The Deacetoxylation of 17β-Acetoxy-steroids on Alumina

By RAMESH KANOJIA,* STEVEN ROVINSKY, and IRVING SCHEER

(*Ortho Research Foundation, Raritan, New Jersey* 08869)

Summary Several 17β-acetoxy-17-substituted steroids undergo deacetoxylation on activated alumina at room temperature to afford olefinic products, whereas the parent carbinols remain unchanged under similar conditions.

CHEMICAL transformations of various kinds are known to occur on alumina.[1] We report here the deacetoxylation of steroidal 17β-acetates on activated alumina at room temperature under the conditions of chromatography.

3-Methoxy-17β-acetoxy-17α-ethynyloestra-1,3,5(10)-triene (**1b**) when allowed to remain on a column of neutral alumina† for 2—5 d afforded upon elution with benzene a crystalline product (*ca.* 50%) m.p. 156—157°,‡ $[\alpha]_D^{26.2}$ +63°. The absence of acetoxy-peaks in the i.r. and n.m.r. spectra indicated it to be a product of deacetoxylation. The appearance of a vinylic proton at δ 6·13 (t, *J* 2·5 Hz) and a deshielded ethynyl proton at 3·07 in its n.m.r. spectrum (60 MHz, $CDCl_3$) as well as an augmented u.v. absorption at 225 nm (ε 19,200) established the conjugated enyne structure (**3a**) for the major product of deacetoxylation. The identical enyne was obtained by treatment of (**1a**) with $POCl_3$ in pyridine.[2] An isomeric enyne detected in trace amounts in the deacetoxylation product was shown to be the product formed by Wagner–Meerwein migration of the C-13 methyl group to C-17, by comparison

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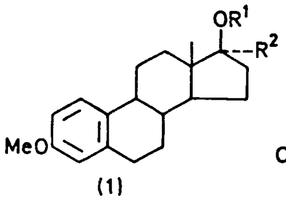
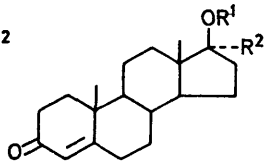
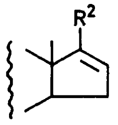
† Neutral Alumina, Woelm, Grade I, Activity 1.

‡ Satisfactory analyses were obtained for compounds for which m.p.s. are reported.


(1)


(2)

a, R^1=H, R^2=C≡CH
b; R^1=Ac, R^2=C≡CH
c, R^1=H, R^2=Me
d, R^1=Ac, R^2=Me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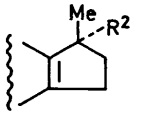
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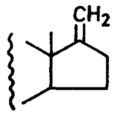
(5)

a, R^2=C≡CH
b; R^2=Me

with (4a) m p 118·5—120 5°, $[\alpha]_D^{23\ 5}$ −26°, n m r ($CDCl_3$) δ 1·31 (s, 3H, C-13 Me migrated to C-17), 2·18 (s, 1H, ethynyl H), obtained by dehydration of (**1a**) with formic acid[3] The 17α-methyl derivative (**1d**) similarly afforded on alumina a mixture of isomeric olefins (**4b**),[4] (**3b**) m p 122—123 5°, $[\alpha]_D^{26\ 2}$ +112°, n m r δ 0 75 (s, 3H, 13-Me), 1·69 (s, 3H, 17-Me), 5 33 (m, 1H, 16-H), and (**5**) m p 81—82°, $[\alpha]_D^{27}$ +57°, n m r δ 0 82 (s, 3H, 13-Me), 4 68 (t, *J* 2 5 Hz, 2H, C-17 methylene) In the Δ^4-3-keto-series, the 17α-methyl compound (**2d**) afforded a mixture of the corresponding Δ^{16} compound (**3b**) and the $\Delta^{17(20)}$ compound (**5**)[5] without a trace of the Wagner–Meerwein rearrangement product of the type (**4b**) whereas the 17α-ethynyl analogue (**2b**) failed to deacetoxylate on alumina These observations indicate that the A ring substituents exert a long-range control over the reaction The carbinols (**1a**), (**1c**), and (**2c**) failed to give any dehydration product on alumina under the conditions of chromatography

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[4] R Kirdani, R Dorfman, and R Nes, *Steroids* 1963 **1**, 219

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