series. In the course of the investigation on the syntheses of ochotensinans, we synthesized ochotensinan-9,14-diones and successively investigated the fragmentation patterns in the mass spectra of ochotensinan-9,14-diones. Although the general fragmentation patterns of the ochotensine type alkaloids have been reported (4,5,6,7) the mass spectra of the ochotensinan-9,14-diones have not yet been reported. Furthermore, we developed a general method for the synthesis of substituted ochotensinan-9,14-diones. Condensation of substituted phenethylamines with ninhydrin (VII) afforded the ochotensinan-9,14-diones in one step. Eschweiler-Clarke reaction of the condensation products gave the 7-methyl derivatives. Eight compounds (VIII-XV), thus synthesized as described in the experimental section, were examined under electron-impact, and the features of their fragmentation patterns were found to be considerably different from those of the ochotensine alkaloids. Herein we wish to report these results.

The mass spectra of 2,3-dihydroxyochotensinan-9,14-dione (VIII) and its 2-*O*-methyl analog (IX) exhibit a strong molecular ion, indicating a higher degree of stabilization. The cleavage, which took place in VIII and IX, produced four major fragments (ions VIIIa-d and IXb-e, respectively). In the case of VIII, a characteristic ion VIIIa, formed by the loss of carbon monoxide and the hydrogen radical from the molecular ion, was observed at m/e 266. Further loss of carbon monoxide from the ion VIIIa afforded the ion VIIIc. Another important fragment, the ion VIIIb, which would be generated by the elimination of the hydroxyl radical and carbon monoxide, was observed at m/e 250. The ion VIIIb afforded the ion VIIId by further loss of carbon monoxide as in the formation of ion VIIIc. Besides these four ions, the ion (VIII-18), which formed with elimination of water, was observed at m/e 277 (8). The computerized mass measurements confirmed the composition of these ions (see Table I), and

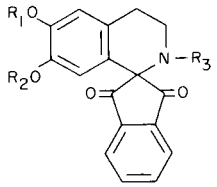
SCHEME 1



I, R_1 = R_2 = H
II, R_1 = H, R_2 = Me
III, R_1 = Me, R_2 = tosyl
IV, R_1 = H, R_2 = tosyl
V, R_1 = R_2 = Me
VI, R_1 = Me, R_2 = Et



VII



VIII, R_1 = R_2 = R_3 = H
IX, R_1 = R_3 = H, R_2 = Me
X, R_1 = R_3 = H, R_2 = tosyl
XI, R_1 = R_2 = Me, R_3 = H
XII, R_1 = Me, R_2 = Et, R_3 = H
XIII, R_1 = R_2 = R_3 = Me
XIV, R_1 = R_3 = Me, R_2 = Et
XV, R_1 = R_2 = Me, R_3 = COOEt

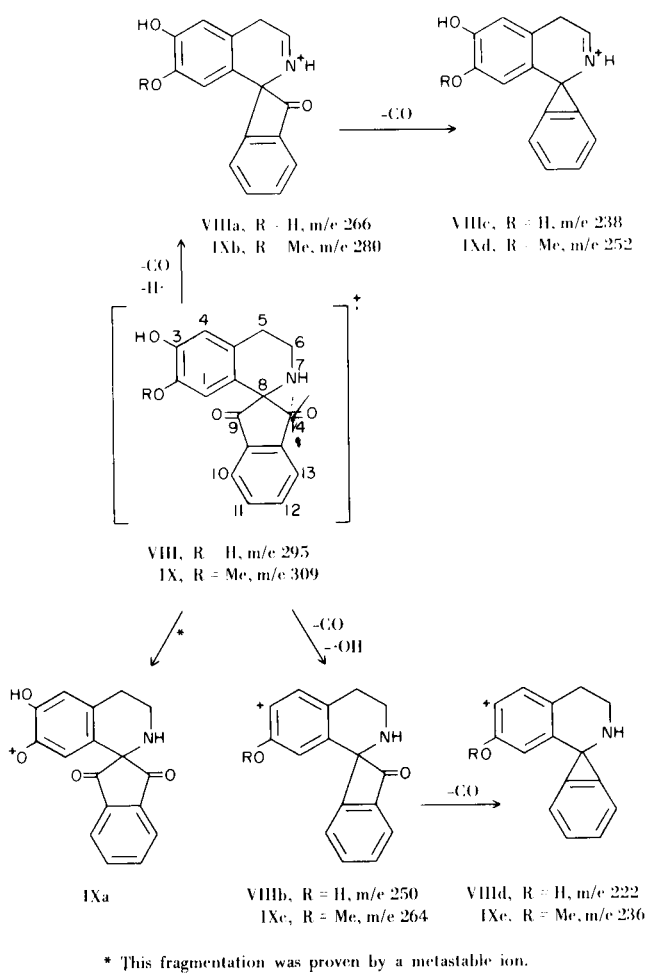
TABLE I

Compound and its fragment	m/e (observed)	Relative Intensity (%)	m/e (calculated)	Elements
VIII	295.0862	(100)	295.0881	$C_{17}H_{13}N_1O_4$
VIII-H_2O	277.0717	(34)	277.0696	$C_{17}H_{11}N_1O_3$
VIIIa	266.0825	(16)	266.0817	$C_{16}H_{12}N_1O_3$
VIIIb	250.0863	(16)	250.0867	$C_{16}H_{12}N_1O_2$
VIIIc	238.0856	(30)	238.0867	$C_{15}H_{12}N_1O_2$
VIIId	222.0906	(10)	222.0918	$C_{15}H_{12}N_1O_2$
IX	309.0989	(100)	309.0979	$C_{18}H_{15}N_1O_4$
IXa	294.0764	(6)	294.0765	$C_{17}H_{12}N_1O_4$
IXb	280.0988	(7)	280.0973	$C_{17}H_{14}N_1O_3$
IXc	264.1055	(82)	264.1024	$C_{17}H_{14}N_1O_2$
IXd	252.1048	(16)	252.1024	$C_{16}H_{14}N_1O_2$
IXe	236.1083	(6)	236.1075	$C_{16}H_{14}N_1O_1$
XI	323.1149	(100)	323.1156	$C_{19}H_{17}N_1O_4$
XIa	294.1131	(8)	294.1130	$C_{18}H_{14}N_1O_3$
XIb	267.1222	(22)	267.1258	$C_{17}H_{17}N_1O_2$
XII	337.1340	(100)	337.1313	$C_{20}H_{19}N_1O_4$
XIIa	308.1313	(10)	308.1286	$C_{19}H_{18}N_1O_3$
XIIb	281.1387	(22)	281.1415	$C_{18}H_{19}N_1O_2$
XIIc	264.1005	(68)	264.1023	$C_{17}H_{14}N_1O_2$
XIId	252.1030	(12)	252.1024	$C_{16}H_{14}N_1O_2$
XIII	337.1312	(100)	337.1312	$C_{20}H_{19}N_1O_4$
XIIIa	322.1095	(24)	332.1079	$C_{19}H_{16}N_1O_4$
XIIIb	308.1248	(20)	308.1285	$C_{19}H_{18}N_1O_3$
XIIIc	294.1108	(16)	294.1128	$C_{18}H_{16}N_1O_3$
XIIId	280.1314	(60)	280.1335	$C_{18}H_{18}N_1O_2$
XIIIe	278.1175	(94)	278.1179	$C_{18}H_{16}N_1O_2$
XIIIf	266.1189	(12)	266.1197	$C_{17}H_{16}N_1O_2$
XIIIg	264.1022	(17)	264.1023	$C_{17}H_{14}N_1O_2$
XIIIh	250.1244	(18)	250.1231	$C_{17}H_{16}N_1O_1$
XIV	315.1496	(100)	351.1469	$C_{21}H_{21}N_1O_4$
XIVa	337.1287	(22)	337.1313	$C_{20}H_{19}N_1O_4$
XIVb	322.1431	(18)	322.1442	$C_{20}H_{20}N_1O_3$
XIVc	278.1187	(96)	278.1180	$C_{18}H_{16}N_1O_2$
XIVd	266.1194	(16)	266.1180	$C_{17}H_{16}N_1O_2$
XIVe	264.1034	(12)	264.1025	$C_{17}H_{14}N_1O_2$

this mode of decomposition was observed in the 2-*O*-methyl analog (IX), which gave a fragmentation pattern very similar to that of VIII, as shown in Scheme 1. However, in the case of IX, the ion $[M-18]^{+\cdot}$ was not observed, but the ion IXa was formed by the loss of the methyl radical from the molecular ion. The mass spectrum of the 3-hydroxy-2-tosyloxyochotensinan-9,14-dione (X) under electron-impact exhibited interesting results. *O*-Tosyl derivatives showed a weak molecular ion peak compared with both phenolic ochotensinan-9,14-diones (VIII and IX), although the ion [M-154], $[VIII]^{+\cdot}$, derived from the molecular ion was observed as a base peak, and the ions corresponding to ions VIIIa-d were shown with a higher intensity. Therefore, the protection of one of the hydroxyl groups with a tosyl group might be an interesting method to give fragments with high intensity in a series of diphenolic ochotensinan compounds such as VIII.

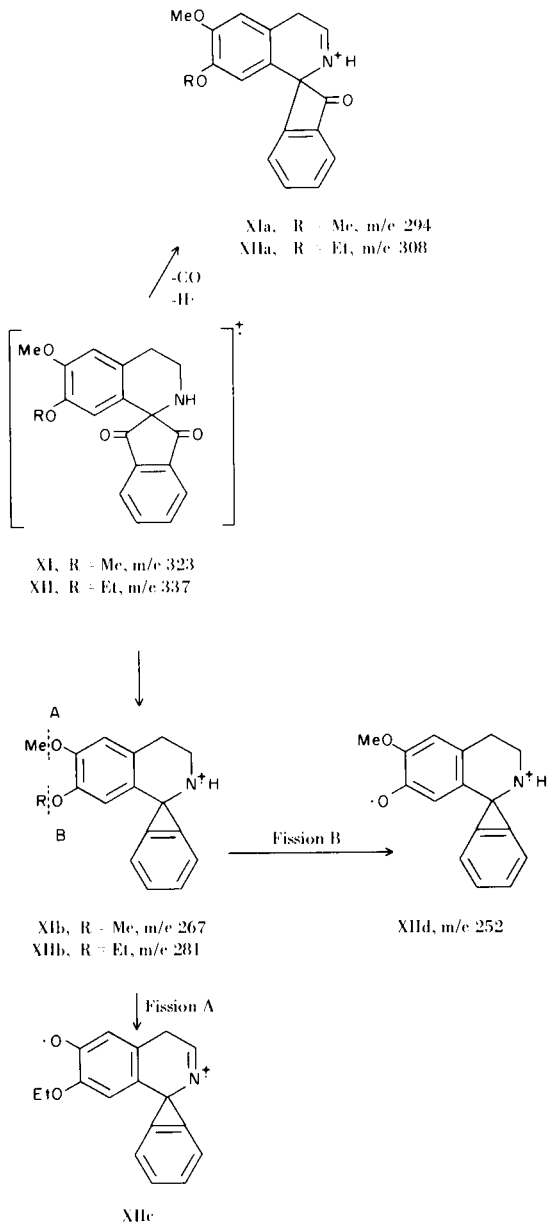
In the above three compounds, the ions VIIId and IXe were weak. It is of interest to compare the mass spectra of the phenolic ochotensinan-9,14-diones with those of the 2,3-dialkoxy analog. The 2,3-dimethoxyochotensinan-9,14-dione (XI) showed a simple mass spectrum, in which the molecular ion peak was observed as a base peak. Two ions XIa and XIb were observed at m/e 294 and 267, respectively, as characteristic peaks, and the mode of the formation of both ions is similar to that of the ions VIIIa or IXb and VIIIb or IXc. Elimination of carbon monoxide and the hydrogen radical gave the ion XIa from the molecular ion, and loss of two carbon monoxide molecules produced the ion XIb. The composition of both ions was confirmed by high resolution mass spectra with computerized measurements. The 3-ethoxy-2-methoxyochotensinan-9,14-dione (XII) also exhibited a fragmentation similar to XI as shown in Scheme 3. Fission A and

SCHEME 2



* This fragmentation was proven by a metastable ion.

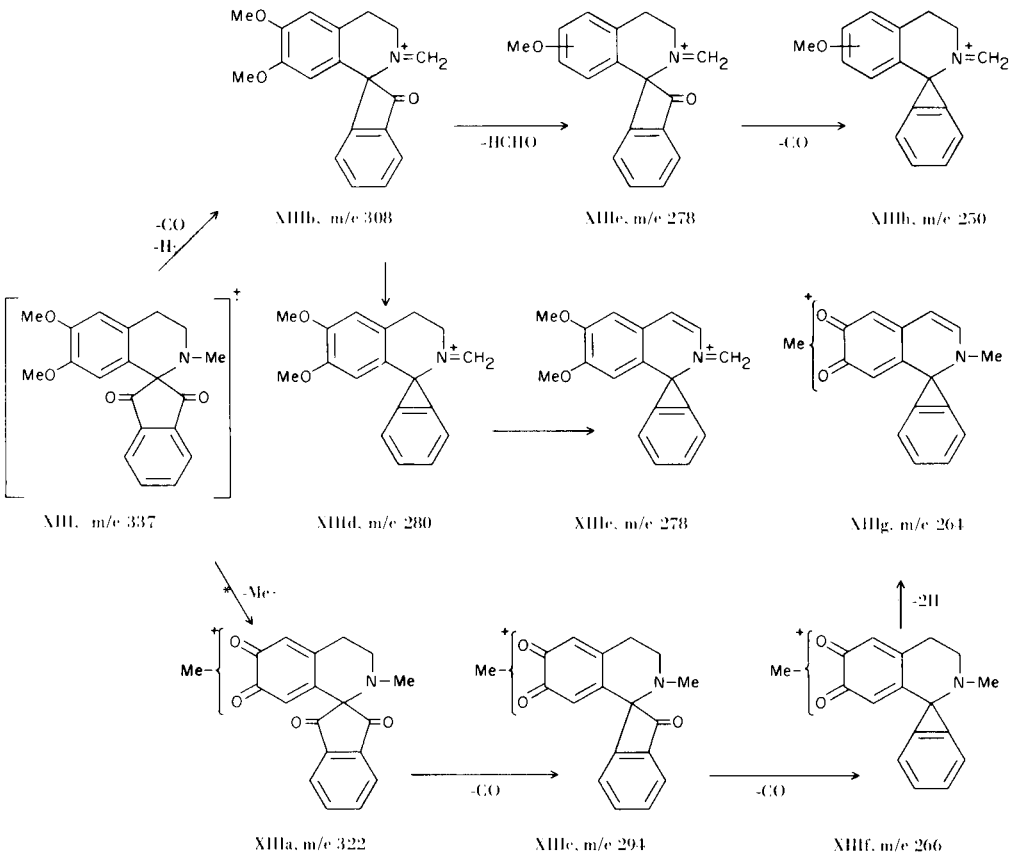
SCHEME 3



elimination of two hydrogen atoms in the ion XIIb, derived from the molecular ion, afforded the ion XIIc, and the formation of ion XIId at m/e 252 as another characteristic peak could be accounted for by fission B.

Finally, *N*-methyl derivatives XIII and XIV were examined under electron-impact. The features of their fragmentation patterns were found to be similar to those of the above compounds. Both of the compounds XIII and XIV exhibit a strong molecular ion. Elimination of carbon monoxide and the hydrogen atom from the molecular ion formed the ion XIIIb at m/e 308, which led to the ion XIIId by further loss of carbon monoxide. Two hydrogens were removed from the ion XIIId to give the stable fragment ion XIIIe with a conjugated system at m/e 278. This fragmentation pattern was also shown in the mass spectra of XIV. In this case, the ion XIVc, derived from the molecular ion through loss of the methyl radical, two carbon monoxides and two hydrogens, was observed at m/e 278 with a high intensity caused by the conjugated system. The ion XIIIh was formed at m/e 250 through the ion XIIIe, which was derived from the ion XIIIb by the elimination of one of the methoxyl groups as formaldehyde. Main fragmentation features in XIII and XIV were shown in Scheme 4 and 5, respectively. Although alternative plausible ion structures XVI and XVII for the ions M-29 and M-57, respectively (Scheme 6), could be considered, these fragmentation process could not be applied to the *N*-substituted derivatives XIII, XIV, and XV. Composition of all fragments described here was confirmed by computerized high resolution mass measurements.

SCHEME 4



* This fragmentation was proven by a metastable ion.

In summary, it is interesting that the 2,3-disubstituted ochotensinan-9,14-diones have afforded significantly different features from the ochotensin alkaloids in their mass spectra and finally that the ions having a three membered ring system were formed.

EXPERIMENTAL

Melting points are uncorrected. Mass spectra were taken on a Hitachi RMU-7 spectrometer equipped with a direct inlet system; chamber voltage 80 eV, total emission 80 μA, evaporation temperature 200°, ion chamber temperature in the case of VIII and XIV, 150°; IX, 200°; X, 180°; XI and XIII, 160°; XII, 130°, and high resolution mass spectra were also measured with a Hitachi RMU-7 spectrometer and calculated with a Hitach-10 computer using perflouorokerosin as an internal reference. The error margins were ± 3 (VII, XII, XIV), and ± 5 (IX, XI, XIII) millimass.

3-Hydroxy-4-tosyloxyphenethylamine (IV) Hydrochloride.

A mixture of 2.8 g. of 3-methoxy-4-tosyloxyphenethylamine (III) (9) and 20 ml. of concentrated hydrochloric acid was refluxed for 3 days under a stream of carbon dioxide, and the reaction mixture was then evaporated to dryness *in vacuo* to give a residue, which was chromatographed on 40 g. of silica gel (10). The chloroform-methanol (10:1) eluate gave 1.45 g. of a colorless powder, the crystallization of which from methanol-ether afforded the amine (IV) hydrochloride as colorless needles, m.p. 200-201°; ir ν max cm^{-1} (potassium bromide): 3300 (associated OH); nmr (11) ppm (deuterium oxide): 2.49 (3H, s, *p*-$CH_3C_6H_4$-), 1.5-1.95 (4H, m, $C_6H_3CH_2CH_2$-), -1.8 ~ -2.2 (3H, m, $C_6H_3CH_2$-), -2.3 ~ -2.9 (4H, m, *p*-$CH_3C_6H_4SO_2$-).

Anal. Calcd. for $C_{15}H_{18}ClNO_4S$: C, 52.40; H, 5.30; N, 4.00. Found: C, 52.83; H, 5.14; N, 4.16. Mass: m/e 307 (*M*-HCl).

2,3-Dihydroxyochotensinan-9,14-dione (VIII).

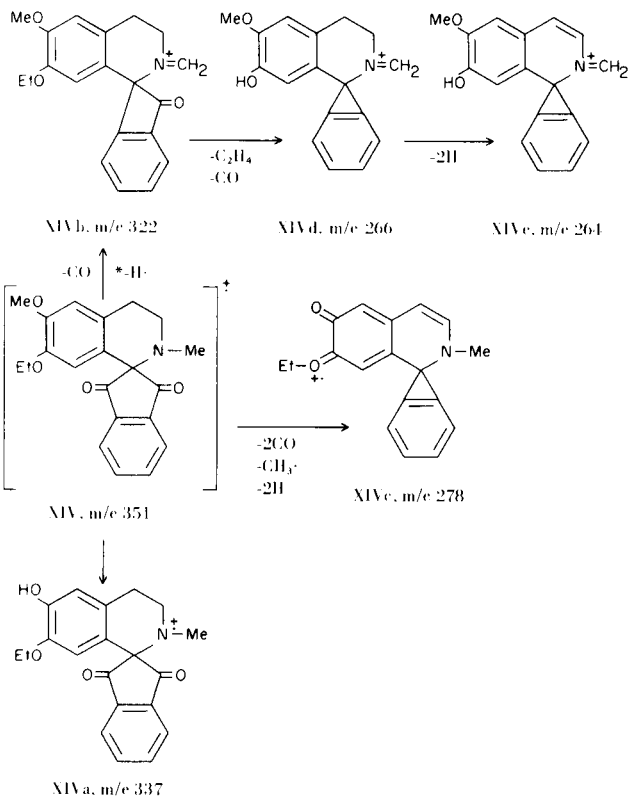
A mixture of 500 mg. of 3,4-dihydroxyphenethylamine (I) (12) hydrochloride, 566 mg. of ninhydrin (VII) and 200 ml. of absolute ethanol was set aside at room temperature for 4 days. After removal of the solvent under reduced pressure, the residue was chromatographed on 40 g. of silica gel. The chloroform-methanol (95:5) eluate gave 190 mg. of a pale yellow solid, the recrystallization of which from acetone-hexane gave VIII as pale yellow needles, m.p. 220° dec.; Beilstein test (-); ir ν max cm^{-1} (potassium bromide): 1745 (ketone C=O), 1705 (ketone C=O).

Anal. Calcd. for $C_{17}H_{13}NO_4$: C, 69.23; H, 4.44; N, 4.75. Found: C, 68.83; H, 4.43; N, 4.97.

3-Hydroxy-2-tosyloxyochotensinan-9,14-dione (X) Hydrochloride.

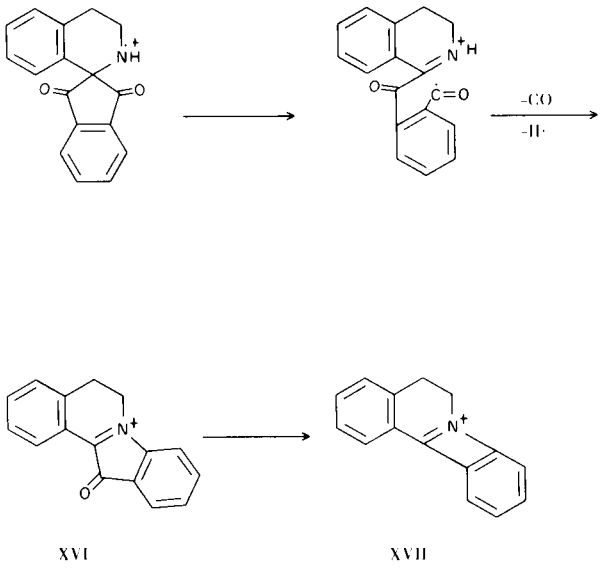
A solution of 250 mg. of 3-hydroxy-4-tosyloxyphenethylamine

SCHEME 5



* This fragmentation was proven by a metastable ion.

SCHEME 6



(IV) hydrochloride, 180 mg. of ninhydrin (VII) and 100 ml. of absolute ethanol was allowed to stand at room temperature for 4 days. After removal of the solvent under reduced pressure, the residue was triturated with chloroform (containing 2% methanol)-ether to give 105 mg. of X as pale yellow needles, the recrystallization of which from methanol-ether gave the hydrochloride of X as colorless needles, m.p. 205-208°; Beilstein test (+); ir ν max cm^{-1} (potassium bromide): 1762 (ketone C=O), 1720 (ketone C=O).

Anal. Calcd. for $C_{24}H_{20}ClNO_6S$: C, 59.22; H, 4.08; N, 2.99. Found: C, 59.08; H, 4.16; N, 3.06.

2,3-Dimethoxyochotensinan-9,14-dione (XI).

To a solution of 100 mg. of 3-hydroxy-2-methoxyochotensinan-9,14-dione (IX), 200 ml. of tetrahydrofuran and 20 ml. of methanol was added an ethereal solution of diazomethane (prepared from 3.5 g. of *p*-toluenesulfonyl-*N*-methyl-*N*-nitrosoamide) (13). After being allowed to stand overnight, the solvent was removed under reduced pressure to give 90.5 mg. of a pale yellow solid, which was recrystallized from chloroform-hexane to give pale yellow needles, m.p. 170-172°; ir ν max cm^{-1} (potassium bromide): 1742 (ketone C=O), 1704 (ketone C=O); nmr (14) ppm (deuteriochloroform): 2.82 (2H, t, J = 6 Hz, -CH_2NH-), 3.43 (2H, t, J = 6 Hz, $(MeO)_2$-$C_6H_2CH_2$CH-), 3.49 (3H, s, C_2-OCH_3), 3.80 (3H, s, C_3-OCH_3), 5.87 (1H, s, C_1-H), 6.61 (1H, s, C_4-H), 7.70-8.15 (4H, m, C_{10}, C_{11}, C_{12}, C_{13}-H), 1.94 (1H, s, N*H*, exchanged with deuterium dioxide).

Anal. Calcd. for $C_{19}H_{17}NO_4$: C, 70.57; H, 5.30; N, 4.33. Found: C, 70.35; H, 5.55; N, 4.30.

A Synthesis of XI from VIII.

Methylation of hydrochloride of 100 mg. of VIII with diazomethane, followed by treatment with 10% ammonia, as in the preceding method, afforded 87 mg. of XI, the m.p., ir and nmr spectra of which were identical with those of an authentic sample.

A Synthesis of XI from 3,4-Dimethoxyphenethylamine (V) and VII (15).

To a stirred solution of 2 g. of ninhydrin in 50 ml. of absolute ethanol was added dropwise a solution of 2 g. of 3,4-dimethoxyphenethylamine (V) in 25 ml. of absolute ethanol under ice-cooling in a current of nitrogen. A white precipitate soon separated, and, after the mixture had been stirred for 1 hour, the ice-water bath was replaced by a dry ice-acetone bath. Dry hydrogen chloride gas was bubbled over the surface of the mixture until the precipitate had dissolved to give a clear pale reddish solution. The solution was then slowly heated to 80-85° on a water-bath and kept aside at this temperature for about 7-10 minutes. The solvent was removed under reduced pressure and the residue was dissolved in 300 ml. of chloroform, to which solution was added an excess of 10% ammonia. The solvent layer was washed with water, dried over potassium carbonate and evaporated under reduced pressure to give a solid, which was recrystallized from chloroform-methanol-hexane to give 2.97 g. (83%) of XI as pale yellow needles, the m.p. and spectral data of which were identical with those of an authentic sample.

2-Ethoxy-3-methoxyochotensinan-9,14-dione (XII).

A mixture of 1 g. of ninhydrin (VII) and 1 g. of 4-ethoxy-3-methoxyphenethylamine (VI) was treated in a similar way as described above. Recrystallization from chloroform-methanol-hexane afforded 1.38 g. (81%) of XII as yellow needles, m.p. 129-130°; ir ν max cm^{-1} (potassium bromide): 1712 (ketone C=O), 1744 (ketone C=O); nmr ppm (deuteriochloroform): 1.23 (3H, t, J = 6.75 Hz, CH_3CH_2O), 1.93 (1H, s, N*H*), 2.82 (2H, t, J = 6 Hz, N-CH_2-), 3.46 (2H, t, J = 6 Hz, $(CH_3O)_2C_6H_2CH_2$-), 3.7 (2H, q,

J = 6.75 Hz, CH_3CH_2O), 3.82 (3H, s, -OCH_3), 5.93 (1H, s, C_1-H), 6.67 (1H, s, C_4-H), 7.75-8.25 (4H, m, C_{10}, C_{11}, C_{12}, C_{13}-H). The NH proton at 1.93 ppm exchanged with D_2O.

Anal. Calcd. for $C_{20}H_{19}NO_4$: C, 71.20; H, 5.68; N, 4.15. Found: C, 71.62; H, 5.81; N, 3.97.

2,3-Dimethoxy-7-methylochotensinan-9,14-dione (XIII).

A mixture of 117 mg. of XII, 1.2 ml. of 90% formic acid and 1.2 ml. of 37% formalin was refluxed for 10 minutes. The solution was then cooled, diluted with water and basified with 28% ammonia. The mixture was extracted with chloroform (50 ml. x 2). The extract was washed with water, dried over potassium carbonate and evaporated. The remaining residue was recrystallized from chloroform-hexane to give 78 mg. of XIII as yellowish orange needles, m.p. 184-185°; ir ν max cm^{-1} (potassium bromide): 1705 (ketone C=O), 1740 (ketone C=O); nmr ppm (deuteriochloroform): 2.37 (3H, s, N-CH_3), 2.99 (2H, t, J = 5.25 Hz, N-CH_2-), 3.33 (2H, t, J = 5.25 Hz, $(CH_3O)_2C_6H_2CH_2$-), 3.41 (3H, s, C_2-OCH_3), 3.80 (3H, s, C_3-OCH_3), 5.81 (1H, s, C_1-H), 6.65 (1H, s, C_4-H), 7.75-8.25 (4H, m, C_{10}, C_{11}, C_{12}, C_{13}-H).

Anal. Calcd. for $C_{20}H_{19}NO_4$: C, 71.20; H, 5.68; N, 4.15. Found: C, 71.48; H, 5.63; N, 3.95.

2-Ethoxy-3-methoxy-7-methylochotensinan-9,14-dione (XIV).

A mixture of 200 mg. of XII, 2 ml. of 90% formic acid and 2 ml. of 37% formalin was refluxed for 10 minutes. The reaction mixture was treated in a similar way as described above. The product was recrystallized from chloroform-hexane to give 138 mg. of XIV as yellowish orange needles, m.p. 145-147°; ir ν max cm^{-1} (potassium bromide): 1707 (ketone C=O), 1742 (ketone C=O); nmr ppm (deuteriochloroform): 1.17 (3H, t, J = 6.5 Hz, CH_3CH_2O), 2.40 (3H, s, NCH_3), 3.33 (2H, t, J = 5.25 Hz, $(CH_3O)_2$-$C_6H_2CH_2$-), 3.6 (2H, q, J = 6.5 Hz, CH_3CH_2O-), 3.79 (3H, s, OCH_3), 5.82 (1H, s, C_1-H), 6.65 (1H, s, C_4-H), 7.75-8.2 (4H, m, C_{10}, C_{11}, C_{12}, C_{13}-H).

Anal. Calcd. for $C_{21}H_{21}NO_4$: C, 71.78; H, 6.02; N, 3.99. Found: C, 71.40; H, 5.58; N, 3.98.

7-Ethoxycarbonyl-2,3-dimethoxyochotensinan-9,14-dione (XV).

To a stirred solution of 0.9 g. of XI in 50 ml. of chloroform was added dropwise 0.4 g. of ethyl chlorocarbonate. After stirring for 2 hours at room temperature, the solvent layer was washed with water, dried over sodium sulfate and evaporated under reduced pressure. Recrystallization from chloroform-hexane gave the compound XV as yellow needles, m.p. 180-182°; ir ν max cm^{-1} (potassium bromide): 1753, 1722 (ketone C=O), 1680 cm^{-1} (amide C=O); nmr ppm (deuteriochloroform): 1.25 (3H, t, J = 6.75 Hz, $COOCH_2CH_3$), 3.4 (3H, s, OCH_3), 3.81 (3H, s, OCH_3), 4.07 (2H, q, J = 6.75 Hz, $COOCH_2CH_3$), 5.98 (1H, s, C_2-H), 6.70 (1H, s, C_4-H), 7.7-8.2 (4H, m, C_{10}, C_{11}, C_{12}, C_{13}-H).

Anal. Calcd. for $C_{22}H_{21}NO_6$: C, 66.82; H, 5.35; N, 3.54. Found: C, 66.51; H, 5.47; N, 3.80.

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REFERENCES

(1) Part CDLIV, T. Kametani, K. Fukumoto, and M. Fujihara, *J. Chem. Soc. (C)*, in press.

(2) T. Kametani, S. Takano, and S. Hibino, *J. Pharm. Soc. Japan*, **88**, 1123 (1968).

(3) T. Kametani, S. Hibino, S. Takano, and T. Terui, *J. Heterocyclic Chem.*, **6**, 49 (1969); T. Kametani, K. Fukumoto, H. Yagi, K. Kigasawa, H. Sugahara, M. Hiiragi, and T. Hayasaka, *J. Chem. Soc.*, 112 (1968).

(4) S. McLean, M.-S. Lin, and R. H. F. Manske, *Can. J. Chem.*, **44**, 2449 (1966).

(5) D. B. MacLean, R. A. Bell, J. K. Saunders, and C.-Y. Chen, *ibid.*, 47, 3593 (1969).

(6) R. H. F. Manske, R. Rodrigo, D. B. MacLean, D. E. F. Gracey, and J. K. Saunders, *ibid.*, 47, 3585 (1969).

(7) R. H. F. Manske, R. Rodrigo, D. B. MacLean, D. E. F. Gracey, and J. K. Saunders, *ibid.*, 47, 3589 (1969).

(8) T. Aezel and H. E. Lumpkin, *Anal. Chem.*, **32**, 1819 (1960).

(9) T. Kametani, S. Takano, and F. Sasaki, *J. Pharm. Soc. Japan*, **83**, 1035 (1963).

(10) Silica gel by Kanto Chemical Co., Inc. was used.

(11) Nmr spectra were taken with a Hitachi R-20 spectrometer using D_2O as an internal reference.

(12) T. Kametani, S. Takano, and F. Sasaki, *J. Pharm. Soc. Japan*, **87**, 191 (1967).

(13) F. Arndt, *Org. Syn.*, Coll. Vol. II, p. 461 (1943).

(14) Tetramethylsilane was used as an internal reference.

(15) R. H. F. Manske and Q. A. Ahmed., *Can. J. Chem.*, **48**, 1280 (1970).