$[\alpha]^{24}_D$ −0.24° ($HCCl_3$, c 1.25)] and **7** [evaporative distillation 95 °C (1.0 mmHg); $[\alpha]^{23}_D$ −121° ($HCCl_3$, c 1.43)]. In the pyran series only reductive fragmentation was observed and none of the products from direct hydride displacement was observed. While these glycals can be prepared by the Fischer–Zach method, the high yield of this process together with the generation of the glycal itself rather than the more labile ester derivative offers significant advantages. It should be noted that while the acetonide blocking group is used early in the synthetic sequence to achieve functional group selectivity, it is also a requisite of the lithium–ammonia reduction process and serves two useful roles.[10]

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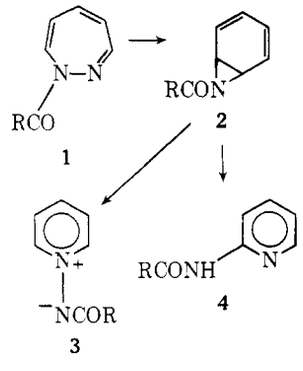
Heterocyclic Studies. 45. Thermal Isomerization of a 1,2-Diazepine to a 1,3-Diazepine

Summary: The 1,2-diazepine **5** at 110 °C gives a mixture of the 6-benzamidopyridine **6** and the 1-benzoyl-1,3-diazepine **7**.

Sir: 1-Acyl- and 1-alkoxycarbonyl-1,2-diazepines, readily available by photoisomerization of 1-iminopyridinium ylides,[1] undergo a variety of reactions on heating. 1-Benzoyl-1,2-diazepines[2] and 1-acyl-3,5,7-triaryldiazepines[3] give 1-acyliminopyridinium ylides **3**, and this path is also observed on treatment of 1-alkoxycarbonyl-1,2-diazepines **1** (R = OR′) in hot acetic acid.[4] 2-Aminopyridine derivatives **4** are formed in low yields, together with acyclic dienaminonitriles, on heating 1-alkoxycarbonyldiazepines at 150–170 °C neat or in refluxing



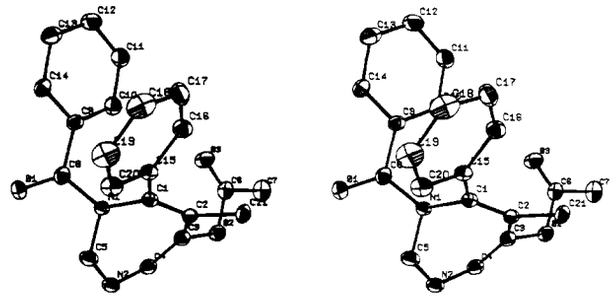
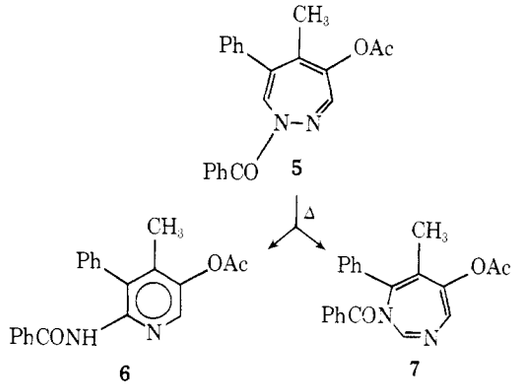


Figure 1. ORTEP stereoprojection of **7** (hydrogens omitted).

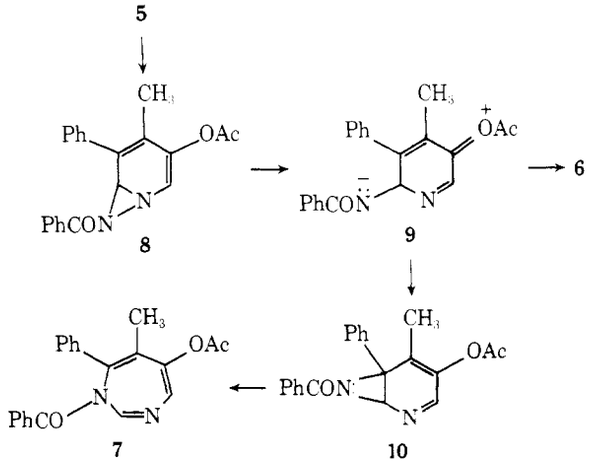
xylene.[4,5] The pyridine products from these reactions have been suggested to arise via 1,7-diazabicyclo[4.1.0]heptadiene valence isomers, but the factors that determine the product distribution are not well defined.

We have now found an additional pathway for the thermal isomerization of 1,2-diazepines. 1-Benzoyl-4-acetoxy-5-methyl-6-phenyl-1,2-diazepine (**5**), prepared by O-acetylation of the 1,5-dihydrodiazepinone,[6] undergoes a very facile thermal reaction to give the 3-acetoxy-6-benzamidopyridine **6** in 50% yield. A second product, isolated in 16% yield, is the 1-benzoyl-1,3-diazepine **7**, in which the positions of carbon and nitrogen in the seven-membered ring have been interchanged. Fully unsaturated 1,3-diazepines such as **7** are little known compounds, although the corresponding 1,3-oxazepines are well characterized.[7,8] The structure of **7** was established by x-ray crystallography.



Several other 1-acyl-4-acyloxydiazepines gave similar mixtures of products (as seen by NMR) on heating in chlorobenzene at 120 °C. In each case the 6-acylamido-3-acyloxypyridines were isolated and characterized as the major products; the minor products have not been isolated but are presumed to be the corresponding 1,3-diazepines.

Scheme I



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The pathway to the 1,3-diazepines **7** from the 1,2-diazepine **5** must involve the bicyclic valence isomers **8** and **10** (Scheme I). Analogous steps have been postulated[8,12] for the formation of 2-arylbenz[*d*]-1,3-oxazepines with the photoisomerization of 2-arylquinoline 1-oxides; however, benzo[*d*]-1,3-diazepines are not observed in the analogous reactions of quinoline-1-acylimides.[13,14] The fact that products of type **6** or **7** have not been observed in thermal reactions of other 1-benzoyldiazepines suggests that the acetoxy group of **5** is an important factor in the mechanism. A possible role is stabilization of a dipolar intermediate such as **9**, which could give rise to **6** and **10** by well precedented steps.

Experimental. A solution of **5** in toluene was kept at 110 °C for 40 min. After removal of solvent, the NMR spectrum of the solid residue indicated a mixture of two products in a 6:4 ratio. Fractional crystallization of the mixture from CH_2Cl_2–ether gave the main product (50% yield) as white crystals: mp 169–170 °C; IR ν (KBr) 3300, 1755, 1650; NMR δ ($CDCl_3$) 1.97 (s, 3), 2.38 (s, 3), 7.2–7.7 (m, 10), 7.82 (br, 1), 8.33 (s, 1); anal.[9] This compound was identified as the 6-benzamido-3-acetoxypyridine **6** by mild alkaline hydrolysis to the known 6-benzamido-3-hydroxypyridine.[10] The more soluble fractions were recrystallized several times from ether and benzene to give the 1,3-diazepine **7** as large, faceted prisms: mp 146–147 °C; IR ν (KBr) 1760, 1670, 1635; NMR δ ($CDCl_3$) 1.75 (s, 3), 2.28 (s, 3), 6.7–7.7 (m, 12); anal.[9]

Crystallography. Crystals of **7** were orthorhombic, space group *Pbca*, with $a = 25.029$ (9), $b = 10.123$ (6), and $c = 14.191$ (6) Å; $d_{calcd} = 1.28$ g cm^{-3} for $Z = 8$.

Intensity data were obtained with Mo Kα radiation with scan rate of 1°/min over a range of 1.75° plus Kα_1 – Kα_2. A total of 2345 reflections were measured, with 2093 observed. No absorption correction was made. The structure was solved by tangent refinement techniques using the ORTEP program to find a possible molecule from several *E* maps. Subsequent cycles of least-squares refinement located all nonhydrogen atoms with anisotropic temperature factors.[11] Hydrogen positions were calculated and were not refined. Further refinement led to a final $R = 0.083$ and $R_w = 0.071$ where $R = \Sigma||F_o| - |F_c||/\Sigma|F_o|$ and $R_w = [\Sigma_w(|F_o| - |F_c|)^2/\Sigma_w|F_o|^2]^{1/2}$. A final difference map encompassing the atoms of the seven-membered ring showed no electron density greater than 0.5 e/Å^3. A stereoscopic view of **7** is shown in Figure 1.

Acknowledgment. We are most grateful to Dr. Lloyd Guggenberger, E. I. du Pont de Nemours and Co., for providing the diffractometer data used in the crystallographic analysis.

Supplementary Material Available: Table of positional and thermal parameters for the structure of **7** (2 pages). Ordering information is given on any current masthead page.

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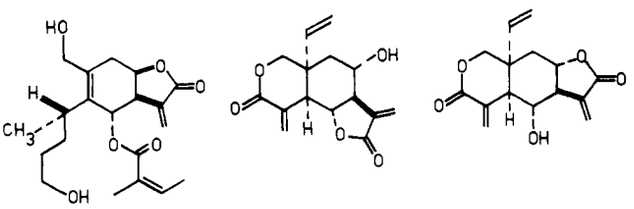
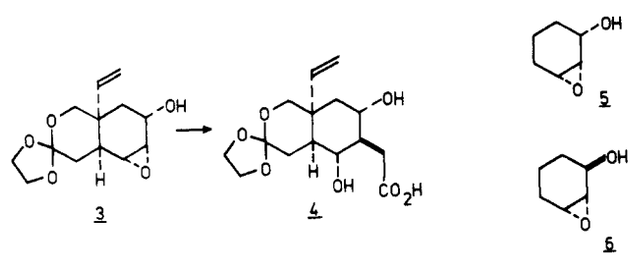
Ring-Opening Reactions of α-Oxy Epoxides with *tert*-Butyl Dilithioacetoacetate

Summary: tert-Butyl dilithioacetoacetate has been employed in ring-opening reactions of certain α-hydroxy epoxides and α-methoxymethyloxy epoxides. The regiochemical nature of ring opening for this dinanion is essentially the same as that previously observed for dilithioacetate. A notable exception, however, was observed with an α-methoxymethyloxy epoxide bearing a geminal dialkyl substituent at the α′ position. This substance was found to regiospecifically open to the corresponding 1,3-dioxy system.

Sir: The occurrence in nature of antitumor agents such as eriolangin (**1**) and vernolepin (**2**) which contain either cis- or trans-lactone arrays bearing an α-hydroxy group has prompted the experimental consideration of elaborating such systems by the vehicle of ring opening of α-oxygen substituted epoxides with an appropriate nucleophile. In a brilliant series of investigations, Danishefsky and co-workers succeeded in this regard with the ring opening of the α-hydroxy epoxide **3** with dilithioacetate to realize formation of the acid diol **4**, subsequently converted into both vernolepin and vernomenin.[1] In addition, these authors have also studied the dilithioacetate induced ring opening of the simple α-hydroxy epoxides **5** and **6** together with their trimethylsilyloxy analogues.[2]

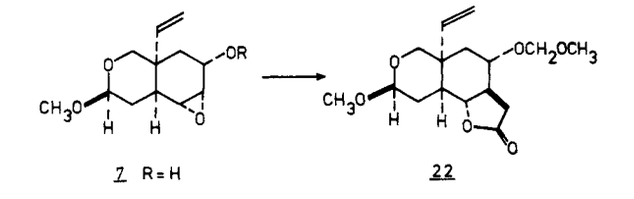


1 Eriolangin **2** Vernolepin **8** Vernomenin



3 **4** **5** **6**

Recently, we attained the same synthetic juncture in our synthesis of vernolepin which required regiospecific ring opening of the α-hydroxy epoxide **7**. We were, however, interested in using an alcohol-protected form of **7** to realize the exclusive formation of vernolepin as opposed to the concurrent construction of both vernolepin and its biologically less active isomer vernomenin (**8**). Taking cognizance of Danishefsky's results, which indicated that α-trimethylsilyloxy epoxides would either not react or would open predominantly in the undesired manner,[1,2] we nevertheless examine the feasibility of preparing vernolepin by ring opening of the α-methoxy-



7 R = H **22**
9 R = CH_2OCH_3

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