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ANTIMICROBIAL ACTION AND SUPEROXIDE DISMUTATION BEHAVIOUR OF 5-NITROSALICYLALDEHYDE

Pharmacology

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ABSTRACT

Superoxide dismutase activity and antimicrobial actions are among burgeoning research fields. Herein we report these two implications in respect to a commercially available compound which is a derivative of Salicylaldehyde known as notro-salicylaldehyde. The presence of active functional groups like aldehydic and nitro expect fruitful results of this form. The overall results have shown a broad spectrum biological activity of the compound. The SOD behaviour was not so much effective as compared with native enzyme.

KEYWORDS

INTRODUCTION

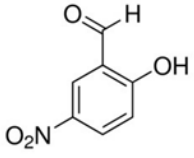
Salicylaldehyde derivatives are important class of therapeutic [1] compounds. In combination with certain other drugs, they are used for the treatment of various bacterial infections. The nitro derivative is of current interest because it enhances the biological activities. The Schiff bases derived by the condensation of sulphonamides with salicylaldehyde are not only good complexing agents [2], but bactericides [3,4] as well. Aromatic hydroxyaldehyde form stable complexes and the presence of a phenolic hydroxyl group at their *o*-position impart an additional donor site of the molecule making it bidentate. Such chelating properties are eye-catching features in this context [5-7]. Superoxide dismutation is a bio-catalytic disproportio nation of O_2^- to hydrogen peroxide (H_2O_2) and dioxygen (O_2) to protect cells from oxidative damage caused by O_2. Therefore, SODs malfunction and over-production of O_2^- beyond the catalytic capacity of SODs are the consequences, suspected to be related to certain neurological diseases such as Parkinson's disease, Alzheimer's disease and amyotrophic lateral sclerosis [8].

Considering the pronounced biological activity of the target ligand a study was undertaken to report Super-oxide dismutase behaviour and antimicrobial action of 5-nitrosalicylaldehyde.

EXEPERIMENTAL

Materials and methods

5-nitrosalicylaldehyde was a product of HiMedia. Ethanol was supplied by Bengal Chemicals and Pharmaceuticals Ltd., Kolkata All chemicals used were of analytical reagent grade and were used without any further purification. The figure below shows the structure of the target ligand.



Biological assays

A hot nutrient agar solution (20 mL) was poured into the sterilized Petri dishes and allowed to attain room temperature. The seed layer medium was melted and cooled to 45˚C with gentle shaking. The previously grown sub-culture was added to the seed layer medium aseptically and mixed well. It was immediately raked into the Petri plate and allowed to attain room temperature. Then wells were made with a sterile cork borer and to these wells, 0.01 mL of drug/sample solution was added and the plates were allowed to cool for 1 h to facilitate the diffusion. The plates were incubated at 37˚C for 48 h. At the end of the incubation period, the inhibition zone around the wells was measured. Streptomycin was used as the standard antibacterial agent.

The alkaline DMSO-NBT method was used as per the reports made elsewhere [9]. A typical 400 µL sample to be assayed was added to the solution containing 2.1 mL of 0.2 M potassium phosphate buffer (pH 8.6) and 1 mL of 56 µM NBT. The tubes were kept in ice for 15 min and then 1.5 mL of alkaline DMSO solution containing superoxide ions was added with stirring. The absorbance of the violet colour developed was monitored at 560 nm against a sample prepared under similar conditions except that NaOH was absent in DMSO. A unit superoxide dismutase (SOD) activity is the concentration of complex or enzyme, which causes 50% inhibition of alkaline dimethyl superoxide (DMSO), mediated reduction of nitro blue tetrazolium chloride (NBT).

RESULTS AND DISCUSSION

The inhibition zones of the compound against different microbes have been given in Tbale 1.. Overall the ligand has been found more active against *Streptococcus* and *Pseudomonas*.. The dose-dependent enhanced activity remarks the broad range activity of the compound. The remarked activity culminates the relevance of nitro and aldehydic component towards the cell wall structure. Similarly the low activity indices among other microbes could be the common problem of resistance.

Table 1: Inhibition zones

Strain	100 mg/ml	75 mg/ml	50 mg/ml	1 mg/ml (Std.)
	Zone of inhibition (mm)			
Streptococcus	41.75±0.957	35.0±1.154	31.25±1.892	46.75±0.957
Pseudomonas	41.50±1.732	37.0±2.449	29.75±2.986	45.25±1.50
E. coli	24.50±2.380	20.50±1.290	17.75±0.957	33.25±1.707
Aspergillus	26.50±1.914	22.50±1.0	16.75±0.957	31.0±1.414

The NBT assay was followed from the reports made elsewhere by recording the absorbance rendering kinetic reduction of NBT at 560 nm. DMSO was selected as superoxide generator under alkaline medium. The calculated fraction causing 50% inhibition of NBT reduction is called IC50 in the present assay. The resultant IC50 of the compound comes out to be 50 µM, respectively. The flexibility of the involved ligand under the chelating milieu shows bio-catalytic activity towards the dismutation of superoxide anion. The enhanced or suppressed dismutation can be attributed to the factors like nature of compound as well as the overall geometrical changes in the molecular skeleton [10].

CONCLUSIONS

From the results it can be remarked that the compound is a broad spectrum antimicrobial agent and is superoxide dismutating potential. Comparing with other salicyaldehyde derivatives the more exploration is expected in future.

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