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REACTION OF ACID ANHYDRIDES—IV[1]

STEROIDAL 3-TRICHLOROACETOXY-$\Delta^{3,5}$-DIENES; A SIMPLE DECONJUGATION OF Δ^4-3-KETONES

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Abstract—Steroidal Δ^4-3-ketones **1**, **4** and **5** react with trichloroacetic anhydride resulting in 3-trichloroacetoxy-$\Delta^{3,5}$-dienes **2**, **6** and **7**. Spectroscopic or other slightly basic methanol converts the 3-trichloroacetoxy-dienes **2** and **7** into the corresponding Δ^5-3-ketones **3** and **8**. The rate of its methanolysis is much faster than that of the isomerization reaction of the resulting Δ^5-3-ketones **3** and **8** to the more stable Δ^4-3-ketones **1** and **5**. The methanolysis of the 3-acetoxy-diene **16** may also result in primary formation of the Δ^5-3-ketone **3c**, but since the rate of its formation is comparable to that of its isomerization to the Δ^4-3-ketone, the former compound is not isolable. The $\Delta^{4,6}$-3-ketones **10** and **14** also give 3-trichloroacetoxy-$\Delta^{3,5,7}$-trienes **11** and **15**, the former yielding on methanolysis a mixture of the $\Delta^{5,7}$-3-ketone **12**, and the $\Delta^{3,7}$-3-ketone **13**.

WE HAVE reported recently that trichloroacetic anhydride react with ketones to give the *gem* bistrichloroacetates.[2] The latter compounds undergo elimination in the presence of *p*-toluenesulphonic acid resulting in the enol trichloroacetates. However, the product isolated from the reaction of the steroidal Δ^4-3-ketone, testosterone acetate **1c**, with trichloroacetic anhydride was the dienol-ester, the 3-trichloroacetoxy-diene **2c**.[2] The corresponding 3,3-bistrichloroacetoxy derivative was observed only as an intermediate in this reaction.

In this paper we describe the preparation and the properties of a few steroidal 3-trichloroacetoxy-dienes.

The following Δ^4-3-ketones were converted to the corresponding 3-trichloroacetoxydienes **2**: testosterone, 19-nortestosterone, their 17β-acetates and 17α-ethynyl-17β-acetates (**1a–1f**), cholestenone **1g** and 17α-hydroxyprogesterone (**1h**).‡ In addition, the 4-methyl- and 6-methyl-3-trichloroacetoxy-dienes **6** and **7** were synthesized. In most cases the yields were high, and the products were obtained in pure form by crystallization alone, chromatographic separation seldom being necessary. Whenever the starting ketones possessed acid sensitive functons, small amounts of pyridine were added, prior to the product isolations, to neutralize the trichloroacetic acid formed.

The trichloroacetoxy-dienes **2** showed a high negative D-line rotation as did the corresponding acetoxy-dienes.[3] In the IR spectrum, these compounds showed trichloroester vibrational bands at 5·63–5·67 μ, and at ca. 8·2 μ. Their double bond stretching bands appeared at ca. 6·0 and 6·1 μ, and those due to trichloromethyl group at ca. 11·5–12·5 μ.

The UV spectra of the trichloroacetoxy-dienes **2**, were measured in ethanol, cyclohexane and methanol. The λ_{max} and their ε values in the first two solvents were found to be almost identical λ_{max} 232 mμ (ε_{EtOH} 16500 and $\varepsilon_{C_6H_{12}}$ 17500). However,

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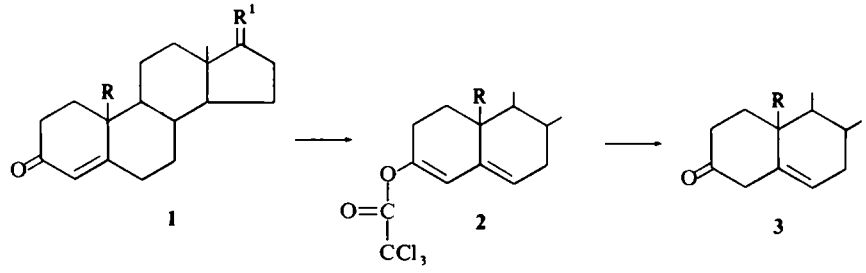
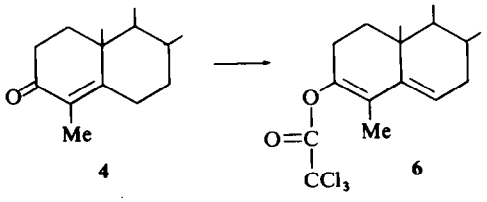
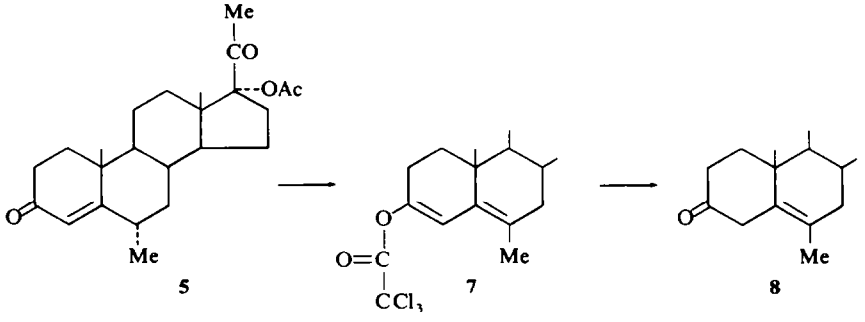
‡ Some of these compounds were found to possess physiological activity.

CHART I



R	*R*¹
a: Me	OH, H
b: H	OH, H
c: Me	OAc, H
d: H	OAc, H
e: Me	OAc, C≡CH
f: H	OAc, C≡C
g: Me	C_8H_{17}
h: Me	OAc, OH





in methanol spectrum grade (of Fluka or BDH), after the compounds were warmed for a short time in order to effect solution, no high intensity band was observed. On the other hand, the high intensity band was present in the UV spectrum of the trichloroacetoxy-dienes **2**, in pure, non-spectroscopic methanol. Comparison of this methanol with the spectroscopic one revealed that the latter was slightly basic (comparative pH 8·3–8·5 versus 7·2–7·5). It thus appeared to us that the disappearance of the high intensity absorption band in trichloroacetoxy-dienes **2** indicated its methanolysis, and the formation of the weakly absorbing Δ^5-3-ketones **3**.

In a preparative scale experiment, the trichloroacetoxy-diene **2a** was heated for 2 min with spectroscopic methanol at 50–60°, the methanol evaporated at 5° under reduced pressure, and the residue identified as the Δ^5-3-ketone **3a**.

In this manner, the 3-trichloroacetoxy-dienes **2a**, **2b**, **2g**, **2h** and 6-Me derivative **7** were converted into the corresponding Δ^5-3-ketones **3a**, **3b**, **3g**, **3h** and **8**. These ketones were obtained generally in a high state of purity and their UV spectrum showed the characteristic, enhanced n–π^* CO bands at ca. 290 mμ.[4]

The conversion of the trichloroacetoxy-dienes **2** to the Δ^3-ketones **3** could also be effected with non-spectroscopic methanol to which a small amount of triethylamine was added.

The facile methanolysis of the trichloroacetoxy-dienes **2** might be due to the strong inductive effect of the trichloromethyl group which increases the electron deficiency of the carbonyl C atom of the ester group. It is of importance to note that the subsequent protonation occurs at the vinylic position at C4 and not at C6.

It was shown by Ringold and Malhotra[5] that protonation of $\Delta^{3,5}$-enolates occurs at C4 and that of corresponding enols or enol-esters at C6. It thus appears that methanolysis of the trichloroacetoxy-dienes **2** liberates $\Delta^{3,5}$-enolate ion which undergoes protonation at C4.

A more detailed study of methanolysis was performed, the reaction being monitored using both NMR and UV measurements.

For the NMR measurements, the trichloroacetoxy-diene **2c** was dissolved in deuteriochloroform to which methanol containing traces of triethylamine were added. The peaks due to the starting material gradually decreased in intensity, while those of the Δ^5-3-ketone **3c** and an additional one at 4·0 ppm (three protons in relation to the signals of the product) appeared. The latter signal was assigned to the Me protons of the methyltrichloroacetate formed in the reaction. This compound could be isolated from a preparative methanolysis of **2c** with spectroscopic methanol, after concentration of the solution to $\frac{1}{10}$ of its volume, and GLC separation of the residue.

In order to study the stereochemistry of the protonation of **2a**, it was treated in deuteriochloroform with methanol-d_4 containing traces of triethylamine. The product of this reaction was expected to contain one hydrogen and one deuterium atom at C4, the configuration of which might have been established from the NMR spectrum.†

† The two protons at C4 in Δ^5-3-ketone **3a** form an AB quartet (J = 16 c/s). In CCl_4 (60 Mc) a broad doublet appears at 3·15 and a sharp one at 2·66 ppm, and in C_6D_6 at 3·08 (broad) and 2·88 (sharp) ppm. At 100 Mc the broad doublet is resolved into a pair of doublets (J = 1·5 and 16 c/s). Since the 4β-axial proton may be coupled with the vinylic protons at C6 the former lines (at 3·15 and 3·08 ppm in CCl_4 and C_6D_6 respectively) are attributable to this proton. The aromatic solvent induced shift is also in accord with this assignment.

The NMR spectrum of the reaction mixture after it was left at room temperature for a short time showed the characteristic signal of the C19 Me protons (at 1·26 ppm) of the Δ^5-3-ketone **3a**, which increased gradually in its intensity. However, no signals of the C4 protons could be observed even at the outset of the reaction. Thus the C4 hydrogen in Δ^5-3-ketone exchanged rapidly with the deuterium of the methanol which did not permit the establishment of the stereochemical course of the protonation.†

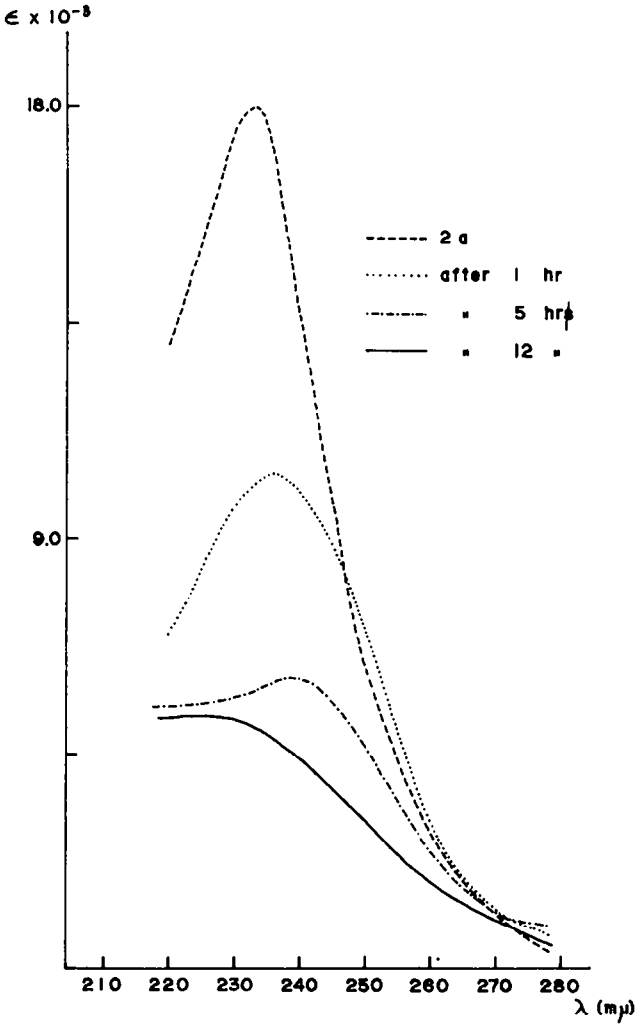


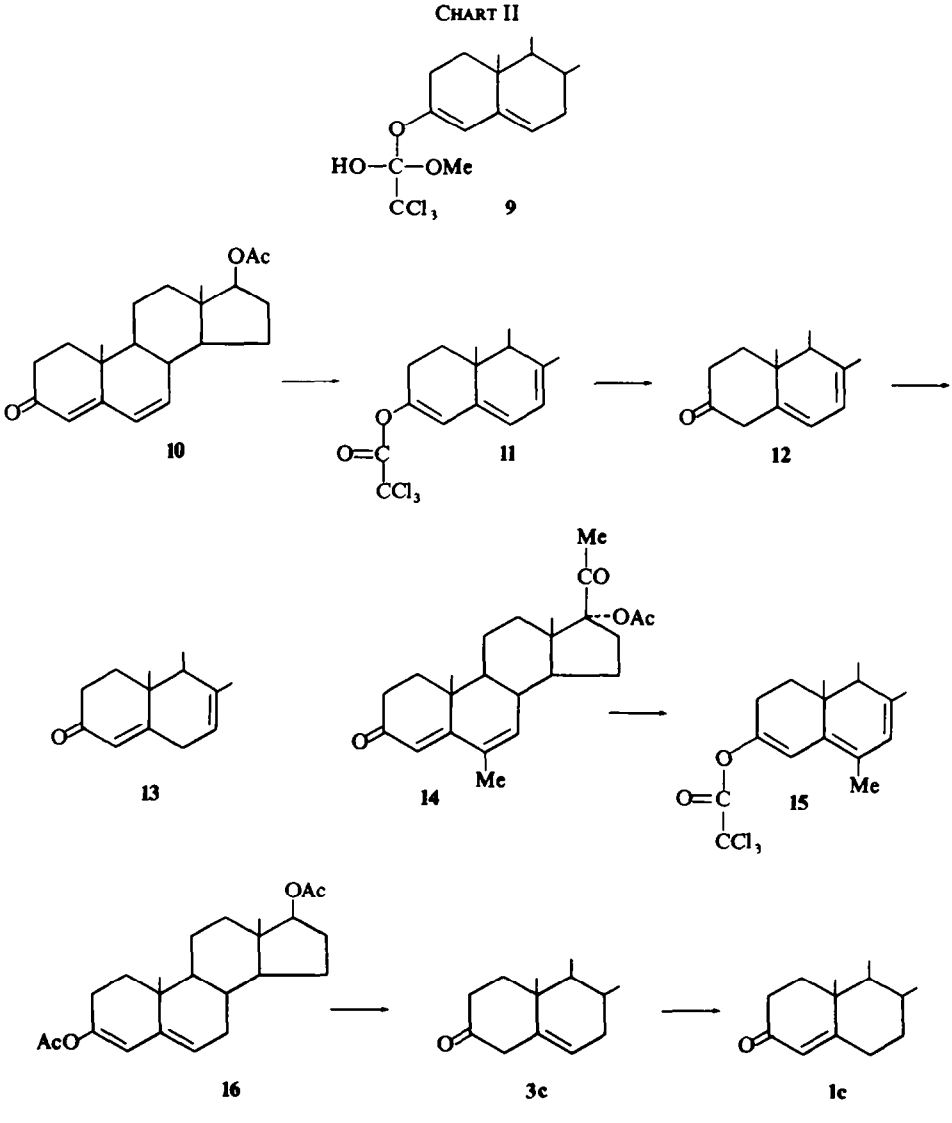
FIG. 1. UV spectrum of 3-trichloroacetoxy-diene **2a** in (a) pure methanol and in spectrum grade methanol: dioxan (10:1): (b) after 1 hr; (c) after 5 hr and (d) after 12 hr.

† The ease of the exchange of the hydrogens at C4 in Δ^5-3-keto steroids was already noted.[6]

For the UV studies, the trichloroacetoxy-diene **2a** was dissolved in a small volume of dioxan which was then diluted with spectrum grade methanol. The high intensity absorption peak of the starting material at 232 mμ gradually decreased in its intensity and after a few hours it disappeared, which signifies conversion to the Δ^5-3-ketone **3a**.

In addition a change in the position of the absorption peak was observed. The max at 232 mμ at the commencement of the methanolysis shifted to longer wavelengths reaching a max value of 236 mμ achieved when its intensity had decreased by ca. 50%. The lowest observable maximum corresponding to ca. 90% conversion to the Δ^5-3-ketone was at 238 mμ (Fig. 1). The UV shift may be due to the formation of an *intermediate* addition product of methoxide ion to the trichloroacetoxy function **9**. It is expected that this intermediate will have λ_{max} at higher wavelength, than the

CHART II



starting trichloroester. A similar addition product, containing tetrahedral carbon were previously formulated as an intermediate in ethanolysis of ethyltrifluoroacetate.[7]

Under these conditions no isomerization of the Δ^5-3-ketone to the Δ^4-3-ketone could be observed. Only after heating did the 240 mμ absorption start to appear and addition of a drop of hydrochloric acid solution resulted in the formation of a high intensity band at 240 mμ due to the Δ^4-3-ketone **1**.

A different behaviour was observed when the 3-trichloroacetoxy-diene **6** derived from 4-methyl-Δ^4-3-ketone **4** was reacted with slightly basic methanol. At room temperature no change in the UV spectrum of **6** was observed, and after heating for 2 min the λ_{max} shifted from 240 mμ (ε, 16,000) to 246 mμ (ε 12,000) indicating the presence of a mixture of the starting material and the Δ^4-3-ketone **4**. Additional heating resulted in the UV spectrum of pure **4** (λ_{max} 250 mμ; ε, 16,000). The steric interference of the 4-Me substituent to the attack of the OMe ion might be responsible for this behaviour.

We also tried to prepare the homoannular $\Delta^{5,7}$-diene-3-one system by similar methanolysis of the 3-trichloroacetoxy-$\Delta^{3,5,7}$-triene **11**. The former system was until recently unreported in the literature:† the oxidation of the corresponding 3-hydroxy-$\Delta^{5,7}$-diene results in the isomerized $\Delta^{4,7}$-dien-3-one.[9]

Treatment of the $\Delta^{4,6}$-dien-3-one **10** with trichloroacetic anhydride gave the desired 3-trichloroacetoxy-triene **11**. The positional assignment of its double bonds follows from the similarity of its UV spectrum (λ_{max} 302, 315 and 330 mμ) with that of the corresponding 3-acetoxy-$\Delta^{3,5,7}$-triene (λ_{max} 301, 313 and 328 mμ)[11] and from its NMR spectrum which shows three vinylic protons. The other possible isomer, the 3-trichloroacetoxy-$\Delta^{2,4,6}$-triene has four vinylic protons.

When the 3-trichloroacetoxy-triene **11** was dissolved in the spectrum grade methanol at 0°, its UV spectrum showed the expected high intensity band at λ_{max} 320 mμ. On the other hand at room temperature the spectrum undergoes considerable changes (Fig. 2): after two min the intensity of the 320 mμ band peak decreased and new peaks in 280 mμ region and at 240 mμ appeared. After another 20 min at room temperature the intensity of the latter peak had increased considerably at the expense of the two former bands. Similar results were obtained in non-spectroscopic methanol containing traces of triethylamine. However, after warming the solution of **11** for one minute only, the UV spectrum showed the 240 mμ band as the most intense one. Since the 240 mμ band belongs to the $\Delta^{3,7}$-dien-3-one **13**, it is probable that the primary product of methanolysis of **11** was the desired homoannular-$\Delta^{5,7}$-diene **12** which is expected to possess bands in the 280 mμ region. Thus the isomerisation of the $\Delta^{5,7}$-dien-3-one **12** to the more thermodynamically stable isomer $\Delta^{3,7}$-dienone **13** is a fast process occurring concurrently with the methanolysis of **11**. Attempts to isolate the homoannular-diene **12** after a short treatment with methanol were unsuccessful.

A similar behaviour was observed on methanolysis of 3-trichloroacetoxy-6-methyl-triene **15** [λ_{max} 320 mμ (ε 14,200), 2 vinylic protons and vinylic methyl group in the NMR spectrum]. After short heating with spectroscopic or basic methanol, new bands at ca. 285 mμ and at 245 mμ appeared, the former being assigned to the primary

† It was reported recently that oxidation of 7-dehydrocholesterol with aluminium isopropoxide leads to a mixture of $\Delta^{5,7}$-dien-3-one and $\Delta^{4,7}$-diene-3-one.[8]

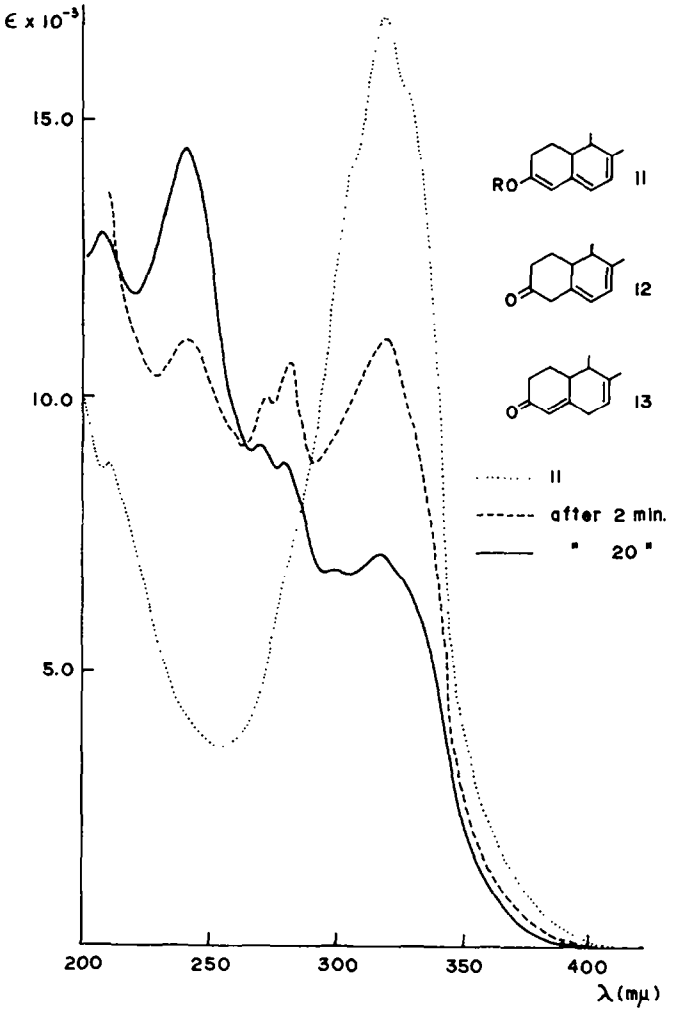


FIG. 2. UV spectrum of 3-trichloroacetoxy-triene **11** in (a) pure methanol and in spectrum grade methanol: (b) after 2′ and (c) after 20′. (b) and (c) represent mixtures of **11**, **12** and **13**.

product of methanolysis, the corresponding 6-methyl-$\Delta^{5,7}$-dien-3-one and the latter to the more stable $\Delta^{4,7}$-dien-3-one (Fig. 3). Also in this case we could not isolate the desired homoannular dienone.

The methanolysis of 3-acetoxy-$\Delta^{3,5}$-diene **16** was then compared with that of the trichloroacetoxy-diene **2c**. Slightly basic spectroscopic methanol does not effect the 3-acetoxy-diene **16** at room temperature. More basic methanol (containing triethylamine), which converted the trichloroacetoxydiene **2c** to the Δ^5-3-ketone **3c** already after 2 min, reacts very slowly with the 3-acetoxy-diene **16**: after $2\frac{1}{2}$ hr, the intensity of its absorption maximum had decreased by ca. 10%, and after 26 hr by another 10%, giving a max which was shifted by 2 mμ to longer wavelengths, indicating partial formation of Δ^4-3-ketone **2c**. Since in the same solution and after similar time periods, Δ^5-3-ketone **3c** also isomerizes to the Δ^4-3-ketone **1c**, it was not possible

to decide whether the former was an intermediate in the conversion of **16** to **1c**. In order to resolve this point, the 3-acetoxy-diene **16** was heated with sodium deuterioxide in methanol-Od_1 and deuterium oxide for 2 hr, resulting in testosterone, deuterated at C4 (no vinylic protons in the NMR spectrum). In a comparative experiment, testosterone itself was heated with the same reagent and under the same conditions, resulting in a partial exchange, only 40% of its vinylic C4 proton were exchanged with deuterium, as found by the integration of the signal at 5·76 ppm.

Thus, the acetoxy-diene **16**, under basic conditions, undergoes methanolysis, and liberates also the enolate ion which subsequently protonates at C4. Since the rates of solvolysis and of isomerisation reactions are probably similar in this case, the Δ^5-3-

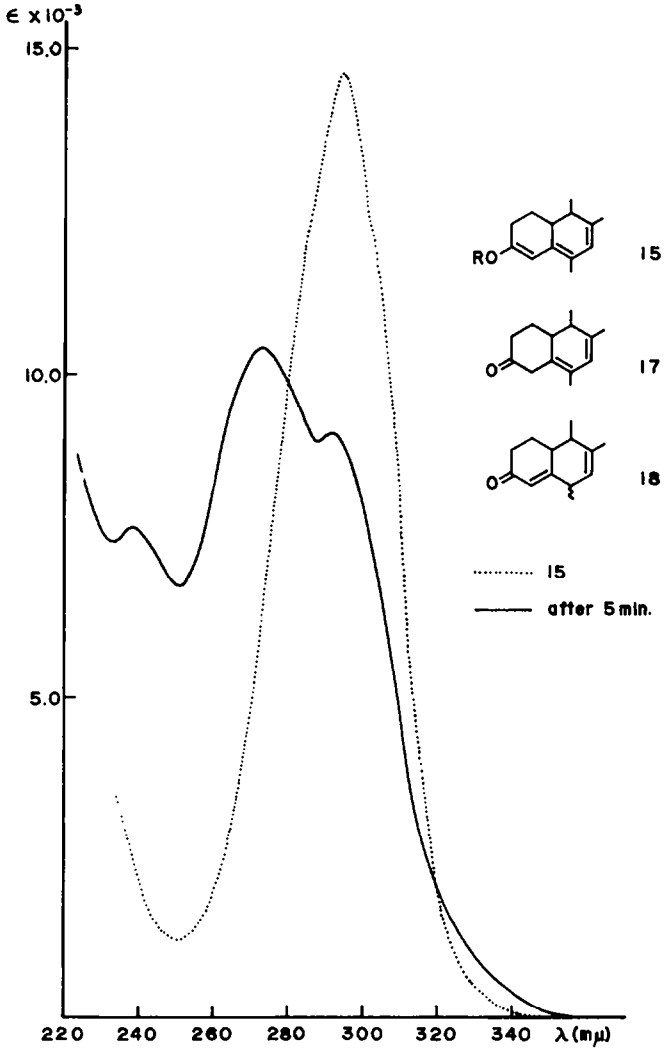


FIG. 3. UV spectrum of 3-trichloroacetoxy-6-methyl-triene **15** (a) in pure methanol and (b) in spectrum grade methanol after 5′ heating at 50°. (b) represents mixture of **15**, **17** and **18**.

ketone cannot be isolated from acetoxy-diene **16**. The methanolysis of the 3-trichloroacetoxy-diene **2** on the contrary is much faster, enabling a quantitative formation of the Δ^5-3-ketone **3**, prior to its isomerisation to the more stable Δ^4-3-ketone **1**.

EXPERIMENTAL

All m.ps were taken in capillaries and were uncorrected. The IR spectra were determined on a Perkin–Elmer Infracord, and the rotations were done in $CHCl_3$ soln. UV absorption spectra were measured on a Cary 14 spectrophotometer. The NMR spectra were determined on a Varian A-60 spectrometer, peak positions are indicated in ppm down-field from TMS serving as internal reference.

Preparation of 3-trichloroacetoxy-3,5-dienes **2**, **6** *and* **7** *and of 3-trichloroacetoxy-3,5,7-trienes* **11** *and* **15**. The keto steroids **1**, **4**, **5**, **10** and **14** were treated with ca. 2 moles equivs of trichloroacetic anhydride and heated on a water bath until a clear soln was obtained. The soln was then evaporated in high vacuum to dryness. In case of **1e** and **1f** a small amount of pyridine was added prior to evaporation to neutralize the trichloroacetic acid. The residue was either directly crystallized or chromatographed on silica gel, and eluted with pentane or mixtures of ether : pentane.

3,17β-Bis-*trichloroacetoxyandrosta-3,5-diene* **2a**. Obtained from **1a** after crystallization from ether (65%), m.p. 208–210°; $[\alpha]_D$ −80°; λ_{max}^{KBr} 5·63, 5·66, 5·97, 6·09, 7·97, 8·16, 11·67, 12·04 and 12·79 μ, δ^{CDCl_3} 0·93 (3H, s, C18), 1·05 (3H, s, C19), 4·80 (m, 1H, C17), 5·45 (m, 1H, C6) and 5·86 ppm (d, 1·5 c/s, 1H, C4). (Found: C, 47·43; H, 4·21. Calcd. for $C_{23}H_{26}O_4Cl_6$: C, 47·67; H, 4·56%).

3,17β-Bis-*trichloroacetoxyestra-3,5-diene* **2b**. Obtained from **1b** after crystallization from ether–pentane (60%), m.p. 150–152°; λ_{max}^{KBr} 5·64, 5·66, 5·97, 6·10, 7·89, 7·94, 11·24, 11·30, 11·46, 11·75, 11·90, 12·60 and 12·80 μ. (Found: C, 46·83; H, 4·51. Calcd. for $C_{22}H_{24}O_4Cl_6$: C, 46·75; H, 4·28%).

17β-*Acetoxy-3-trichloroacetoxyandrosta-3,5-diene* **2c**. Obtained from **1c** after crystallization from ether–pentane (51%), m.p. 169–173° $[\alpha]_D$ −95·5°[2].

17β-*Acetoxy-3-trichloroacetoxyestra-3,5-diene* **2d**. Obtained from **1d** after chromatography and crystallization from ether–hexane (40%), m.p. 136–138°; λ_{max}^{KBr} 5·65, 5·75, 8·14, 8·18, 11·27, 11·44, 11·87 and 12·00 μ. (Found: C, 57·51; H, 5·72. Calcd. for $C_{22}H_{27}O_4Cl_3$: C, 57·21; H, 5·89%).

3-*Trichloroacetoxy*-17β-*acetoxy*-17α-*ethynylandrosta-3,5-diene* **2e**. Obtained from **1e** after addition of pyridine chromatography and crystallization from ether–pentane (25%), m.p. 126–127°; $[\alpha]_D$ −119°; λ_{max}^{KBr} 3·05, 5·64, 5·74, 7·96, 8·07, 11·38, 11·87, 12·25 and 12·40 μ. δ^{CDCl_3} 0·90 (3H, s, C18), 1·05 (3H, s, C19), 2·05 (3H, s, C17), 2·60 (1H, s, C21), 5·45 (1H, m, C6) and 5·61 (1H, d, 1·5 c/s, C4) ppm. (Found: C, 59·58; H, 5·11. Calcd. for $C_{25}H_{29}O_4Cl_3$: C, 60·07; H, 5·85%).

3-*Trichloroacetoxy*-17β-*acetoxy*-17α-*ethynylestra-3,5-diene* **2f**. Obtained from **1f** after addition of pyridine, chromatography and crystallization from pentane, m.p. 135–138°; $[\alpha]_D$ −141°; λ_{max}^{KBr} 3·05, 5·65, 5·72, 5·99, 6·09, 7·99, 8·12, 8·25, 11·10, 11·91 and 12·20 μ.

3-*Trichloroacetoxycholesta-3,5-diene* **2g**. Obtained from **1g** after chromatography and crystallization from EtOH (85%), m.p. 136–142°; λ_{max}^{KBr} 5·66, 5·99, 6·10, 8·20, 11·10, 11·90, 12·15 and 12·89 μ.

3-*Trichloroacetoxy*-17α-*hydroxypregna-3,5-dione-20-one* **2h**. Obtained from **1h** after crystallization from ether (40%), m.p. 174–176°; $[\alpha]_D$ −112°; λ_{max}^{KBr} 5·67, 5·91, 8·18, 11·21, 11·46, 11·55, 11·89 and 12·15 μ. δ^{CDCl_3} 0·77 (3H, s, C18), 1·05 (3H, s, C19), 2·27 (3H, s, C21), 5·54 (1H, m, C6) and 5·90 ppm (1H, d, 1·5 c/s, C4). (Found: C, 57·99; H, 6·18. Calcd. for $C_{23}H_{29}O_4Cl_3$: C, 58·05; H, 6·14%).

3-*Trichloroacetoxy*-17β-*acetoxy-4-methylandrosta-3,5-diene* **6**. Obtained from **4** after crystallization from ether : pentane (60%), m.p. 166–168°; $[\alpha]_D$ −100°; λ_{max}^{KBr} 5·63, 5·75, 5·95, 6·09, 7·98, 8·15, 11·35, 11·56, 11·91, 12·15 and 12·62 μ. (Found: C, 58·72; H, 6·42. Calcd. for $C_{24}H_{31}O_4Cl_3$: C, 58·84; H, 6·38%).

3-*Trichloroacetoxy-6-methyl*-17β-*acetoxypregna-3,5-diene-20-one* **7**. Obtained from **5** after chromatography and crystallization from ether : pentane (55%), m.p. 140–142°, λ_{max}^{KBr} 5·65, 5·72, 5·74, 8·19, 11·60, 11·98 and 12·15 μ; δ^{CDCl_3} 0·70 (3H, s, C18), 1·00 (3H, s, C19), 1·70 (3H, s, C6), 2·07 (3H, s, C17), 2·3 (3H, s, C21), 6·3 ppm (1H, s, C4). (Found: C, 58·72; H, 5·81. Calcd. for $C_{26}H_{33}O_5Cl_3$: C, 58·93; H, 5·90%).

3-*Trichloroacetoxy*-17β-*acetoxyandrosta-3,5,7-triene* **11**. Obtained from **10** after crystallization from ether (40%), m.p. 188–190°; λ_{max}^{KBr} 5·68, 5·71, 6·05, 8·01, 8·12, 11·21, 11·43, 11·71 and 12·08 μ. (Found: C, 57·35; H, 5·92. Calcd. for $C_{23}H_{27}O_4Cl_3$: C, 57·21; H, 5·89%).

3-*Trichloroacetoxy*-17α-*acetoxy-6-methylpregna-3,5,7-triene-20-one* **15**. Obtained from **14** after crystallization from ether (30%), m.p. 230–233°; $[\alpha]_D$ −100°; λ_{max}^{KBr} 5·69, 5·79, 5·88, 6·14, 6·15, 8·03, 8·18, 11·33,

11·42 and 11·52 μ; δ^{CDCl_3} 0·60 (3H, s, C18), 0·96 (3H, s, C19), 1·80 (3H, s, C6), 2·08 (3H, s, C19), 2·10 (3H, s, C21), 5·50 (1H, m, C7) and 6·30 ppm (1H, d, 1·5 c/s, C4). (Found: C, 58·63; H, 5·80. Calcd. for $C_{26}H_{31}O_5Cl_3$: C, 58·93; H, 5·90%).

Preparation of Δ^5*-3-ketones* **3**. Compound **2** (0·5–1 mM) in spectrum-grade MeOH (BDH or Fluka) or in non-spectroscopic MeOH (100 cc) containing Et_3N (ca. 0·01 mM) were heated at 60° for 2–10 min. The solvent was then evaporated to dryness in high vacuum at 5° and the residue crystallized directly or chromatographed on silica gel and the product **3** eluted either with pentane or with a mixture of ether–pentane.

17β-*Trichloroacetoxyandrost-5-en-3-one* **3a**. Obtained from **2a** after crystallization from ether–pentane, m.p. 136–138°; λ_{max}^{KBr} 5·82 and 5·70 μ. (Found: C, 58·20; H, 6·18. Calcd. for $C_{21}H_{27}O_3Cl_3$: C, 58·14; H, 6·27%).

17β-*Trichloroacetoxyestr-5-en-3-one* **3b**. Obtained from **2b** after chromatography and recrystallization from ether–pentane, m.p. 83–85°; λ_{max}^{KBr} 5·81 and 9·03 μ. (Found: C, 57·00; H, 5·91. Calcd. for $C_{20}H_{25}O_3Cl_3$: C, 57·22; H, 6·00%).

Cholest-5-en-3-one **3g**. Obtained from **2g** after crystallization from MeOH, m.p. 116–118° identical with an authentic specimen.

17α-*Hydroxypregn-5-ene-3,20-dione* **3h**. Obtained from **2h** after recrystallization from ether, m.p. 202–204°. λ_{max}^{KBr} 2·50 and 5·86 μ. (Found: C, 76·75; H, 8·92. Calcd. for $C_{21}H_{30}O_3$: C, 76·63; H, 9·15%).

17α-*Acetoxy-6-methylpregn-5-ene-3,20-dione* **8**. Obtained from **7** after chromatography and crystallization from ether–pentane, m.p. 152–153°; λ_{max}^{KBr} 5·86; 5·76 μ. (Found: C, 74·30; H, 8·92. Calcd. for $C_{24}H_{34}O_4$: C, 74·58; H, 8·87%).

Isolation of methyl trichloroacetate. Compound **2c**, 500 mg, in 250 cc MeOH (spectrum grade, BDH) was heated at 60° for 2 min. The solvent was concentrated in high vacuum until ca. 25 cc was left. Part of this residue was injected into a gas chromatograph (using a column of silicon rubber 5% on chromosorb). Samples of a product having the same retention time as an authentic sample of methyl trichloroacetate were collected and identified as the latter by IR spectrum.

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