Formation of Ketones from Steroidal Thioacetals

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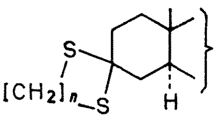
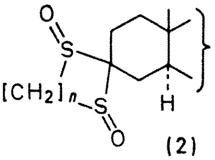
Summary Oxidation of steroidal thioacetals, with 1-chlorobenzotriazole forms disulphoxides which are converted by base into the corresponding ketones.

THE potential of thioacetals as acid-stable protective groups for ketones is severely restricted by the difficulty of regenerating the carbonyl function. Daum and Clarke[1] converted the 3,3-ethylene thioacetals of cholestan-3-one and 17β-acetoxyandrostan-3-one into the corresponding disulphones which were decomposed to the parent ketones under relatively vigorous conditions (boiling alcoholic NaOMe followed by the introduction of gaseous oxygen). The treatment of thioacetals of simple ketones,[2] and aldehydes[3] with mercuric chloride–cadmium carbonate to regenerate the carbonyl compound was unsuccessful in the steroid series. We now report a simple method apparently of general applicability, which uses the disulphoxides of steroidal ethylene and trimethylene thioacetals for the regeneration of ketones from the thio-derivatives.

The thioacetal (1) is oxidised[4] at −80° in methylene dichloride by 1-chlorobenzotriazole to the disulphoxide (2). The derivative is not isolated but is decomposed directly by the addition of excess of sodium hydroxide[4] to form the ketone (in at least 50% yield); we did not attempt to establish optimum conditions. This reaction was successfully applied to the ethylene and trimethylene thioacetals of cholestan-3-one, 17β-acetoxy-testosterone, 17β-acetoxy-19-nor-testosterone, 17β-acetoxy-androstan-3-one and 17β-acetoxy-19-nor-androstan-3-one.†


(1)


(2)

The reaction was shown to proceed *via* the corresponding disulphoxide (2). The ethylene and trimethylene thioacetals (1) were converted by *m*-chloroperoxybenzoic acid into the corresponding disulphoxides (2) which on solution in alcoholic sodium methoxide or hydroxide, at room temperature, rapidly (usually during 5—10 min) decomposed to yield the parent ketones in at least 50% yield.

This process should facilitate the preparation of ketones by the 1,3-dithian alkylation procedure.[5]

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† All new compounds gave satisfactory spectral and analytical data.

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