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CIRCULAR DICHROISM OF SOME STEROIDAL 6-MEMBERED KETOXIMES

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ABSTRACT - Some oximes of 4- and 6-ketosteroids, of des-A-5-keto-steroids, and the related compounds 31 and 33 have been synthesized. In three cases stable *E/Z* pairs are formed which could be separated. The CD-spectra of all compounds have been measured. The Cotton effects around 217 nm of the 6-hydroxyimino-5α-steroids (1 - 18, 34, 36) are negative, those of the corresponding 4-analogues (20 - 23) are positive. A similar relationship holds for the des-A-steroidoximes 24 - 26 *vs.* 27, and the syn-oximes 34/36 *vs.* their anti-analogues 35/37. This Cotton effect can, therefore, be used for the determination of the configuration of such oximes. The Cotton effects below 200 nm do not always show similar regularities.

1. INTRODUCTION

In continuation of our studies of saturated oximes[1] we have prepared three series of steroidal ketoximes by direct oximation[2] of the corresponding 6-oxo-5α-cholestanes, 5α- or 5β-hydroxy-4-oxocholestanes, and des-A-5-oxo-steroids. Moreover, we have obtained the cyclic oxime derivative 28 and the cyclic hydrazone derivative 29. All attempts to prepare 7-membered ring A analogues of compounds 28 and 29 failed. Treatment of the hydroxyimino acid 30 with thionylchloride gave in our hands the cyclic lactame 31 instead of the described compound 31a.[3] The reaction of the keto acid 32 with hydrazine led to the isolation of 33 and not to the expected product 33a. The syntheses of the oximes 3, 6 - 10, 12, 13[2] and 24[3] have already been published. In this paper we also describe the syntheses of the oximes 1, 6, and 34-37, whose CD-data have been presented earlier.[1]

The stereochemistry of the hydroxylic groups of these oximes was proved by ^{1}H NMR and in some cases also by ^{13}C NMR spectra. The ^{1}H NMR spectra of the oximes 1 to 27 showed signals of the strongly deshielded equatorial protons at the alpha position to the hydroxyimino function (7β-H for compounds 1 - 18, 3α-H for 19, 3β-H for compounds 20-23, 6α-H for 25 and 26, and 10α-H for 27, *resp.*), proving thus the cisoid stereochemistry of the hydroxyl group. Such signals are not present in the ^{1}H NMR spectra of 28 and 29.

The structures of the products 31 and 33 were established from their IR, ^{1}H and ^{13}C NMR, and MS data. The ^{1}H NMR spectrum of 31 showed a single olefinic proton signal as a doublet of doublets, and in its ^{13}C NMR spectrum were present one signal of a carbonyl group and two carbon signals of the trisubstituted alkene. The ^{13}C NMR spectrum of 33 indicated the presence of one carbon signal of the carbonyl group and the signal of the strongly deshielded quaternary carbon atom substituted by two hetero atoms.

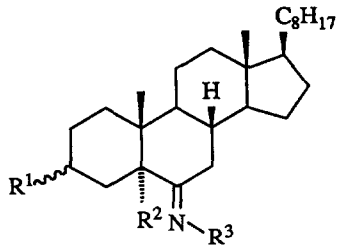
2. CHIROPTICAL PROPERTIES

The CD data of all investigated oximes are summarized in Tables 1 - 3. Most 6-hydroxyimino-5α-cholestanes (1 - 18, Table 1) show two Cotton effects above 185 nm. The sign of the first one around 220 nm is always negative and does not depend on the functionalization at C(5) (5α-H, 5α-OH, 5α-OMe, 5α-OAc, 5α-O_2CEt). The second short-wavelength Cotton effect around 200 nm is of opposite sign and could not be observed for 3, 4, 6, and 9. The change of the substituent at the 3- and/or 5-position influences only the magnitudes of both these Cotton effects.

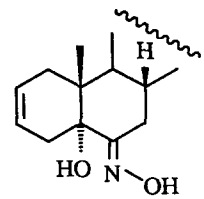
A different behaviour was observed for 4-hydroxyimino-5α-hydroxycholestanes which are further substituted at C(7) (compounds 20 - 23, Table 2, Figure 2). The first Cotton effect of these compounds is always positive, whereas the sign of the second depends on the configuration of the near-by 7-substituent (positive for 7β-OR, negative for 7α-OR). The sign of the first Cotton effect of 19 differs from those of 20 - 23 because of the change of the A/B ring junction. Compounds 24 - 28 (Table 3, Figure 3) behave similarly to the 6-hydroxyimino-cholestanes 34 - 37.[1] Almost all of them give two Cotton effects of mutually opposite signs (only a single negative CD at 213 nm: 27, 36); that around 220 nm depends on the relative configuration of the hydroxyimino group (positive for E- and negative for Z-isomers). 28 showed an additional long-wavelength CD at 251 nm. The hydrazone derivative 29 gives a CD curve of similar shape as the oxime derivative 28 (without the 251 nm CD), only the λ_{max}-values of both Cotton effects are red-shifted.

The data presented here (and published earlier by us[1-4]) clearly show that the sign of the essential Cotton effect of oximes and their derivatives around 220 nm depends on the conformation of the ring which contains the hydroxyimino function. If this possesses a symmetry plane, in which the C=N double bond lies, the sign of this Cotton effect depends also on the relative configuration of the hydroxyimino function. On the basis of this observations we propose the chirality rules shown in Figure 4 for the

prediction of the sign of the 220 nm Cotton effect of steroidal 4- and 6-ketoximes, *resp.*

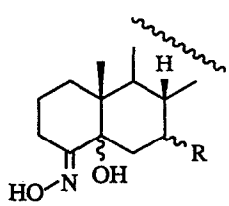


1 - 3 , 5 - 18



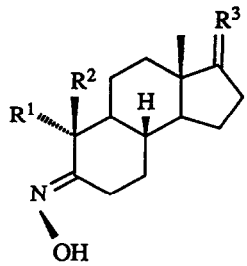
4

1	R^1	=	ß-OAc ,	R^2	= H	,	R^3 =	OH
2		=	ß-OAc ,		= H	,	=	OAc
3		=	H ,		= OH	,	=	OH
5		=	ß-OH ,		= OH	,	=	OH
6		=	ß-OAc ,		= OH	,	=	OH
7		=	ß-OAc ,		= OH	,	=	OAc
8		=	ß-Cl ,		= OH	,	=	OH
9		=	α-OAc ,		= OH	,	=	OH
10		=	α-OAc ,		= OH	,	=	OAc
11		=	α-OH ,		= OH	,	=	OH
12		=	ß-OAc ,		= OMe	,	=	OH
13		=	ß-OAc ,		= OMe	,	=	OAc
14		=	α-OAc ,		= OMe	,	=	OH
15		=	α-OH ,		= OMe	,	=	OH
16		=	ß-OAc ,		= OAc	,	=	OH
17		=	α-OAc ,		= OAc	,	=	OH
18		=	ß-OAc ,		= $OCOC_2H_5$,		=	OH

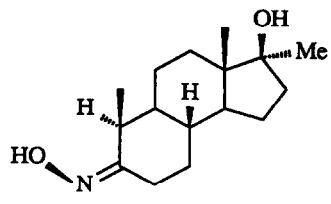


19 - 23

19	5ß-OH,	R	=	H
20	5α-OH,		=	ß-OH
21	5α-OH,		=	ß-OAc
22	5α-OH,		=	α-OH
23	5α-OH,		=	α-OAc

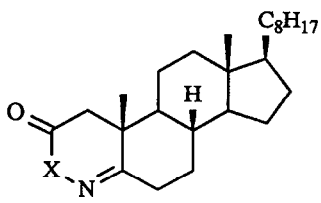


24 - 26



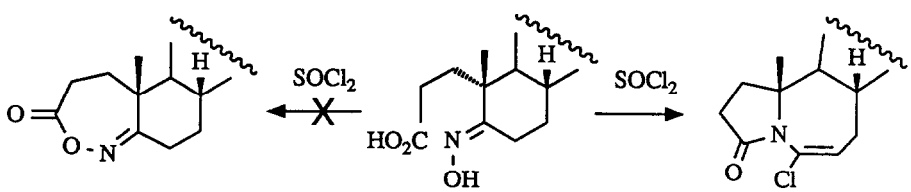
27

24	R^1	=	$(CH_2)_2CO_2Me$,	R^2	=	Me ,	R^3	=	ß-C_8H_{17} , α-Me
25		=	Me ,		=	H ,		=	ß-OH , α-Me
26		=	H ,		=	Me ,		=	ß-OH , α-Me

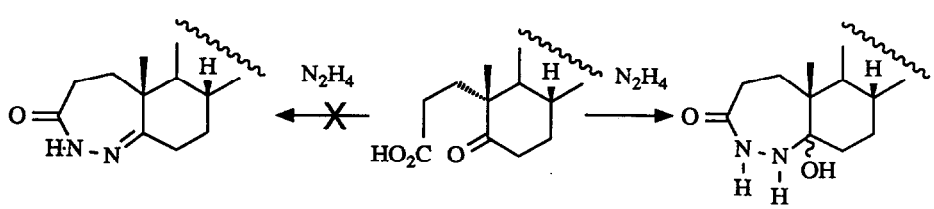


28 , 29

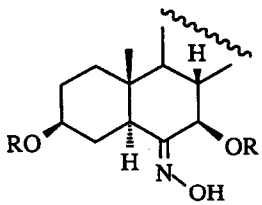
28 X = O
29 X = NH



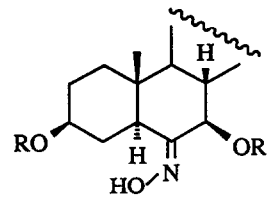
31a **30** **31**



33a **32** **33**



34 R = Ac
36 R = H



35 R = Ac
37 R = H

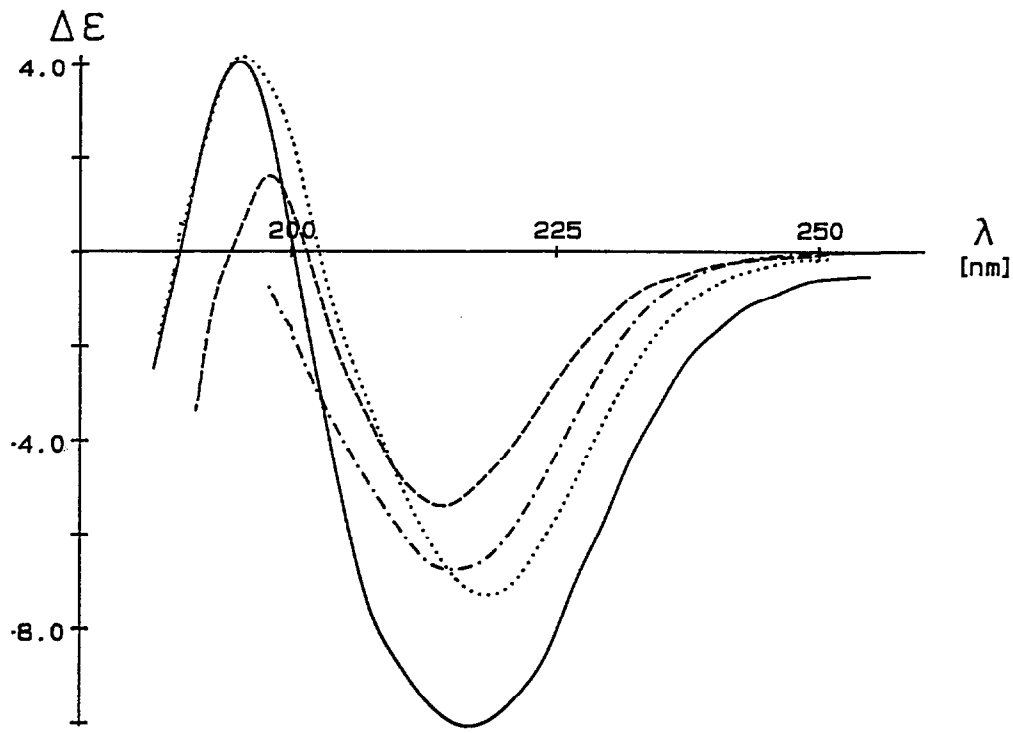


Figure 1: CD of 1 (-------), 6 (-·-·-·-), 12 (·····), and 16 (———), solvent acetonitrile.

Table 1: CD-data of the 6-hydroxyimino-5α-cholestanes (in acetonitrile)

Compound	Δε (λ[nm]) 1. Band	2. Band
1	-5.40 (214)	+1.7 (198)
2	-8.11 (212)	+7.9 (195)
3	-7.58 (216)	
4	-8.59 (217)	
5	-8.26 (216)	+2.6 (192)
6	-6.78 (219)	
7	-8.64 (216)	+4.1 (196)
8	-7.73 (215)	+3.4 (190)
9	-6.00 (216)	
10	-6.38 (216)	+5.8 (196)
11	-6.17 (217)	+3.1 (195)
12	-7.24 (218)	+4.3 (195)
13	-9.30 (220)	+8.0 (197)
14	-9.82 (219)	+12.1 (195)
15	-10.15 (219)	+12.9 (196)
16	-10.05 (217)	+4.1 (195)
17	-9.79 (216)	+7.9 (194)
18	-8.99 (219)	+6.5 (195)

Table 2: CD-data of the 4-hydroxyiminocholestanes (in acetonitrile).

Compound	Δε (λ[nm]) 1. Band	2. Band
19[a)]	-7.89 (219)	
20	+4.82 (217)	+2.8 (196)
21	+3.94 (218)	+5.5 (188)
22	+3.10 (220)	-1.0 (200)
23	+5.38 (218)	-0.7 (196)

[a)] In dioxane solution.

Table 3: CD-data of compounds 24 - 29, 31, and 33 (in acetonitrile)

Compound	Δε (λ[nm]) Additional Bands		1. Band	2. Band
24			+2.27 (221)	-8.9 (197)
25			+0.88 (219)	-5.0 (198)
26			+0.77 (222)	-5.9 (197)
27			-3.26 (213)	
28		+0.65 (251)	-24.99 (216)	+15.1 (198)
29		-17.83 (239)	+36.8 (212)	
31		-2.54 (247)	+28.2 (221)	
33	+0.08 (297)	-0.06 (259)	+2.9 (230)	-3.7 (207)
34			-5.23 (222)	+3.2 (195)
35			+2.41 (223)	-5.3 (194)
36			-4.38 (220)	
37			+1.47 (215)	-4.4 (193)

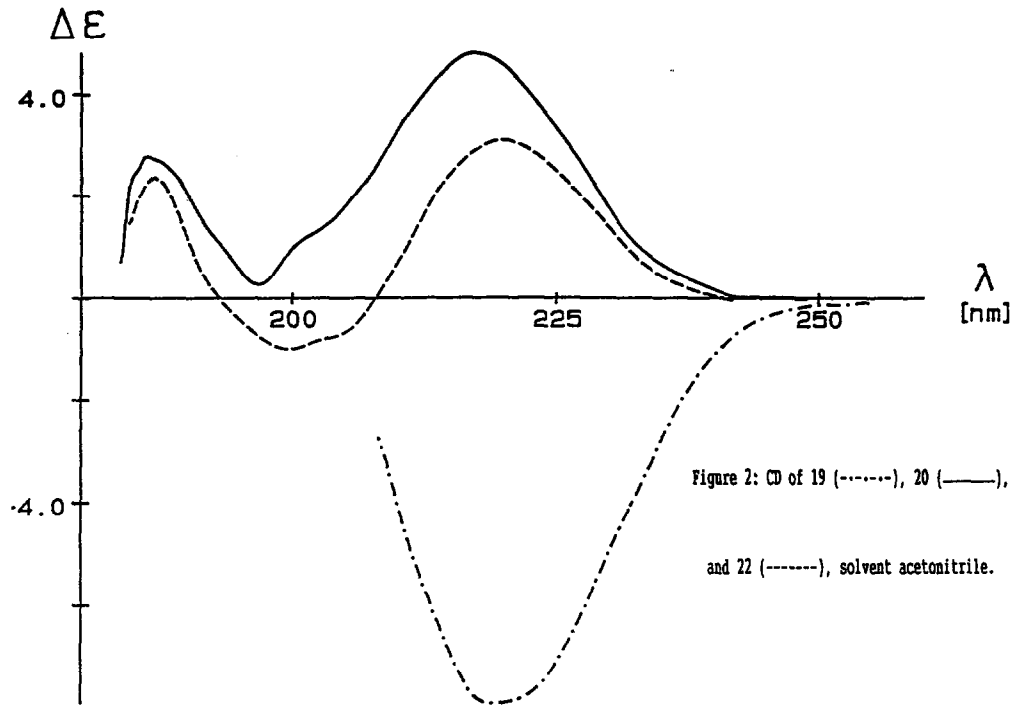


Figure 2: CD of 19 (-·-·-·-), 20 (———), and 22 (-------), solvent acetonitrile.

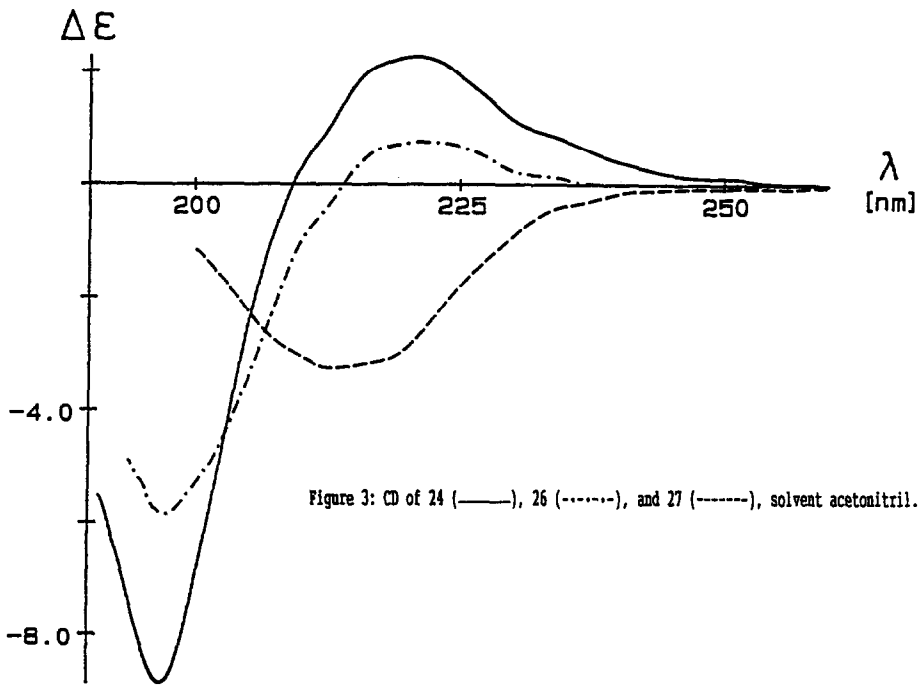


Figure 3: CD of 24 (———), 26 (-·-·-·-), and 27 (-------), solvent acetonitril.

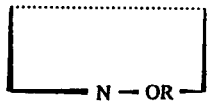


Figure 4: Chirality rule for six-membered ketoximes. The given configuration (Projection from N towards C) leads to a negative CD within the 1. band.

Table 4: ^{13}C Chemical shifts of the isomeric oximes 25, 26, 27, 34, and 35

C-atom	25	26	27	34[a]	35[a]
1	-	-	-	36.3	36.7
2	-	-	-	27.0	27.0
3	-	-	-	73.1	73.3
4	-	-	-	28.1	31.0
5	159.9	161.5	161.3	48.2	50.0
6	23.6	19.3	27.4	152.8	152.2
7	29.9	30.2	31.3[b]	76.5	76.2
8	41.2[b]	34.4	34.6	41.4	43.2
9	50.3	46.7	45.1	53.5	53.9
10	41.5[b]	38.8	30.2	38.6	39.2
11	26.3	25.2	25.0	21.7	21.6
12	38.3	38.3	38.3	39.5	39.5
13	45.3	45.5	45.5	44.0	43.8
14	48.9	49.4	49.5	55.4	55.2[b]
15	23.0	23.0	22.9	26.0	25.8
16	31.2	31.1	31.2[b]	28.5	28.5
17	79.6	79.6	79.6	55.1	55.1[b]
18	14.1	14.1	14.0	12.1	12.1
19	13.5	13.4	11.2	12.7	13.5
17α-Me	26.1	26.1	26.1	-	-
3-OAc	-	-	-	170.4	170.5
	-	-	-	21.4	21.4
7-OAc	-	-	-	171.0	170.1
	-	-	-	21.3	21.1

[a] Without side-chain signals. [b] May be interchanged.

3. EXPERIMENTAL

General procedures

Melting points were determined on a Boetius micro-melting point apparatus and are uncorrected. Unless otherwise stated optical rotations were measured on a Perkin-Elmer 241 polarimeter in $CHCl_3$ solution, concentrations are given in g/100 ml. IR-spectra were recorded on an UR-20 spectrometer in KBr pellets, or on a Pye Unicam SP 1100 in chloroform solutions {ν [cm^{-1}]}. ^1H NMR spectra were taken on a Tesla BS 567, Bruker AM-80, or Bruker AM-400, ^{13}C NMR spectra on a Bruker AM-400 {ppm}. Mass spectra were recorded on a Varian MAT CH-4 spectrometer {m/z(rel. intensity [%])}, CD spectra on a modified ISA-JOBIN-YVON Dichrograph Mark III {$\Delta\epsilon(\lambda[nm])$}. Column chromatography was performed on Kieselgel 60 (70-230 mesh), Merck. The syntheses of the oximes 3, 6 - 10, 12, and 13 were reported earlier by us.[2]

Syntheses of the oximes 1, 4, 5, 11, 14-27, and 34-37. To a solution of the corresponding ketone (0.5g) in 6 ml pyridine an excess of hydroxylamine hydrochloride (*ca.* 0.25g) was added and the reaction mixture was left for 2-5 days at room temperature. The progress of the reaction was monitored by TLC. The oximes 16 - 18 were obtained in moderate yield after 5-6 months. After partitioning between water and ether or benzene the organic layer was washed twice with water, dried over Na_2SO_4 sicc., and evaporated in vacuo. The crude product was purified by column chromatography and crystallized from the indicated solvent. The data obtained by us for the oximes 1,[5] 4,[6] 5,[6] 16,[7] and 24[3] agree well with those cited in the literature.

(6E)-6-Acetoxyimino-5α-cholestan-3β-ol acetate (2) was obtained from the oxime 1 according to the earlier published procedure.[2] Crystallization from hexane gave pure 2 (75%), m.p. 136-138°C; IR (KBr): 1778, 1742, 1648, 1248, 1040, 941, 928. Lit.[8]: m.p. 130-131°C (hexane); IR (CCl_4): 1765, 1730, 1635.

(6E)-6-Hydroxyimino-5α-cholestane-3α,5-diol (11). Yield 90%; m.p. 242-245°C (MeOH); $[\alpha]_D$: -37.4 (THF, c=1.1); IR (KBr): 1675, 1171, 1026, 917; ^1H NMR (100 MHz, $CDCl_3$): 0.65 (s, 18-Me), 0.79 (s, 19-Me), 3.11 (br. d, J= 12.1Hz, 7βH), 4.21 (m, 3βH). Anal. found C 74.5; H 11.0; N 3.0: $C_{27}H_{47}NO_3$ requires C 74.8; H 10.9; N 3.2.

(6E)-6-Hydroxyimino-5-methoxy-5α-cholestan-3α-ol 3-acetate (14). Yield 85%; m.p. 183.5-185°C (hexane-ether); $[\alpha]_D$: -42.6 (c=0.5); IR (KBr): 3465, 1718, 1290, 1250, 1108, 1085, 918; ^1H NMR (400 MHz, $CDCl_3$): 0.63 (s,18-Me), 0.80 (s, 19-Me), 2.04 (s, OAc), 3.01 (s, OMe), 3.11 (dd, J=12.4 and 2.7 Hz, 7βH), 5.07 (m, 3βH), 8.33 (br s, NOH); Anal. found C 73.7; H 10.7; N 3.3: $C_{30}H_{51}NO_4$ requires C 73.6; H 10.5; N 2.9.

(6E)-6-Hydroxyimino-5-methoxy-5α-cholestane-3α-ol (15). Yield 80%; m.p.97-100°C (MeOH); $[\alpha]_D$: -22.0 (c=0.4); IR (KBr): 3530, 1665, 1100, 1055, 920, 815; ^1H NMR (400 MHz, $CDCl_3$): 0.63 (s, 18-Me), 0.80 (s, 19-Me), 3.14 (s, OMe), 3.15 (dd, J=13.5 and 4.5 Hz, 7βH), 3.59 (d, J=11.4 Hz, 3α-OH), 3.93 (br d, J=11.4 Hz, 3βH), 8.38 (s, NOH); Anal. found C 74.9; H 10.9; N 2.9: $C_{28}H_{49}NO_3$ requires C 75.1; H 11.0; N 3.1.

(6E)-6-Hydroxyimino-5α-cholestane-3α,5-diol 3,5-diacatate (17). Yield 35%; m.p. 212-215°C (MeOH); $[\alpha]_D$: -66.2 (c=0.4); IR (KBr): 3430, 1748, 1718, 1280, 1168, 1045, 1030, 920; ^1H NMR (400 MHz, $CDCl_3$): 0.63, (s, 18-Me), 0.80 (s, 19-Me), 1.98 (s, OAc), 2.06 (s, OAc), 2.11 (dd, J=16.3 and 4.3 Hz, 4βH), 2.70 (br d, J=16.3 Hz, 4αH), 3.20 (dd, J=13.4 and 4.6 Hz, 7βH), 5.15 (m, 3βH), 7.15 (br s, NOH); Anal. found C 72.0; H 10.1; N 2.9; $C_{31}H_{51}NO_5$ requires C 71.9; H 9.9; N 2.9.

(6E)-6-Hydroxyimino-5α-cholestane-3β,5-diol 3-acetate 5-propionate (18). Yield 46%; m.p. 149-151°C (MeOH); $[\alpha]_D$: -58.3 (c=0.6); IR (KBr): 3550-3300, 1748, 1247, 1150, 1060, 1026; ^1H NMR (400 MHz, $CDCl_3$): 0.63, (s, 18-Me), 0.86 (s, 19-Me),1.14 (t, J=7.6 Hz, CH_3CH_2), 1.98 (s, OAc), 2.36 (m, CH_3CH_2), 2.65 (ddd, J=14.3, 4.8 and 1.7 Hz, 4αH), 3.22 (dd, J=13.6 and 4.3 Hz, 7βH), 4.81 (br m, 3αH), 7.74 (br, NOH); Anal. found C 72.3;H 10.1; N 2.7: $C_{32}H_{53}NO_5$ requires C 72.3; H 10.1; N 2.6.

(4E)-4-Hydroxyimino-5β-cholestan-5-ol (19). Yield 86%; m.p. 228-231°C (Me_2CO); $[\alpha]_D$: -31.8 (THF, C=0.84); IR (KBr): 3495, 3435, 955, 925, 900, 872; ^1H NMR (400 MHz, $CDCl_3$): 0.62 (s, 18-Me), 0.99 (s, 19-Me), 3.22 (br d, J=15.1 Hz, 3αH); Anal. found C 77.5; H 11.6; N 3.4: $C_{27}H_{47}NO_2$ requires C 77.6; H 11.3; N 3.4.

(4E)-4-Hydroxyimino-5α-cholestane-5,7β-diol (20). Yield 88%; m.p. 217-223°C (MeOH); $[\alpha]_D$: +140.9 (THF, C=0.9); IR (KBr): 3500-3400, 1666, 1040, 932, 870; ^1H NMR (100 MHz

$CDCl_3$): 0.69 (s, 18-Me), 0.86 (s, 19-Me), 3.13 (br d, J=14.9 Hz, 3βH), 3.48 (s, OH), 3.78 br m, 7αH); Anal. found C 74.5; H 10.8; N 3.1: $C_{27}H_{47}NO_3$ requires C 74.7; H 10.7; N 3.1.

(4E)-4-Hydroxyimino-5α-cholestane-5,7β-diol 7-acetate (21). Yield 81%; m.p. 210-212.5°C (MeOH); $[\alpha]_D$: +134.4 (c=0.5); IR (KBr): 3605, 3435, 1718, 1275, 1040, 930, 870, 700; ^{1}H NMR (400 MHz, $CDCl_3$): 0.66 (s, 18-Me), 0.80 (s, 19-Me), 2.02 (s, OAc), 2.09 (td, J=13.4 and 6.4 Hz, 3αH), 2.21 (dd, (J=14.1 and 4.7 Hz, 6αH), 3.03 (br dd, J=13.7 and 4.4 Hz, 3βH), 3.23 (s, 5αOH), 4.76 (br m, 7αH), 9.24 (NOH); Anal. found C 73.5; H 10.3; N 3.1: $C_{29}H_{49}NO_4$ requires C 73.2; H 10.4; N 2.9.

(4E)-4-Hydroxyimino-5α-cholestane-5,7α-diol (22). Yield 76%; m.p. 216-218°C (MeOH); $[\alpha]_D$: +93.0 (c=0.6); IR (KBr): 3500-3300, 1662, 1128, 925, 870; ^{1}H NMR (100 MHz, $CDCl_3$): 0.67 (s, 18-Me), 0.83 (s, 19-Me), 3.12 (br d, J=13.7 Hz, 3βH), 3.95 (m, 7βH), 4.55 (br, OH), 8.30 (br, NOH); Anal. found C 74.9; H 11.1; N 3.0: $C_{27}H_{47}NO_3$ requires C 74.8; H 10.9; N 3.2.

(4E)-4-Hydroxyimino-5α-cholestane-5,7α-diol 7-acetate (23). Yield 83%; m.p. 185-188°C (hexane-ether); $[\alpha]_D$: +107.9 (c=0.8); IR (KBr): 3467, 1715, 1280, 1048, 927, 870; ^{1}H NMR (400 MHz, $CDCl_3$): 0.63 (s, 18-Me), 0.82 (s, 19-Me), 2.06 (s, OAc), 2.11 (td, J=13.8 and 6.8 Hz, 3αH), 3.12 (br dd, J=13.8 and 4.2 Hz, 3βH), 3.31 (s, 5αOH), 5.18 (br q, J=3Hz, 7βH), 7.93 (s, NOH); Anal. found C 73.0; H 10.1; N 3.1: $C_{29}H_{49}NO_4$ requires C 73.2; H 10.4; N 2.9.

(5E)-5-Hydroxyimino-17α-methyl-des-A-10α-androstan-17β-ol (25). Yield 80%; m.p. 93-96°C (Me_2CO); $[\alpha]_D$: +56.3 (THF, c=1.2); IR (KBr): 3600-3200, 1680, 1090, 945, 930; ^{1}H NMR (400 MHz, DMSO): 0.78 (s, 18-Me), 0.99 (d, J=6.5 Hz, 19-Me), 1.06 (s, 17α-OH), 1.98 (dq, J=11.3 and 6.8 Hz,10βH), 3.27 (br d, J=13.9 Hz, 6αH), 4.06 (s, 17βOH), 10.24 (s, NOH); ^{13}C NMR (DMSO) see Table 4; Anal. found C 72.6; H 10.4; N 5.5: $C_{16}H_{27}NO_2$ requires C 72.4; H 10.3; N 5.3.

(5E)-5-Hydroxyimino-17α-methyl-des-A-androstan-17β-ol (26). Yield 35%; m.p. 190-192°C (ether); $[\alpha]_D$: +39.2 (THF, c=0.7); IR (KBr): 3500-3200, 1665, 1380, 1300, 1150, 1110, 1088, 955, 879; ^{1}H NMR (400 MHz, DMSO): 0.76 (s, 18-Me), 0.97 (d, J=7.3 Hz, 19-Me), 1.06 (s, 17αCH_3), 2.32 (dq, J=4.4 and 7.1 Hz, 10αH), 3.05 (dd, J=13.1 and 4.2 Hz, 6αH), 4.05 (s, 17βOH), 10.00 (s, NOH); ^{13}C NMR (DMSO) see Table 4; Anal. found C 72.5; H 10.4; N 5.5: $C_{16}H_{27}NO_2$ requires C 72.4; H 10.3; N 5.5.

(5Z)-5-Hydroxyimino-17α-methyl-des-A-androstan-17β-ol (27). Yield 30%; m.p. 188-189°C (Me_2CO-ether); $[\alpha]_D$: -13.9 (THF, c=1.2); IR (KBr): 3450, 3340, 1660, 1160, 1110, 1090, 970, 941, 910; ^{1}H NMR (400 MHz, DMSO): 0.76 (s, 18-Me), 0.90 (d, J=7.2 Hz, 19-Me), 1.06 (s, 17αCH_3), 2.06 (br d, J=13.6 Hz, 6αH), 2.14 (td, J=13.6 and 4.8 Hz, 6βH), 3.31 (m, 10αH, overlapped with H_2O signal); ^{13}C NMR (DMSO) see Table 4; Anal. found C 72.5; H 10.4; N 5.4: $C_{16}H_{27}NO_2$ requires C 72.4; H 10.3; N 5.3.

4-Aza-3-oxacholest-4-en-2-one (28) was prepared from 5-hydroxy-3-oxa-A-nor-5β-cholestan-2-one according to the literature method.[9] The crude product was filtered through silicagel and crystallized from methanol to afford 28, m.p. 127-130°C; $[\alpha]_D$: +65.0 (c=0.8); IR (KBr): 1773, 1245, 1190, 904; ^{1}H NMR (80 MHz, $CDCl_3$): 0.69 (s, 18-Me), 1.13 (s, 19-Me), 2.21 and 2.75 (AB_q, J_{AB}=16 Hz, 1αH and 1βH); Anal. found C 77.6; H 10.9; N 3.5: $C_{25}H_{41}NO_2$ requires C 77.5; H 10.7; N 3.6.

3,4-Bisazacholest-4-en-2-one (29) was synthesized by the known method.[10] Filtration of the crude product through silicagel and crystallization from methanol gave 29, m.p. 213-214°C; IR (KBr): 3280, 3125, 1680, 1213, 1100, 756; ^{1}H NMR (400 MHz, $CDCl_3$): 0.67 (s, 18-Me), 1.03 (s, 19-Me), 2.18 and 2.49 (AB_q, J_{AB}=16.6 Hz, 1αH and 1βH), 8.68 (s, NH); ^{13}C NMR (100.6 MHz, $CDCl_3$): 166.8 (C-2), 159.1 (C-5), 38.6 (C-10), 16.8 (C-19), 11.8 (C-18).Lit.[10]: m.p. 212-212.5°C (MeOH).

6-Chloro-5-aza-A-nor-B-homocholest-6-en-3-one (31). The oxime-acid 30 was treated with thionyl chloride according to the method of praparation of 4a-aza-4-oxa-A-homocholest-4a-en-3-one (31a).[3] The neutral product was filtered through silica-gel and crystallized from hexane to give 31, m.p. 131-133°C; $[\alpha]_D$: +99.0 (c=1); IR (KBr): 1735, 1670, 1180, 856, 822, 795; ^{1}H NMR (400 MHz, $CDCl_3$): 0.68 (s, 18-Me), 1.31 (s, 19-Me), 2.34 (ddd, J=17.5, 9.9, and 3.1 Hz, 2aH), 2.46 (dt, J=17.5 and 9.6 Hz, 2bH), 5.96 (dd, J=9.2 and 5.3 Hz, 7H); ^{13}C NMR ($CDCl_3$): 173.3 (C-3), 127.5 (C-6), 127.3 (C-7), 64.2 (C-10), 19.9 (C-19), 12.0 (C-18); MS: 421 (M+2, 8), 419 (M^+, 22), 384 (M-Cl, 49), 171 (100); Anal. found C 74.0; H 10.1; N 3.5: $C_{26}H_{42}NOCl$ requires C 74.3; H 10.1; N 3.3. Lit.[3]: m.p. 133-134°C; $[\alpha]_D$: +8.4 ($CHCl_3$); IR (nujol): 1725, 1648, 1160.

5-Hydroxy-4,4a-bisaza-A-homo-5a-cholestan-3-one (33). A mixture of the keto-acid 32[3] (1.28 g) and hydrazine hydrate (3 ml) in 30 ml of ethanol was heated under reflux for 220 min. The reaction mixture was diluted with water and the product was extracted with benzene. After usual work-up the crude product was treated with hot hexane and gave colourless crystals which after recrystallization from methanol afforded 33 (0.85 g, 66%); m.p. 166-169°C; $[\alpha]_D$: +61.4 (THF, c=0.42), IR (KBr): 3330, 1640, 1054, 940, 900; ^{1}H NMR (400 MHz, $CDCl_3$): 0.64 (s, 18-Me), 1.05 (s, 19-Me), 2.38 (3H, m), 3.24 and 4.15 (1H and 2H, m and m, OH and 2xNH); ^{13}C NMR (100.6 MHz, $CDCl_3$): 171.4 (C-3), 91.0 (C-5), 40.0 (C-10), 17.9 (C-19), 11.9 (C-18); MS: 418 (M$^+$, 13), 400 (M-H_2O, 100), 387 (92); Anal. found C 74.2; H 11.3; N 6.8: $C_{26}H_{46}N_2O_2$ requires C 74.6; H 11.1; N 6.7.

(6Z)-6-Hydroxyimino-5a-cholestane-3β,7β-diol 3,7-diacetate (34). Yield 12%; oil; $[\alpha]_D$: +32.5 (c=0.8); IR (KBr): 3500, 1755, 1260, 1065; ^{1}H NMR (400 Mz, $CDCl_3$): 0.65 (s, 18-Me), 0.77 (s, 19-Me), 1.92 (s, OAc), 1.99 (s, OAc), 4.60 (br m, 3αH), 4.98 (d, J=11 Hz, 7αH), 9.32 (s, NOH); ^{13}C NMR ($CDCl_3$): see Table 4; Anal. found C 72.0; H 10.0; N 2.9: $C_{31}H_{51}NO_5$ requires C 71.9; H 9.9; N 2.7.

(6E)-6-Hydroxyimino-5a-cholestane-3β,7β-diol 3,7-diacetate (35). Yield 66%; m.p. 136-139°C (hexane); $[\alpha]_D$: +87.6 (c=1.1); IR (KBr): 3300, 1760, 1260, 1045; ^{1}H NMR (400 MHz, $CDCl_3$): 0.65 (s, 18-Me), 0.93 (s, 19-Me), 1.99 (s, OAc), 2.02 (s, OAc), 2.11 (dd, J=12.9 and 2.7 Hz, 5αH), 2.35 (br d, J=12.7 Hz, 4αH), 2.51 (q, J=12.7 Hz, 4βH), 4.46 (br m, 3αH), 4.87 (d, J=10.7 Hz, 7αH), 8.47 (s, NOH); ^{13}C NMR ($CDCl_3$): see Table 4; Anal. found C 72.0; H 10.1; N 2.6: $C_{31}H_{51}NO_5$ requires C 71.9; H 9.9; N 2.7.

(6Z)-6-Hydroxyimino-5a-cholestane-3β,7β-diol (36). Yield 35%; m.p. 182-185°C(MeOH); $[\alpha]_D$: +18.2 (c=1); IR (KBr): 3600-3100, 1650, 1070, 1032, 890; ^{1}H NMR (400 MHz, $CDCl_3$): 0.68 (s, 18-Me), 0.78 (s, 19-Me), 3.55 (br m, 3αH), 4.19 (d, J=9.4 Hz, 7αH), 5.84 (br, OH); Anal. found C 74.9; H 11.0; N 3.4: $C_{27}H_{47}NO_3$ requires C 74.8; H 10.9; N 3.2.

(6E)-6-Hydroxyimino-5a-cholestane-3β,7β-diol (37). Yield 55%; oil; $[\alpha]_D$: +90.7 (c=0.8); IR ($CHCl_3$): 3625, 1050, 1010, 980; ^{1}H NMR (400 MHz, $CDCl_3$): 0.65 (s, 18-Me), 0.87 (s, 19-Me), 3.41 (br m, 3αH), 3.71 (d, J=9.6 Hz, 7αH), 5.46 (br, OH); Anal. found C 74.6; H 10.6; N 3.0: $C_{27}H_{47}NO_3$ requires C 74.8; H 10.9; N 3.2.

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