Adducts Derived from Steroidal-5,7-dienes and 4-Phenyl-1,2,4-triazoline-3,5-dione: a Route to Steroidal 8(14)- and 14(15)-enes

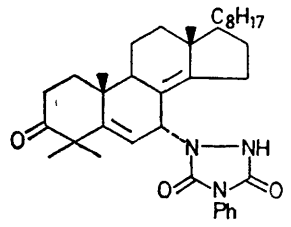
By JITKA BRYNJOLFFSSEN, ALICE EMKE, DAVID HANDS, JOHN M. MIDGLEY,* and W. BASIL WHALLEY
(*The School of Pharmacy, The University, London* WC1N 1AX)

Summary The acid-catalysed decomposition of adducts derived from various steroidal-5,7-dienes and 4-phenyl-1,2,4-triazoline-3,5-dione furnishes novel routes to unsaturated steroids containing *inter alia* the 8(14)- or 14(15)-ene function.

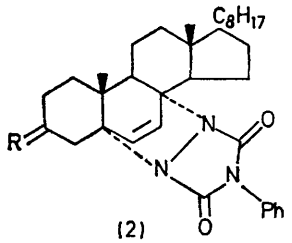
IN continuation of our investigations of adducts derived from steroidal-5,7-dienes and 4-phenyl-1,2,4-triazoline-3,5-dione we now report reactions which furnish various 8(14)- or 15(15)-enes from certain adducts.

Thus, interaction of 4,4-dimethylcholesta-5,7-diene-3-one, in dichloromethane, at room temperature, with 4-phenyl-1,2,4-triazoline-3,5-dione, gave a 1:1 adduct (**1**), m.p. 160° (decomp.), $[\alpha]_D^{21}$ — 185° (acetone). The n.m.r. signal at τ 9·5—9·0 (s, 1H, replaceable with D_2O) may be ascribed to NH absorption; this is confirmed by the i.r. spectrum, ν_{max} 3450 and 3160 cm^{-1}. The 7α-orientation is consistent with the derivation of (**1**) by an α-face approach of the reagent which results in an 8(14)-as opposed to an 8(9)-double bond. The location of a double bond at 8(14) is also consistent with the downfield shift[1] of the C-18 methyl signal relative to the parent steroid (**1**), and with the n.m.r. spectra[2] of cognate 7α-8(14)-ene adducts.

When a solution of (**1**) in 'aged' chloroform (or in 0·001 M ethanolic HCl) was refluxed during 10 min, tetrahydro-4-phenyltriazole-3,5-dione and 4,4-dimethylcholesta-5,7,14-(15)-trien-3-one (90%), m.p. 157°, were formed. The same products were produced almost immediately when a solution of (**1**) in benzene was treated with BF_3–Et_2O. Reduction of 4,4-dimethylcholesta-5,7-14(15)-triene-3-one with $LiAlH_4$ gave 4,4-dimethylcholesta-5,7,14(15)-trien-3β-ol (75%), m.p. 137—139°, clearly different from an authentic specimen of 4,4-dimethylcholesta-5,7,9(11)-trien-3β-ol.[3]



(**1**)



(**2**)

Other derivatives of 3-oxo-4,4-dimethylcholesta- and 3-oxo-4,4-dimethylergosta-5,7-diene reacted similarly.

Oxidation of the adduct (**2**; R = H, HO) with 4N-chromic acid gave the ketone (**2**; R = O), which at room temperature in benzene, containing BF_3-Et_2O rapidly formed cholesta-4,6,8(14)-trien-3-one, m.p. 61—63°. Ergosterol similarly gave ergosta-4,6,8(14),22-tetraen-3-one, m.p. 113—115°[4] previously isolated as a fungal metabolite.[5]

All new compounds had the requisite spectral and analytical properties.

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[1] N. S. Bhacca and D. H. Williams, 'Applications of NMR Spectroscopy in Organic Chemistry,' Holden Day, San Francisco, 1964, p. 21.
[2] A. van der Gen, J. Lakeman, M. A. M. P. Gras, and H. O. Huisman, *Tetrahedron*, 1964, **20**, 2521; A. van der Gen, J. Lakeman, U. K. Pandit, and H. O. Huisman, *ibid.*, 1965, **21**, 3641; J. Lakeman, W. N. Speckamp, and H. O. Huisman, *ibid.*, 1968, **24**, 5151; A. Abramovitch and P. W. Le Quesne, *J. Org. Chem.*, 1974, **39**, 2197.
[3] E. Ohki, *Chem. Pharm. Bull.* (*Japan*), 1960, **8**, 46.
[4] D. H. R. Barton and T. Bruun, *J. Chem. Soc.*, 1951, 2728.
[5] R. D. Daftary, Y. Pomeranz, R. G. Cooks, and N. L. Wolfe, *Experienta*, 1970, **26**, 1056.