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Review on Antimicrobial Activity of Pyrimidine



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ABSTRACT

Pyrimidine is two nitrogen-containing heterocycles have a presence in several important biological molecules like nucleic acid, enzymes. Pyrimidine compounds are known for various biological activities like antifungal, antimicrobial and anticancer. Here we are reviewing the antimicrobial activity of pyrimidine derivatives.



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INTRODUCTION

Pyrimidine is one of the most researched heterocycles due to its potent biological properties and its presence in important biomolecules like protein, enzyme, and nucleic acids. The structural resemblance with biological molecules can show important biological interactions and can utilize for the development of potent antimicrobial agents. Pyrimidine compounds are known for various biological activities like antiviral, anticancer, anti-inflammatory and many more. Many therapeutic agents were found to contain Pyrimidine nuclei like gemcitabine, buspirone, thonzylamine, Etravirine, enazadrem, iclaprim, rosuvastatin, stavudine (anti-HIV) and raltegravir (anti-HIV) as shown in figure no 1.

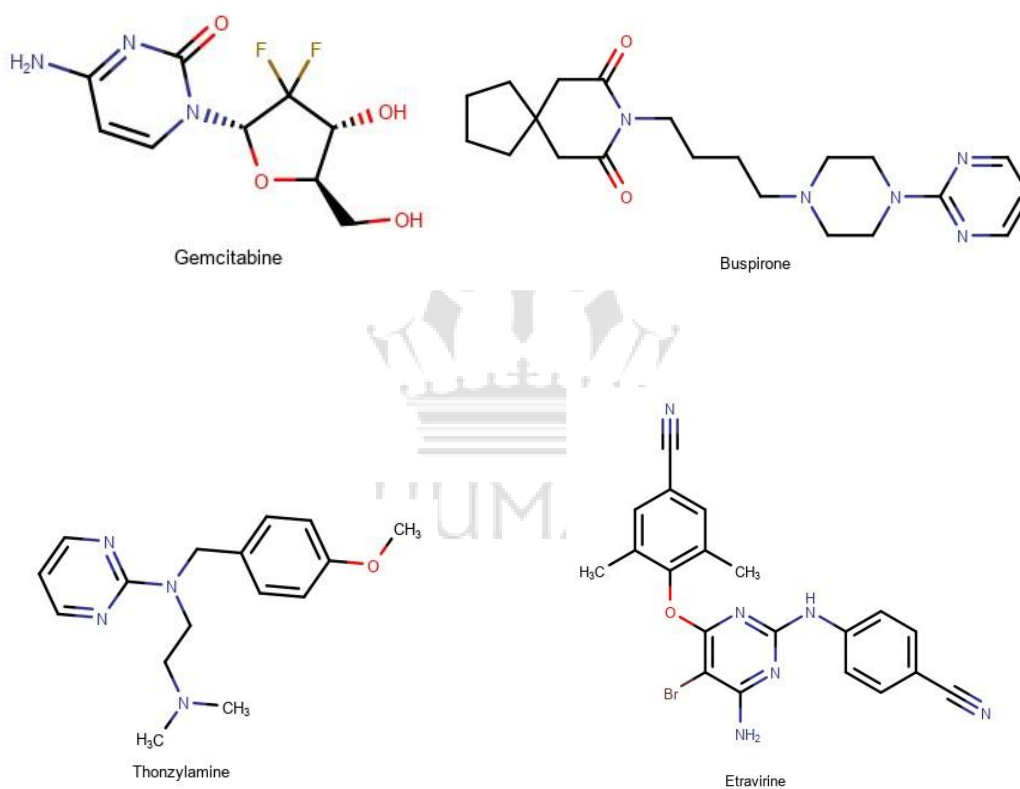
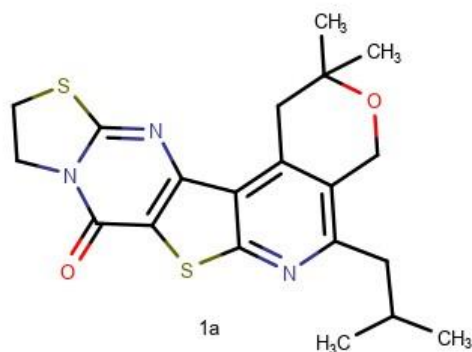


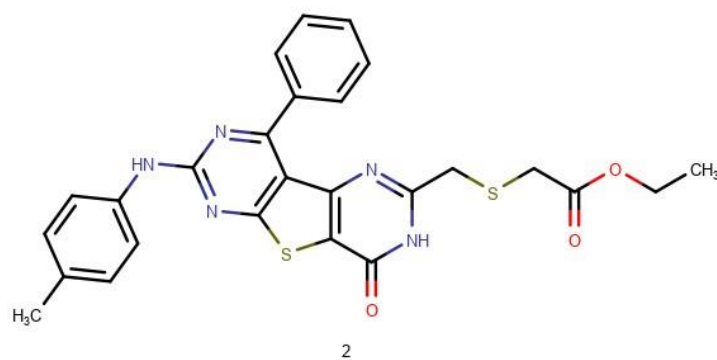
Figure no 1: Pyrimidine nucleus containing therapeutic agents

The number of pyrimidine derivatives with potent antimicrobial potency has been reported. Here we have summarized some antimicrobial applications of the pyrimidine.

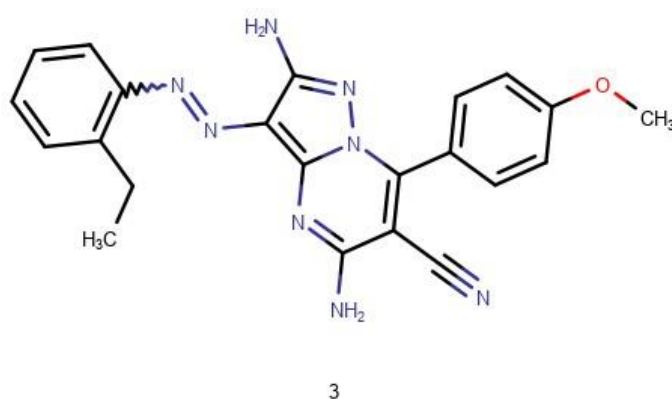
Sirakanyan et.al.(2019)reported the antimicrobial activity of novel pyrano[4'',3'':4',5']pyrido[3',2':4,5]thieno[3,2-d]pyrimidine. 18,18-dimethyl-14-(2-methylpropyl)-17-oxa-5,11-dithia-3,8,13-triazapentacyclo[10.8.0.0^{2,10}.0^{4,8}.0^{15,20}]icosa-1(20),2(10),3,12,14-pentaen-9-one (1a) is potent compounds observed in the series.



Saber et. al. (2020) reported the synthesis of various heterocycles containing thieno[2,3-d]pyrimidine (2). The developed compound showed excellent antimicrobial activity.

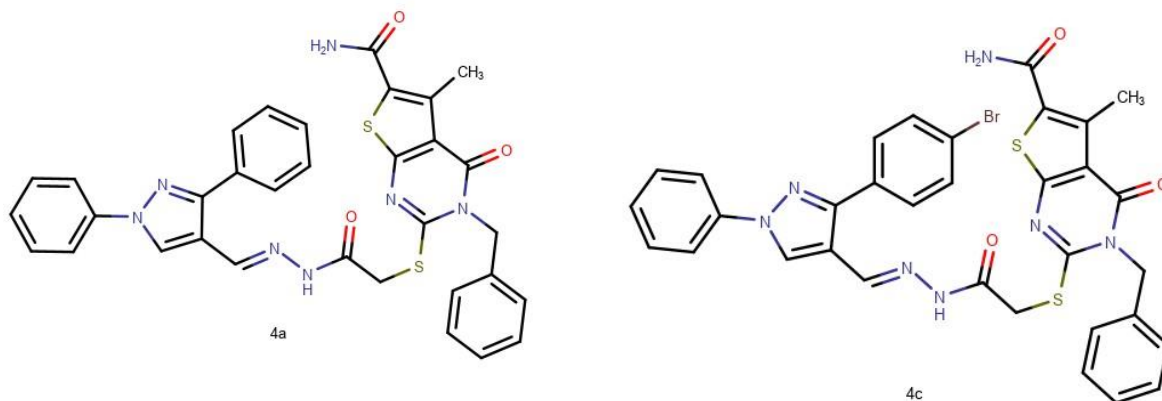


Ismail et. al. (2020) reported antimicrobial activity of New Arylazopyrazole and Arylazopyrazolo[1,5-a]pyrimidine (3) derivatives. All the compounds developed in the series have shown good antimicrobial activity.

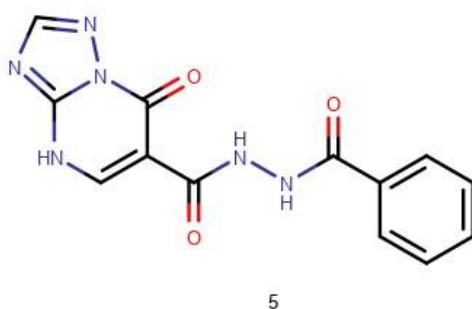


Some 3,4- Dihydrothieno[2,3-d]pyrimidine derivatives as potential antimicrobial agents have been developed by Shaaban et. al. (2019). (E)-3-benzyl-2-{2-[2-((1,3-diphenyl-1H-pyrazol-4-yl)methylene)hydrazinyl]-2-oxoethylthio}-5-methyl-4-oxo-3,4-dihydrothieno[2,3-

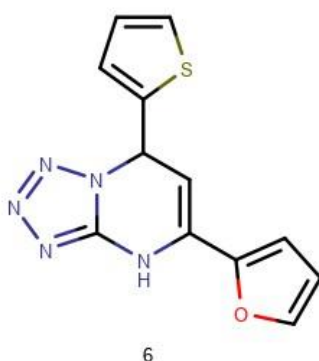
d]pyrimidine-6-carboxamide (4b), (E)-3-benzyl-2-[2-[(3-(4-bromophenyl)-1-phenyl-1H-pyrazol-4-yl)methylene]hydrazinyl]-2-oxoethylthio]-5-methyl-4-oxo-3,4-dihydrothieno[2,3-d]pyrimidine-6-carboxamide (4c) are some of the active compounds which are developed.



George et. al.(2019) reported the development of 1,2,4-triazolo[1,5-a]pyrimidine derivatives as antimicrobial, N'-Benzoyl-7-oxo-4,7-dihydro-1,2,4-triazolo[1,5-a]pyrimidine-6-carbohydrazide (5) is the promising antimicrobial agent.



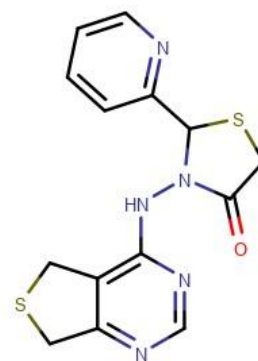
Radwan et. al. (2019) reported the development of the new fused Pyrimidine and Pyridine derivatives as antimicrobial agents. 5-(Furan-2-yl)-7-(thiophene-2-yl)-4,7-dihydro-1,2,4-triazolo[1,5-a]pyrimidine(6) found to be promising agent.



Arshad et. al. (2020) reported the development of 1, 3-thiazolidin-4-one derivatives bearing pyrimidine moieties as antimicrobial agents. 3-(5,7-dihydrothieno[3,4-d]pyrimidin-4-ylamino)-2-(4-hydroxyphenyl)-1,3-thiazolidin-4-one (7a), 3-(5,7-dihydrothieno[3,4-d]pyrimidin-4-ylamino)-2-(pyridin-2-yl)-1,3-thiazolidin-4-one (7b) are potent molecules.

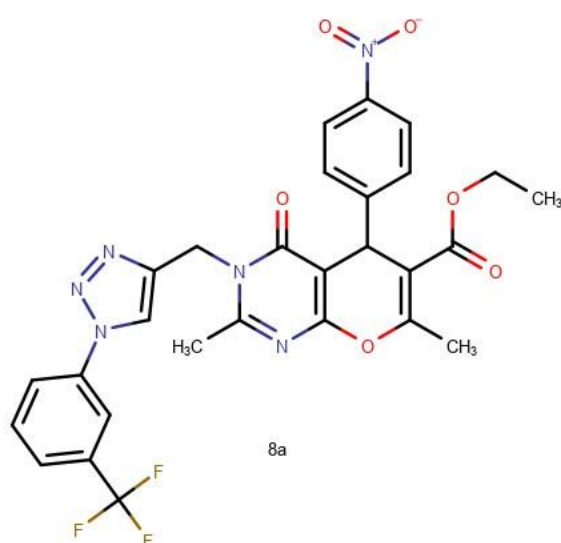


7a

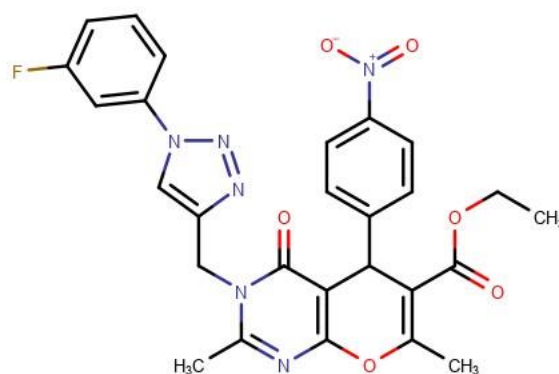


7b

Maddila et. al. (2020) reported the development of pyrano[2,3-d]-pyrimidine bearing 1,2,3-triazoles as antimicrobial agents. Ethyl 2,7-dimethyl-5-(4-nitrophenyl)-4-oxo-3-((1-(3-(trifluoromethyl)phenyl)-1H-1,2,3-triazol-4-yl)methyl)-4,5-dihydro-3H-pyrano[2,3-d]pyrimidine-6-carboxylate (8a), Ethyl 3-((1-(3-fluorophenyl)-1H-1,2,3-triazol-4-yl)methyl)-2,7-dimethyl-5-(4-nitrophenyl)-4-oxo-4,5-dihydro-3H-pyrano[2,3-d]pyrimidine-6-carboxylate (8b) are potent molecules.

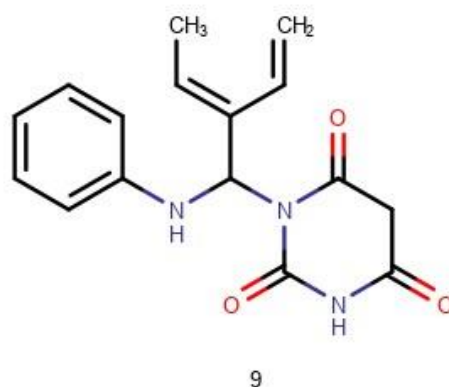


8a

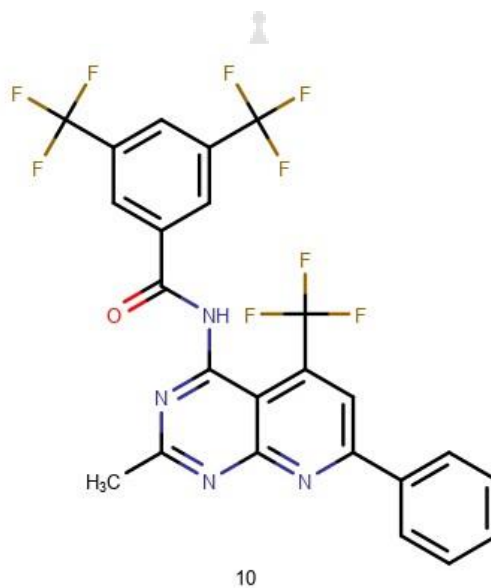


8b

Selvaraj et. al.(2020) reported the synthesis and antimicrobial studies of 1-[anilino (phenyl) methyl] pyrimidine-2, 4, 6-trione which is derived from the Mannich reaction.



Karpoornath et. al.(2019) reported heterofused pyrimidine analogs as antimicrobial agents. N-(2-methyl-7-phenyl-5-(trifluoromethyl)pyrido[2,3-d]pyrimidin-4-yl)-3,5-bis-trifluoromethylbenzamide was found to be active compound.



SUMMARY:

Pyrimidine is one of the most researched heterocycles due to its potent biological properties and its presence in important biomolecules like protein, enzyme and nucleic acids. The structural resemblance with biological molecules can show important biological interactions and can utilize for the development of potent antimicrobial agents.

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