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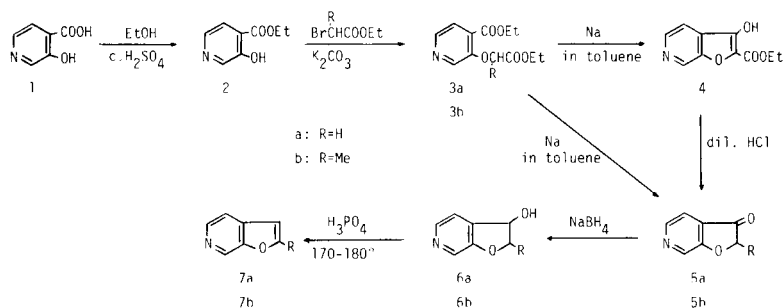
A simple synthesis of furo[2,3-*c*]pyridine and its 2- and 3-methyl derivatives from ethyl 3-hydroxyisonicotinate (**2**) is described. The hydroxy ester **2** was *O*-alkylated with ethyl bromoacetate or ethyl 2-bromopropionate to give the diester **3a** or **3b**. Cyclization of compound **3a** afforded ethyl 3-hydroxyfuro[2,3-*c*]pyridine-2-carboxylate (**4**) which was hydrolyzed and decarboxylated to give furo[2,3-*c*]pyridin-3(2*H*)-one (**5a**). Cyclization of **3b** gave the 2-methyl derivative **5b**. Reduction of **5a** and **5b** with sodium borohydride yielded the corresponding hydroxy derivative **6a** and **6b**, respectively, which were dehydrated with phosphoric acid to give furo[2,3-*c*]pyridine (**7a**) and its 2-methyl derivative **7b**. 4-Acetylpyridin-3-ol (**8**) was *O*-alkylated with ethyl bromoacetate to give ethyl 2-(4-acetyl-3-pyridyloxy)acetate (**9**). Saponification of compound **9**, and the subsequent intramolecular Perkin reaction gave 3-methylfuro[2,3-*c*]pyridine (**10**). Cyclization of **9** with sodium ethoxide gave 3-methylfuro[2,3-*c*]pyridine-2-carboxylic acid, which in turn was decarboxylated to give compound **10**.

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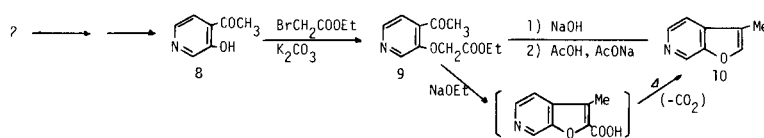
As part of a continuing interest in the chemistry of furopyridines, it appeared appropriate to synthesize 2-(**7b**) and 3-methylfuro[2,3-*c*]pyridine (**10**). In an earlier paper [1] we described the synthesis of parent molecule furo[2,3-*c*]pyridine (**7a**) from 3-furaldehyde through a series of reactions, including a Knövenagel condensation to form 2-(3-furyl)acrylic acid, formation of the acid azide, cyclization to furo[2,3-*c*]pyridin-7(6*H*)-one, chlorination of the hydroxy group and reductive elimination of the chlorine. However, this procedure seemed unsuitable for the synthesis of **7b** and **10**, because a search in the literature suggested that preparation of 4- and 5-methyl-3-furaldehy-

de is complicated. Meanwhile, we recently reported a synthesis of furo[3,2-*'*]pyridine and its 2- and 3-methyl derivatives from 3-hydroxypicolinic acid [2]. This method seemed to be applicable for the synthesis of **7a**, **7b** and **10** from 3-hydroxyisonicotinic acid (**1**).

To start with, we prepared the hydroxy acid **1** by the method of Crum and Fuchsmann [3]. Esterification of the acid **1** with ethanol by the conventional method yielded the ethyl ester (**2**) in good yield. The ester **2** was *O*-alkylated with ethyl bromoacetate to give ethyl 2-(4-ethoxycarbonyl-3-pyridyloxy)acetate (**3a**). The diester **3a** was cyclized to ethyl 3-hydroxyfuro[2,3-*c*]pyridine-2-carboxylate (**4**) by



Scheme 1



Scheme 2

treating with sodium in refluxing toluene. Heating of the hydroxy ester **4** with hydrochloric acid gave furo[2,3-*c*]pyridin-3(2*H*)-one (**5a**). The ¹H nmr spectrum of **5a** showed that this compound exists in keto form in deuteriochloroform solution but in enol form in deuteriomethanol. Reduction of the ketone **5a** with sodium borohydride in methanol afforded 2,3-dihydrofuro[2,3-*c*]pyridin-3-ol (**6a**). The hydroxy compound **6a** was smoothly dehydrated by heating with phosphoric acid to give furo[2,3-*c*]pyridine (**7a**) in 27.3% yield from **2**.

Similarly, 2-methyl derivative **7b** was obtained in 32.8% yield. *O*-Alkylation of the ester **2** with ethyl 2-bromopropionate gave ethyl 2-(4-ethoxycarbonyl-3-pyridyloxy)propionate (**3b**), which in turn was cyclized to 2-methylfuro[2,3-*c*]pyridin-3(2*H*)-one (**5b**). This compound also exists in keto form in less polar solvent and in enol form in protic solvent. Reduction of the ketone **5b** with sodium borohydride gave a mixture of *cis*- and *trans*-2-methyl-2,3-dihydrofuro[2,3-*c*]pyridin-3-ol (**6b**) (ratio: *ca.* 1:1). Dehydration of the hydroxy derivative gave 2-methylfuro[2,3-*c*]pyridine (**7b**).

The ethyl ester **2** was converted to 4-acetylpyridin-3-ol (**8**) according to the method of Camparini *et al* [4]. *O*-Alkylation of compound **8** with ethyl bromoacetate yielded ethyl 2-(4-acetyl-3-pyridyloxy)acetate (**9**). Compound **9** was saponified with sodium hydroxide, and the resulting carboxylic acid was submitted to an intramolecular Perkin reaction to give the required 3-methylfuro[2,3-*c*]pyridine (**10**) in 13% overall yield. Alternatively, compound **9** was cyclized to 3-methylfuro[2,3-*c*]pyridine-2-carboxylic acid by heating with sodium ethoxide in toluene, which in turn was decarboxylated to give compound **10** in 8.8% overall yield.

EXPERIMENTAL

Melting points were determined by using micro melting point apparatus (Yangimoto). All melting points are uncorrected. Infrared (ir) spectra were taken on a JASCO A-102 spectrometer. Proton nuclear magnetic resonance (¹H nmr) spectra were recorded on a JEOL JNM-PMX 60 spectrometer. Chemical shifts are reported in part per million related to tetramethylsilane as an internal standard.

Ethyl 3-Hydroxyisocotinate (**2**).

In a flask equipped with a condenser and a water separator, a mixture of 3-hydroxyisocotinic acid [**3**] (30 g, 0.216 mole), ethanol (550 ml), benzene (180 ml) and 98% sulfuric acid (9 ml) was refluxed for 48 hours. After evaporation of the excess ethanol and benzene *in vacuo*, the slightly yellow syrup was dissolved in 700 ml of water, neutralized with sodium bicarbonate, extracted with chloroform and dried over magnesium sulfate. Evaporation of the solvent afforded a yellow viscous syrup, which was distilled *in vacuo* to give 29.9 g (83%) of pure **2**, bp 72-77° (0.1 mm Hg). The distillate solidified on standing at room temperature, mp 39-41°; ir (liquid film): 3200 (m), 3050 (w), 2980 (m), 2930 (w), 2900 (w), 1690 (s), 1600 (m), 1555 (m), 1480 (m), 1460 (w), 1455 (w), 1440 (w), 1415 (w), 1390 (m), 1370 (s), 1325 (s), 1310 (s), 1275 (m), 1250 (w), 1220 (s), 1200 (m), 1165 (m), 1135 (m), 1110 (w), 1095 (s), 1060 (s), 1020 (s), 955 (w), 925 (w), 890 (m), 865 (w), 835 (w), 790 (m) cm⁻¹; ¹H nmr (deuteriochloroform): δ

1.41 (t, J = 7.0 Hz, 3H, OCH₂CH₃), 4.42 (q, J = 7.0 Hz, 2H, OCH₂CH₃), 7.57 (d, J = 5.0 Hz, 1H, H-5), 8.13 (d, J = 5.0 Hz, 1H, H-6), 8.43 (s, 1H, H-2).

Anal. Calcd. for C₈H₉NO₃: C, 57.47; H, 5.42; N, 8.38. Found: C, 57.07; H, 5.37; N, 8.56.

Ethyl 2-(4-Ethoxycarbonyl-3-pyridyloxy)acetate (**3a**).

A mixture of compound **2** (17 g, 0.102 mole), ethyl bromoacetate (19 g, 0.114 mole) and anhydrous potassium carbonate (32 g) in dry acetone (120 ml) was stirred under reflux for 2 hours. After filtration of the inorganic materials, the filtrate was evaporated *in vacuo* to give a red-brown syrup, which was dissolved in chloroform, washed with water and dried over magnesium sulfate. After evaporation of the solvent, the residual syrup was distilled to give 16.0 g (62%) of **3a** as a pale yellow oil (which solidified gradually on standing at room temperature), bp 150-160° (0.3 mm Hg); ir (liquid film): 3050 (w), 3020 (w), 2960 (m), 2920 (m), 2890 (m), 2850 (w), 1755 (s), 1730 (s), 1585 (m), 1550 (m), 1490 (m), 1460 (m), 1440 (m), 1415 (s), 1385 (m), 1370 (m), 1360 (m), 1310 (s), 1270 (s), 1240 (m), 1200 (s), 1180 (s), 1100 (s), 1080 (s), 1045 (m), 1015 (m), 870 (w), 850 (m), 835 (m), 780 (m), 750 (w), 700 (m) cm⁻¹; ¹H nmr (deuteriochloroform): δ 1.29 (t, J = 7.0 Hz, 3H, OCH₂CH₃), 1.41 (t, J = 7.0 Hz, 3H, OCH₂CH₃), 4.25 (q, J = 7.0 Hz, 2H, OCH₂CH₃), 4.37 (q, J = 7.0 Hz, 2H, OCH₂CH₃), 4.77 (s, 2H, OCH₂COOEt), 7.54 (d, J = 4.8 Hz, 1H, H-5), 8.32 (d, J = 4.8 Hz, 1H, H-6), 8.34 (s, 1H, H-2).

Anal. Calcd. for C₁₂H₁₃NO₅: C, 56.91; H, 5.97; N, 5.53. Found: C, 56.81; H, 5.99; N, 5.58.

Ethyl 3-Hydroxyfuro[2,3-*c*]pyridine-2-carboxylate (**4**).

To a refluxing suspension of sodium (1.9 g, 82.6 mmoles) in toluene (200 ml) and absolute ethanol (1 ml) was added dropwise a solution of compound **3a** (19 g, 75.1 mmoles) in toluene (150 ml) over 15 minutes. After stirring and refluxing for 6 hours, the reaction mixture was cooled and extracted with water (300 ml). The aqueous layer was acidified with acetic acid and the resulting crystalline product was filtered and dried in a desiccator to give 13 g of crude **4a**, which was recrystallized from ethanol to give 11.5 g (74%) of pure sample of mp 182-183° dec (slightly yellow plates); ir (potassium bromide): 3400 (broad w), 3100-2300 (m), 3000 (m), 2970 (m), 2910 (m), 1700 (s), 1610 (m), 1590 (s), 1570 (s), 1485 (w), 1460 (w), 1440 (s), 1420 (w), 1390 (m), 1365 (m), 1325 (s), 1280 (s), 1235 (m), 1190 (s), 1160 (s), 1130 (s), 1110 (s), 1025 (s), 905 (w), 880 (w), 860 (w), 830 (w), 820 (m), 785 (w), 760 (m), 730 (w), cm⁻¹; ¹H nmr (deuteriochloroform): δ 1.43 (t, J = 7.0 Hz, 3H, OCH₂CH₃), 4.44 (q, J = 7.0 Hz, 2H, OCH₂CH₃), 7.58 (dd, J = 5.0, 1.0 Hz, 1H, H-4), 8.42 (d, J = 5.0 Hz, 1H, H-5), 8.84 (d, J = 1.0 Hz, 1H, H-7).

Anal. Calcd. for C₁₀H₉NO₄: C, 57.97; H, 4.38; N, 6.76. Found: C, 57.84; H, 4.53; N, 6.91.

Furo[2,3-*c*]pyridin-3(2*H*)-one (**5a**).

Compound **4** (2.0 g, 9.66 mmoles) was heated with 10% hydrochloric acid (15 ml) under reflux for 2.5 hours. Evaporation of the excess hydrochloric acid gave 1.6 g (97%) of crude hydrochloride of **5a**, which was recrystallized from methanol to afford pure sample of **5a**·HCl, mp 188-190°.

Anal. Calcd. for C₇H₆NO₂Cl: C, 49.00; H, 3.52; N, 8.16. Found: C, 48.96; H, 3.61; N, 3.19.

The aqueous solution of **5a**·HCl was basified with sodium carbonate, and the resulting crystalline solid was filtered and dried in a desiccator to give the free base **5a**, which was unstable and no suitable solvent for recrystallization could be found; ¹H nmr (deuteriochloroform): δ 4.62 (s, 2H, methylene protons at C-2), 7.43 (dd, J = 4.8, 1.2 Hz, 1H, H-4), 8.43 (d, J = 4.8 Hz, 1H, H-5), 8.65 (d, J = 1.2 Hz, 1H, H-7); ¹H nmr (deuteriomethanol): δ 7.15 (s, 1H, H-2, gradually exchanged with deuterium of the solvent), 7.25 (dd, J = 5.2, 1.0 Hz, 1H, H-4), 8.18 (d, J = 5.2 Hz, 1H, H-5), 8.56 (d, J = 1.0 Hz, 1H, H-7).

2,3-Dihydrofuro[2,3-*c*]pyridin-3-ol (**6a**).

To a stirred solution of **5a**·HCl (3.23 g, 17.0 mmoles) in methanol (100 ml) was added portionwise sodium borohydride (3.0 g, 79 mmoles) with

ice-cooling, and the mixture was stirred at room temperature for 30 minutes. After evaporation of the solvent *in vacuo*, the slightly brown syrup was treated with water and extracted with chloroform. Drying (magnesium sulfate) and evaporation of the solvent gave 1.73 g (76%) of **6a** as an almost colorless solid mass. The analytical sample was obtained by recrystallization from methanol-ether as colorless needles, mp 97-101°; ir (potassium bromide): 3100 (broad s), 2960 (w), 2930 (w), 2900 (w), 2830 (m), 2710 (w), 1600 (w), 1580 (m), 1375 (s), 1440 (m), 1410 (s), 1340 (w), 1330 (w), 1290 (m), 1250 (s), 1225 (s), 1200 (m), 1170 (s), 1155 (w), 1075 (s), 1035 (s), 1010 (m), 985 (m), 885 (w), 850 (m), 820 (s), 805 (s), 745 (w), 720 (m) cm^{-1} ; ^1H nmr (deuteriochloroform): δ 4.35 (dd, $J = 10.4, 6.0$ Hz, 1H, one of the methylene protons at C-2), 4.52 (dd, $J = 10.4, 6.0$ Hz, 1H, another proton of the methylene at C-2), 4.90 (broad s, 1H, OH), 5.32 (dd, $J = 6.0, 4.4$ Hz, 1H, H-3), 7.22 (dd, $J = 4.6, 0.7$ Hz, 1H, H-4), 7.87 (d, $J = 4.6$ Hz, 1H, H-5), 7.90 (ill-split d, $J = 0.7$ Hz, 1H, H-7).

Anal. Calcd. for $\text{C}_7\text{H}_7\text{NO}_2$: C, 61.31; H, 5.15; N, 10.21. Found: C, 61.19; H, 5.19; N, 10.00.

Furo [2,3-*c*]pyridine (7a).

A solution of **6a** (1.73 g, 12.6 mmoles) in 85% phosphoric acid (20 ml) was heated at 180° with stirring for 18 hours. After cooling, the pale brown mixture was diluted with 100 ml of water, made alkaline with aqueous ammonia, extracted with ether and dried over potassium carbonate. After removal of most of the solvent under atmospheric pressure, the pale brown oil was distilled *in vacuo* to give 1.23 g (82%) of furo [2,3-*c*]pyridine (**7a**) as a colorless oil, bp 100-120° (bath temperature) (27 mm Hg) (literature [1], bp 150° (40 mm Hg)). The ir and ^1H nmr spectra were completely identical with those of the sample prepared by the method previously reported [1].

Ethyl 2-(4-Ethoxycarbonyl-3-pyridyloxy)propionate (3b).

A mixture of compound **2** (3.0 g, 18 mmoles), ethyl 2-bromopropionate (3.6 g, 20 mmoles) and anhydrous potassium carbonate (5.0 g) in dry acetone (40 ml) was refluxed and stirred for 2 hours. After cooling, the insoluble materials and the solvent were removed to give a brown syrup which was dissolved in ether, washed with water and dried over magnesium sulfate. After evaporation of the solvent, the oily residue was distilled to give 3.9 g (81%) of **3b** as a slightly yellow oil, bp 170° (bath temperature) (0.2 mm Hg); ir (liquid film): 3050 (w), 2970 (m), 2920 (w), 2880 (w), 2850 (w), 1730 (s), 1710 (s), 1585 (w), 1550 (w), 1485 (m), 1440 (m), 1410 (m), 1385 (w), 1360 (m), 1305 (s), 1270 (s), 1240 (m), 1210 (m), 1200 (s), 1180 (m), 1120 (m), 1090 (s), 1060 (m), 1040 (m), 1010 (m), 940 (w), 850 (w), 830 (w), 780 (w), cm^{-1} ; ^1H nmr (deuteriochloroform): δ 1.28 (t, $J = 6.8$ Hz, 3H, OCH_2CH_3), 1.40 (t, $J = 6.8$ Hz, 3H, OCH_2CH_3), 1.68 (d, $J = 6.4$ Hz, 3H, $-\text{CH}(\text{CH}_3)\text{COOEt}$), 4.22 (q, $J = 6.8$ Hz, 2H, OCH_2CH_3), 4.38 (q, $J = 6.8$ Hz, 2H, OCH_2CH_3), 4.88 (q, $J = 6.4$ Hz, 1H, $-\text{CH}(\text{CH}_3)\text{COOEt}$), 7.51 (d, $J = 4.8$ Hz, 1H, H-5), 8.26 (d, $J = 4.8$ Hz, 1H, H-6), 8.28 (s, 1H, H-2).

Anal. Calcd. for $\text{C}_{13}\text{H}_{17}\text{NO}_5$: C, 58.42; H, 6.41; N, 5.24. Found: 58.30; H, 6.34; N, 5.47.

2-Methylfuro[2,3-*c*]pyridin-3(2*H*)-one (5b).

To a refluxing suspension of sodium (0.4 g, 17.4 mmoles) in toluene (10 ml) and absolute ethanol (0.5 ml) was added dropwise a solution of compound **3b** (3.9 g, 14.6 mmoles) in toluene (30 ml) over 10 minutes. The mixture was stirred and refluxed for 11 hours. After cooling, the mixture was extracted with water (100 ml). The aqueous layer was acidified with hydrochloric acid and then basified with sodium bicarbonate. After cooling in an ice bath, the resulting crystalline product was filtered and dried in a desiccator to give 1.3 g, (60%) of **5b** (pale yellow crystalline powder). Recrystallization from methanol gave analytically pure sample of mp 109-111°; ^1H nmr (deuteriochloroform): δ 1.57 (d, $J = 7.4$ Hz, 3H, $\text{C}_2\text{-CH}_3$), 4.65 (q, $J = 7.4$ Hz, 1H, H-2), 7.42 (dd, $J = 5.0, 0.8$ Hz, 1H, H-4), 8.32 (d, $J = 5.0$ Hz, 1H, H-5), 8.61 (d, $J = 0.8$ Hz, 1H, H-7); ^1H nmr (deuteriomethanol): δ 2.35 (s, 3H, $\text{C}_2\text{-CH}_3$), 7.47 (dd, $J = 5.0, 0.8$ Hz, 1H, H-4), 8.12 (d, $J = 5.0$ Hz, H-5), 8.44 (d, $J = 0.8$ Hz, 1H, H-7).

Anal. Calcd. for $\text{C}_8\text{H}_7\text{NO}_2$: C, 64.42; H, 4.73; N, 9.39. Found: C, 64.33; H, 4.64; N, 9.17.

2-Methyl-2,3-dihydrofuro[2,3-*c*]pyridin-3-ol (6b).

To a solution of **5b** (4.4 g, 29.5 mmoles) in methanol (100 ml) was added portionwise sodium borohydride (4.4 g, 116 mmoles) with ice-cooling and stirring. The mixture was stirred at room temperature for 30 minutes. After evaporation of the solvent *in vacuo*, the pale orange syrup was treated with water and chloroform. The chloroform layer was dried (magnesium sulfate) and evaporated the solvent to give 3.19 g (71.5%) of **6b** as a colorless viscous oil, bp 150° (bath temperature) (0.05 mm Hg). The distillate gradually solidified on standing for several days, mp 50-93°; ^1H nmr (deuteriochloroform): δ 1.36 (d, $J = 6.4$ Hz, 1.5H, methyl of the *trans* isomer), 1.48 (d, $J = 6.0$ Hz, 1.5H, methyl of the *cis* isomer), 4.56 (qn, $J = 6.0$ Hz, 0.5H, H-2 of the *cis* isomer), 4.57 (dq, $J = 6.4, 4.4$ Hz, 0.5H, H-2 of the *trans* isomer), 4.85 (d, $J = 4.4$ Hz, 0.5H, H-3 of the *trans* isomer), 4.99 (d, $J = 6.0$ Hz, 0.5H, H-3 of the *cis* isomer), 5.51 (s, 1H, -OH), 7.17 (dd, $J = 4.4, 0.8$ Hz, 1H, H-4), 7.79 (d, 4.4 Hz, 1H, H-5), 7.81 (d, $J = 0.8$ Hz, 1H, H-7).

Anal. Calcd. for $\text{C}_8\text{H}_9\text{NO}_2$: C, 63.56; H, 6.00; N, 9.27. Found: C, 63.62; H, 6.03; N, 9.14.

2-Methylfuro[2,3-*c*]pyridine (7b).

A mixture of compound **6b** (0.45 g, 3.0 mmoles) in 85% phosphoric acid (5 ml) was heated at 170-180° for 12 hours. After cooling, the slightly brown mixture was diluted with water (20 ml) and basified with aqueous ammonia and extracted with chloroform. After drying over magnesium sulfate, the chloroform was evaporated under atmospheric pressure, and the light brown residue distilled to give 0.37 g (95%) of **7b**, bp 120-130° (bath temperature) (33 mm Hg), as a colorless oil; ir (liquid film): 3080 (w), 3040 (w), 3020 (w), 2980 (w), 2930 (w), 2900 (w), 1600 (s), 1580 (s), 1565 (w), 1460 (m), 1415 (s), 1370 (w), 1315 (w), 1270 (w), 1250 (s), 1180 (s), 1145 (m), 1130 (w), 1020 (m), 990 (w), 930 (m), 880 (m), 820 (s) cm^{-1} ; ^1H nmr (deuteriochloroform): δ 2.37 (d, $J = 0.8$ Hz, 3H, $\text{C}_2\text{-CH}_3$), 6.27 (qn, $J = 0.8$ Hz, 1H, H-3), 7.27 (dd, $J = 5.0, 1.0$ Hz, 1H, H-4), 8.24 (d, $J = 5.0$ Hz, 1H, H-5), 8.64 (dd, $J = 1.0, 0.8$ Hz, 1H, H-7).

Anal. Calcd. for $\text{C}_8\text{H}_7\text{NO}$: C, 72.17; H, 5.30; N, 10.52. Found: C, 71.97; H, 5.41; N, 10.41.

The methiodide had mp 183-184° (from methanol-acetone) (colorless needles).

Anal. Calcd. for $\text{C}_9\text{H}_{11}\text{NOI}$: C, 39.29; H, 3.60; N, 5.09. Found: C, 39.09; H, 3.66; N, 4.97.

Ethyl 2-(4-Acetyl-3-pyridyloxy)acetate (9).

A mixture of 4-acetyl-3-pyridinol (**8**) [4] (0.62 g, 4.5 mmoles), anhydrous potassium carbonate (1.0 g) and ethyl bromoacetate (1.21 g, 7.24 mmoles) in dry acetone (10 ml) was refluxed and stirred for 2 hours. After removal of the insoluble materials, the dark brown filtrate was evaporated to leave a brown syrupy residue, which was treated with chloroform and water. The chloroform layer was dried (magnesium sulfate) and evaporated to give 0.52 g of redish syrup. Distillation of the syrup yielded 0.3 g (31.4%) of compound **9** as a yellow oil, bp 130-140° (bath temperature) (0.03 mm Hg); ^1H nmr (deuteriochloroform): δ 1.26 (t, $J = 7.0$ Hz, 3H, OCH_2CH_3), 2.62 (s, 3H, $-\text{COCH}_3$), 4.19 (q, $J = 7.0$ Hz, 2H, OCH_2CH_3), 4.70 (s, 2H, OCH_2COOEt), 7.34 (d, $J = 5.0$ Hz, 1H, H-5), 8.15 (s, 1H, H-2), 8.21 (d, $J = 5.0$ Hz, 1H, H-6).

Anal. Calcd. for $\text{C}_{11}\text{H}_{13}\text{NO}_4$: C, 59.18; H, 5.87; N, 6.27. Found: C, 58.89; H, 6.02; N, 6.10.

3-Methylfuro[2,3-*c*]pyridine (10).

A) A solution of compound **9** (0.4 g, 1.8 mmoles) and sodium hydroxide (0.3 g, 7.5 mmoles) in 50% ethanol (5 ml) was heated on a water bath for 15 minutes. After evaporation of the ethanol *in vacuo* to dryness, the residual mass was refluxed with acetic anhydride (4 ml) and anhydrous sodium acetate (1.0 g) for 2 hours. The excess of acetic anhydride and acetic acid formed were evaporated *in vacuo*, and the residue dissolved in 10 ml of water, basified with 10% sodium hydroxide solution, extracted with

ether and dried (potassium carbonate). The residue of the ethereal solution was distilled *in vacuo* to give 0.10 g (42%) of 3-methylfuro[2,3-*c*]pyridine (**10**), bp 120-130° (bath temperature) (28 mm Hg), as a slightly yellow oil which solidified on cooling in an ice bath; ir (liquid film): 3100 (w), 3060 (m), 3030 (m), 3010 (w), 2980 (w), 2910 (m), 2850 (w), 1605 (m), 1580 (m), 1565 (w), 1465 (s), 1420 (s), 1385 (m), 1345 (m), 1305 (m), 1285 (s), 1260 (m), 1230 (w), 1180 (s), 1080 (s), 1020 (m), 990 (w), 920 (w), 900 (w), 860 (s), 775 (s), 760 (w), 700 (w) cm^{-1} ; ^1H nmr (deuteriochloroform): δ 2.19 (d, $J = 1.2$ Hz, 3H, $\text{C}_2\text{-CH}_3$), 7.35 (dd, $J = 5.0, 0.8$ Hz, 1H, H-4), 7.42 (q, $J = 1.2$ Hz, 1H, H-2), 8.30 (d, $J = 5.0$ Hz, 1H, H-5), 8.71 (d, $J = 0.8$ Hz, 1H, H-7).

Anal. Calcd. for $\text{C}_8\text{H}_7\text{NO}$: C, 72.17; H, 5.30; N, 10.52. Found: C, 71.86; H, 5.69; N, 10.13.

The methiodide had mp 151-153° (from acetone) (colorless prisms).

Anal. Calcd. for $\text{C}_9\text{H}_{10}\text{INO}$: C, 39.29; H, 3.66; N, 5.09. Found: C, 39.12; H, 3.66; N, 4.90.

B) A mixture of compound **9** (0.6 g, 2.7 mmoles) and sodium ethoxide (0.22 g, 3.25 mmoles) in toluene (20 ml) was refluxed with stirring for 7

hours. After evaporation of the solvent, the residual brown mass was dissolved in water acidified with acetic acid and evaporated *in vacuo* to dryness. The brown mass was mixed with copper powder (0.7 g) in a 5-ml flask equipped with an air condenser, and then heated to pyrolyze using a soft flame. The distillate was dissolved in ether, and filtered off the insoluble material. The residue of the filtrate was distilled *in vacuo* to give 0.1 g (28%) of compound **10**, bp 115-120° (bath temperature) (22 mm Hg). The ir and ^1H nmr spectra were completely identical with those of the sample obtained by the method A.

REFERENCES AND NOTES

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