hexane) II as yellow-orange prisms, m.p. 98.5–100.5°. Found for $C_{14}H_{11}N$: C, 86.92; H, 5.82; N, 7.13. The ultraviolet spectrum of II in hexane showed λ_{max} in mμ (log ε) at 251 (4.34), 274 (4.38) and 286 (4.30). The visible spectrum had a single broad peak with λ_{max} at 432 mμ and log ε 3.30. On hydrogenation over a Rh–C catalyst II took up 4.0 moles of hydrogen readily to form VI (identified by ultraviolet and infrared spectra). A solution of II in concentrated sulfuric acid showed λ_{max} in mμ (log ε) at 220 (4.15), 254 (4.0) and 295 (4.08). The last two maxima also were obtained with a solution in glacial acetic acid. II was degraded slowly by acetic acid and was decomposed by alumina or silica gel. It was stable to alcoholic alkali.

The properties of II suggest that the orange impurity in the 1,5-pyrindine obtained by Robison[7] was 1-pyrindine. Further studies on I, II and related compounds are in progress.

(7) M. M. Robison, THIS JOURNAL, **80**, 6254 (1958).
(8) Standard Oil of California Fellow, summer, 1958.

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16-HYDROXYLATED STEROIDS. XI.[1] THE PREPARATION AND EPIMERIZATION OF 16β-ACETOXY-17α-HYDROXY-CORTICOIDS

Sir:

The important biological and therapeutic properties of triamcinolone (9α-fluoro-11β,16α,17α,21-tetrahydroxy-1,4-pregnadiene-3,20-dione, IX) and related 16α-hydroxy-compounds[2] have created interest in the preparation of the various 16β-hydroxy analogs. This report is concerned with the synthesis and properties of the 16β-acetoxy derivatives of 17α-hydroxy-corticoids.

Treatment of 21-acetoxy-16α,17α-epoxy-4,9(11)-pregnadiene-3,20-dione (I)[3] with sulfuric acid and acetic acid[4] yielded 16β,21-diacetoxy-17α-hydroxy-4,9(11)-pregnadiene-3,20-dione (II), m.p. 173–175°; λ_{max}^{EtOH} 239 mμ (ε 15,700), found C, 67.78; H, 7.56. Addition of the elements of hypobromous acid[5] afforded the amorphous bromohydrin III which was cyclized to 16β,21-diacetoxy-9β,11β-epoxy-17α-hydroxy-4-pregnene-3,20-dione (IV), m.p. 200–202°, λ_{max}^{EtOH} 243–244 mμ (ε 15,200), found C, 65.28; H, 7.28. The latter with hydrogen fluoride gave the fluorohydrin diacetate V, m.p. 239-241.5°, λ_{max}^{EtOH} 239 mμ (ε 16,500), ν_{max}^{KBr} 3540, 3420, 1755, 1738, 1718, 1669, 1627 cm.$^{-1}$, $[\alpha]^{24}D$ + 106° (acetone), found C, 62.66; H, 7.11; F, 4.05. Dehydrogenation of V with selenium dioxide in *t*-butyl alcohol produced 16β,21-diacetoxy-9α-fluoro-11β,17α-dihydroxy-1,4-pregnadiene-3,20-dione (VI), m.p. 233.5–236°, λ_{max}^{EtOH} 238 mμ (ε 13,000), ν_{max}^{KBr} 3490, 3320, 1755, 1733, 1713, 1660, 1620, 1608 cm.$^{-1}$, $[\alpha]^{25}D$ + 76.5° (acetone), found C, 63.13; H, 6.53; F, 3.62.

Saponification of the 9β,11β-oxide diacetate IV with potassium hydroxide in methanol in an inert atmosphere, yielded, most unexpectedly, 9β,11β-epoxy-16α,17α,21-trihydroxy-4-pregnene-3,20-dione (VII)[2a,c] identical in all respects with an authentic sample. Similarly 16β,21-diacetoxy-9α-fluoro-11β,17α-dihydroxy-4-pregnene-3,20-dione (V) was converted into 9α-fluoro-11β,16α,17α,21-tetrahydroxy-4-pregnene-3,20-dione (VIII),[2a,c] and 16β,21-diacetoxy-9α-fluoro-11β,17α-dihydroxy-1,4-pregnadiene-3,20-dione (VI) into triamcinolone (IX).[2a,c]

A further study of this epimerization revealed that treatment of 16β,21-diacetoxy-17α-hydroxy-4-pregnene-3,20-dione (X)[4] with potassium hydroxide, sodium methoxide, sodium carbonate or sodium bicarbonate gave in all cases 16α,17α,21-trihydroxy-4-pregnene-3,20-dione (XI).[6,7] Careful partition chromatography of the product in some of these experiments has revealed the presence of at least two additional products, designated as A and B, isomeric with XI.

Work is in progress to determine the structure of compounds A and B, and to establish a possible mechanism for the epimerization.

Both 9α-fluoro-16β,21-diacetates, V and VI, were inactive in the rat liver glycogen assay at a 500 μg. dose level.[8]

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(5) J. Fried and E. F. Sabo, THIS JOURNAL, **75**, 2273 (1953); **76**, 1455 (1954); **79**, 1130 (1957).
(6) W. S. Allen and S. Bernstein, *ibid.*, **78**, 1909 (1956).
(7) Heusler and Wettstein[4] first reported this reaction and assumed the product to be a D-homo rearrangement compound. We wish to thank Dr. Wettstein for sending us a sample of his compound, the infrared spectrum of which revealed it to be identical to authentic XI. J. Romo and A. R. De Vivar, *J. Org. Chem.*, **21**, 902 (1956), also have assumed the product obtained by treatment of 21-acetoxy-4,16-pregnadiene-3,20-dione with osmium tetroxide and then decomposition of the osmate complex with sodium sulfite in an alcohol medium to be a D-homo product since it was identical to the Heusler–Wettstein compound. Dr. Romo kindly sent us a sample of his product, which proved to be identical to authentic XI.
(8) We are indebted to L. Bortle, E. Heyder, J. Perrine, E. Ross and I. Ringler of the Experimental Therapeutics Research Section for these results.

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ALKALINE REARRANGEMENT OF PHENYL GROUPS LINKED TO SILICON

Sir:

It long has been recognized that strong bases may cause cleavage of phenyl groups attached to silicon,[1] as well as rearrangement of siloxane bonds.[2] Bailey and Pines[3] have reported that sodium ethoxide brings about disproportionation of crotyl-

(1) F. S. Kipping and A. G. Murray, *J. Chem. Soc.*, 1427 (1928).
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(3) D. L. Bailey and A. N. Pines, *Ind. Eng. Chem.*, **46**, 2363 (1954).