658. *The Constitution of Conessine. Part II.*

By Robert D. Haworth, James McKenna, and Gordon H. Whitfield.

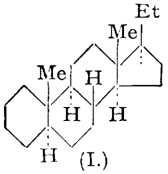
The ultra-violet absorption spectra of conessine and its derivatives have been examined, and as a result three partial formulæ, (II), (III), and (IV), have been proposed for the pregnatriene, $C_{21}H_{30}$, obtained by Späth and Hromatka (*loc. cit.*). Hofmann degradation of conessine metho-salts under a variety of conditions has been investigated, and it is concluded that the conjugated diene system present in *apo*conessine is derived from the original double bond in conessine and the double bond introduced during the elimination of trimethylamine.

Conessine and dihydroconessine metho-salts are isomerised to some extent by alkali, and the new bases hetero*conessine* and its *dihydro*-derivative have been isolated. Direct pyrolysis of dihydroconessine dimethohydroxide, however, gave a base, $C_{25}H_{44}N_2$, probably formed by rupture of the heterocyclic ring of the alkaloid.

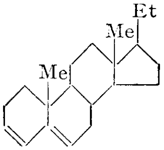
A small yield of 5-*allo*pregnane is obtained by Emde reduction of hexahydro*apo*conessine methochloride.

In Part I (this vol., 831) the conversion of conessine into 5-*allo*pregnane (I) was described and it was concluded that the structural formula of the alkaloid was derived from (I) by the insertion of a dimethylamino-group, a cyclic methylimino-group, and one double bond. Although a complete solution of this problem has not yet been reached, the present communication includes a number of observations which have a bearing on the structural position, excluding several possible formulæ for the base and its degradation products.

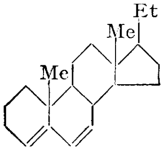
The ultra-violet absorption spectra of conessine, *neo*conessine (Siddiqui and Vasisht, *J. Sci. Res. India*, 1945, **3**, 559), *iso*conessine (Siddiqui, *Proc. Indian Acad. Sci.*, 1935, **2**, 426), *hetero*conessine (see below), dihydroconessine (Späth and Hromatka, *Ber.*, 1930, **63**, 126) and dioxyconessine (Warnecke, *Ber.*, 1886, **19**, 60, 78, 1682) exhibit no maximum in the region examined (log ε in ethanol for these six bases at 2120 A. is approximately 3·1) and it may be concluded that neither conessine nor any of the isomers and derivatives listed above contains a vinylamine group (see Bowden, Braude, Jones, and Weedon, *J.*, 1946, 46). *apo*Conessine, $C_{23}H_{35}N$ (Kanga, Ayyar, and Simonsen, *J.*, 1926, 2123; Späth and Hromatka, *loc. cit.*), and the lævorotatory pregnatriene $C_{21}H_{30}$ (Späth and Hromatka, *loc. cit.*) have identical absorption spectra in ethanol, showing a peak at 2350 ± 5 A. (log ε 4·3). *apo*Conessine must also, therefore, be devoid of a vinylamine group, otherwise a marked difference in the spectra would be expected on account of the additional chromophoric effect of the heteroenoid group (cf. Bowden *et al.*, *loc. cit.*). The presence of a diene system in the pregnatriene is suggested by the yellow colour which is developed in acetic acid solution with *p*-nitrobenzenediazonium chloride and by the red colour developed in 90% trichloroacetic acid (Rosenheim, *Biochem. J.*, 1929, **23**, 47; Schönheimer and Evans, *J. Biol. Chem.*, 1936, **114**, 567), and as a result of earlier spectroscopic studies in the steroid field it is also possible to deduce from the maximum at 2350 A. that both *apo*conessine and the pregnatriene contain a conjugated diene system distributed either between two different rings or between a ring and a side chain (Fieser and Campbell, *J. Amer. Chem. Soc.*, 1938, **60**, 160). Nine conjugated diene structures of the above types may be advanced for the pregnatriene. Woodward (*J. Amer. Chem. Soc.*, 1942, **64**, 72) and Fieser, Fieser, and Rajagopalan (*J. Org. Chem.*, 1948, **13**, 800) have, however, pointed out that the $\lambda_{max.}$ of steroid dienes of this type may be calculated by adding to the $\lambda_{max.}$ of the parent buta-1 : 3-diene (taken for the purposes of such calculations as 2170 A. by Woodward and 2140 A. by Fieser *et al.*) 50 A. for each alkyl substituent and 50 A. for each exocyclic double bond. On this basis the pregnatriene structure is limited to (II), (III), or (IV), with a third isolated double bond, but we are unable to decide between these three alternatives at the moment. Of the six excluded structures five would be expected to show a $\lambda_{max.}$ at 2440 A. and the sixth at 2240 A. (if the butadiene value given by Fieser *et al.* is used); the calculated value of 2340 A. from (II), (III), and (IV) is in good agreement with experiment.



(I.)



(II.)



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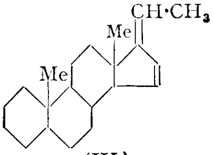

(IV.)

Important evidence that the conjugated diene system of *apo*conessine is produced from the original conessine double bond and the double bond introduced by the elimination of the dimethylamino-group as trimethylamine has been obtained by a detailed study of the Hofmann degradation of conessine dimethohydroxide. The yields of *apo*conessine obtained by the methods reported by Kanga, Ayyar, and Simonsen (*loc. cit.*) and Späth and Hromatka (*loc. cit.*) were found to be variable and often unsatisfactory; but the simple pyrolysis process described in the Experimental section gives *apo*conessine in yields consistently exceeding 60%. Heating conessine dimethiodide with a large excess of potassium hydroxide in ethylene glycol or aqueous ethylene glycol (cf. Julian, Meyer, and Printy, *J. Amer. Chem. Soc.*, 1948, **70**, 887) gave a mixture of *apo*conessine, a methiodide $C_{22}H_{33}N,CH_3I$, and a new base, m. p. 131°, isomeric with conessine and for which the name hetero*conessine* (see below) is proposed, in addition to non-crystalline products. The methiodide $C_{22}H_{33}N,CH_3I$, which was sparingly soluble in water but readily soluble in chloroform, was clearly formed by elimination of the dimethylamino-group of conessine, and when the corresponding methohydroxide was pyrolysed *in vacuo* *apo*conessine was produced. The ultra-violet absorption spectrum of the methiodide $C_{22}H_{33}N,CH_3I$ in ethanol was identical with that of *apo*conessine methiodide and had a flat peak between ~2210 and 2280 A. (log ε 4·4). The extinction curve appeared to be additively composed of the separate contributions of the iodide anion, which has, in ethanol, $\lambda_{max.}$ 2170 A. (log. ε 4·1) (Landolt–Börnstein, "Physikalisch-Chemische Tabellen," 5th edn., 3rd Suppl., Part 2, p. 1333) and of *apo*conessine; subtraction of the iodide contributions to the total extinction at each wave-length left a curve with $\lambda_{max.}$ 2350 A. (log ε 4·2). In the same way conessine dimethiodide gave a curve corresponding to its anion. The methochloride corresponding to the new methiodide $C_{22}H_{33}N,CH_3I$, like *apo*conessine methochloride, had $\lambda_{max.}$ 2350 A. in ethanol, but its very hygroscopic properties made it impossible to determine its extinction coefficient reliably (the highest value observed for log ε was 3·9 at 2350 A.). It is concluded that the new metho-salts have the same diene system as *apo*conessine, being intermediate between the latter base and the conessine dimetho-salts; and, as the elimination of the dimethylamino-group leads to the introduction of only one double bond, the diene system in the new metho-salts and in *apo*conessine must be derived from the original double bond of the alkaloid and the double bond formed during the elimination of the dimethylamino-group.

The new base, hetero*conessine*, m. p. 131°, which gave an oxalate sparingly soluble in water, was unsaturated to acidified potassium permanganate and liberated iodine from potassium iodate–dilute sulphuric acid in acetic acid. When reduced in acetic acid in the presence of a palladium–charcoal catalyst, one mole of hydrogen was absorbed with the formation of *dihydro*-hetero*conessine*, $C_{24}H_{42}N_2$, m. p. 101—103°. This saturated dihydro-derivative was also encountered during some experiments with *dihydroconessine*, m. p. 105°, prepared in almost quantitative yield and without the formation of isomers by the reduction of conessine. When dihydroconessine dimethohydroxide was heated in boiling ethylene glycol, it was converted into a mixture of bases containing dihydroconessine and dihydro*hetero*conessine, which were separated by fractional crystallisation from acetone. The isomerisation of conessine and dihydroconessine by way of the dimetho-salts to *hetero*conessine and dihydro*hetero*conessine respectively will be further investigated; conessine itself was found to be unaffected by prolonged boiling with alcoholic potassium hydroxide or with a solution of sodium in ethylene glycol.

Direct pyrolysis of dihydroconessine dimethohydroxide yielded no trimethylamine but gave a basic mixture from which a small amount of an unsaturated crystalline *base*, m. p. 66—70°, was isolated by chromatography. This compound was formed in almost theoretical yield when the pyrolysis was conducted *in vacuo*, but its high solubility rendered purification difficult, and analysis suggests that it is probably an impure specimen of the diacidic *methine* $C_{25}H_{44}N_2$, formed by rupture of the heterocyclic ring. The retention of the dimethylamino-group in this case is to be contrasted with the very ready elimination of this group as trimethylamine during the pyrolysis of conessine dimethohydroxide (Kanga, Ayyar, and Simonsen, *loc. cit.*; Späth and Hromatka, *loc. cit.*). This is understandable in view of the formation of the conjugated diene system in the latter instance; if the conessine double bond were γδ to the nitrogen of the dimethylamino-group, allylic activation of the β-proton would be an additional factor favouring the elimination.

Späth and Hromatka (*loc. cit.*) showed that catalytic reduction of *apo*conessine in acetic acid gave hexahydro*apo*conessine and a small quantity of a product yielding a picrate, m. p. 260°. We find that the latter product is a quaternary acetate, readily soluble in water, which with potassium iodide gave a crystalline *methiodide*, m. p. 303—304°. Analyses of the picrate and methiodide are in agreement with the formula $C_{22}H_{37}N$ for the base, and this remarkable formation of a quaternary salt during catalytic reduction requires further investigation although strychnine chemistry contains an analogous case (Achmatowicz and Robinson, *J.*, 1934, 581). Hexahydro*apo*conessine was recovered from attempted degradation of its metho-salts by Hofmann's method and no other product was isolated. A considerable quantity of hexahydro*apo*conessine was also recovered when its methochloride was reduced with sodium amalgam (Emde reaction), although in this case a small yield of hydrocarbon was obtained from which 5-*allo*pregnane, m. p. 81—82°, was isolated. It follows that hexahydro*apo*conessine has the same steric configuration as 5-*allo*pregnane, and the difficulty encountered in the Emde degradation contrasts sharply with the relative ease with which *apo*conessine methochloride undergoes the reaction (Späth and Hromatka, *loc. cit.*); the presence of an allylamine system in *apo*conessine would provide an explanation of this difference.

EXPERIMENTAL.

Hofmann Degradation of Conessine Dimetho-salts.—(a) *Pyrolysis of conessine dimethohydroxide.* Conessine dimethiodide (8 g.), m. p. 330°, dissolved in water (100 c.c.), was shaken for 12 hours with excess of freshly prepared silver oxide. After addition of water (150 c.c.), the silver salts were allowed to settle, and the supernatant liquors were decanted and boiled for 5 minutes to coagulate suspended silver salts, which were again allowed to settle. The clear decanted mother-liquors were then evaporated over a free flame in small portions (50 c.c.) in a 250-c.c. conical flask, and the residue was carefully ignited until evolution of trimethylamine ceased. The base was dissolved in ether and washed well with water, the ethereal layer dried, and the solvent removed. The total residual *apo*conessine (3·2 g.) crystallised from methanol in needles, m. p. 68°. Addition of potassium iodide to the aqueous washings gave a little conessine dimethiodide, m. p. 330° after recrystallisation from water (Found: I, 37·1. Calc. for $C_{24}H_{40}N_2,2CH_3I,3H_2O$: I, 36·6%).

(b) *Action of potassium hydroxide on conessine dimethiodide in ethylene glycol or aqueous ethylene glycol:* hetero*conessine and the methiodide* $C_{22}H_{33}N,CH_3I$. Small yields of these two compounds were obtained in preliminary experiments when conessine dimethiodide was refluxed for 2—3 hours with 3—4 times its weight of potassium hydroxide in 70% aqueous ethylene glycol. Numerous attempts were made to improve the yields, and an experiment typifying the conditions later adopted is described below. Separation of the products made use of the following solubility relations observed in salts of the conessine series. Conessine and its isomeric diacidic bases give sulphates which are readily soluble in water or dilute sulphuric acid, but oxalates which are sparingly soluble in cold water; monoacid bases, such as *apo*conessine, give very sparingly soluble sulphates. Dimethiodides, such as conessine dimethiodide, are readily soluble in water but not in chloroform, but monomethiodides of monoacidic bases are sparingly soluble in water, readily soluble in chloroform, and naturally unaffected by further treatment with methyl iodide. The monomethiodides of diacidic bases are also sparingly soluble in water, but soluble in chloroform, and may be separated from the metho-salts of monoacidic bases by dissolution in dilute acetic or hydriodic acid, or by conversion by methyl iodide into dimetho-salts, which then show solubility in water but not in chloroform.

A solution of conessine dimethiodide (4 g.) in warm ethylene glycol (30 c.c.) was mixed with a solution of potassium hydroxide (12 g.) in warm ethylene glycol (30 c.c.), and the mixture boiled very gently for 5 minutes. The odour of volatile amine was evident, and the solution became cloudy. The solution was cooled, mixed with water (90 c.c.), and extracted 3 times with 50-c.c. lots of chloroform. The extract was washed thrice with water, the solvent removed, and the residue separated into a basic oil (1·0 g.), soluble in ether, and a monomethiodide (1·1 g.), insoluble in ether. The basic oil contained some *apo*conessine which was separated as the insoluble sulphate, and the recovered *apo*conessine had m. p. 68° (from ethanol), undepressed on admixture with an authentic specimen; the residual base generally could not be obtained crystalline. The dilute glycol liquors and aqueous washings containing dimethiodide were clarified with charcoal, concentrated until the temperature of the boiling liquid was 150°, and then refluxed for 3 hours; no odour of trimethylamine was noted, but potassium iodide and an insoluble oil gradually separated. The mixture was extracted with chloroform, the extract was well washed with water and then evaporated, and the *hetero*conessine again separated with ether. The base was dissolved in hot dilute sulphuric acid, cooled, filtered from a trace of precipitated *apo*conessine sulphate, recovered by addition of aqueous ammonia, and re-isolated with ether (yield, 0·1 g.).

hetero*Conessine* was purified by sublimation at 220° (bath temp.)/0·005 mm. and crystallised from acetone in prismatic needles, m. p. 130—131° (Found: C, 80·8; H, 10·9; N, 7·5. $C_{24}H_{40}N_2$ requires C, 80·9; H, 11·2; N, 7·9%), depressed very considerably by admixture with conessine, m. p. 127—128°, or with *neo*conessine (Siddiqui and Sharma, *loc. cit.*). A solution of the base in cold dilute sulphuric acid reduced potassium permanganate, and, when it was boiled with dilute sulphuric acid and potassium iodate, iodine was liberated.

The monomethiodide fraction (1·1 g.) obtained above was dissolved in methanol and refluxed for 3 hours with excess of methyl iodide. The solvents were removed, the residue was dissolved in chloroform and extracted 3 times with warm water, and the chloroform was evaporated off. The residue (0·4 g.) was recrystallised from aqueous methanol, giving the new monomethiodide (0·1 g.). A second crop was shown by analysis to contain considerable dimethiodide.

The *monomethiodide* crystallised from water in rectangular plates, m. p. 325° (decomp., but no odour of volatile base) (Found: N, 2·8, 2·95; I, 28·0. $C_{22}H_{33}N,CH_3I$ requires N, 3·1; I, 28·0%), giving a marked depression with conessine dimethiodide, m. p. 330° (decomp., with an odour of volatile base). The compound is very sparingly soluble in cold and only moderately so in hot water, but dissolved readily in chloroform. It was recovered unchanged after crystallisation from dilute acetic acid or further treatment with methyl iodide. The corresponding methochloride was very soluble in water or methanol and sparingly soluble in acetone, ethyl acetate, or ether; it was obtained, by addition of ether to a methanol solution, as a white, very hygroscopic powder which on heating shrank at 80° (loss of water) and melted with decomposition at 220°.

The yields of *hetero*conessine and of the new monomethiodide obtained by the above procedure are somewhat variable, and further work is in progress. Vigorous refluxing at the initial stage, or prolonging the time of heating to 40 minutes, had a very adverse effect, giving an increased yield of *apo*conessine and non-crystalline base. In one experiment, where the reaction mixture was initially boiled gently for 25 minutes, the yield of *hetero*conessine was increased considerably, but that of the new monomethiodide was very much reduced.

Production of apo*Conessine from the Methiodide* $C_{22}H_{33}N,CH_3I$.—The methiodide (50 mg.) in 50% aqueous methanol (15 c.c.) was shaken for 4 hours with excess of freshly prepared silver oxide, the mixture boiled and filtered, and the clear filtrate evaporated to a low bulk over a naked flame and finally on the water-bath at 15 mm. The residue was then heated at 150° (bath temp.)/0·05 mm.; a colourless oil distilled, which solidified on treatment with methanol (yield, 20 mg.; m. p. 60—62°). After crystallisation from methanol the base was obtained as long needles, m. p. 68—69°, undepressed on admixture with an authentic specimen of *apo*conessine of the same m. p.

The direct-pyrolysis procedure described above for conessine dimethohydroxide also gave some *apo*conessine, but the vacuum procedure appeared to be better for the small quantities involved.

Reduction of hetero*Conessine.*—A solution of *hetero*conessine (60 mg.) in acetic acid (5 c.c.) was shaken in hydrogen with 15% palladium–charcoal (0·25 g.) at 15°. Hydrogen uptake (3·8 c.c. Calc. for one double bond, 3·9 c.c.) proceeded slowly and ceased after 48 hours. The mixture was filtered, the solvent was removed under reduced pressure, and the *dihydro*hetero*conessine*, liberated with aqueous ammonia and isolated with ether, crystallised from acetone in colourless needles, m. p. 101—103° (Found: C, 79·8; H, 11·5; N, 7·9. $C_{24}H_{42}N_2$ requires C, 80·4; H, 11·8; N, 7·8%), unaffected by treatment with potassium permanganate or iodate in dilute sulphuric acid, and identical with the compound obtained during Hofmann degradation of dihydroconessine dimethohydroxide (see below).

Dihydroconessine.—Conessine (1·5 g.) in acetic acid (75 c.c.) was shaken in a hydrogen atmosphere in the presence of 15% palladium–charcoal (2 g.) at 10°. After 8 hours absorption of hydrogen (105 c.c. Calc. for one double bond, 99 c.c.) was complete; the solvent was removed, and the base, isolated in the usual way, separated from acetone in colourless prisms (1·4 g.), m. p. 105° (Späth and Hromatka, *loc. cit.*, give m. p. 105—105·5°). The base did not liberate iodine when warmed with iodate in dilute sulphuric acid, and there was no evidence of the formation of a second isomer during the reduction. The dimethiodide, prepared in boiling methanol, separated from methanol in irregular colourless prisms, m. p. 337° (decomp.) (Found: N, 4·4; I, 39·5. Calc. for $C_{24}H_{42}N_2,2CH_3I$: N, 4·3; I, 39·2%) (Bertho, *Annalen*, 1943, **555**, 214, gives m. p. 303—304°).

Attempted Hofmann Reaction on Dihydroconessine Dimethiodide.—(*a*) An aqueous solution of dihydroconessine dimethiodide was converted into the corresponding dimethohydroxide in the usual way. An aliquot portion corresponding to dihydroconessine (0·6 g.) was evaporated to a small volume, ethylene glycol (10 c.c.) added, and the solution evaporated to a volume of 3 c.c. After refluxing under an air-condenser for 30 minutes, the solution was cooled and diluted with water, and excess of potassium iodide was added. The solution was extracted with chloroform, and the extract was washed and evaporated. The residual viscous oil (0·55 g.), which dissolved in ether leaving only a trace of insoluble methiodide, was fractionally crystallised from acetone and yielded crude dihydroconessine (3 mg.), m. p. 97—99°, and dihydro*hetero*conessine (50 mg.), m. p. 100—102° (Found: C, 79·9; H, 11·4; N, 8·0%), depressed by admixture with dihydroconessine to 85—90° but undepressed by admixture with dihydro*hetero*conessine described above. With aqueous ethylene glycol at 140° (3 hours) dihydroconessine dimethohydroxide (equivalent to 0·3 g. of dihydroconessine) gave a mixture of bases (0·06 g.) similar to that obtained above, and after treatment with potassium iodide gave a *methiodide*, white nodules from water, m. p. 325°, soluble in chloroform, hot water, and cold dilute acetic acid, and giving analytical figures indicative of dihydroconessine monomethiodide or an isomer (Found: N, 5·5; I, 26·25. $C_{24}H_{42}N_2,CH_3I$ requires N, 5·6; I, 25·4%).

(*b*) *Methine.* Dihydroconessine dimethiodide (2 g.) was converted into an aqueous solution of the dimethohydroxide in the usual way and the solution evaporated, finally at 15 mm. The residue was heated at 190° (bath temp.)/0·04 mm., and the colourless oil which distilled was dissolved in ether; the solution was washed and evaporated, and the crystalline residue (0·85 g.), which was extremely soluble in the usual organic solvents, treated with a warm mixture of 5 c.c. of concentrated hydrochloric acid and 10 c.c. of water and then cooled to ~0°. An insoluble hydrochloride which separated was collected (30 mg.); it recrystallised from water in colourless needles, m. p. 280° (Found, in material dried at 100° for 3 hours over phosphoric oxide: N, 3·0; Cl, 10·6%); the nature of this salt will be discussed in a later paper. The base was recovered from the filtrate by addition of aqueous ammonia and re-isolated with ether, which was evaporated; the benzene solution of the residue was poured through a 15 × 1-cm. column of alumina. Elution with large volumes of benzene gave only a small quantity of base saturated to permanganate; the bulk of the substance was not eluted by alcohol or acetone, but only by pyridine. The residue obtained on evaporating the pyridine crystallised from aqueous acetone, whereupon the *methine* was obtained as long colourless needles, m. p. 66—70° to a cloudy melt (Found: C, 78·7; H, 12·1; N, 8·0. $C_{25}H_{44}N_2$ requires C, 80·6; H, 11·8; N, 7·5%). A solution of the base in dilute sulphuric acid was strongly reducing to permanganate, but did not liberate iodine when boiled with potassium iodate.

Reduction of apo*Conessine.*—*apo*Conessine (2·32 g.) in acetic acid (40 c.c.) was reduced in the presence of 10% palladium–charcoal (0·9 g.) at 15°. Two moles of hydrogen were rapidly absorbed, but reduction required 65 hours (hydrogen uptake, 483 c.c. Calc. for 3 double bonds, 505 c.c.). After removal of the catalyst and solvent, basification and extraction with ether yielded crude hexahydro*apo*conessine (1·86 g.), m. p. 66—67° after two crystallisations from methanol (Späth and Hromatka, *loc. cit*, give m. p. 68—69°), giving a *methiodide* which crystallised from methyl alcohol in colourless needles, m. p. 253° (Found: N, 2·9. $C_{23}H_{41}N,CH_3I$ requires N, 3·0%). The methanolic mother-liquors from the recrystallisation of the hexahydro*apo*conessine gave a colourless oil, saturated to acid permanganate, yielding a *methiodide* which separated from methanol in colourless needles, m. p. 237—238° (Found : C, 61·1; H, 8·9; N, 2·9; I, 26·5. $C_{23}H_{41}N,CH_3I$ requires C, 60·9; H, 9·3; N, 3·0; I, 26·8%), which may be an isomer of the hexahydro*apo*conessine methiodide.

After removal of the hexahydro*apo*conessine with ether, extraction of the yellow aqueous liquors from the reduction mixture with chloroform gave a fawn-coloured amorphous powder (0·3 g.), yielding a picrate which crystallised from methanol as yellow needles, m. p. 261—262° (Found : N, 10·1. Calc. for $C_{29}H_{42}O_7N_4$: N, 10·0%) (Späth and Hromatka, *loc. cit.*, give m. p. 255—256°). The amorphous powder gave with potassium iodide in aqueous solution a crystalline quaternary *iodide*, which separated from alcohol in colourless prisms, m. p. 303—304° (Found : C, 60·2; H, 9·0; N, 3·0. $C_{22}H_{37}N,CH_3I$ requires C, 60·4; H, 8·8; N, 3·1%).

*Action of Sodium Amalgam on Hexahydro*apo*conessine Methochloride.*—*Hexahydro*apo*conessine methochloride* separated from methanol in colourless rectangular needles, m. p. 315—318° (Found : N, 3·8; Cl, 8·7. $C_{23}H_{41}N,CH_3Cl$ requires N, 3·7; Cl, 9·3%). This salt (0·2 g.) in water (100 c.c.) was heated on the steam-bath, and a continuous stream of carbon dioxide was passed through the solution during the addition, during 2 hours, of 5% sodium amalgam (80 g.). Extraction with ether gave an oil (0·19 g.), which was dissolved in light petroleum. Basic material was precipitated as hydrochloride, from which hexahydro*apo*conessine, m. p. 67°, was recovered. The residual light petroleum liquors yielded a crude hydrocarbon (40 mg.), m. p. 51—63°, which was dissolved in light petroleum (b. p. 40—60°) (2 c.c.), poured through an alumina column, and eluted with light petroleum (b. p. 40—60°). Repeated recrystallisation of the product from methanol–ether, and sublimation at 0·005 mm. (bath temp. 120°), gave 5-*allo*pregnane (2 mg.), m. p. 81—82°, undepressed by admixture with a sample of 5-*allo*pregnane prepared from progesterone.

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THE UNIVERSITY, SHEFFIELD, 10.

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