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Thiazolo-Triazole a nucleus possessing range of pharmacological activities: A review

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Abstract

Thiazolo-Triazole is a fused ring heterocyclic system consisting of three nitrogen atoms and one Sulphur atom shows wide range of biological activities. Thiazolo-Triazole can be synthesized using Regioselective and electro synthesis methods.Thiazolo-Triazole possess wide spectrum of biological activities like including antibacterial, antifungal, anti-inflammatory, anticonvulsant, antidepressant, antihypertensive, analgesic, and Diuretic properties. The present reviews attempted to gather the various developments in synthesis and biological activities of Thiazolo-Triazole derivatives.

Key words: Biological activities, SAR, Thiazolotriazole, Total synthesis.

INTRODUCTION

Thiazole, or 1,3-thiazole, is a heterocyclic compound that contains both sulfur and nitrogen. The term thiazole also refers to a large family of derivatives.Thiazole itself is a pale yellow liquid with a pyridine-like odor and the molecular formula C_3H_3NS. The thiazole ring is notable as a component of the vitamin thiamin.

Molecular and electronic structure

Thiazoles' are members of the azoles heterocycles that includes imidazoles and oxazoles. Thiazole can also be considered a functional group. Oxazoles are related compounds, with sulfur replaced by oxygen. Thiazoles are structurally similar to imidazoles. Thiazole rings are planar and aromatic Thiazoles are characterized by larger pi-electron delocalization than the corresponding oxazoles and have therefore greater aromaticity. This aromaticity is evidenced by the chemical shift of the ring protons in proton NMR spectroscopy (between 7.27 and 8.77 ppm),

clearly indicating a strong diamagnetic ring current. The calculated pi-electron density marks C5 as the primary site for electrophilic substitution, and C2 as the site for nucleophilic substitution.

1,2,4-Triazole is one of a pair of isomeric chemical compounds with molecular formula $C_2H_3N_3$, called triazoles, which have a five-membered ring of two carbon atoms and three nitrogen atoms. 1, 2, 4-Triazoles can be prepared using the Einhorn-Brunner reaction or the Pellizzari reaction.

Einhorn-Brunner reaction

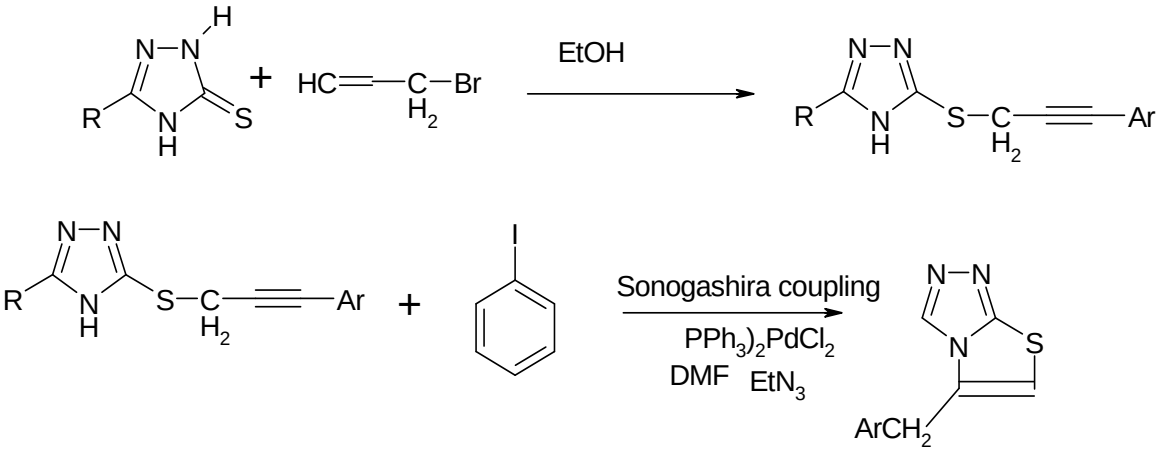
The Einhorn-Brunner reaction is the chemical reaction of imides with alkyl hydrazines to form a mixture of isomeric 1, 2, 4-triazoles. The Pellizzari reaction is the chemical reaction of an amide and a hydrazide to form a 1, 2, 4-triazole.

The fused nucleus of triazole with thiazole moiety gives Thiazolotriazole. It attracts the attention medicinal chemist due to its wide range of activities and safety, efficacy.

Methods of synthesis

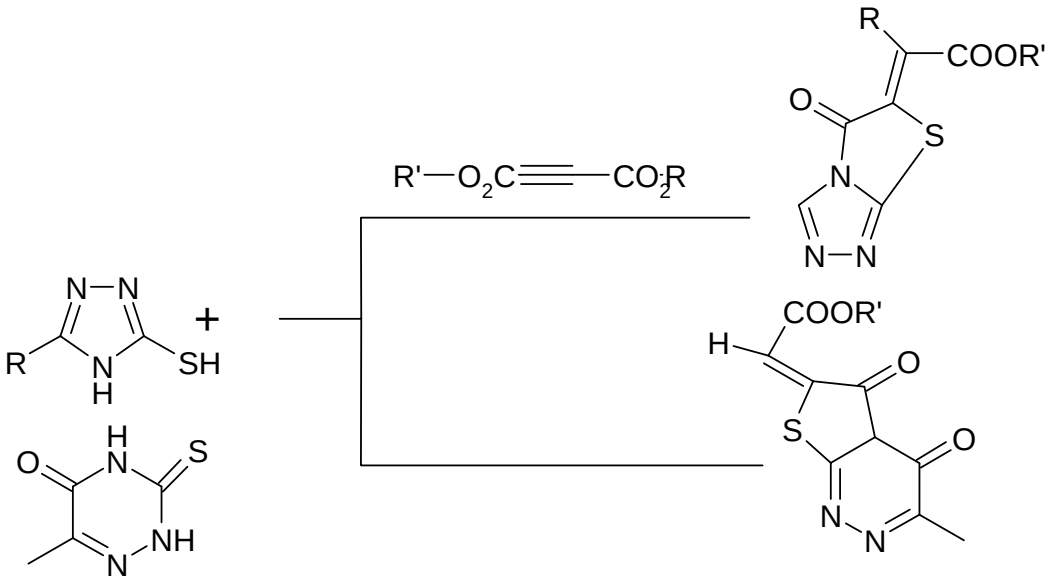
Regioselective synthesis of 6-benzylthiazolo- [3, 2-b] 1, 2, 4-triazoles during Sonogashira coupling

The reaction of 3-mercaptopropargyl-1,2,4-triazoles with various iodobenzenes catalyzed by Pd–Cu leads to the Regioselective formation of 6-benzylthiazolo[3,2-b]1,2,4-triazoles Probably a two-step process had occurred: a standard Sonogashira coupling followed by a Pd(II)-catalyzed intermolecular cyclization of either nitrogen or nitrogen onto the triple bond followed by base-induced aromatization. [1]



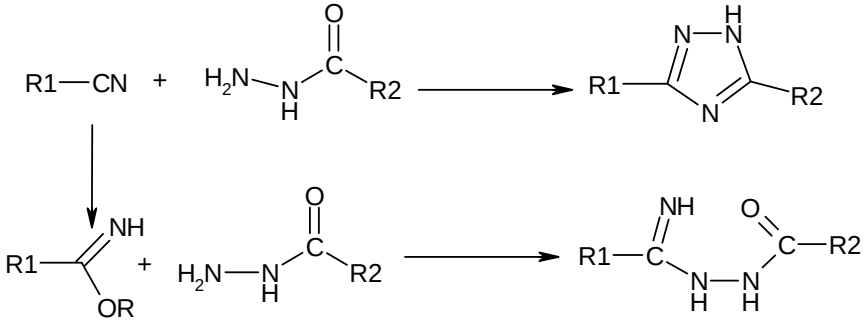
Novel electrosynthesis of a condensed thioheterocyclic system

An efficient and convenient electrosynthesis of thioheterocyclic compounds is described via a onepot, two-component condensation of triazoles with acetylenedicarboxylic acid esters. [2]



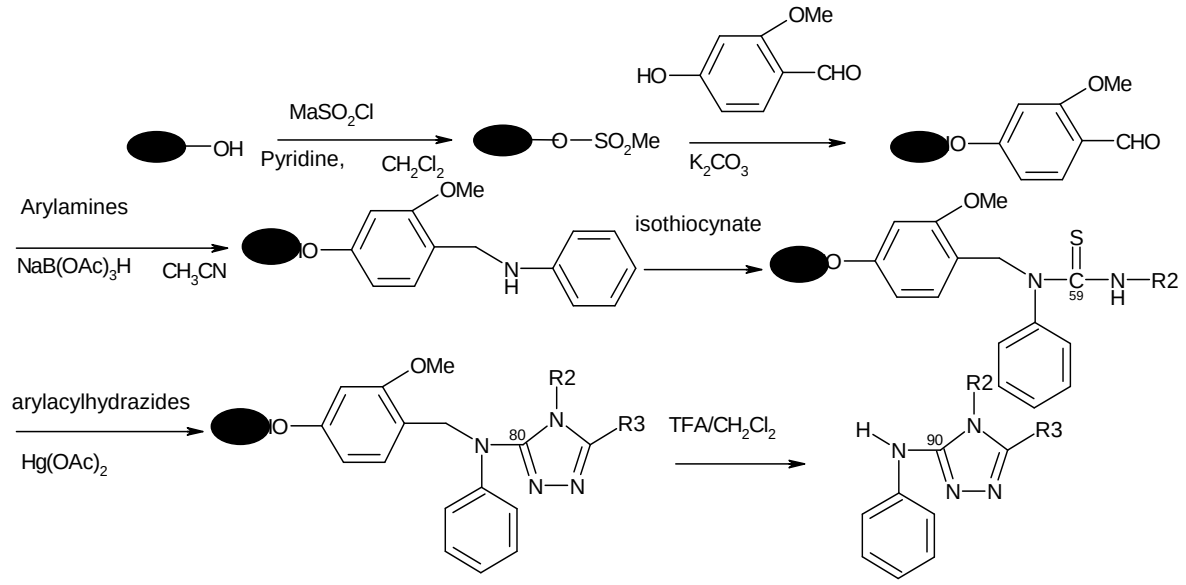
Base-catalyzed, direct synthesis of 3,5-disubstituted 1,2,4-triazoles

A convenient and efficient one step, base-catalyzed synthesis of 3,5-disubstituted 1,2,4-triazoles by the condensation of a nitrile and a hydrazide is presented. A diverse range of functionality and heterocycles are tolerated under the reaction conditions developed, and the reactivity of the nitrile partner is relatively insensitive to electronic effects.[3]



Traceless liquid-phase synthesis

A liquid-phase route to 3-alkylamino-4,5-disubstituted-1,2,4-triazoles has been developed, which permits the incorporation of three elements of diversity. The heterocycle was constructed upon PEG6000 (soluble polymer) modified by 4-hydroxy-2-methoxybenzaldehyde, from which a traceless cleavage could be realized with TFA/CH2Cl2. This method provided a library of 3-alkylamino-4,5-disubstituted-1,2,4-triazoles with reasonable yields and excellent purity.[4]



Solid phase synthesis of Triazole using $FeCl_3$ using Oxidative cyclization

An efficient and mild method for the synthesis of 1,2,4-Triazole by the Oxidative cyclization in the solid state by grinding at room temperature has been described.[5]

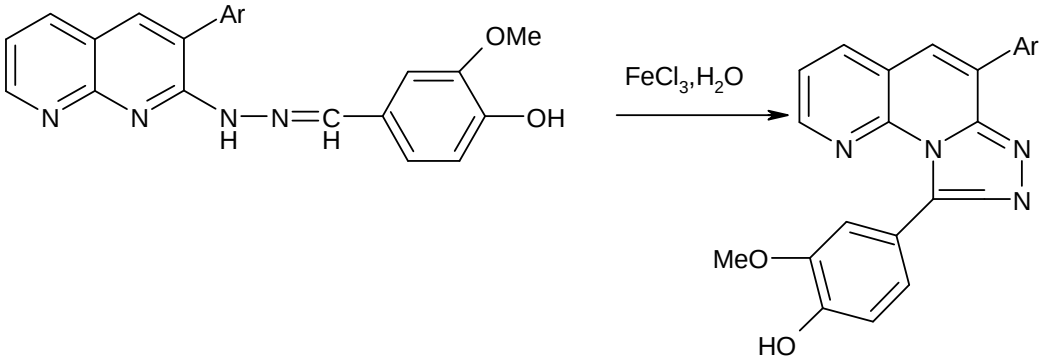
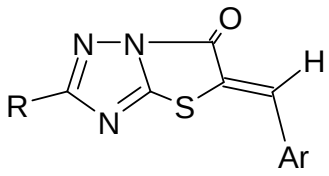
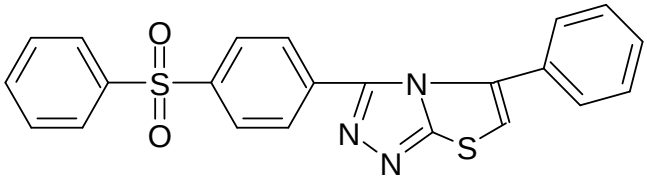
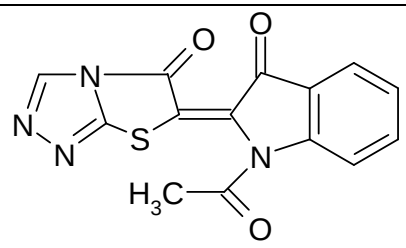
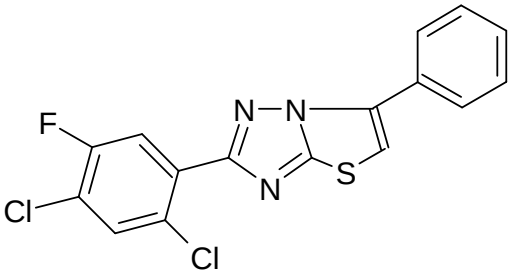
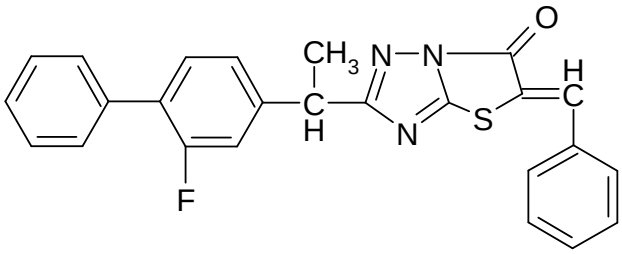
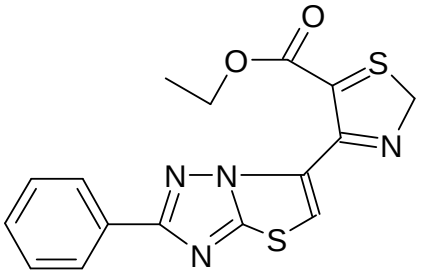
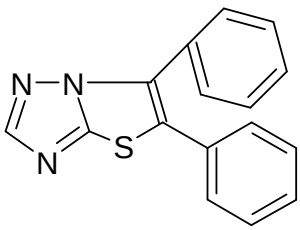
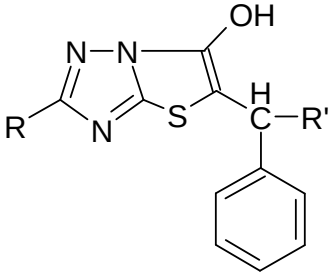
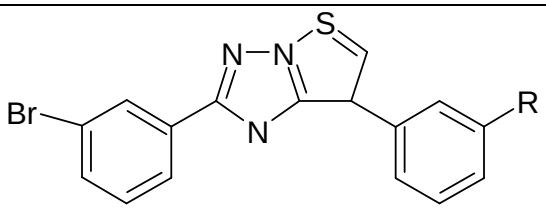


Table no: 1: Various pharmacological activities of Thiazolotriazole derivatives

Sr. No	Authors	Structure	Pharmacological activity
1	Mevlüt Ertan *et al;*2000		anti-inflammatory activity [6]
2	Stefania-Felicia Barbuceanu *et al;*2009		antibacterial activity [7]

3	Roman Lesyk *et al*;2007		Anticancer activity [8]
4	Mari Sithambaram Karthikeyan ;2009		Analgesic activity [9]
5	Tozkoparan B. *et al*;2000		Ulcerogenic activity [10]
6	Jean-François Riou *et al*;2009		Anticancer activity [11]
7	P. Roy *et al*;1997		COX-2 Inhibitors [12]
8	Birsen Tozkoparan *et al*;2002		anti-inflammatory activity [13]

9	J.K.Makrandi et al;2007		Diuretic activity [14]

CONCLUSION

The plethora of research subscribed in this review indicates a wide spectrum of pharmacological activities exhibited by Thiazolo-Triazole derivatives. The biological profiles of these new generations of Thiazolo-Triazoles would represent a fruitful matrix for further development of better medicinal agents. An attempt is made to focus on some synthetic methods of Thiazolo-Triazoles including Regioselective and electro synthesis. It can act as an important tool for medicinal chemists to develop newer compounds possessing Thiazolo-Triazole moiety that could be better agents in terms of efficacy and safety.

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