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NITROGENOUS ANALOGUES OF STEROIDS—VII*

TRANSFORMATION OF CHOLESTEROL INTO 3β-HYDROXY-5-AZACHOLESTANE

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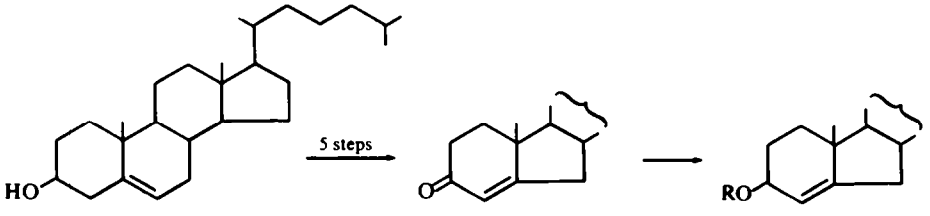
Abstract—The synthesis of 3β-hydroxy-5-azacholestane (**10a**) from cholesterol (**1**) is described. B-norcholest-4-ene-3-one (**2**) obtained from **1**, was reduced to carbinol **3a**. The acetyl derivative (**3b**) of the latter, after ozonolysis and methylation, afforded the methyl ester of 3β-acetoxy-4,5-seco-5-keto-B-norcholestan-4-oic acid (**5b**). Beckmann rearrangement of the oxime **6**, obtained from **5b**, yielded lactam **7b**, which was hydrolysed to hydroxyacid **7a**; the latter, after N-cyclization and LAH reduction, afforded 3β-hydroxy-5-azacholestane (**10a**).

5-AZASTEROIDS, which have been obtained by us by transformations of natural systems, are compounds with modified A, or A and B rings.[1–4] None had an oxygen function at C-3, characteristic of the majority of steroids. In this report we present the synthesis of 3β-hydroxy-5-azacholestane (**10a**) which is a complete nitrogenous analogue of the natural system, i.e. it contains six-membered rings A and B, as well as a preserved 3β oxygen function. The scheme of the synthesis did not differ from those previously applied.[1–4] As substrate we used B-norcholest-4-ene-3-one (**2**), synthesised from cholesterol (**1**) according to the method of Dauben and Fonken.[5] In turn, B-norketone (**2**) was reduced with LAH, yielding 3β-hydroxy-B-norcholest-4-ene (**3a**). Carbinol **3a**, treated with Ac_2O in pyridine, was converted into acetyl derivative **3b**. Both compounds **3a** and **3b**



1 **2** **3a** R = H
b R = Ac

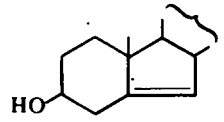
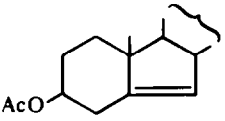
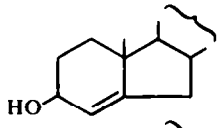
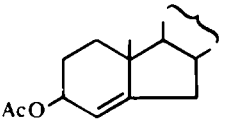
are known substances described by Sorm *et al.*,[6] who have assigned a β configuration to the OH and AcO group, as well as the position of the double bond at C-4. Since during the course of the synthesis the configuration on carbon C-3 was to remain intact, its unequivocal determination† in compounds **3a** and **3b** was essential for specifying the configuration on atom C-3 in the final product. Comparison of the NMR spectra of

* Part VI: W. J. Rodewald, J. Jaszczyński, *Roczniki Chemii* **42**, 625 (1968).

† Obtained by us acetyl derivative **3b**, despite expected spectroscopic and analytical properties, showed m.p. 39–40° (lit.[6] m.p. 60–61°), i.e. about 20° lower than reported by Czechoslovak authors; this raised doubts as to the identity of both compounds.

compounds **3a** and **3b** versus their isomeric analogues **4a** and **4b**, with a double bond at C-5 in ring B and known β-configuration[5] of the substituent at C-3, was performed. The relevant data are presented in Table 1. The signal of the H-3 proton of the carbinol (**4a**)

TABLE 1

Nr	Compound	H-3 (ppm)	(w/2) H-3 (Hz)	H_{olef} (ppm)	(w/2) H_{olef} (Hz)
4a		3·48	22·0	5·31	4·9
4b		4·60	23·0	5·36	3·9
3a		4·24	16·0	5·28	7·0
3b		5·30	17·0	5·27	7·2

occurs at δ 3·48, and in its acetyl derivative it is shifted downfield by 1·12 ppm. Corresponding signals of the carbinol (**3a**) and its acetyl derivative appear at δ 4·24 and 5·30, respectively. They are shifted downfield by about 0·7 ppm relative to the analogous signals in compounds **4a** and **4b**. This indicates that in compounds **3a** and **3b**, the H-3 proton is in the allylic position, therefore the double bond in carbinol **3a** and in its acetyl derivative (**3b**) is located in ring A. The configuration of the OH and AcO groups in compounds **3a** and **3b** respectively, follows from height width (w/2) value of the H-3 proton's signal. From Dreiding models we have estimated the dihedral angles relevant to the coupling constants of the H-3 proton, both in pseudoaxial and pseudoequatorial positions. Coupling constants $J_{2a,3}$ and $J_{2e,3}$ were calculated according to the Karplus[7] relation, whereas $J_{3,4}$ was obtained using the Garbish[8] equation. Calculated coupling constants and dihedral angles are given in Table 2. For pseudoaxial H-3 (β-

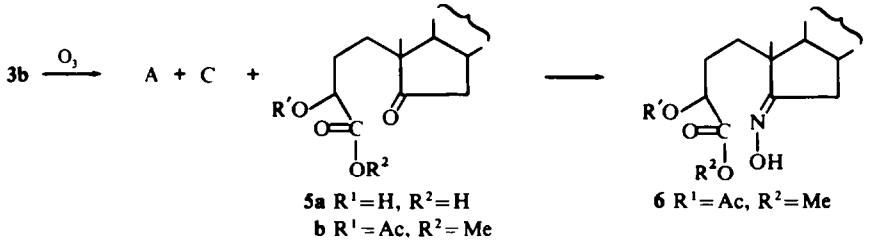
TABLE 2

H-3	Dihedral angles			Coupling constants		
	H_{2e}—C—C—H_3	H_{2a}—C—C—H_3	H_3 C—C—H_4	$H_{2e,3}$	$J_{2a,3}$	$J_{3,4}$
3_{pe}	95°	25°	65°	0	6·7	4·2
3_{pa}	30°	150°	55°	6·1	6·9	3·9

substituent) the sum of the coupling constants amounts to 16·9 Hz, whereas for pseudoequatorial H-3 (α-substituent) it amounts to 10·9 Hz. The values of 16 and 17 Hz, obtained for the H-3 proton in **3a** and **3b** respectively, indicate clearly that the C-3 substituent must be pseudoequatorial, i.e. both the OH group in **3a** and AcO group in **3b** show the β-configuration.

The cleavage of the double bond in ring A of 3β-acetoxy-B-norcholest-4-ene (**3b**) was performed by ozonolysis followed by oxidative cleavage of resulting ozonides. The obtained acid fraction was methylated with CH_2N_2. TLC analysis of the crude product indicated the presence of three main components (A, B, C). These compounds were isolated in pure state. Compound B*, b.p. 180°/10^{-4} mm, $[\alpha]^2_D{}^0$ −50·7°, turned out to be the desired methyl ester of 3β-acetoxy-4,5-seco-5-keto-B-norcholestan-4-oic acid (**5b**). Its IR spectrum indicated the presence of the ketone and ester group (strong bands at 1730 and 1220 cm^{-1}); the NMR spectrum exhibited signals due to the protons of the acetyl group (δ 2·10), carbomethoxyl group (δ 3·70) and proton α relative to these groups (δ 4·91). Together with the analytical data, these findings permitted us to assign the formula **5b** to this compound. Hydrolysis of ester **5b** with alcoholic-aqueous KOH, yielded hydroxyacid **5a**, m.p. 111–112°, $[\alpha]^2_D{}^0$ − 0·9°. The IR spectrum exhibited two main absorption bands, a broad band at 1696 cm^{-1} with a shoulder at 1725 cm^{-1} (C=O of carboxyl group and five-membered ring ketone) and a band at 3600–2500 cm^{-1} (OH).

Ester **5b**, treated with hydroxylamine hydrochloride in pyridine, gave crystalline oxime **6**, m.p. 109–111°. Its IR spectrum showed an absorption characteristic of the >C=N—OH group (3250 and 1660 cm^{-1}), as well as of the ester groups (1740 and 1225 cm^{-1}). The structure of oxime **6** was confirmed by NMR, which showed the



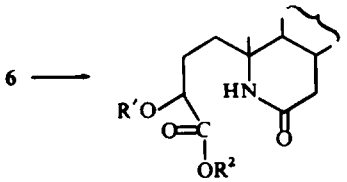
presence of =N—OH proton (δ 7·03) and the intact —CH/OCOCH$_3$/CO$_2$CH$_3$ fragment. The assignment of configuration *anti* to this compound followed from its subsequent reactions.

The next stage of the synthesis involved conversion of oxime **6** into lactam **7** by Beckmann rearrangement. Relatively the best results were obtained by treatment of oxime **6** with $SOCl_2$ in ether at −10°. Under these conditions, two main products, markedly differing in TLC mobility, were formed. They were separated by silica gel coloumn chromatography. The less mobile compound+ was obtained in about 45% yield as a gum exhibiting no tendency to crystallization. In its IR spectrum, the presence of maxima characteristic of the acetyl and carbomethoxyl group (1719, 1226 cm^{-1}) and of the lactam group in the six-membered ring (3173, 1630 cm^{-1}), was observed. The NMR

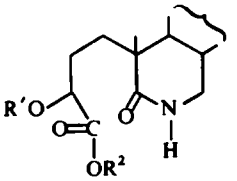
* The structure of products A and C will be described elsewhere.

\+ The structure of the other product will be described elsewhere.

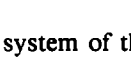
spectrum confirmed the presence of the acetyl (δ 2·08), carbomethoxyl group (δ 3·69), the proton α relative to both these groups (δ 4·92) and a lactam NH proton (δ 6·62). The chemical shift of the 19-CH_3 group was very instructive. Its signal occurred at δ 1·13, i.e. was shifted downfield relative to its position in the parent oxime (**6**) and ketone (**5b**), thus indicating the location of nitrogen in position 5 and excluding the isomeric structure **8**.



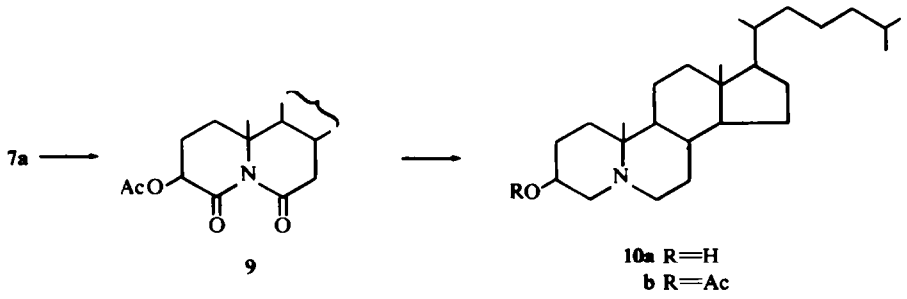
7a R^1=H, R^2=H
b R^1=Ac, R^2=Me



8 R^1=Ac, R^2=Me

According to the scheme of the synthesis, the ester groups in lactam **7b** should be hydrolysed, and after protecting the hydroxyl group at C-3 by acetylation, the reclosure of ring A had to be attained by N-cyclization. The hydrolysis of compound **7b** with alcoholic-aqueous KOH yielded free 3β-hydroxy-4,5-seco-5-aza-6-ketocholestan-4-oic acid (**7a**) which remained amorphous despite chromatographic purification. The IR spectrum exhibited the absorption of the associated OH and lactam NH groups (3200–3400 cm^{-1}), as well as of the carbonyls of the six-membered ring lactam (1629 cm^{-1}) and carboxyl group (1704 cm^{-1}). In the NMR spectrum, signals at δ 2·08 and δ 3·69 disappeared, this indicating splitting off of the acetyl and carbomethoxyl groups. The acetylation of hydroxyacid **7a** with Ac_2O in pyridine at room temp., gave crystalline product $C_{28}H_{45}NO_4$, m.p. 199–200°, $[\alpha]^{19}_D$ − 50°. Its IR spectrum showed the presence of the maxima characteristic of the acetyl group (1741, 1220 cm^{-1}) and disappearance of the carboxyl group and lactam system absorptions. On the other hand, at 1650 cm^{-1} there appeared a relatively strong band, which could be assigned to the dicyclic imide system. These findings indicated that, in addition to the acetylation of OH group at C-3, N-cyclization of ring A with formation of the imide system also took place. The assigned structure of 3β-acetoxy-5-aza-cholestadi-4,6-one (**9**) was confirmed by the NMR spectrum, showing the signal of the AcO group protons (δ 2·17) and of the proton α relative to this group (pair of doublets at δ 5·29, $J_{2a,3a}$ = 10 Hz, $J_{2e,3e}$ = 7 Hz). No signals of the lactam and carboxyl group protons were present. The values of the coupling constants of the H-3 proton proved the axial orientation of the latter, and thus the equatorial position of the AcO group. Since for the flattened system of the dicyclic imide  there is only possibility of trans-condensation of rings A/B, the equatorial position of the AcO group unequivocally proves its β-configuration. It can thus be concluded that in the course of the synthesis the configuration of the substituent at C-3 remained unchanged.

3β-Acetoxyimide **9**, reduced with LAH in boiling dioxane, afforded a crystalline product (90%), m.p. 146–147° (from acetone), $[\alpha]^{14}_D$ + 11·4°. Its IR spectrum pointed to the presence of OH group (3405 cm^{-1}) and the complete disappearance of the carbonyl groups. The NMR spectrum contained the signals characteristic of the steroid Me groups, methylene envelope, the OH group (δ 3·38), H-3 proton (δ 3·72) and protons of the two methylene groups α relative to the nitrogen atom (δ 2·20–2·70, 4H).



These data and the elemental analysis unequivocally indicated the resulting compound to be the final product of the synthesis: 3β-hydroxy-5-azacholestane (**10a**). Compound **10a**, treated with Ac_2O in pyridine, afforded the crystalline acetyl derivative **10b**, m.p. 100–102° (from acetone), $[\alpha]_D^{12}$ + 8·3°. The IR spectrum of the latter showed the presence of the acetoxyl group absorption (1736, 1242 cm^{-1}) and the disappearance of the OH group band. The NMR spectrum confirmed the introduction of the acetyl group (δ 2·08). After the addition of TFA, in the NMR spectrum of **10b**, the signals of the methylene groups α relative to the nitrogen were shifted downfield. The signal of 19-CH_3 group also showed a downfield shift by 0·49 ppm. This constituted an independent proof of the location of nitrogen in position 5, since only in this case could the 19-CH_3 group be deshielded by $-\overset{|}{\underset{|}{N}}{}^+$. 3β-Hydroxy-5-azacholestane (**10a**) exhibited properties of a tertiary amine; treated with MeI it yielded crystalline quaternary methyliodide, m.p. 259–261° (from MeOH). It also showed a positive test with Dragendorf's reagent.

In the cycle of transformations of cholesterol (**1**) into 3β-hydroxy-5-azacholestane (**10a**), the configuration of the steroid skeleton remained unchanged. The configuration on carbon C-3 also showed no change, according to the NMR spectrum of imide **9**. Thus, β-configuration of the oxygen function was proved. Moreover, the half height width (w/2) of the proton α relative to the oxygen function in azasteroid **10a** amounted to 23 Hz, and in its acetyl derivative **10b** – to 21 Hz. Since these values are characteristic of the axial protons,[9] it proved that the substituent at C-3 is equatorial in both compounds. At the same time, it rules out the possibility of *cis*-condensation of rings A/B since in the latter case the β-substituent at C-3 would show an axial orientation. Instead the data indicated that rings A and B in 3β-hydroxy-5-azacholestane (**10a**) are *trans* condensed, and thus compound **10a** is an azasteroid with configuration fully analogous to that of cholestanol.

EXPERIMENTAL

B-norcholest-4-ene-3-one was synthesized from cholesterol.[5] Ozonolysis was carried out in the apparatus according to Smith *et al.* (org. Synth. Coll. Vol. III, 673). M.ps were taken on Köffler hot stage and are uncorrected. The b.ps of microdistillations refer to the air-bath temp. Measurements of optical rotation were performed on a Hilger polarimeter in $CHCl_3$. The IR spectra were recorded on a Hilger-800, a Unicam SP-200 and UR-20 spectrophotometers, using films for liquids, and KBr mulls for solids. NMR spectra were taken at 60 MHz on a Varian HA-60 and HA-60/IL spectrometers, using $CDCl_3$ solutions with TMS (δ = O ppm) as internal reference. For TLC silica gel G (Merck) was used. All reactions and chromatographic separations were monitored in TLC.

3β-*Hydroxy*-B-*norcholest*-4-*ene* (**3a**). A solution of B-norcholest-4-ene-3-one (1·0 g) in abs. ether (23 ml) was added dropwise (15 min) at 4° to a stirred suspension of LAH (0·36 g) in abs. ether (18 ml). After 15 min, excess hydride was decomposed with H_2O and the precipitate dissolved in 3% HCl (25 ml). The water

layer was extracted with ether, washed with water and dried over anhyd. $MgSO_4$. After evaporation of the solvent, a crystalline product (0·98 g) m.p. 86–94° was obtained. Two recrystallizations from MeOH afforded carbinol **3a** (0·79 g) as colorless needles, m.p. 106–107° (lit.[6] 106–107°), $[\alpha]^1{}_D^9$ −32° (c=0·2) (lit.[6] $[\alpha]^2{}_D{}^0$ −30°), ν_{max} 3286 (OH), 1650 (C=C), 1000 (C—O) cm^{-1}, δ: 4·24 (m, 1H, >CH—OH), 5·28 (broad s, 1H, >CH=).

3β-*Acetoxy*-B-*norcholest*-4-*ene* (**3b**). The solution of 3β-hydroxy-B-norcholest-4-ene (2·0 g) in pyridine (10 ml) and Ac_2O (6 ml) was left for 17 hr at room temp., poured on ice, neutralized with sat. $NaHCO_3$ and extracted with ether. The ether extracts were washed with a 3% HCl and water, dried over anhyd. $MgSO_4$ and evaporated. An oily residue (2·07 g) was chromatographed on alumina (25 g, II act.). Elution with petroleum ether (40–60°) gave an oily product (1·88 g), crystallized when triturated with EtOH. After recrystallization from the same solvent, 3β-acetoxy-B-norcholest-4-ene (**3b**) was obtained as colorless needles (0·95 g), m.p. 39–40° (lit.[6] 61–61°), $[\alpha]_D^{19}$ −56° (C=0·5) lit.[6] $[\alpha]_D^{20}$ −62°). From the mother liquor a second crop (0·53 g) m.p. 39–40° was obtained. ν_{max} 1730 (C=O), 1665 (C=C), 1230 (C—O) cm^{-1}, δ: 2·07 (s, 3H, CH_3—CO—), 5·27 (m, 1H, >CH=), 5·30 (m, 1H, >CH—OAc), (Found: C, 80·95; H, 11·38. $C_{28}H_{46}O_2$ requires: C, 81·10; H, 11·18%).

Methyl ester of 3β-*acetoxy*-4,5-*seco*-5-*keto*-B-*norcholestan*-4-*oic acid* (**5b**). A solution of 3β-acetoxy-B-norcholest-4-ene (2·6 g) in CH_2Cl_2 (67 ml) was cooled in CO_2/acetone and saturated with ozone till the blue color appeared. The mixture was then flushed with oxygen and the solvent evaporated. To the oily residue (2·61 g), dissolved in ether (38 ml), a mixture of 85% formic acid (38 ml) and 30% H_2O_2 (38 ml) was added. After 16 hr the solvents were evaporated (bath temp. <50°), the residue diluted with ice-water and the solution brought to pH 9 with 3% NaOH. The alkaline solution was extracted with ether (these extracts were discarded), water layer made acidic (pH 1–2) with 10% HCl and extracted (4×) with ether. Combined ether extracts were washed with water, dried over anhyd. $MgSO_4$, evaporated to a small volume (3 ml), cooled in ice-water and reacted with excess of an etheral solution of CH_2N_2. The solution was evaporated and an oily product (2·0 g) chromatographed on silica gel (44 g, below 0·08 mm) coloumn. The coloumn was eluted with C_6H_6/EtOAc 95:5 mixture and 15 ml fractions collected. Fractions 6–10* afforded methyl ester of 3β-*acetoxy*-4,5-*seco*-5-*keto*-B-*norcholestan*-4-*oic acid* (0·49 g). Rechromatography of the fractions 4, 5 and 11–17 gave further quantity of **5b** (0·22 g). A total yield of ester **5b** 0·57 g (29%), b.p. 180°/10^{-4} mm, $[\alpha]^2{}_D{}^0$ −50° (c=0·4), ν_{max} 1730 (C=O), 1220 (C—O) cm^{-1}, δ: 3·70 (s, 3H, —OCH_3), 4·91 (m, 1H, >CH—OAc). (Found: C, 73·24; H, 10·67. $C_{29}H_{48}O_5$ requires: C, 73·07; H, 10·15%).

3β-*Hydroxy*-4,5-*seco*-5-*keto*-B-*norcholestan*-4-*oic acid* (**5a**). The solution of methyl ester of 3β-acetoxy-4,5-seco-5-keto-B-norcholestan-4-oic acid (200 mg) in MeOH (15 ml) and 5% KOH (15 ml) was heated under reflux for 1 hr. The mixture was poured on ice and washed with ether. the water layer was acidified (pH 1) with 10% HCl and the precipitated acid extracted with $CHCl_3$. Dried (anhyd. $MgSO_4$) $CHCl_3$ solution was evaporated to give acid **5a** (188 mg), which crystallized after trituration with hexane. Recrystallization from this solvent yielded acid **5a**, m.p. 111–112°, $[\alpha]^2{}_D{}^0$ −0·9° (c=0·3), ν_{max} 3500–3600 (OH), 1725, 1696 (C=O), 1280 (C—O) cm^{-1}. (Found: C, 74·51; H, 10·32. $C_{26}H_{44}O_4$ requires: C, 74·24; H, 10·54%).

Oxime of the methyl ester of 3β-*acetoxy*-4,5-*seco*-5-*keto*-B-*norcholestan*-4-*oic acid* (**6**). The solution of ketoester **5b** (2·0 g) and hydroxylamine hydrochloride (4·0 g) in MeOH (32 ml) and pyridine (13 ml) was heated on a water bath for ½ hour, poured on ice and acidified (pH 1) with 10% HCl. The water layer was extracted with ether, the extract washed with water, dried (anhyd. $MgSO_4$) and evaporated to dryness. An amorphous product (2·05 g) crystallized after MeOH treatment. Recrystallization from this solvent yielded oxime **6** as colorless plates, m.p. 109–111°, $[\alpha]^1{}_D^8$ −21° (c=0·3), ν_{max} 3250 (N—OH), 1660 (C=N), 1740 (C=O), 1222 (C—O) cm^{-1}, δ: 2·09 (s, 3H, CH_3—CO—), 3·70 (s, 3H, —OCH_3), 4·88 (m, 1H, >CH—OAc), 7·03 (broad s, 1H, =N—OH). (Found: C, 70·50; H, 10·55. $C_{29}H_{49}O_5N$ requires: C, 70·84; H, 10·05%).

Methyl ester of 3β-*acetoxy*-4,5-*seco*-5-*aza*-6-*ketocholestan*-4-*oic acid* (**7b**). To a solution of oxime **6** (200 mg) in abs. ether, chilled in ice-water bath, a solution of $SOCl_2$ (0·5 ml) in abs. ether (5 ml) was added dropwise with stirring. After 1 hr. the mixture was poured on ice, neutralized with sat. $NaHCO_3$ and extracted with ether. The ether extract was dried (anhyd. $MgSO_4$) and evaporated to give an oily product (195 mg) which was chromatographed on silica gel (3 g, below 0·08 mm). The coloumn was eluted with C_6H_6/$CHCl_3$/EtOAc 3:3:4 (0·5 ml fractions were collected). Combined fractions 19–29† afforded the lactam **7b** (88 mg, 44% yield), $[\alpha]_D^{19}$ −13° (C=0·2), ν_{max} 3173 (lactam NH), 1719 (ester C=O), 1630

* Fractions 1 and 2 contained substance A. Fractions 19–55 contained substance C.

† Fractions 1–3 contained the less polar component (67 mg).

(lactam C=O), 1226 (C—O) cm^{-1}, δ: 2·08 (s, 3H, CH_3—CO—), 3·69 (s, 3H, —OCH_3), 4·92 (broad t, 1H, >CH—OAc), 6·62 (m, 1H, >NH).

3β-*Hydroxy*-4,5-*seco*-5-*aza*-6-*ketocholestan*-4-*oic acid* (**7a**). The solution of lactam **7b** (100 mg) in the mixture of MeOH (3 ml) and 5% KOH (7 ml) was heated on a water bath for 1 hr., poured on ice and washed with ether. The aqueous layer was brought to pH 1 (10% HCl) and extracted with $CHCl_3$. The extract was dried (anhyd. $MgSO_4$) and evaporated to give acid **7a** (82 mg, 82% yield) as a homogenous in TLC gum, $[\alpha]_D^{12}$ + 4·7 (C = 0·2), ν_{max} 3200–3400 (OH, NH), 1620 (lactam C=O), 1704 (acid C=O) cm^{-1}, δ: 4·08 (m, 1H, >CH—OH) 6·8–8·1 (broad m, OH, COOH, NH).

3β-*Acetoxy*-5-*azacholestadi*-4,6-*one* (**9**). To a solution of acid **7a** (350 mg) in pyridine (15 ml), chilled in ice, Ac_2O (8 ml) was added, and the mixture left overnight at 0°, poured on ice, brought to pH 8–9 (satur. Na_2CO_3) and extracted with ether. The ether extract was washed with 3% HCl and water, dried (anhyd. $MgSO_4$), and evaporated to give imide **9** (340 mg), which recrystallized from ether, m.p. 199–200°, $[\alpha]_D^{19}$ − 50° (c = 0·5), ν_{max} 1741 (C=O), 1650 (imide C=O), 1220 (C—O) cm^{-1}, δ: 2·17 (s, 3H, CH_3—CO—), 5·29 (m, 1H CH—OAc). (Found: C, 73·26; H, 10·02. $C_{28}H_{45}O_4N$ requires: C, 73·16; H, 9·87%).

3β-*Hydroxy*-5-*azacholestane* (**10a**). To a stirred suspension of LAH (3·0 g) in boiling dioxane (50 ml), a solution of imide **9** (500 mg) in dioxane (50 ml) was added dropwise over 2 hr. The mixture was heated under reflux for further 14 hr. then cooled in ice. Excess hydride was decomposed with water, and 20% KOH (100 ml) added, the organic layer separated, and the aqueous layer extracted with $CHCl_3$. The combined organic extracts were dried (anhyd. Na_2CO_3) and evaporated to give, homogeneous to TLC, 3β-*hydroxy*-5-*azacholestane* (**10a**) (490 mg), which after recrystallization from acetone showed m.p. 146–147°, $[\alpha]_D^{19}$ + 11·4° (c = 0·3), ν_{max} 3405 (OH) cm^{-1}, δ: 3·38 (broad s, 1H, OH), 3·72 (m, 1H, >CH—OH) 2·20–2·70 (m, 4H, —CH_2—N). (Found: C, 79·85; H, 11·79. $C_{26}H_{47}ON$ requires: C, 80·14; H, 12·15%).

Methyliodide of 3β-*hydroxy*-5-*azacholestane*. A solution of 3β-hydroxy-5-azacholestane (40 mg) in MeOH (1·5 ml) and MeI (0·5 ml) was left at room temp. for 24 hr. The solvents were evaporated and the residue recrystallized twice from MeOH to yield methyliodide of 3β-*hydroxy*-5-*azacholestane*, m.p. 258–261°. (Found: C, 61·04; H, 9·48. $C_{27}H_{50}NOI$ requires: C, 61·02; H, 9·42%).

3β-*Acetoxy*-5-*azacholestane* (**10b**). A solution of 3β-hydroxy-5-azacholestane (80 mg) in pyridine (3 ml) and Ac_2O (1·5 ml) was left at room temp. for 16 hr, poured on ice, brought to pH 8 (sat. Na_2CO_3) and extracted with ether. The ether extract was dried (anhyd. Na_2CO_3) and evaporated to give the residue, which crystallized after treatment with acetone. Recrystallization from this solvent afforded 3β-*acetoxy*-5-*azacholestane* (**10b**) (60 mg), m.p. 100–102°, $[\alpha]_D^{12}$ + 8·3° (c = 0·4), ν_{max} 1736 (C=O), 1242 (C—O) cm^{-1}, δ: 2·08 (s, 3H, CH_3—CO—). (Found: C, 78·40; H, 11·44. $C_{28}H_{49}O_2N$ requires: C, 77·90; H, 11·44%).

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