

SYNTHESIS OF A MEDIUM-SIZE CARBOCYCLIC SYSTEM

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In a previous publication we have shown that a variety of steroidal alcohols react with mercuric oxide and iodine<sup>1</sup> in either heat or preferably light-induced reaction to give products which can be explained as having originated through alkoxy radical intermediates. This reaction is especially useful in functionalizing non-activated carbon atoms through a six membered transition state.<sup>2</sup> When such a transition state is forbidden then intermediate alkoxy radicals are consumed via intermolecular hydrogen abstraction, disproportionation, and decomposition by radical elimination.<sup>3</sup> An example of the latter type is represented by the conversion of cyclo-pentanol to 6-iodovaleraldehyde.<sup>4</sup>

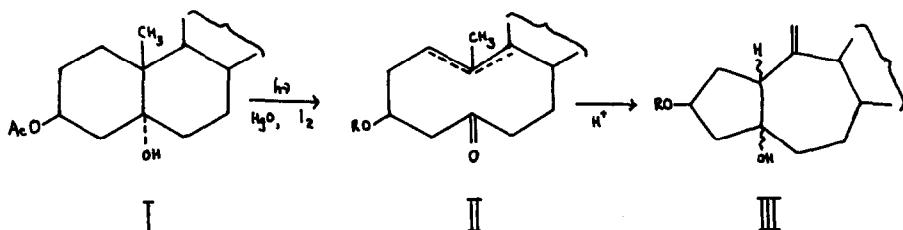
In this communication we report the extension of this principle to the synthesis of a medium-size carbocyclic system.<sup>5</sup>

\*With the co-operation of the Chemistry Department.

Irradiation of cholestane-3 $\beta$ ,5 $\alpha$ -diol 3-acetate (partial, I) with mercuric oxide and iodine gave in 40-45% yield a compound,<sup>a,b</sup> m.p. 128-130°,  $[\alpha]_D^{25} +5^\circ$  (in  $\text{CHCl}_3$ ),  $\nu_{\text{max}}^{\text{CCl}_4}$  1707 and 1743  $\text{cm}^{-1}$ , the n.m.r. spectrum<sup>c</sup> has peaks at 2.03 (singlet 3H; acetate methyl), 1.77 (singlet 3H;  $\text{CH}_3-\text{C}=\text{C}$ ), 0.91, 0.80 and 0.70 (singlets; for remaining 4 methyl groups), p.p.m. down field from tetramethyl silane as an internal standard. Structure II (R = Ac) for this compound is based on the following evidence. The acetoxy ketone (II, R = Ac) on treatment with methanolic potassium hydroxide gave the alcohol (II, R = H), m.p. 155°-156°,  $[\alpha]_D^{25} +21^\circ$  (in  $\text{CHCl}_3$ ), which could be reacetylated to yield II (R = Ac). Treatment of the acetoxy ketone (II, R = Ac) with  $\text{HCl}-\text{CHCl}_3$  at 0°C furnished in 60% yield an isomeric compound (B) m.p. 108-109°,  $[\alpha]_D^{25} +44^\circ$  (in  $\text{CHCl}_3$ ),  $\nu_{\text{max}}^{\text{KBr}}$  1620, 1745, 3500 and 3550  $\text{cm}^{-1}$ . This acid rearrangement product (B) on hydrolysis yielded a diol m.p. 148-149°,  $[\alpha]_D^{25} +45^\circ$  (in  $\text{CHCl}_3$ ) which on Jones oxidation was converted to a compound whose infrared spectrum showed peaks attributed to an hydroxyl group and a five membered ring ketone.<sup>6</sup> On ozonolysis B gave formaldehyde isolated as its dimedone derivative in 40% yield. We therefore formulate B as III (R = Ac). Acid catalysed

a. Another compound m.p. 128-130°C,  $[\alpha]_D^{25} +46^\circ$  (in  $\text{CHCl}_3$ ) was also isolated in 6% yield. b. A similar reaction using lead tetraacetate has recently been observed by M. Lj. Mihailovic, M. Stefanovic, Lj. Lorenc and M. Gasic, *Tetrahedron Letters*, 28, 1867 (1964). c. We thank Mr. D.N. Henty and his staff for kindly determining the n.m.r. spectra.

rearrangement of II ( $R = Ac$ ) to III ( $R = Ac$ ) can be rationalized only if the double bond in II ( $R = Ac$ ) is between  $C_1$  and  $C_{10}$ . The possibility that under the cyclisation conditions shift of the double bond ( $\Delta^{9(10)} \rightarrow \Delta^{10(1)}$ ) might have occurred although unlikely has not been eliminated. We may also point out that using a 60 Mc Varian instrument we were not able to see clearly an olefinic proton in II ( $R = Ac$  or H). Stereochemistry of II and III and other aspects of this problem will be discussed in the full paper.



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5. For recent developments in the synthesis of medium-size carbocyclic systems see E.J. Corey and A.G. Hortmann, J. Am. Chem. Soc., 85, 4033 (1963); E.J. Corey and E. Hamanaka, ibid, 86, 1642 (1964).
6. We thank Dr. J. Hudec for helpful criticism