

A SYNTHESIS OF FURAN DERIVATIVES FROM 1-PHENYL- $\beta$ -LACTAMS

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Oxidation of 1-phenyl-3-vinyl- $\beta$ -lactams with *m*-chloroperbenzoic acid gave 3-( $\alpha,\beta$ -epoxy)-1-phenyl- $\beta$ -lactam derivatives (1). Condensation of 1-phenyl- $\beta$ -lactams (2) with  $\alpha$ -sulfenyl ketones gave the corresponding alcohols (3). Methylation of (3) with methyl iodide, followed by treatment of the sulfonium salts with *t*-BuOK also afforded (1). Furthermore, reduction of 3-( $\alpha$ -methylthioacyl)-1-phenyl- $\beta$ -lactams with  $\text{NaBH}_4$  afforded the alcohols (4), which were converted to 3-( $\alpha,\beta$ -epoxy) derivatives through the sulfonium salts. These lactams were treated with methanesulfonic acid at 100 °C to give a variety of substituted  $\alpha$ -anilinomethyl- $\Delta^{\alpha,\beta}$ -butenolides (5). Catalytic hydrogenation of (5) over Ni catalyst gave  $\alpha$ -anilinomethyl- $\gamma$ -lactones, which were lead to  $\alpha$ -methylene- $\gamma$ -lactones (6). Reduction of (5) with DIBALH gave 3-anilinomethylfuran derivatives (7), hydrogenolysis of which over Pd-C yielded 3-methylfuran derivatives. By this method, ( $\pm$ )-menthofuran (8) and ( $\pm$ )-laevigatin (9) were synthesized. Alkylation of (5) with alkylolithium afforded 2-alkyl-3-anilinomethylfuran derivatives (10). Furthermore, 3-(2-hydroxyalkylidene)-1-phenyl- $\beta$ -lactams, derived from (1) were treated with trifluoroacetic acid under reflux to give the furo[3,2-*c*]quinolines (11).

