Spiro-bithiazole derivatives of amidinothiocarbamides: Novel utilization of the synthon 2-arylimino-5-carbethoxy-thiazolidin-4-one

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Amidinothiocarbamide and 3-arylamidinothiocarbamides have been used in the synthesis of novel spiro-bithiazoles containing the amidino moiety by interaction with 2-arylimino-5-bromo-5-carbethoxy-thiazolidin-4-ones. In addition, our laboratory has extensively investigated the chemistry and utility of the synthon 2-arylimino-5-carbethoxy-thiazolidin-4-one in the synthesis of a wide variety of heterocyclic moieties. Herein, the reaction of spiro-bithiazole derivatives arrived at by the interaction of I and 2-arylimino-5-bromo-5-carbethoxy-thiazolidin-5-ones 2.

Interaction of amidinothiocarbamide 1a and 2-arylimino-5-bromo-5-carbethoxy-thiazolidin-4-ones 2

The reaction of TNP A (0.02 mol) was carried out under various conditions by using different solvents such as DMF, dichloromethane, methanol, and triethylamine (TEA). Satisfactory results were obtained when the solvent was DMF and tri-n-propyl amine (TPA) was employed.

Interaction of amidinothiocarbamide 1a and 2-arylimino-5-bromo-5-carbethoxy-thiazolidin-4-ones 2

The reaction was carried out under various conditions by using different solvents such as DMF, dichloromethane, methanol, and triethylamine (TEA). Satisfactory results were obtained when the solvent was DMF and tri-n-propyl amine (TPA) was employed. For example, 5-bromo-5-carbethoxy-2-phenylimino-thiazolidin-4-one (2a, 0.01 mole) and amidinothiocarbamide (1a, 0.01 mole) were reacted together in DMF in the presence of TPA (0.02 mole) to afford 3, 8-diaza-4, 9-dioxo-1, 6-dithia-2-guanidino-7-phenylimino-(8H)-spiro [4.4] non-2-ene 3a.

Experimental Section

Melting points were determined in open glass capillaries and are uncorrected. IR were recorded on a Perkin-Elmer 1600 series FTIR spectrophotometer. \( ^1H \) NMR and \( ^13C \) NMR spectra were recorded on a Bruker 500 AMX and Varian VXR 300s (300 MHz) spectrometers using DMSO-d6 as a solvent (D2O studies were carried out wherever required). TLC in various solvents showed the compounds to be homogeneous. All new compounds gave satisfactory elemental analyses within an error of 0.3% from calculated values.

Amidinothiocarbamide 1a and 3-arylamidinothiocarbamide 1b-e and 2-arylimino-5-bromo-5-carbethoxy-thiazolidin-4-ones 2 were prepared by known literature methods.


Amidinothiocarbamide (1a, 0.01 mole, 1.18 g) was dissolved in DMF (15 ml) containing tri-n-propyl amine (TPA, 0.02 mole, 3.79 ml). 5-Bromo-5-carbethoxy-2-phenylimino-thiazolidin-4-one 2a was added in small portions with stirring at room temperature over a period of 15 min. Stirring was continued.
for a further 30 min after which the reaction contents were kept at 100 °C for 4 hr. The reaction mixture was then cooled and poured onto crushed ice to precipitate a yellow compound. It was filtered, washed with cold water and crystallized from aq. ethanol (60%) to afford 3a.

By adopting a similar procedure, the compounds 3b-d were prepared and are included in Table I.

3-Tolylamidinothiocarbamide (1c, 2.08 g, 0.01 mole) was dissolved in DMP (20mL) containing TNPA (0.02 mole, 3.79 mL). 5-Bromo-5-carboxy-2-phenylimino-thiazolidin-4-one 2a was added in small portions with stirring at room temperature over a period of 15 min. Stirring was continued for a further 30 min after which the reaction contents were kept at 100°C for 4 hr. The reaction contents were then cooled and poured onto crushed ice to precipitate 3, 8-diaza-4, 9-dioxo-1, 6-dithia-7-phenylimino-2-(3-tolylguanidino)-(8H)-spiro [4.4] non-2-ene 3f. It was filtered while cold and washed with ice cold water at the pump, air dried and then boiled with several portions of pet. ether (60-80°C) and filtered while hot. The dry powdery material thus obtained was purified by crystallization from a chloroform/pet. ether (60-80°C) mixture (1: 2), m.p. 116°C, yield 80%.

By following the abovementioned procedure, the compounds 3e, g-t were synthesized and are included in Table II.
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References