

RESEARCH ON THE SYNTHESIS METHOD OF SULPHONAMIDE AND ITS USE IN ANALYTICAL CHEMISTRY

1 Dr. Kishor Chandra Joshi

**HOD and Assistant professor Department of Chemistry,
Radhe Hari Govt P. G. College
Kashipur, (U. S. Nagar) Uttarakhand**

2 Dr. Pran Vir Pratap,

**Assistant Professor
Department of Chemistry
Radhe Hari Govt. (P.G.) College,
Kashipur (U. S. Nagar) Uttarakhand**

ABSTRACT

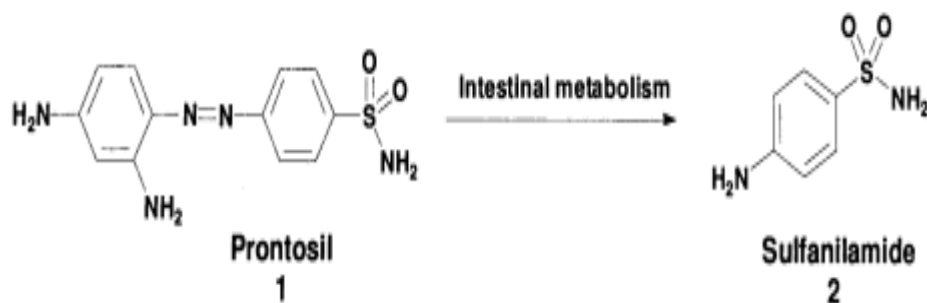
Sulphonamides, as one of the earliest classes of synthetic antibacterial agents, remain essential in pharmaceutical and chemical industries due to their broad-spectrum activity and versatile applications. Many distributions about the blend of new compounds, their chemotherapeutic activity, their natural properties and their Kinetic and enzymatic approaches has been distributed from that point forward to give a knowledge into the method of activity. This shows significance of Sulfonamides which have revolutionized the treatment of bacterial infection. Just a portion of the critical truth can be talked about in this paper which incorporates a subjective selection.

Key words : sulfonamide, treatment

INTRODUCTION

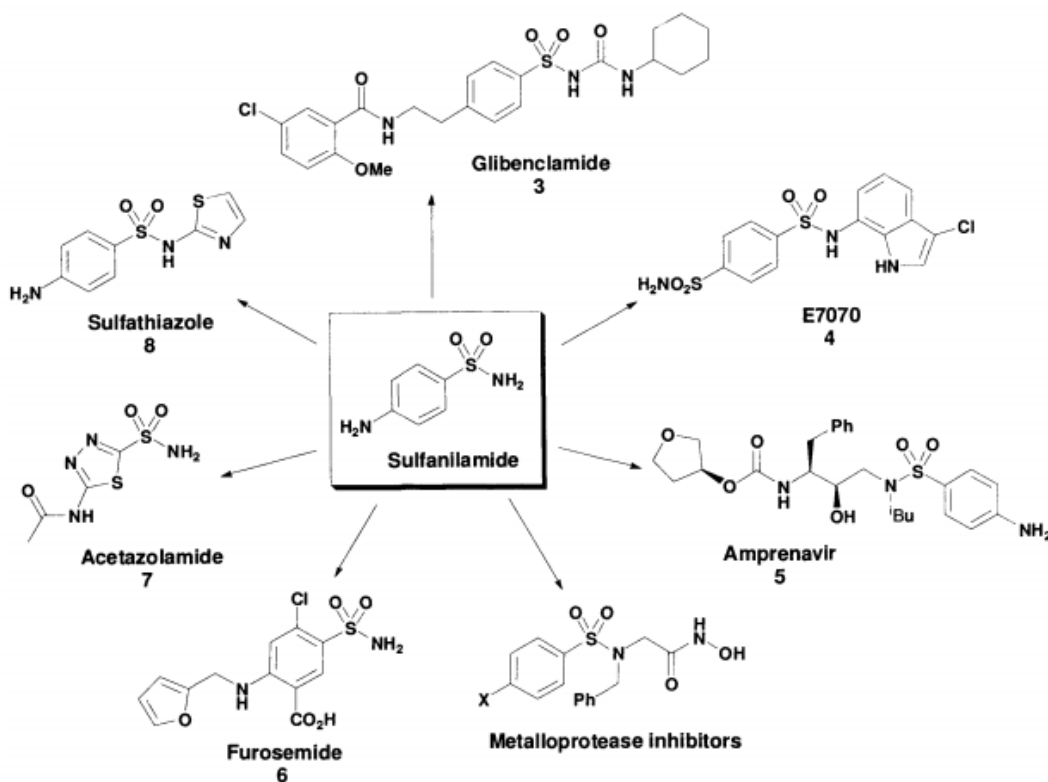
Sulfonamides are an essential class of synthetic bacteriostatic antibiotics still utilized today for the treatment of bacterial infections and those caused by other microorganisms. They are otherwise called sulfa drugs and were the primary source of therapy against bacterial infections before the presentation of penicillin in 1941. Despite the fact that sulfonamides have generally been replaced by different agents, they still keep up impressive activity in specific sorts of infection, for instance in the urinary tract, eye and ear, and bronchitis. One of the principal sulfonamides distinguished by Domagk et al. in 1935 was the red azo color known as Prontosil. It was dynamic against streptococcal infection in vivo, yet not in vitro.

This perception was at last cleared up when it was found that Prontosil was used by microscopic organisms in the intestines into sulfanilamide, the dynamic metabolite (Scheme I).



Scheme I

Having verified that sulfanilamide was the antibacterial operator this prompted its union in 1936. Since then there have been numerous analogs of sulfanilamide created as pharmacological agents that show an extensive variety of organic exercises (Figure 1). For instance, Glibenclamide has discovered use as a hypoglycaemic operator, E 7070 is an anticancer specialist, Amprenavir is utilized as a part of HIV treatment, Furosemide as a diuretic, Acetazolamide as a carbonic anhydrase inhibitor, and Sulfathiazole as an antibacterial agent.



Scheme 2

Sulfonamides Chemical Properties, Usage, Production

Sulfonamides, otherwise called amino benzene sulfonamide, sulfonamide, aniline sulfonamide, sulfonamide of aniline, which is accelerated from watery ethanol and is leaf- molded gems or a white crystalline powder, scentless, taste biting first sweet at that point, the instance of light staining. Relative atomic mass is 172.22. The relative thickness is 1.08.

Dissolving point 165~166/186°C. Not solvent in benzene, ether, chloroform, dissolvable in water (g/l): when at 10°C is 2.6, when at 25 °C is 7.5, when at 40°C is 17.0, when at 60°C is 40.0, when at 100°C is 477, likewise dissolvable in ethanol, dissolvable 1g in per 37ml ethyl liquor, dissolvable 1g in each 5ml CH₃)₂CO, broken up in glycerin, propylene glycol, sodium hydroxide and hydrochloric corrosive (potassium) arrangement, a fluid arrangement of sulfonamide in litmus paper is impartial, 0.5% of a watery arrangement of pH = 5.8 to 6.1.

Chemical properties

White granular or crystalline powder, odorless. Marginally biting taste. Slightly soluble in water, ethanol, methanol, ether and (CH₃)₂CO₂ dissolvable in bubbling water, glycerol, hydrochloric corrosive, sodium hydroxide and potassium hydroxide arrangement, insoluble in chloroform, ether, benzene, oil ether.

Uses

- For the pharmaceutical business, it is the primary crude material for the blend of sulfa drugs.
- Used as a reagent to decide nitrite, additionally utilized as a part of the pharmaceutical business.
- Used as intermediates for the combination of other sulfa drugs, notwithstanding for wound cleansing.
- Amino benzene sulfonamide is transitional of herbicide asulam, and also middle of the road of sulfa medication.
- The product is a vital middle of the road of sulfa drugs.
- Veterinary prescription, topical mitigating drugs, for analysis and identification.

Wide range antibacterial, effectively affecting hemolytic streptococcus, Neisseria meningitidis, Staphylococcus aureus and other Gram-positive and negative microorganisms. This product is topical application, it can be halfway assimilated from the injury. For injury diseases of hemolytic streptococcus and staphylococcus. It can likewise be utilized to rapidly stop the draining injury.

Action of Sulfonamides

The majority of sulfonamides prevent bacterial reproduction by going about as an antimetabolite to Para-aminobenzoic acid (PABA), where PABA is an essential component in the biosynthesis of tetrahydrofolic acid. Aggressive hindrance of PABA handling enzymes by sulfonamides at last hinders the action of dihydrofolic acid synthetase, and in this manner prevents dihydrofolic acid development (Scheme 2).

As microscopic organisms can't take up tetrahydrofolic acid from their environment, restraint of dihydrofolic acid synthetase will keep the microbes from thymidine and uridine. These two nucleosides are required for DNA replication and interpretation, subsequently cell development and division is disturbed, and along these lines gives enough time to the body's own particular immune system to dispose of the bacterial danger.

1. Value of sulfonamides as therapeutic agents

Sulfonamides were primarily developed as antibacterial agents, with sulfanilamide the first recognized sulfonamide antibacterial. Since then many other effective antibacterials derived from sulfonamides have been discovered and utilised in medicine. For example, other common sulfonamide antibacterials still in circulation are Sulfathiazole, Sulfaquinoxaline, silver Sulfadiazine (Silvadene), Sulfasalazine (Azulfidine®), and Sulfamethoxazole (Gantanol)

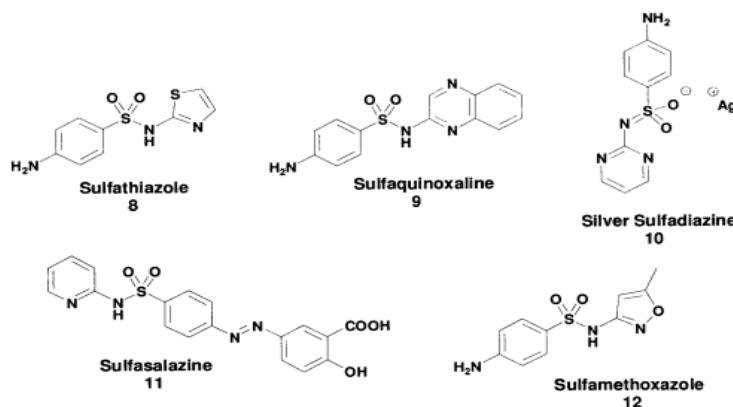


Figure 2

REVIEW OF LITERATURE

E. L. Cussler, G. D. (2010) Moggridge until recently, the chemical industry has been dominated by the manufacture of bulk commodity chemicals such as benzene, ammonia, and polypropylene. However, over the last decade a significant shift occurred. Now most chemical companies devote any new resources to the design and manufacture of specialty, high value-added chemical products such as pharmaceuticals, cosmetics, and electronic coatings. Although the jobs held by chemical engineers have also changed to reflect this altered business, their training has remained static, emphasizing traditional commodities.

Jean-Louis Burgot (2015) This book of general analytical chemistry – as opposed to instrumental analysis or separation methods – in aqueous solutions is focuses on fundamentals, which is an area too often overlooked in the literature. Explanations abound of the chemical and physical principles of different operations of chemical analysis in aqueous solutions. Once these principles are firmly established, numerous examples of applications are also given.

Clyde Frank 2012 Analytical Chemistry, Second Edition covers the fundamental principles of analytical chemistry. This edition is organized into 30 chapters that present various analytical chemistry methods. This book begins with a core of six chapters discussing the concepts basic to all of analytical chemistry. The fundamentals, concepts, applications, calculations, instrumentation, and chemical reactions of five major areas of analytical chemistry, namely, neutralization, potentiometry, spectroscopy, chromatography, and electrolysis methods, are emphasized in separate chapters.

Mumtaz Alam, Mymoona Akhtar, Hasan Asif (2017) A pharmaceutical analyst needs to have a clear understanding of the methods used to test a particular sample. This book is a sincere attempt in educating students about the concepts of the various analytical testing methods. The book has been written to cater to the needs of the B. Pharm. students in accordance with the AICTE syllabus. It can also serve as a supplementary text for the Pharm. D., D. Pharm. and the B. Sc. (Analytical Chemistry) students.

Donald J. Pietrzyk (2019). The retention of aniline derivatives, sulfonamides, and several N- heterocyclics on paper impregnated with a strong acidic H^+ -form resin was investigated. Solvent systems used were ethanol, acetonitrile, dimethylformamide, dimethylsulfoxide, pyridine, and butylamine mixed with water.

Either aprotic, amphiprotic, basic, or acidic developing mixtures can be used for separations. The retention data can be correlated, in general, to the K_a values for the weak bases and to column and batch retention data obtained with strongly acidic cation resin.

Christiana NonyeIgwe and Uchechukwu Chris Okoro (2021) This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The synthesis and biological activity of N-heteroaryl substituted benzene sulphonamides (3a–h) were successful. Simple condensation reaction of benzene sulphonyl chloride (1) with substituted heteroaromatic compounds (2a–h) under dry pyridine and acetone gave the target molecules (3a–h) in good to excellent yield. The compounds were characterized using FTIR, ^1H NMR, and ^{13}C NMR.

Anna Gulkowska, Martin Krauss, Daniel Rentsch, and Juliane Hollender (2022). The mechanism of covalent bond formation of the model sulfonamide sulfathiazole (STZ) and the stronger nucleophile para-ethoxyaniline was studied in reactions with model humic acid constituents (quinones and other carbonyl compounds) in the absence and presence of laccase. As revealed by high resolution mass spectrometry, the initial bonding of STZ occurred by 1,2- and 1,4-nucleophilic additions of the aromatic amino group to quinones resulting in imine and anilinoquinone formation, respectively.

RESULT AND CONCLUSION

The present investigation gives a record of the utilization of p-radiance sulfonamidine as spot test reagents for copper (II) and Cerium (IV). A spot test is a test that can be made specifically on the obscure utilizing just a drop or two of the material. By and large spot tests can be made with no past separations, because of the focal points over the ordinary methods of subjective analysis.

Many spot tests don't give clear convincing outcomes and the accomplishment of the test relies on the aptitude of the investigator, additionally that many tests require the utilization of exorbitant organic reagents including complex reactions. Subsequently spot tests are constrained to those which give straightforward, effectively deciphered outcomes. In performing spot test, it is ideal to run a clear and a known alongside the obscure for correlation. The spot tests were carried on spot plates on account of the accompanying reasons. In the event of copper, alcoholic arrangement of the reagent was added with pyridine to the drop of copper arrangement. These fluids spread on paper and the force of the spot was brought down. Spot of (M/40000) arrangement is extremely pale and can be situated with trouble. The cerium arrangements are made in sulphuric acid which singes the paper and henceforth dim red spot can not be very much recognized from the burning. In the wake of putting the drop of the metal arrangement on hatman paper it must be permitted to dry before the ligand arrangement is included. This operation is time taking.

In the event of copper, the shading is created in arrangement and in this way this technique is not pertinent when spot tests are done on spot plates the metal arrangements can be blended with the reagent arrangement quickly, in this way sparing time. As no turbidity is seen when metal arrangement of test focuses are blended with the ligand arrangements, running of a clear is redundant. Stable dissolvable complexes are framed if there should be an occurrence of the two metals with the reagents. Other metal particles don't cover the shading framed in the event of copper or cerium. Copper-ligand complex is more grounded than copper pyridine complex as of now specified and copper gives shading even

in nearness of numerous cations. This shows the test can be said to be particular for copper(II). The same can be said if there should arise an occurrence of cerium. The breaking points of distinguishing proof of copper and cerium are reasonably in concurrence with as far as possible With different reagents. In this way it can be induced that the reagents can be extremely very much utilized as spot test reagents for copper and cerium.

REFERENCES

- Mumtaz Alam, MymoonaAkhtar, HasanAsif Textbook of Practical Analytical Chemistry Elsevier Health Sciences Year 2017
- Donald J. Pietrzyk Separation of Weak Organic Bases Such as Aniline, N- Heterocyclic, and Sulfonamide Derivatives on Cation Exchange Resin. Article in Journal of Chromatography A 87(2):543-553 with 2 Reads DOI: 10.1016/S0021-9673(01)91756-X Vol. No: 01 Issue: 1 Year: December 2019
- Christiana Nonyelgwe and Uchechukwu Chris Okoro Synthesis, Characterization, and Evaluation for Antibacterial and Antifungal Activities of N-Heteroaryl Substituted Benzene Sulphonamides Organic Chemistry International Volume 2022, Article ID 419518, 5 pages <http://dx.doi.org/10.1155/2014/419518>
- J. Schwarz,^{1,2} H. Knicker,³ G. E. Schaumann,² and S. Thiele-Bruhn¹ Enzymatic Transformation and Bonding of Sulfonamide Antibiotics to Model Humic Substances Hindawi Publishing Corporation Journal of Chemistry Year 2021.
- Eman Y.Z. Fraga, Refat F. Aglanb, Hala A. Mohameda Lanthanum(III) potentiometric sensors based on ethyl benzoyl acetate Vol. No: 10 Issue: Year: 2016
- Srikantha Reddy Mettu. Sulfonamide Anilines and its use in analytical Chemistry, Research Supervisor Mewar University Mewar Rajasthan, Airo International Research Journal Vol. XI, ISSN No. : 2320-3714 India, 2020,
- Schneider, J., Blum, S. P., & Waldvogel, S. R. Electrochemical synthesis of sulfonamides in single-pass flow. ChemElectroChem, 10(23), 2023.
- Kar, S., Sanderson, H., Roy, K., Benfenati, E., & Leszczynski, J. Green Chemistry in the synthesis of pharmaceuticals. Chemical Reviews, 122(3), 3, 2022.