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NOVEL RING TRANSFORMATION OF 6-TRIFLUOROACETYLPYRROLO[1,2-*a*]PYRAZINIUM SALTS TO FORM PYRROLO[1,2-*a*]PYRAZINONES

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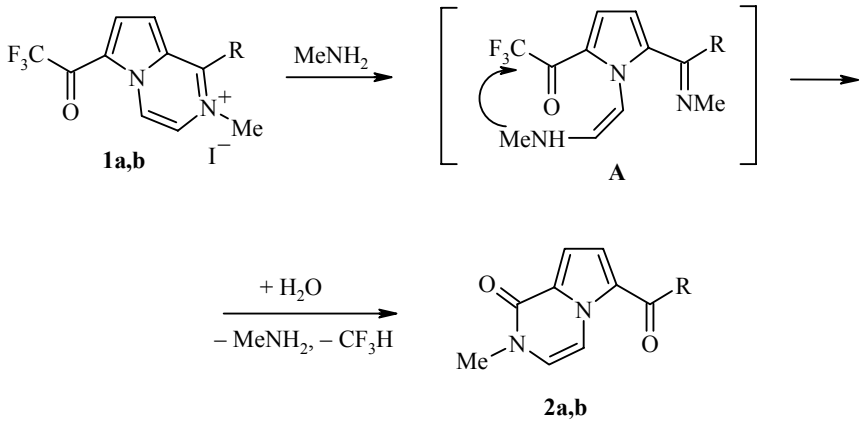
The ability of the pyrazine ring to open when treated with nucleophiles remains little studied. There are a few examples of ANRORC reactions involving the 1,4-diazine ring. Some occur as nucleophilic substitution of the halogen by an amino group, such as in α-halopyrazines [1], others are enamine rearrangements of compounds in the pyrrolo[1,2-*a*]pyrazine series containing a methylene or methine group in the 1 position [2, 3].

We have observed an unusual ring transformation of the pyrazine ring with retention of the type of heterocyclic system. When treated with an aqueous solution of methylamine, the 1-ethyl- and 1-phenyl-6-trifluoroacetylpyrrolo[1,2-*a*]pyrazinium methyl iodides (**1a,b**) are converted to the corresponding 6-acyl-2-methylpyrrolo[1,2-*a*]pyrazinones **2a,b**.

The scheme for such a rearrangement probably includes initial attack by the nucleophile at the positions 1 or 3 of the salt **1a,b**. Subsequent opening of the pyrazine ring leads to intermediate **A**, the enamine group of which attacks the electrophilic center of the trifluoroacetyl group. Cleavage of trifluoromethane leads to products **2a,b**.



1a,b **A** **2a,b**

1, **2 a** R = Ph; **b** R = Et

Conversion of pyrrolo[1,2-*a*]pyrazinium salts to pyrrolo[1,2-*a*]pyrazinones is an ANRORC ring transformation of a previously unknown structural type, occurring with exchange of two exocyclic carbon atoms.

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The ^{1}H NMR spectra were recorded on Varian VXR-400 and Bruker Avance 400 (400 MHz) spectrometers in $CDCl_3$ at a temperature of 28°C, internal standard TMS. The mass spectra were recorded on a Kratos MS-90 with electron impact ionization energy 70 eV. The IR spectra were obtained on a UR-20 spectrometer, CCl4 film. The course of the reaction and the purity of the products were monitored using TLC on Alufol plates in the benzene and 1:1 benzene–ethyl acetate systems.

6-Trifluoroacetylpyrrolo[1,2-*a*]pyrazinium 2-methyl Iodides (General Procedure). A mixture of the corresponding 1-ethyl- or 1-phenyl-6-trifluoroacetylpyrrolo[1,2-*a*]pyrazine (3 mmol) and methyl iodide (5 ml) was heated in a sealed ampul for 5-7 h at 70°C until a precipitate formed. The precipitate was filtered out and washed several times with hot heptane.

6-Acyl-2-methylpyrrolo[1,2-*a*]pyrazinones 2a,b (General Procedure). A mixture of the quaternary salt **1a,b** (1 mmol) and a 40% aqueous solution of methylamine (5 ml) was heated in a sealed glass ampul in a water bath for a few minutes until the salt was completely dissolved. The reaction mixture was allowed to stand overnight for 24 hours until a precipitate formed. The precipitate was filtered out and recrystallized.

6-Benzoyl-2-methylpyrrolo[1,2-*a*]pyrazin-1-one (2a). Yield 78%; mp 211-212°C (acetone). IR spectrum, ν, cm^{-1}: 1630, 1680 (C=O, C=C). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 3.55 (3H, s, N$\underline{CH_3}$); 6.60 (1H, d, J_{34} = 6.1, H-3); 7.09 (1H, d, J_{87} = 3.9, H-8); 7.13 (1H, d, J_{78} = 3.9, H-7); 7.50 (2H, t, *J* = 7.4, *m*-C_6H_5); 7.60 (1H, tt, *J* = 7.4, *J* = 1.2, *p*-C_6H_5); 7.82 (2H, m, *o*-C_6H_5), 8.53 (1H, d, J_{43} = 6.1, H-4). Mass spectrum, *m*/*z* (I_{rel}, %): 252 $[M]^+$ (100), 175 (57), 105 (50) Found, %: C 71.21; H 4.74; N 10.90. $C_{15}H_{12}N_2O_2$. Calculated, %: C 71.42; H 4.79; N 11.11.

2-Methyl-6-propionylpyrrolo[1,2-*a*]pyrazin-1-one (2b). Yield 35%; mp 211-212°C (acetone). IR spectrum, ν, cm^{-1}: 1640, 1660, 1680 (C=O, C=C). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.25 (3H, t, *J* = 7.3, $CH_2\underline{CH_3}$); 2.94 (2H, q, *J* = 7.3, $\underline{CH_2}CH_3$); 3.51 (3H, s, N$\underline{CH_3}$); 6.55 (1H, d, J_{34} = 6.0, H-3); 7.11 (1H, d, J_{87} = 4.3, H-8); 7.26 (1H, d, J_{78} = 4.3, H-7); 8.55 (1H, d, J_{43} = 6.0, H-4). Mass spectrum, *m*/*z* (I_{rel}, %): 204 $[M]^+$ (64), 175 (100), 151 (57), 120 (80). Found, %: C 63.78; H 5.20; N 12.67. $C_{11}H_{12}N_2O_2$. Calculated, %: C 63.70; H 5.92; N 12.63.

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