National Conference on New Trends in Green Chemistry and Environmental Science
In Association with International Journal of Scientific Research in Science and Technology
Volume 9 | Issue 8 | Print ISSN : 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)

A Review on Biological Significance of 4-Aminoantipyrine (An Antipyrine derivative)

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ABSTRACT

The derived from 4-Aminoantipyrine and its derivatives havelarge importance in medicinal, pharmaceutical as well as industrial field as is to be specificantiviral, antibacterial activity, antifungal activity, anticancer activity,antipyretic activity, antitumor activity, pestricides, as complexing agents etc.

Thenovelschiff basesbased on the 4-Aminoantipyrine and their d-block metal complexes are very much effective compounds. The biological superb importance of these metal complexes revealed that these molecules are also effective or productive against various strains of microorganisms. Schiff base complexes exhibitoutstanding catalytic activity in several types of reactions, their thermal stability is chief aspect for their applications as an activator or catalyst.

This article reported that thebriefsummary of biological significance of Schiff bases and metal complexes based on 4-Aminoantipyrine.

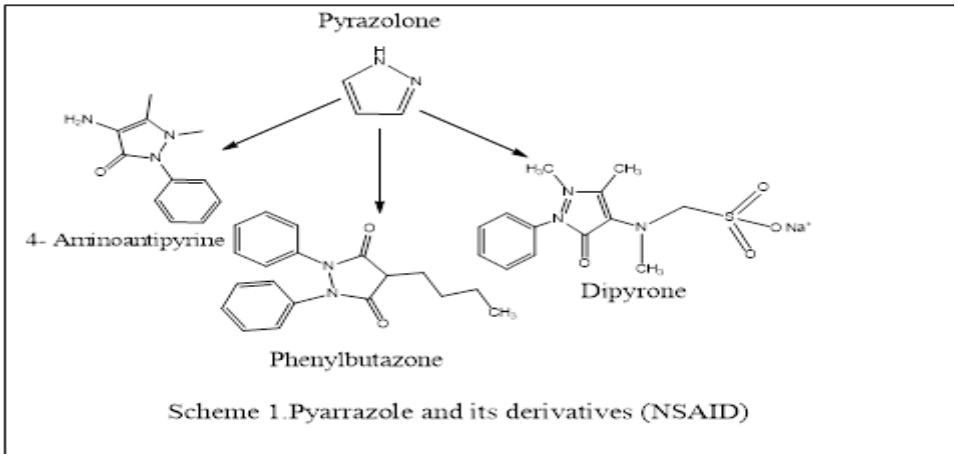
Keywords: 4-Aminoantipyrine, Pyrazole, NSAID, Schiff bases, metal complexes Anticancer, DNA.

I. INTRODUCTION

In recent day's heterocyclic compounds are attracting to the researcher towards them due to many reasons, among them mainly of their biological activities or pharmacological activities especially antifungal, antimicrobial, antidiabetics, anti HIV, anticancer, DNA binding, DNA cleavage etc. Because of these things scientist and research student are centralized on heterocyclic compounds (cyclic ring containing N, O or S atoms,). Many drugs are builts up by heterocyclic units. Some of the donor atoms such as nitrogen, oxygen, sulfur, azomethine nitrogen, amino-nitrogen and phenolic or alcoholic oxygen plays very important role in concerned with bioactivity.

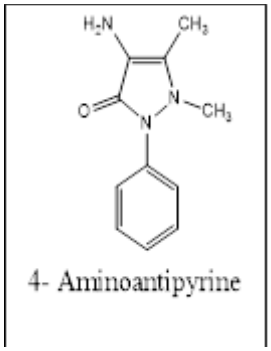
In the last few decades researcher have mainly focused on the Schiff bases derived from heterocyclic ring with carbonyl compounds, as its important special centre of attraction in many areas like medicinal, biological, analytical, clinical and pharmacological field [1-3]. Among them 4-aminoantipyrine based heterocyclic compounds have an extremely appreciated as it is originate in nature and have extensive biological or pharmacological activities [4],thederivative of pyrazolecalled as 4-Aminoantipyrine which is

actually temperature reducing agent [5]. It also utilizedfor the constitution of azo compounds (-N=N-) is usedas cytotoxic agents, as in printing industries [6]. Pyrazolone (N-heterocyclic compound) is an active moiety which evolves an important activity against arthritis, joint disorders as well as other musculo-skeletal disorders. Earlier work of many scientists revealed that some drugs exhibited increased much more activities when they areused as metal chelates by using Schiff base rather than as organic compounds.4-aminoantipyrine as coordination has been modified or reorganized into a flexible ligand (ductile) system with the help of condensation with a multiplicity of reagents such as aldehyde(RCHO), ketone(RCOR) etc. [7-11]. Pyrazolone is five-membered heterocyclic nitrogen containing compounds. The preparation of pyrazolines has been displayed [12-13] by the reaction of nucleophiles that isphenylhydrazineorhydrazine hydrate etc. Pyrazolines have been used as analgesic [14], antimicrobial agents and [15] antifungicidal [16]. Many medicines or drugs contain a pyrazole ring system. Derivatives of pyrazolineexhibit as insecticides and fungicidal agents. Pyrazolone sometimes referred as nonsteroidal anti-inflammatory agents. Derivatives of pyrazoloneis class ofNSAID (nonsteroidal anti-inflammatory drug) accommodate dipyrone, phenylbutazone, 4-Aminoantipyrine and oxyphenbutazone which are shown in scheme 1.They contain heteroatoms(nitrogen, oxygen or sulphur) in the ringthis heteroatom exhibit biological activities are to be specific nonsteroidal anti-inflammatory agents.4-aminoantipyrine is chief derivative. They have anelevatedpotency to attenuate or prevent the anti-platelet effects ofacetylsalicylic acid or namely as aspirin [17] and that is the reason that we have mainly focused on 4-Aminoantipyrine.



Scheme 1.Pyarrazole and its derivatives (NSAID)

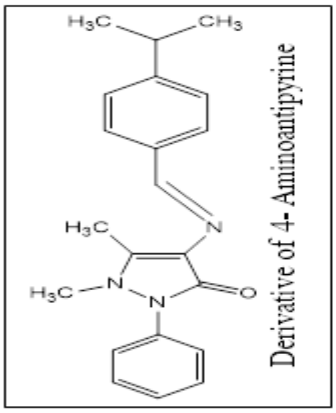
The antipyrine was firstly uncovered by the Knorr in 1884. He named the compound “Antipyrine” a derivative of pyrazole. The pyrazole derivatives displayed antipyretic activity i.e. temperature reducing agent in human body. Transition or d-block metal complexes derived from derivatives of pyrazolone are of appreciable interest of scientist, chemist and research student because of their significant biological or pharmacological activities, especiallyderivativesof pyrazolone based Schiff-base. Among the pyrazolone derivatives, 4-aminoantipyrine is capable to gives diverse types of Schiff bases with carbonyl compounds is to be specific Aldehydes or ketones, and they are considered to be higher ranking reagents in pharmacological, biological, clinical and analytical applications [13]. Antipyrine has been used as an antipyretic drugthat is for reduce the fever, swelling, immflamation and also it is analgesic drug to reduces the pain of particular body area.

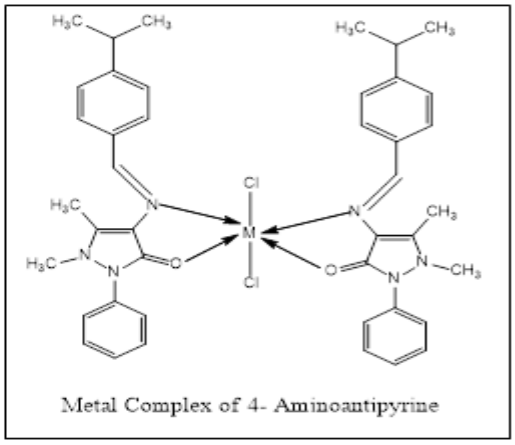


The 4-Aminoantipyrine also have been antiquated for the prophylactic of some diseases including cancer as well as the protection against oxidative stress, these are very important pathway in therapeutic applications [18]. Some of the derivatives of antipyrine were also used as antimicrobial [19], anticancer activity [20-22], analgesic [23], and anti-inflammatory [24]. The derivatives of 4-Aminoantipyrine are collectively introduced in travenously to invent liver infectious [25] in clinical medication.

Performance of 4-aminoantipyrine based Schiff base ligands and their metal complexesand study of antimicrobial activity:

In the company of pyrazole derivatives the metal complexes based on the 4-Aminoantipyrine are richer and more diverse in concerned with higher biological activities. 4-Aminoantipyrine based metal complexes displays multiplicity in bioactivities as antimicrobial, anti-malarial and anti-tumorous activities. Literature survey proved that Schiff bases synthesized from 4-Aminoantipyrine showed high inhibitory activities than ligands against S. aureus, K. pneumoniae, S. typhi, P. aeruginosa and Bacillus subtilis [26]. While observing the studies of 4-aminoantipyrine and its metal complexes; Cu (II) and Ni(II)complexes revealed that thehighly antimicrobial activity against K. pneumoniae, P. aeruginosa, S. aureus, Candida sp., E. coli and A. boumanii.[27]Also oxovanadil complexes derived from 4-Aminoantipyrine and its Schiff bases showed broad antimicrobial activities against Sarcinalutea, S. aphylococcus and B. subtilis (three gram +ve bacteria). P. aeruginosa, E. coli, S. typhi, K. pneumoniae, Proteus mirabilis, Serratiamarcescens and Shigellasonnie (seven gram -vebacteria). Candida albicans, Aspergillusflarus and Penicilliumchrysogenum (three fungal species)[28] From the observation it is clear that the inherent activities of metal-based pharmaceutical agents varies remarkably with a someexchanges in the Schiff base attached to the d-block metal ion [29].





DNA binding as well as DNA cleavage studies of 4-aminoantipyrine derived Schiff-base metal complexes:

Generally, because of the stacking interaction between aromatic chromophore of the complexes and the base pairs of DNA; the complexes binds to DNA with aromatic moieties by intercalation mainly results in bathochromism and hypochromism.4-Aminoantipyrine based ligands and their metal complexes have been showed interaction with DNA and capable to the breakage of DNA strands of cancer genes, due to this the replication property of cancer gene is demolished. It was observed that platinum based metal complexes showed the ability of breaking the DNA strands and due to this cis-platin is discovered. 4-Aminoantipyrine based ligands and their metal complexes also showed significant affinity towards DNA, specificity for the DNA base sequence recognition, tuning the redox potential [30-32].

Many researcher have been studied the metal complexes derived from 4-aminoantipyrine Schiff base ligands and electrophoretic behavior and cleavage activities against CT DNA of oxovanadiun metal complexes and reported that the metal complexes were able to convert super coiled DNA into open circular DNA[33-35].

Anticancer and Antioxidant aspects of 4-aminoantipyrine based ligands and their metal complexes:

Generally the Schiff bases of 4-Aminoantipyrine and its metal complexes shows large assortment of anticancer activities. Many researchers have observed that if cancer cells such as colon cancer (HCT-15) & Prostate cancer (PC-3) cells, breast cancer (MDA MB-231), cervical cancer (HeLa), and non-cancer cells like peripheral blood mononuclear cells (PBMCs) and human embryonic kidney cells (HEK-293) treated as per standard protocol the dose decreases up to 50% of the inhibition of the cells (IC50).

Recently the researcher has given the much more dedication on the anticancer activities of the ligand and metal complexes derived from 4-Aminoantiyrine Schiff bases. While studying they observed and reported that the cytotoxicity of the ligand and its metal complexes showed dose-dependent cytotoxicity in cancer cells. Among them, the nickel and copper complexes were more active at the lower dose levels in comparison with the ligand of other metal complexes. Remarkably, the cytotoxicity was more increased than their ligands and selective to the cancer cells. However, when this was compared with the standard reference of drug cisplatin, it was seen that nickel and copper complexes were more active. Similarly, theactiveand highly antioxidant activity of Ni (II) and Cu (II) complex was found [36-38].

II. CONCLUSION

Above all inclusive data the researcher opinion is thechemical study of heterocyclic Schiff base ligands and their transition metal complexes is flowering field that is being noticed. Recently more concentration focalized on Schiff bases and their metal complexes derived from 4-aminoantipyrine with derivative of aldehydes and ketones because they displayed wide ranging and number of applications. On the dissimilarity between Schiff base and metal complex; the metal complexes exhibit considerable biological as well as other activities than free organic ligands.

By the current scheme we can conclude that Schiff base ligands and their metal complexes have great capacity for future research in the synthesis of unique derivatives containing these types of moieties which

can be deeply explored for different types of biological activities. And there is a large scope in studies as well as selective biological studies of 4-Aminoantipyrine based Schiff base ligands and their metal complexes.

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