Retro-1,4-cycloaddition of Adducts Derived from Steroidal 5,7-Dienes and 4-Phenyl-1,2,4-triazoline-3,5-dione

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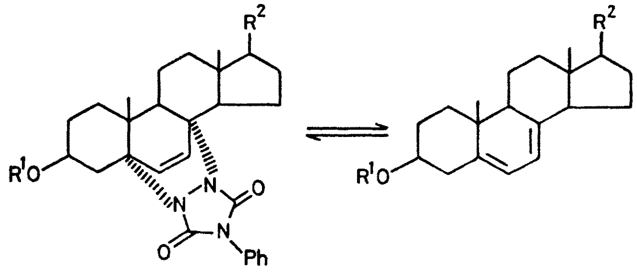
Summary 1,4-Cycloadducts of various steroidal 5,7-dienes and 4-phenyl-1,2,4-triazoline-3,5-dione gave the corresponding steroidal 5,7-dienes in high yields when heated with organic bases at reflux for 15 min.

Steroidal conjugated dienes may be protected by reaction with 4-phenyl-1,2,4-triazoline-3,5-dione (PTAD),[1] with formation of a cyclic Diels–Alder adduct. Barton *et al.*[2] reported an efficient regeneration of the 5,7-diene system by $LiAlH_4$ reduction of the ergosterol Diels–Alder adduct. The alkali alkoxide-catalysed cleavage of the urazole residue was only moderately successful (30—50% yields).[2] More recently[3] a method was reported for the retro-1,4-cycloaddition of ergosterol series adducts, effected by anhydrous K_2CO_3 in Me_2SO or *NN*-dimethylformamide. Yields were optimum at 120 °C and 7 h reaction. However, treatment of the 1,4 adduct of 7-dehydrocholesterol and PTAD gave yields of only 52%. Attempts at reversing the cycloaddition with organic bases (hydrazine hydrate[2] or pyridine[3]) were unsuccessful.

We report here a simple method for the retro-1,4-cycloaddition by refluxing for 15 min the adducts derived from steroidal 5,7-dienes and PTAD with organic bases such as tetramethylguanidine or 2,4,6-trimethylpyridine (*sym*-collidine). The reaction of the adduct of the ergosterol acetate (**1a**)[2] is representative. The adduct (**1a**) (0·5 g) in tetramethylguanidine† (5 ml) was heated at reflux for 15 min to give ergosterol acetate (**2a**) in 90% yield after usual work-up and crystallization. Analogous results were obtained with ergosterol adduct (**1b**)[2] and in the cholesterol series with (**1c**) and (**1d**).[4] 80—85% Yields were obtained by using *sym*-collidine.



(1) (2)

a; $R^1 = Ac$, $R^2 = C_9H_{17}$
b; $R^1 = H$, $R^2 = C_9H_{17}$
c; $R^1 = Ac$, $R^2 = C_8H_{17}$
d; $R^1 = H$, $R^2 = C_8H_{17}$

The method is useful because of its simplicity, speed, and the high yields obtained as well as its applicability to compounds having groups which are sensitive to $LiAlH_4$, to mineral bases, or to prolonged heating.

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† The solvents were freshly distilled, and all compounds gave correct analyses and spectral data.

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