

DEGRADATION OF BILE ACID SIDE CHAIN WITH LEAD TETRAACETATE*

A.S. Vaidya, S.M. Dixit and A.S. Rao

National Chemical Laboratory, Poona-8, India

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The synthesis of medicinally important 11-oxygenated steroids from bile acids continues to attract attention¹. One of the important problems in this transformation is the degradation of the side chain of bile acids². Since lead tetraacetate has proved useful in: (1) the oxidation of many steroidal alcohols³ to yield products functionalized at C-18 or C-19 which are non-activated and (2) the preparation of alkenes from acids by oxidative decarboxylation⁴, it was considered of interest to explore its utility in the degradation of bile acid side-chain.

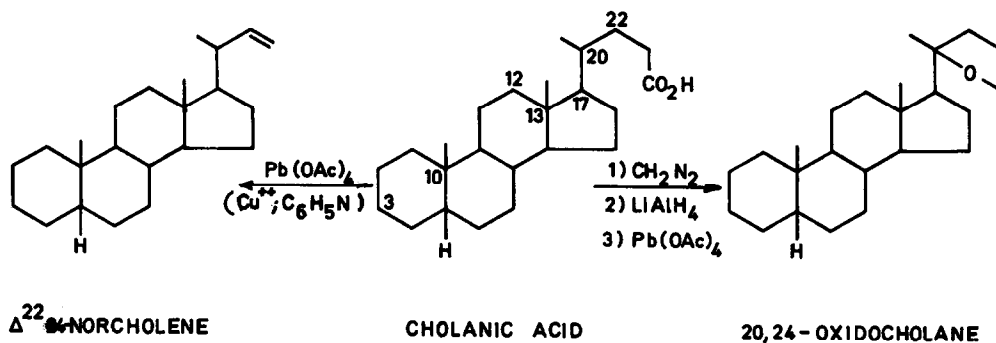
The oxidative decarboxylation of cholanic acid (3.0 m.moles) was carried out by heating it on steam bath for one hour in nitrogen atmosphere with a mixture of benzene (20 ml), lead tetraacetate (5.45 m.moles), cupric acetate (0.67 m.moles) and pyridine (1.1 m.moles). The product (yield = 60%) is the expected Δ^{22} -24-norcholene, m.p. 74°, (α)_D²⁹ + 16° (c, 5.2 in CHCl₃), ν _{max}^{Nujol} 910, 990 and 1640 cm⁻¹ (-CH=CH₂), τ ^{CCl₄} 9.32 (3H, singlet, angular CH₃ at C-13), 9.07 (3H, singlet, angular CH₃ at C-10) 8.97 (doublet; J = 7 cps; CH₃ attached to C-20) 4.3 to 5.3 (3H, multiplet, 3 vinyl protons) (Found: C, 87.7; H, 12.4; mol.wt. (mass spectrum) 314. C₂₃H₃₈ requires C, 87.6; H, 12.4%. mol.wt. 314).

In a similar fashion 3 α , 12 α -diacetoxycholanic acid was oxidatively decarboxylated to furnish 3 α , 12 α -diacetoxy- Δ^{22} -24-norcholene, m.p. 129-130°, (α)_D²⁹ + 78° (c, 3.3 in CHCl₃), ν _{max}^{Nujol} 920, 1010 and 1645 cm⁻¹ (-CH=CH₂) 1250, 1740 cm⁻¹ (CH₃ C=O-), τ ^{CCl₄} 3H singlets at 9.27, 9.09, 8.06 and 7.96 τ , 3H doublet at 9.10 and multiplet in the region 4.0-5.5 τ (Found: C, 75.5; H, 9.7; mol.wt. (mass spectrum) 430; C₂₇H₄₂O₄ requires C, 75.3; H, 9.8%; mol.wt. 430).

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Oxidation of 24-hydroxycholeane with lead tetraacetate in boiling benzene solution furnished 20,24-oxidocholeane, γ^{CCl_4} 8.83 (3H, singlet, CH_3 attached to C-20) which was transformed to the lactone of 20-hydroxychoLANIC acid $\bar{\Delta}$ m.p. 153 $^{\circ}$, $\nu_{max}^{CS_2}$ 1760 cm^{-1} (γ -lactone); mass spectrum-molecular ion peak at m/e 358; base peak at m/e 99 (fragment obtained by cleavage at C₁₇-C₂₀ and positive charge located on the lactone moiety) on chromic acid oxidation.

Further degradation of the above mentioned compounds obtained through lead tetraacetate oxidation is in progress.



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