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Synthesis Design and Evaluation of Pyridines Against Inflammation

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ABSTRACT

The present study provides general idea regarding the introduction, synthesis, pharmacology and chemistry of oxazole and its derivatives. The current work will also provide information about the use of pyridines in diversity-oriented synthesis and its pharmacological activity as anti-inflammatory. The current work gives the overview of the various synthetic routes used to form a biologically active pyridines moiety, which is helpful for researchers for further novel approaches on oxazole ring for developing better medicinal agents and newer compounds for increasing efficacy and safety of compound.

ORIGINAL RESEARCH ARTICLE

INTRODUCTION

The fundamental ideas and procedures that define the discipline of pharmaceutical chemistry and drug delivery are covered in this introduction, along with the vital function that drug delivery systems play in the pharmaceutical sector. Here's more information to clarify this: Chemistry of Pharmaceuticals: In order to design, develop, and produce medications, pharmaceutical chemistry is a multidisciplinary area that integrates information from several scientific fields, including chemistry, biology, pharmacology, and engineering. It encompasses the study of pharmacological substances, including their production and analytical processes, characteristics, and modes of action. Pharmaceutical chemists are essential to the development of novel pharmaceuticals and the design and formulation of current drugs that are improved to improve its stability, safety, and efficacy. The techniques and tools used to deliver medications to the body's designated site of action and produce the desired therapeutic effect are known as drug delivery systems. [1-2] These systems are essential because it is not enough to simply synthesize effective medications; it is also necessary to deliver them to the target place effectively while minimizing negative effects. Drug delivery systems are designed to increase targeted distribution to particular tissues or cells, regulate release rates, and improve drug bioavailability. Drug distribution encounters a number of difficulties, such as low drug solubility, low bioavailability, and quick drug breakdown or excretion from the body. Furthermore, some medications may be hazardous if not administered to the proper location or may lose their effectiveness quickly due to rapid breakdown or removal. [3] The current work gives the overview of the various synthetic routes used to form a biologically active pyridines moiety, which is helpful for researchers for further novel approaches on oxazole ring for developing better medicinal agents and newer compounds for increasing efficacy and safety of compound.

EXPERIMENTAL WORK

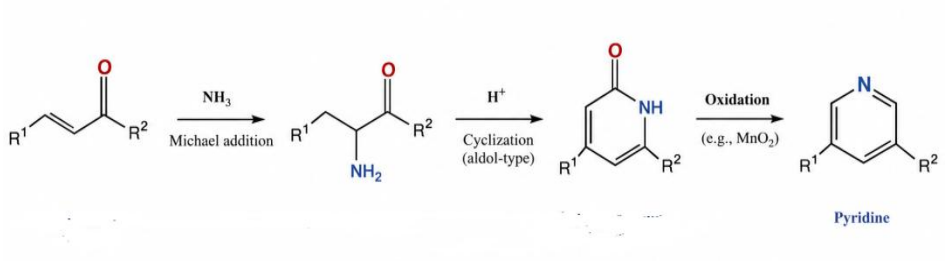
Pyridine Synthesis

The objective of pyridine synthesis is to construct an aromatic six-membered ring containing one nitrogen atom. Classical methods involve cyclization of carbonyl compounds with

ammonia or amines followed by oxidation. Modern methods employ transition-metal catalysis, multicomponent reactions, microwave irradiation, and green solvents to improve selectivity, yield, and sustainability.

Synthesis of various pyridine compounds

1.88 g (0.024 moles) of the legend was turned into a warm solution of 5 mls ethanol and was heated for 5 minutes. Also, 0.475g $NiCl_2$ $6H_2O$ was dissolves in 20 mls dry ethanol into a warmed solution of the ligand. It was reflux for 2 hours and stirred for 10 minutes and allowed to cool overnight at room temperature during a complex was formed. The complex formed was filtered and recrystallized from ethanol. The complex was stored in a beaker and the percentage yield of the complex was obtained as shown below, Therefore, the percentage yield of the complex obtained was 59% Studies shows that synthesizing Ni (II) complex, pyridine with nickel chloride hex hydrate was mixed in an anhydrous solvent and heated the mixture. The product was then filtered and washed with the solvent to remove any impurities. The product was then dried under vacuum to remove any residual solvent. [4-5]



Evaluation of In vitro anti-inflammatory activity

The synthesized compounds were screened for *in vitro* anti-inflammatory activity by using inhibition of albumin denaturation technique. The standard drug and test compounds were dissolved in minimum amount of dimethyl formamide and diluted with phosphate buffer (0.2 M, pH 7.4). Final concentration of DMF in all solutions was less than 2.0%. Test solution (1 ml) containing different concentrations of drug was mixed with 1 ml of 1% mm albumin solution in phosphate buffer and incubated at $27^0 \pm 1^0$c in BOD incubator for 15 min. Denaturation was induced by keeping the reaction mixture at $60^0 \pm 1^0$c in water bath for 10 min. After cooling the turbidity was measured at 660 nm. Percentage of inhibition of denaturation was calculated from control where no drug was added. Each experiment was done in triplicate and average was taken. The diclofenac sodium was used as standard drug.18 % Inhibition of albumin denaturation is depicted in Results. [6]

RESULTS AND DISCUSSION

The physical properties of the ligand and metal complexes obtained changes from Granules state for Ni (II), Cu (I), Ag (I) to a physical crystalline state with various complexes colour and salts.

Table 1 Physical Properties of Derivative Compounds

S.N.	Derivative Compound	State	Colour
1	NI (II)	Granules	Light Green
2	Ag (I)	Granules	Mint Green
3	Cu (I)	Granules	Deep Green

Evaluation of In vitro anti-inflammatory activity

All synthesized derivatives were tested for the *in vitro* anti-inflammatory activity by using inhibition of albumin denaturation technique compared to standard diclofenac. Derivatives showed significant *in vitro* anti inflammatory activity with % inhibition of albumin denaturation 84%, 88% and 80% respectively

Table 2 In vitro anti-inflammatory activity of compounds

S.N.	Groups	Mean ± SD	% Inhibition of albumin denaturation
1	Control	-	-
2	Standard	0.02 ±0.25	97%
3	NI (II)	0.01 ±0.20	84%
4	Ag (I)	0.05 ±0.35	88%
5	Cu (I)	0.08 ±0.30	80%

CONCLUSION

Chemical synthesis lies at the heart of chemical science, providing the tools and strategies necessary to construct molecules with specific structures and properties. Through synthesis, chemists transform simple starting materials into complex compounds that serve as medicines, functional materials, dyes, polymers, and countless other products essential to modern life. The ability to design and execute efficient synthetic routes defines the progress and impact of chemistry as a scientific discipline.

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