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SYNTHESIS OF A NOVEL HETEROCYCLIC SYSTEM: 3-CHLORO-7,8-DIHYDRO[1,4]DIOXINO-[2'',3'':4',5']BENZO[4,5]IMIDAZO[1,2-*c*][1,2,3]THIADIAZOLE

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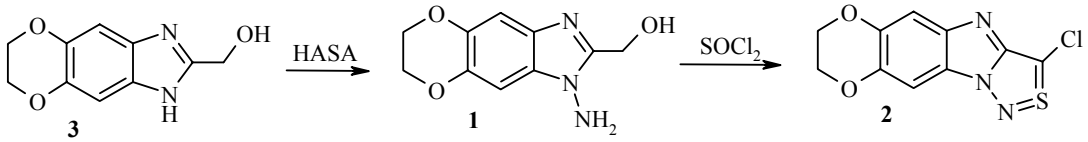
Keywords: benzo[4,5]imidazo[1,2-*c*][1,2,3]thiadiazole, 7,8-dihydro[1,4]dioxino[2",3":4',5']benzo[4,5]-imidazo[1,2-*c*][1,2,3]thiadiazole, thionyl chloride, condensation.

While continuing an investigation of condensed heterocycles including a benzimidazole moiety [1], by condensation of amino alcohol **1** with thionyl chloride we synthesized 3-chloro-7,8-dihydro[1,4]dioxino-[2",3":4',5']benzo[4,5]imidazo[1,2-*c*][1,2,3]thiadiazole (**2**), a representative of a previously unknown heterocyclic system. Compound **1** was synthesized by N-amination of the starting benzimidazole **3** by hydroxylamine-O-sulfonic acid (HASA). In the IR spectrum of thiadiazole **2**, there was no vibration band from an amino group. In the ^{1}H NMR spectra of compounds **1** and **2**, the signal from the methylene protons had the shape of a multiplet, rather than the singlet in the 4 ppm region characteristic of the dioxinobenzimidazole **3**.



The IR spectra were obtained on a Perkin–Elmer Spectrum BX II FT-IR spectrophotometer in nujol; the NMR spectra were obtained on a Varian Unity Inova (300 MHz) in a DMSO-d_6 solution, internal standard TMS.

6,7-Dihydro-1H-[1,4]dioxino[2',3':4,5]benzo[*d*]imidazol-2-yl methanol (3). A mixture of 2,3-dihydro-1,4-benzodioxin-6,7-diamine (16.6 g, 0.1 mol) and glycolic acid (8.36 g, 0.11 mol) in 4 N HCl (200 ml) was boiled for 4 h. Then activated carbon (2 g) was added and the mixture was boiled for another 10 min, filtered, cooled, and alkalinized with concentrated NH_4OH. The precipitate formed was filtered out and washed with H_2O and then recrystallized from methanol. Obtained 12.2 g (59%) of compound **3**; mp 234-235°C. IR spectrum, ν, cm^{-1}: 3150 (NH), 3290 (OH). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 4.22 (4H, s, OCH2); 4.60 (2H, d, *J* = 3, CH_2); 5.63 (1H, t, *J* = 3, OH); 6.92 (2H, br. s, ArH); 11.97 (1H, br. s, NH). Found, %: C 58.54; H 5.11; N 13.82. $C_{10}H_{10}N_2O_3$. Calculated, %: C 58.25; H 4.89; N 13.59.

1-Amino-6,7-dihydro-1H-[1,4]dioxino[2',3':4,5]benzo[*d*]imidazol-2-ylmethanol (1). A mixture of 6,7-dihydro-1H-[1,4]dioxino[2',3':4,5]benzo[*d*]imidazol-2-yl methanol (0.7 g, 3.5 mmol) and potassium hydroxide (0.8 g, 1.2 mmol) in H_2O (20 ml) was heated with stirring at 50°C until a solution was obtained; then a solution of hydroxylamine-O-sulfonic acid (1 g) in H_2O (5 ml), neutralized with $NaHCO_3$ to pH 7, was added.

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The reaction mixture was cooled with ice, keeping the temperature below 40°C. After the exothermic reaction was complete, the mixture was heated for 30 min at 40-50°C. The precipitate formed was filtered out and recrystallized from DMF. Obtained 0.46 g (61%) of compound **1**; mp 203-204°C. IR spectrum, ν, cm^{-1}: 3175, 3198 (NH_2), 3325 (OH). ^1H NMR spectrum, δ, ppm (*J*, Hz): 4.20-4.30 (4H, m, OCH_2); 4.64 (2H, d, *J* = 3, CH_2); 5.30 (1H, t, *J* = 3, OH); 5.82 (2H, s, NH_2); 6.90 and 6.99 (2H, s, ArH). Found, %: C 54.24; H 4.76; N 18.88. $C_{10}H_{11}N_3O_3$. Calculated, %: C 54.30; H 5.01; N 19.00.

3-Chloro-7,8-dihydro[1,4-dioxino[2'',3'':4',5']benzo[4,5]imidazo[1,2-*c*][1,2,3]thiadiazole (2). A mixture of compound **1** (0.16 g, 7 mmol) and thionyl chloride (5 ml) was boiled for 15 min and then evaporated to dryness. The residue was dissolved in water, alkalinized with $NaHCO_3$, and extracted with ethyl acetate. After evaporation, the residue was fractionated chromatographically (Silica gel 60, Fluka) using a 9:1 benzene–ethyl acetate mixture. Obtained 0.042 g (21%) of compound **2**, decomposition temperature >180°C. ^1H NMR spectrum, δ, ppm: 4.36-4.45 (4H, m, OCH_2); 7.37 and 7.59 (2H, s, ArH). Found, %: C 45.03; H 2.51; N 15.89. $C_{10}H_6ClN_3O_2S$. Calculated, %: C 44.87; H 2.26; N 15.70.

REFERENCES

1. S. Tumkevicius, L. Labanauskas, V. Bucinskaite, A. Brukstus, and G. Urbelis, *Tetrahedron Lett.*, **44**, 6635 (2003).