

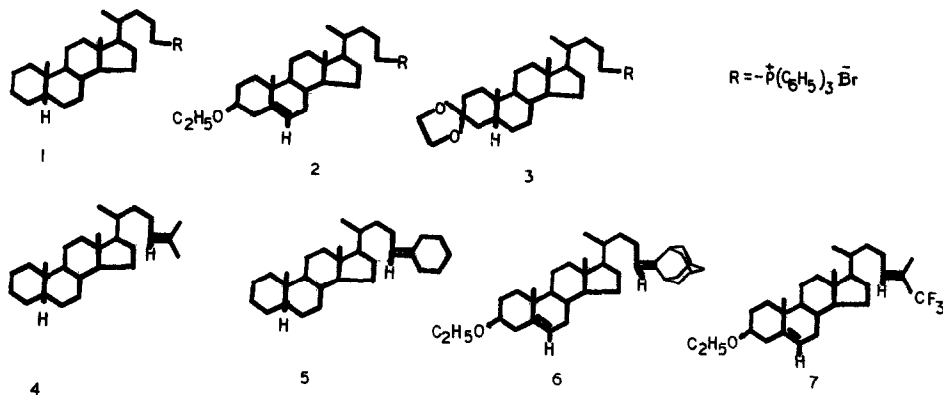
STEROIDAL TRIPHENYL PHOSPHONIUM SALTS, VERSATILE
INTERMEDIATES FOR SIDE CHAIN MODIFICATIONS.

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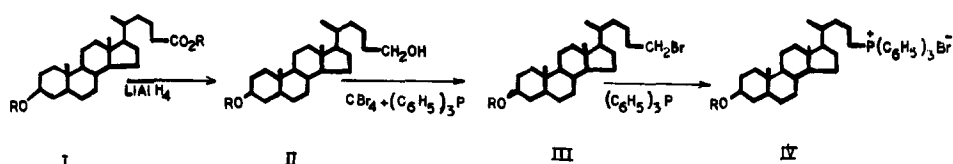
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The Wittig reaction between alkyl triphenyl phosphin ylids and steroidal ketones and aldehydes has been used extensively in the synthesis of sterols with branched chains, and for the replacement of carbonyl groups in various positions of the steroid molecule with methylene groups¹⁾. During our work on the synthesis of sterols fluorinated in the side chain²⁾, we were able to considerably increase the versatility of the Wittig reaction in the steroid field by the preparation of steroidal triphenyl phosphonium salts. In the table are listed some representative examples, together with products obtained by the Wittig reaction.



Compound	mp.	δ NMR ppm
1	174-176°(d)	H ₂₄ 3.65 (broad), 7.8 (aromatic)
2	228-230°(d)	H ₂₄ 3.65 (broad), 7.8 (aromatic)
3	150-151°(d)	H ₂₄ 3.70 (broad), 7.8 (aromatic)
4	oil	H Δ ²⁴ 5.1 (triplet)
5	oil	H Δ ²⁴ 5.1 (triplet)
6	oil	H Δ ²⁴ 5.0 (triplet), H Δ ⁵ 5.35
7	oil	H Δ ⁵ 5.35, H Δ ²⁴ 5.72 (triplet)

Procedure:

Steroidal carboxylic esters (I) with suitably protected functional groups were reduced with LiAlH_4 to the primary alcohols (II), which when treated with CBr_4 and triphenyl phosphine³⁾ in ether yielded the bromides (III). A typical procedure for the formation of the phosphonium salt (IV) from (III) is:

Equimolar parts of the steroid and triphenyl phosphine are refluxed 24 hours under a nitrogen atmosphere in dimethyl formamide (20 ml per 1 g steroid). Ether is then added slowly until the salt crystallizes out. The salt is washed abundantly with ether. Yield 70 - 75%. The reaction can be followed by TLC on silica gel, development with chloroform.

The steroidal phosphonium salts were transformed into ylids with lithium alkyls and reacted with ketones in the normal way (See Sondheimer et al¹⁾). All the listed compounds analysed correctly.

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- 3) Downie I.M., Holmes J.B., Lee J.B., Chem. Ind. (London)
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