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SHORT COMMUNICATIONS

New Synthesis of 6,7-Dihydro[1,3]thiazolo[2,3-*f*]purine-2,4(1*H*,3*H*)-diones

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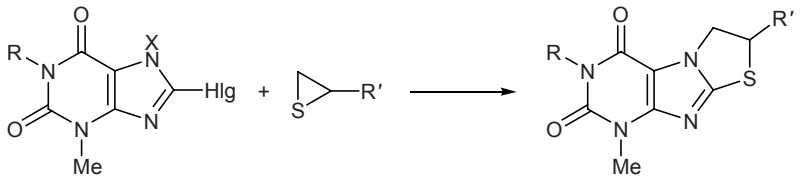
Several methods of synthesis of 6,7-dihydro[1,3]-thiazolo[2,3-*f*]purine-2,4(1*H*,3*H*)-diones have been reported, e.g., from 8-brom-7-(2-haloethyl)-3,7-dihydro-1*H*-purine-2,6-diones and sodium sulfide [1], by reaction of 8-halo-7-(thiiran-2-ylmethyl)-3,7-dihydro-1*H*-purin-2,6-diones with nucleophilic reagents [2], etc. We now propose a new one-step procedure for the preparation of 6,7-dihydro[1,3]thiazolo[2,3-*f*]purin-2,4(1*H*,3*H*)-dione derivatives via reaction of 8-halo-3,7-dihydro-1*H*-purine-2,6-diones with thiiranes. The reactions were carried out in DMF with 8-halo-3,7-dihydro-1*H*-purine-2,6-diones **Ia**–**Ic** as free bases (in the presence of a base) or potassium salts and an equimolar amount of thiirane **IIa**–**IIc**. 6,7-Dihydro[1,3]-thiazolo[2,3-*f*]purine-2,4(1*H*,3*H*)-diones **IIIa**–**IIIc** were thus obtained in 59–68% yield.

The structure of compounds **IIIa**–**IIIc** was confirmed by elemental analyses and ^{1}H and ^{13}C NMR spectra. The properties of compound **IIIa** were consistent with published data [1]. Substituted thiiranes **IIb** and **IIc** gave rise to 7-substituted dihydrothiazolopurines **IIIb** and **IIIc** whose structure was additionally proved by independent synthesis of compound **IIIb** from 8-bromo-1,3-dimethyl-7-(thiiran-2-ylmethyl)-3,7-dihydro-1*H*-purine-2,6-dione and diethylamine [2]. Samples of **IIIb** prepared by the two methods showed no depression of the melting point on mixing, and their ^{1}H NMR spectra were fully identical. Our results indicated that opening of the thiirane ring follows the Krasuskii rule [3].

1,3-Dimethyl-6,7-dihydro[1,3]thiazolo[2,3-*f*]-purine-2,4(1*H*,3*H*)-dione (IIIa). A solution of 2.59 g (10 mmol) of purine **Ia**, 0.56 g (10 mmol) of potassium hydroxide, and 0.60 g (10 mol) of thiirane **IIa** in 40 ml of DMF was heated for 3 h at 45–50°C. The mixture was cooled, and the precipitate was filtered off and washed with water. Yield 1.40 g (59%), mp 259–260°C (from *i*-BuOH) [1]. ^{1}H NMR spectrum, δ, ppm: 3.38 s (3H, 3-CH_3), 3.54 s (3H, 1-CH_3), 3.88–4.00 m (2H, SCH_2), 4.42–4.53 m (2H, NCH_2). Found, %: C 45.56; H 4.33; N 23.18. $C_{14}H_{21}N_5O_2S$. Calculated, %: C 45.37; H 4.23; N 23.51.

7-(Diethylaminomethyl)-1,3-dimethyl-6,7-dihydro[1,3]thiazolo[2,3-*f*]purine-2,4(1*H*,3*H*)-dione (IIIb). A solution of 1.49 g (5 mmol) of purine **Ib** potassium salt and 0.73 g (5 mmol) of thiirane **IIb** in 30 ml of DMF was heated for 1 h under reflux. The mixture was cooled and diluted with water until a solid separated. The precipitate was filtered off and washed with water. Yield 1.10 g (68%), mp 177–178°C (from EtOH). ^{1}H NMR spectrum, δ, ppm: 0.99 t (6H, CH_2CH_3, ^{3}J = 7.1 Hz), 2.55 q (4H, NCH_2CH_3, ^{3}J =



Ia–Ic **IIa–IIc** **IIIa–IIIc**

I, R = Me, Hlg = Br, X = H (**a**), K (**b**); R = H, Hlg = Cl, X = K (**c**); **II**, R′ = H (**a**), Et_2NCH_2 (**b**), $MeOCH_2$ (**c**); **III**, R = Me, R′ = H (**a**), Et_2NCH_2 (**b**); R = H, R′ = $MeOCH_2$ (**c**).

7.1 Hz), 2.78 d (2H, 7-H, ^3J = 7.6 Hz), 3.33 s (3H, 3-CH_3), 3.49 s (3H, 1-CH_3), 4.26 d.d (1H, NCH_2, ^2J = 11.3, ^3J = 6.8 Hz), 4.44 d.d (1H, NCH_2, ^2J = 11.3, ^3J = 7.5 Hz), 4.51–4.61 m (1H, SCH). ^{13}C NMR spectrum, δ_C, ppm: 11.97 (CH_2**C**H_3), 27.83 (1-CH_3), 29.82 (3-CH_3), 47.31 (NCH_2), 49.46 (C^6), 53.42 (C^7), 56.74 (7-CH_2), 106.73 (C^{4a}), 151.15 (C^{9a}), 152.17 (C^2), 153.36 (C^4), 156.82 (C^{8a}). Found, %: C 52.26; H 6.44; N 21.44. $C_{14}H_{21}N_5O_2S$. Calculated, %: C 51.99; H 6.54; N 21.65.

7-Methoxymethyl-1-methyl-6,7-dihydro[1,3]thiazolo[2,3-*f*]purine-2,4(1*H*,3*H*)-dione (IIIc) was synthesized in a similar way from 1.19 g (5 mmol) of purine **Ic** potassium salt and 0.52 g (5 mmol) of thiirane **IIc**. Yield 0.90 g (67%), mp 269–270°C (from EtOH). ^{1}H NMR spectrum, δ, ppm: 3.43 s (3H, OCH_3), 3.51 s (3H, 1-CH_3), 3.67 d (2H, 7-CH_2, ^3J = 6.9 Hz), 4.45 d (2H, NCH_2, ^3J = 5.7 Hz), 4.52–4.62 m (1H, SCH). Found, %: C 45.01; H 4.47; N 20.94. $C_{10}H_{12}N_4O_3S$. Calculated, %: C 44.77; H 4.51; N 20.88.

The ^{1}H and ^{13}C NMR spectra were recorded on a Bruker AM-300 spectrometer at 300 and 75 MHz, respectively, using $CDCl_3$ as solvent and reference. Thiirane (**IIa**) was commercial product (Aldrich). Thiiranes **IIb** and **IIc** were synthesized according to the procedures described in [4] and [5], respectively.

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