Triazole and its Pharmacological Activities: A Review

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Abstract

Triazole is important in medicinal and pharmaceutical fields due to its wide spectrum of biological activity. There is an increased requirement for Antimicrobial Agents because of resistance towards conventional antibiotics. Chemistry of Triazole compounds are of interest due to their Synthetic and Effective Biological Properties likes Analgesic, Anti-Inflammatory, Anti-Oxidant, Analeptic, Sedatives, Anti-Anxiety, Anti-Microbial, Anti-Convulsant, Anti-Cancer. Drugs containing the Triazole ring like Voriconazole, Triazolam, Fluconazole, Intra Conazole, Furacylin, Alprazolam, Etizolam etc are available in market. This review will be helpful to develop new Triazole compounds with better efficacy and lesser toxicity.

Keywords: Triazole, heterocyclic drugs, Biological Activities**.**

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Introduction

Triazole is one of a class of organic heterocyclic compounds containing a five-membered ring structure composed of three nitrogen atoms and two carbon atoms at nonadjacent positions. Triazole and its derivatives are used for biological activities such as antiviral, antibacterial, antifungal and Anti-tuberculosis. Mostly 1,2,4-triazole **(1)** and 1,2,3-triazole **(2)** are very important in the pharmaceutical industry. Heterocycles bearing symmetrical Triazole ring **(1)** is reported to show a broad spectrum of biological activities.

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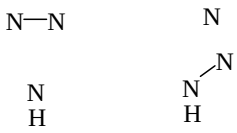


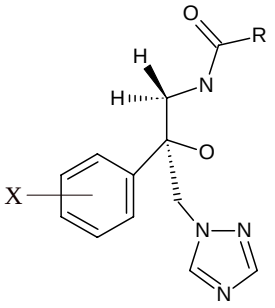
1,2,4-triazole 1,2,3-triazole

1 **2**

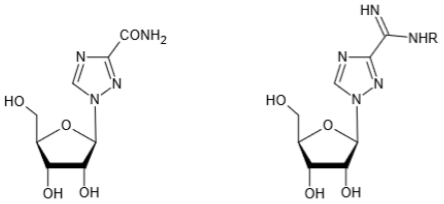
The derivatization of Triazole ring is based on the phenomenon of Bioisosterism in which replacement of oxygen of oxadiazole nucleus with nitrogen atom yields Triazole analogue. The first synthesized clinical useful 1,2,4-triazole which is known as ‘amitrole’. Some novel 1,2,4-triazole act as internal standard inhibitors for nitric oxide synthase in rat plasma and urine**[1]**.

PHARMACOLOGICAL ACTIVITY OF TRIAZOLE

1. **HERBICIDES AND DEFOLIANTS** "3-Amino-1*H*-1,2,4-triazoles: are used as Herbicides and Defoliants also, they were described as catalase inhibitors **[2][3]**. Some Enantiomeric forms of Triazole containing oxazolidine rings were active against *C. Albicans* infections **[4]**.



2. **ANTIVIRAL AGENT** "Ribose N-glycoside" **[5-8]** is an Antiviral Agent with "3-aminocarbonyltriazole", active against both RNA and DNA viruses. This agent is used in aerosols for Lower Respiratory Tract Viral Disease, influenza.



3. **ANGIOTENSIN II RECEPTOR ANTAGONISTS** Triazole derivatives are used to increase the blood pressure. Furthermore,1,2,4-triazole derivatives have been reported as Fungicidal **[12]**, Insecticidal **[13]**, Antimicrobial **[14,15]**, And Anti-Asthmatic **[16]** Agents, Anti-Convulsant **[38]**, Anti-Depressants And Plant Growth Regulators. Moreover, Vorozole, Letrozole, And Anastrozole, appeared to be very effective Aromatase Inhibitors, which in turn prevented Breast Cancer **[18-20]**. 1,2,4-triazole also interact strongly with heme iron and aromatic substituent group on the Triazoles ineraction with active site of Aromatase **[21]**.

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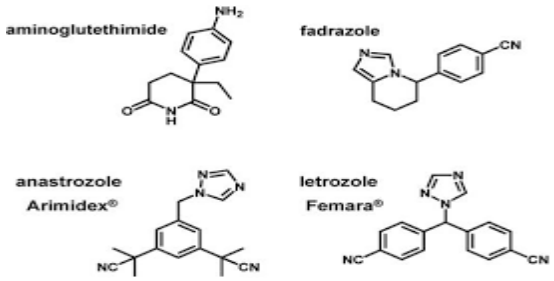
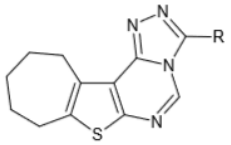


4.ANTI-THYROID ACTIVITY "*S*-Triazolo[1,5-*c*]pyrimidines" are potential therapeutic agents **[22,23]** "3-amino-1,2,4-Triazole" (ATZ), "3-mercapto-1,2,4-Triazole" (MTZ) and "3-nitro- 1,2,4-Triazole" (NTZ) derivativeWITH EFFICIENT Anti-thyroid Activity **[24]**,**[25] "**thienopyrimido-1,2,4-triazoles" were synthesized.



5. **ANTI-HIV ACTIVITY** Al-Masoudi *et al* **[27]** synthesized new Schiff base ligand derived from "5- amino-4-phenyl-4*H*-1,2,4-triazole-3-thiol" and evaluated theirs in-vitro Anti-HIV activity.

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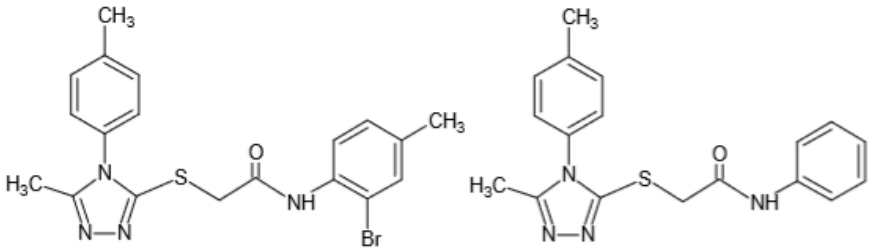
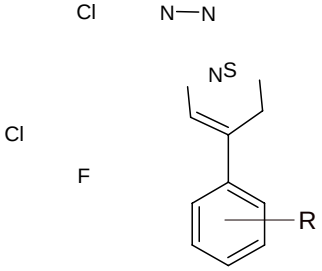
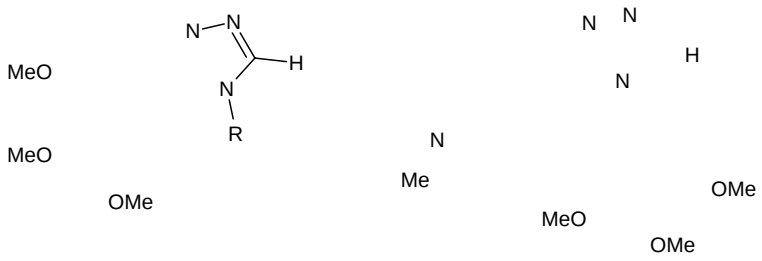


6. ANTI-TUMOR ACTIVITY "3-(3-mercaptoalkyl-7*H*-[1,2,4]triazole[3,4-*b*][1,3,4]-thiadiazin-6-yl)chromen-2-one" and inferred as a potential Anti-Tubercular, Anti-viral and Anti-cancer Agent **[28]**. "1,2,4-triazoles" carrying "2,4-dichloro-5-fluorophenyl" moiety and evaluated Antitumor Activity **[29]**.



"1,2,4-Triazole" derivative as a potent microtubule polymerization inhibitor with potent Anti-Proliferative and Anti-Tumor Activity **[30]**.

7. TUBULIN POLYMERIZATION INHIBITORS Zhang *et al* have synthesized Triazole derivatives and inferred that compounds possess potent Triazole inhibit tubulin polymerization **[31]**.



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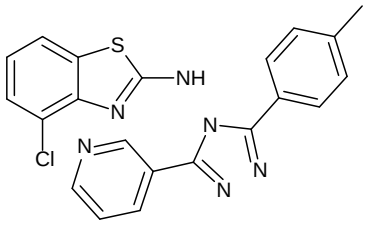
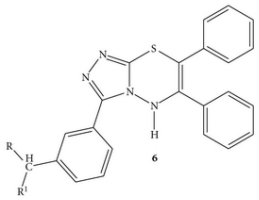
Ouyang and co-worker have synthesized
'1,2,4-triazoles' as a novel class of potent inhibitor of tubulin polymerization **[32]** and studied its SAR.

8. ANTI-INFLAMMATORY ACTIVITY Shehry M.F.*et al* have synthesized a series of "3-(2,4-dichlorophenoxy)methyl)-1,2,4-triazolo(thiadiazoles and thiadiazines)" **[33]** and screened for Anti-Inflammatory Activity.Among the synthesizedcompound"3((2,4dichlorophenoxy)methyl)6(4methoxyphenyl)[1,2,4]triozolo[3,4b](1,3,4)thiadiazole,3,6-Bis((2,4-dichlorophenoxy)methyl)-[1,2,4]triazolo[3,4-b]-[1,3,4]thiadiazole,3-((2,4-Dichlorophenoxy)methyl)-6phenyl7*H*[1,2,4]triazole[3,4-b][1,3,4]thiadiazine and 3-((2,4-Dichlorophenoxymethyl)-7-((3-benzofuran-2-yl)-1-phenyl-1H-pyrazol-4-yl)methylene)-6-(benznofuran-3-yl)-7*H*-[1,2,4]triazolo[3,4-b][1,3,4]thiadiazine" gave anti inflammatory activity.



9. **ANTI- INFLAMMATORY AGENTS** Aytac et. al. have synthesized "3,6-disubstituted-4*H*-1,2,4- triazolo[3,4-b]-1,3,4-thiadiazine"s as potent Analgesic and Anti- Inflammatory Agents **[36]**.



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Abdel-Megeed *et al* **[37]** did molecular modeling studies with acetylated 1,2,4-triazole-3-acetates**,** newer analogues of 4-hydroxyphenyl acetic acid with 1,2,4-triazole have been prepared with potential anti-inflammatory activity.

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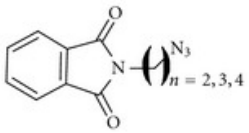
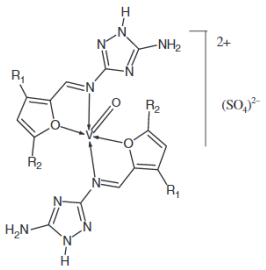
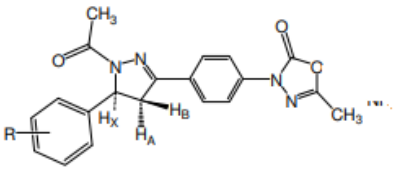


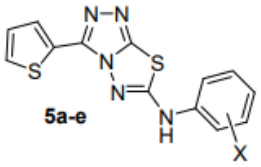
10. ANTI-CONVULSANT ACTIVITY Lee *et. al.* synthesized "3- Substituted-4-(4-hexyloxyphenyl)-4*H*-1,2,4- triazoles" and evaluated Anticonvulsant activity **[38]**.



11. ANTIHAEMOSTATIC ACTIVITY Kamble *et. al.* have synthesized 1,2,4-triazoles incorporating 1,2,4-triazine ring was evaluated for Anti-haemostatic activity **[39]**.



12. ALZHEIMER DISEASE Shiradkar *et. al.* have synthesized "1,2,4-Triazole" derivatives as approach to "cyclin-dependent kinase 5/p25 inhibitors" for the potential treatment of Alzheimer disease[40].



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