REACTIONS OF CARBON SUBOXIDE AND 2,3-BIFUNCTIONAL PYRIDO COMPOUNDS

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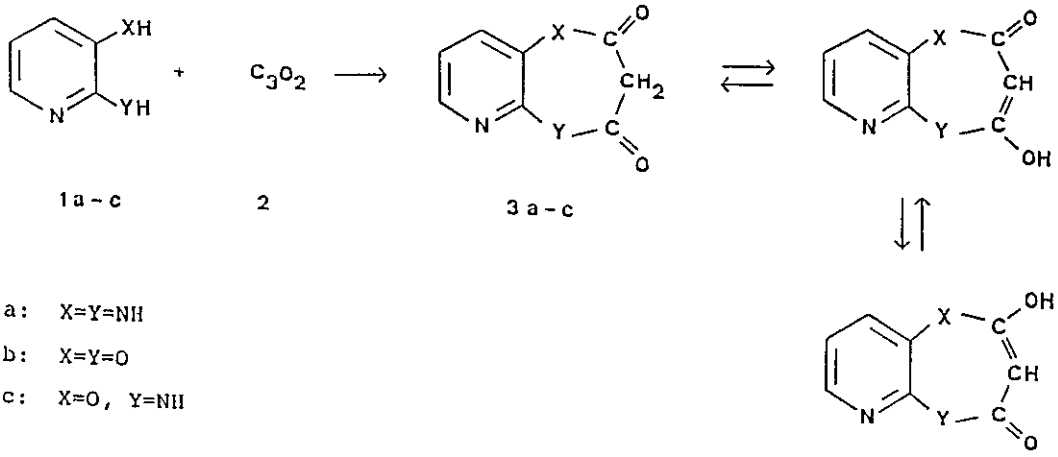
Abstract - The preparation of pyridodiazepines, pyridodioxepins and pyridoxazepines is described here. The structure of the products has been determined by elemental analysis and spectroscopic data.

Moving from former studies on the use of carbon suboxide in the synthesis of new heterocyclic compounds with potential biological activity[1], in this paper we describe the syntheses of some novel pyrido derivatives of seven-membered heterocyclic rings.

By reacting equimolecolar amounts of 2,3-diaminopyridine (1a) with carbon suboxide (2) in a dilute solution of diethyl ether, compound (3a) has been obtained. Compounds (3b) and (3c) have been obtained in a sealed flask at room temperature without solvent. Compounds (3a-c) were isolated in satisfactory yields (70-78%) and purified by chromatography; their structures were determined by analytical and spectroscopic methods.

Scheme 1



1a-c 2 3a-c

a: X=Y=NH
b: X=Y=O
c: X=O, Y=NH

Furthermore ir and ^{1}H nmr spectra showed that (3a-c) exist as a mixture of their tautomeric forms. In fact the ir spectra of (3a-c) showed the band at 3420 cm^{-1} in addition to the characteristic band of the C=O group at 1750 and 1730 cm^{-1}.
The ^{1}H nmr spectra showed the characteristic signals of both methine and methylene protons at δ 7.06 and δ 3.30 ppm respectively, together with an OH signal at δ 6.58 ppm.

EXPERIMENTAL

Melting points were determined on a Kofler hot stage microscope and are uncorrected. The ir spectra were obtained on a Perkin Elmer model 157 G spectrophotometer using potassium bromide mulls. The ^{1}H nmr spectra were recorded on a Varian FT 80 A spectrometer and chemical shifts were determined using tetramethylsilane as an internal standard.
Microanalyses for C, H and N were carried out on a Carlo Erba model 1106 Elemental Analyzer.

1H-Pyrido[2,3-b][1,4]diazepine-2,4(3H,5H)-dione (3a)

To a stirred solution of (1a) (45 mmoles) in dry ether (300 ml), cooled at -5°C, (2) was added during 2 h. When the addition was complete, the mixture was strongly stirred at -5°C for 24 h, and at room temperature for 48 h. The white substance which precipitated from the reaction mixture was collected and, after crystallization from a 70% ethanol solution, it was shown to be (3a) in 80% yield, mp 230°C; ir: 3420, 1740, 1710 cm^{-1}; ^{1}H nmr (pyridine d_5): 8.55 (s, 2 H, 2 NH), 7.63-7.23 (m, 3 H, Arom), 7.06 (s, 1 H, CH=), 6.58 (s, 1 H, OH), 3.50 (s, 2 H, CH_2-CO); Anal. Calcd. for $C_8H_7N_3O_2$: C, 54.23; H, 3.98; N, 23.72. Found: C, 54.20; H, 4.00; N, 23.69.

2H-Pyrido[2,3-b][1,4]dioxepine-2,4(3H)-dione (3b)

A sealed flask containing (1b) (16 mmoles) and (2) (16 mmoles) was kept at room temperature for 6 days. The reaction mixture was crystallized from a 75% ethanol solution to give (3b) in 70% yield, mp 235°C; ir: 3430, 1730, 1690 cm^{-1}; ^{1}H nmr (pyridine d_5): 7.55-7.15 (m, 3 H, Arom), 6.78 (s, 1 H, CH=), 6.28 (s, 1 H, OH), 3.43 (s, 2 H, CH_2-CO); Anal. Calcd. for $C_8H_5NO_4$: C, 53.64;

H, 2.81; N, 7.82. Found: C, 53.25; H, 2.96; N, 7.39.

In the same way, starting from (1c) and (2), the following compound was prepared:

Pyrido[3,2-b][1,4]oxazepine-2,4(3H,5H)-dione (3c): 71% yield, mp 225°C; ir: 3440, 1670 cm^{-1}; ^1H nmr (pyridine d_5): 8.55 (s, 1 H, NH), 7.66-7.08 (m, 3 H, Arom), 6.58 (s, 1 H, CH=C), 6.26 (s, 1 H, OH), 3.50 (s, 2 H, CH_2-CO); Anal. Calcd. for $C_8H_6N_2O_3$: C, 53.93; H, 3.39; N, 15.72. Found: C, 54.02; H, 3.16; N, 15.03.

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