

BIOLOGICAL ACTIVITIES FOR HETEROCYCLIC COMPOUNDS WITH AN EMPHASIS ON PYRIDINE AND ISOXAZOLE NUCLEUS

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Abstract : Heterocyclic compounds containing nitrogen and Oxygen as hetero atoms are an important class of compounds largely employed in pharmaceutical and therapeutic field. A cyclic organic compound containing all carbon atoms in the ring formation is called as carboxylic compound. At least one atom other than carbon like nitrogen, Sulphur, Oxygen in the carboxylic ring constitutes a heterocyclic compound. These compounds generally consist of small (3 and 4 membered) and common (5 to 7 membered) ring system. This method of ring transformation is a deviation from the classical synthetic procedure.

Keyword: Heterocyclic compounds, Pharmaceutical, ring formations, carboxylic ring.

I. INTRODUCTION

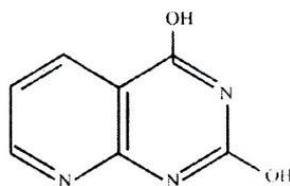
Heterocyclic compounds constitute an important class of compounds forming more than half of the organic compounds known. A cyclic organic compound containing all carbon atoms in the ring formation is called as carboxylic compound. At least one atom other than carbon like Nitrogen, Sulphur, Oxygen in the carboxylic ring constitutes a heterocyclic compound. These compounds generally consist of small (3 and 4 membered) and common (5 to 7 membered) ring system. Aromatic Heterocyclic compounds in contrast are those which behave like benzene in some of their properties. Heterocyclic ring are major compounds of biological molecules like – DNA, RNA, Chlorophyll, Nucleotides – Purines, Pyrimidines, Hemoglobin and vitamins. Wide range of applications of Heterocyclic compounds are in Pharmaceuticals, Agrochemicals, Veterinary Products, Sanitizers, Developers, Antioxidants, Corrosion Inhibitors, Copolymers, Dyes, Alkaloids – Vinblastine, morphine, reserpine etc., Metronidazole, Azidothiamidine, Barbiturates, Antipyrine, Captopril, Methotrexate, etc.

These can broadly classified as –

1. Anti-Inflammatory - Reduce inflammation and pain
 - Do not affect CNS System
 - Pyrimidine & Triazine derivatives show this property

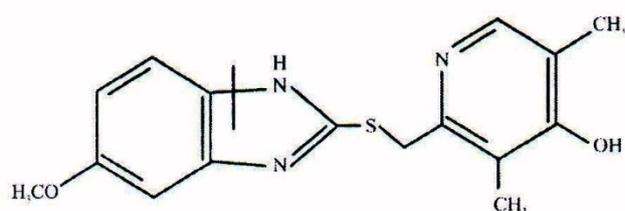


Triazine



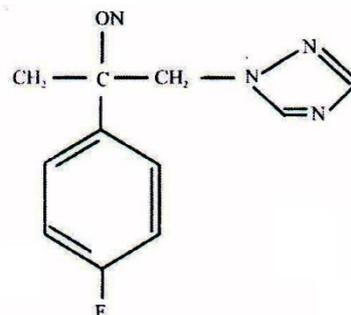
Pyrido [2,3, -d] pyrimidine

2. Anti-ulcer activity - Reduce excess acidity in stomach
 - Substituted benzimidazole compounds
 - Omeprazole analogs



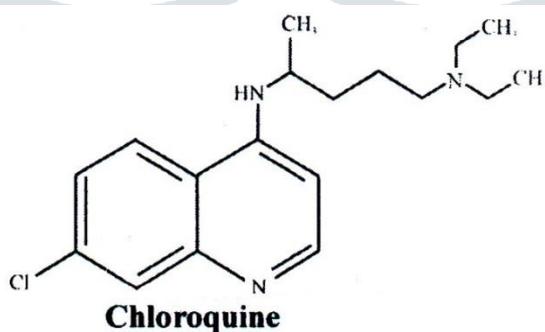
Omeprazole

Pantoprazole



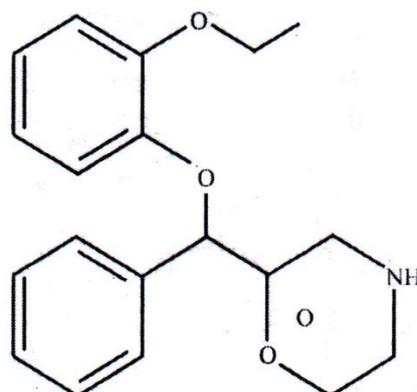
Pantoprazole

3. Anti-malarial Activity - Quinine and its derivatives
 - Lower toxicity



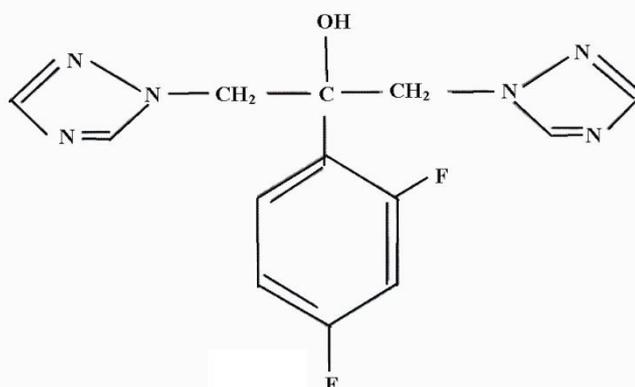
Chloroquine

4. Antibacterial Activity – Caused by unicellular organism like bacteria.
 – Triazine derivatives

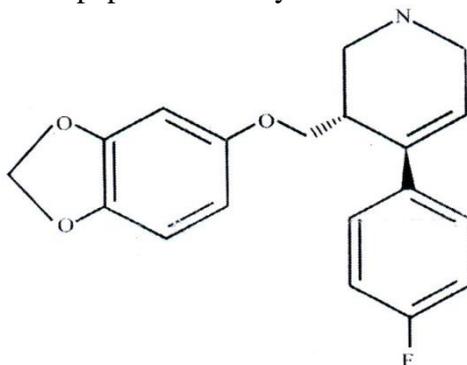


Raboxitine

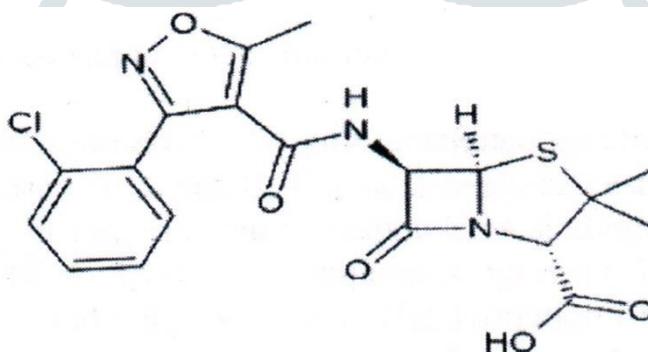
5. Antifungal activity – Micro-organisms like cadila, aspergillus, Zygomcetes etc. cause fungal diseases.
 - Triazole drugs–hexaconazole, Isavuconazole epoxiconazole etc.



6. Antidepressant – Treat depression and mood disorders
- Nano – peptide heterocyclic molecules show this activity



7. Anticancer – abnormal & uncontrolled cell division causes tumour & cancer
- Caused by agents like chemical compounds and radiant energy
 - Quinazoline derivatives show this property.



(Cloxacillin)

II. EXPERIMENTAL

Elemental analysis was carried out by elemental analyser vario EL III, I. R. Spectra was performed by IR-Prestige 21 FTIR spectrum. The visible absorption spectra were recorded on UV-visible spectrophotometer. Perkin Elmer Lambda -25 and NMR spectra (CD Cl₃) on Varian A-60 spectrophotometer with TMS as an internal standard. Mass spectra were measured on JEOL – JMS D-300 spectrometer. Silica gel used for chromatography was 60-120 CE 74 JD (800 W) unmodified domestic oven.

Some marketed drugs with pyridine and isoxazole nucleus with their applications.

Pyridine:

- | | |
|---------------------------------------|---|
| 1. Bacterial and viral infection drug | - SULFAPYRIDINE |
| 2. Anti-histamine drug | - TRIPELENAMINE and MEPYRAMINE |
| 3. Anti-tuberculosis drug | - PIROXICAM, TENOXICAM,
CELECOXIB PYRAZOLONES, PHENYL
BUTAZONE, STREPTONIGRIN,
STREPTONIGRONE AND LAVENDAMYCIN |

2. ISOXAZOLE:

- | | | |
|-------------------------|---|---------------------------------|
| 1. Rheumatoid Arthritis | - | LEFLUNOMIDE |
| 2. Osteoarthritis | - | VALDECOXIB |
| 3. Antibiotic | - | ACETYLSULPISOXAZOLE CYCLOSERINE |
| 4. Antibacterial | - | DRAZOXOLON CYCLOSERINE |
| 5. Antidepressant | - | GABOXADOL ISOCARBOXAZID |
| 6. Anti-inflammatory | - | VALDECONE |
| 7. Anti-tumour | - | ACUCIN |

Selection of Pyridine and Isoxazole molecules

Pyridine:

- Pyridine derivatives containing multi-functional groups can be used as drugs.
- Naturally occurring pyridine derivatives include icotinamide, pyridoxine (Vit, B₆), nicotine and NAD (Nicotinamide Adenine Dinucleotide)

Isoxazole:

- Isoxazole being an azole with oxygen atom next to Nitrogen, exhibits broad spectrum biological activity.
- Substituted isoxazoles are considered to be important syntheses due to their versatility towards chemical transformations.
- Show hypoglycemic, analgesic, anti-inflammatory, anti-fungal, anti-bacterial and HIV-inhibitory activities.
- Isoxazole derivatives are utilized as building blocks and can be transformed to more potent molecules.
- Isoxazole derivatives and their substations affect diverse biological activities.

Synthesis:

There are two methods for synthesis of for polysubstituted pyridines and isoxazole nucleus such as classical and alternative methods. Classical methods describes precursor containing required ring system and an alicyclic heterocompound as starting substance. The alternative methods are synthesis of heterocyclic compounds by ring inter conversion i.e. ring contraction, ring retention and ring expansion. The formation of the starting compound is pyrone of pyran-2-one.

III. CONCLUSION

Synthesis of polysubstituted Pyridine and Isoxazole gives a synthetic route for the formation of biologically active molecules with prominent therapeutic effect. Thus synthesizing drugs beneficial to the society, Pyridines and Isoxazole are an important pharmacophore in modern drug discovery. Changing of the substituent on these moieties the scope for the formation of new molecule is expanded. Thus, the topic still open for further research the work came out will be relevant to present day demand and need of the society too.

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