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Review IJA

Review in Dapsone and Sulfa Derivatives with Their Applications in (Fertilizer, Agrochemical, Industrial, Biochemical) Fields

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Abstract

Dapsone structure discovered in the early twentieth century, German researcher Paul Ehrlich was acquiring notions of selective toxicity established fundamentally on the ability of specific dyes to destroy microorganisms. Gerhard Domagk was later awarded a Nobel Prize for his efforts, achieving a breakthrough in 1932 with the discovery of the antiseptic ingredient Prontosil inflamed (actinodin sulfonamide). Further inquiry of the chemical factors involved opened the technique for sulfa structures and sulfone rehabilitation, beginning with the sighting of sulfanilamide, the active mediator of Prontosil, with Daniel Bovet and his team at the Pasteur Institute (1935), followed by the discovery of dapsone independently by Ernest Fourneau in France and Gladwin Buttle in the United Kingdom. Sulfonamides act as affordable inhibitors of the enzyme dihydropteroate synthetase and reduce the creation of tetrahydrofolate in bacterial cells. Tetrahydrofolate is important in both human and bacterial cells as an enzyme coenzyme that provides one-carbon units for the synthesis of pyrimidines, which are essential for DNA synthesis. If DNA and pyrimidine synthesis are inhibited, the cell cannot grow and divide. The discovery of the chemical structure of sulfa drugs had a great impact on the development of pharmaceutical sciences, photo-biochemistry, especially in the field of skin ointments used to treat skin rashes, eczema, psoriasis, and other purulent inflammatory diseases. Medicinal corporations construct SO_2 and DAP through accurate photo-industrial practices, confirming soaring excellence and integrity. These APIs exist then used in the formulation of different antibiotic products, like tablets, capsules, and suspensions, which are recommended by health care specialists to treat bacterial diseases. Overall, sulfonamides, and DAP are considered biological substances that play a fundamental responsibility in preventing bacterial toxins, supporting affected patients with actual and directed antibiotic behaviors today.

Keywords: Eczema, inflammatory diseases, psoriasis, rashes, skin

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INTRODUCTION

Dapsone is a product of two groups of NH_2 and groups of SO_2 with anti-parasitic properties; it is used for treating leprosy and dermatitis for many years [1, 2]. Additionally, it has been used to treat acne, dermatitis herpetiformis, and many other skin conditions. Dapsone is available both topically and orally. Severe side effects include decreased blood cells, breakdown of red blood cells especially [3–5] in those with glucose-6-phosphate dehydrogenase (G-6-PD) deficiency, or hypersensitivity [4, 6]. Common side effects include nausea and loss of appetite. Other side effects include hepatitis and several skin rashes [7–9]. Figure 1 shows the formation of DAP.

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Figure. 1. Structure of dapsone.

Sulfa compounds: belonging to a class of disinfectant instruments that restrain infective expansion by restricting with folic acid synthesis [10–13]. These structures are highly efficient against various bacterial toxins, involving urinary tract infections [14, 15], respiratory tract infections, and selected skin viruses [16–19].

Creation of Dapsone Derivative and (SO_2-NH-R)

It is interesting to note that certain individuals are more susceptible to this if the renal tubules are blocked than others [20–23]. The Japanese and Chinese, for example, metabolize sulfathiazole more rapidly than Americans and are, therefore, more susceptible to toxic effects [24]. Therefore, the acidity of the proton NH increases. Silver sulfadiazine cream is used topically [25–27]. Sulfadiazine is more effective than sulfathiazole and has subsequently replaced it in treatment. For the prevention of burn infections.

The unique structure of dapsone has led to its inclusion in many basic formulations of anti-allergy drugs and anti-tumor medications [28–30] that inhibit tumor growth in cells adjacent to cancerous cells [31, 32]. Consequently, dapsone has a specific and inhibitory effect on tumor growth in cancerous cells. Furthermore, dapsone is used in the formulation of various reagents for purifying and recycling river water and water contaminated with heavy metals [33–36], due to its composition containing a sulfone group, known for its activity, as well as two chemically active amine groups. There are many methods reported by studies [37, 38]. Preparation of Dapsone by many reactions of amine and amide derivatives (Figures 2–5), methods of preparation.

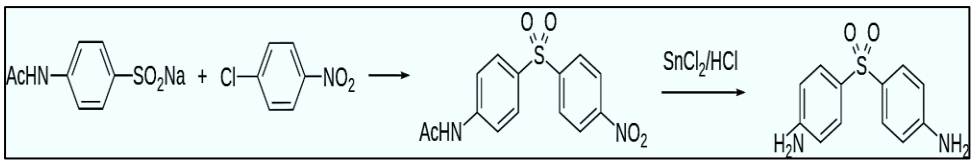

Figure 2. Preparation of dapsoned by reduction.

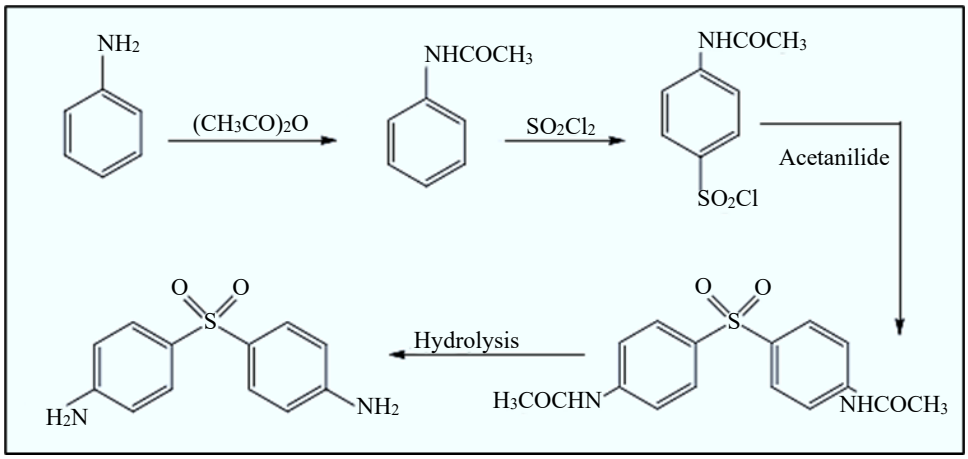

Figure 3. Preparation of dapsone drug by hydrolysis in photo reaction.

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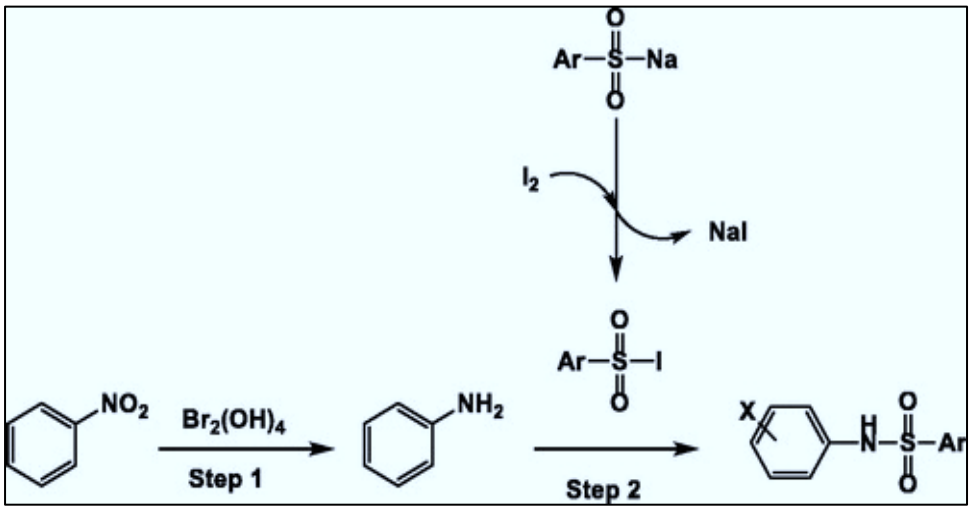

Figure 4. Preparation of sulfonamide drug derivative.

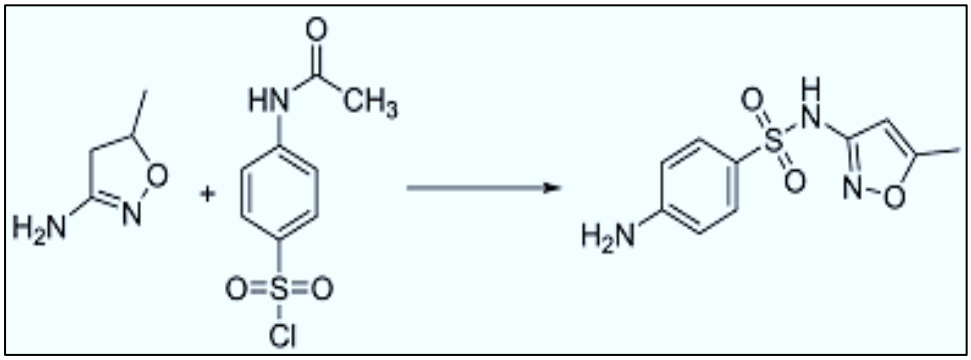

Figure 5. Preparation of sulfamethoxazole drug in biochemical field.

Bio-Applications of Dapsone Compounds and Sulfa Compounds

Dapsone derivatives have pharmaceutical, medical, and bio-applications such as anticancer, antioxidant, antifungal, antibacterial, and other medical applications. Penicillin has largely replaced sulfonamides, and sulfonamides have taken on an important role.

However, interest has been greatly renewed with the discovery of a new generation of long-acting sulfonamides [39]. One example of this new generation is sulfadoxine, which is very stable in the body and requires a single dose every week (Figure 6), derivatives of dapsone from Schiff base.

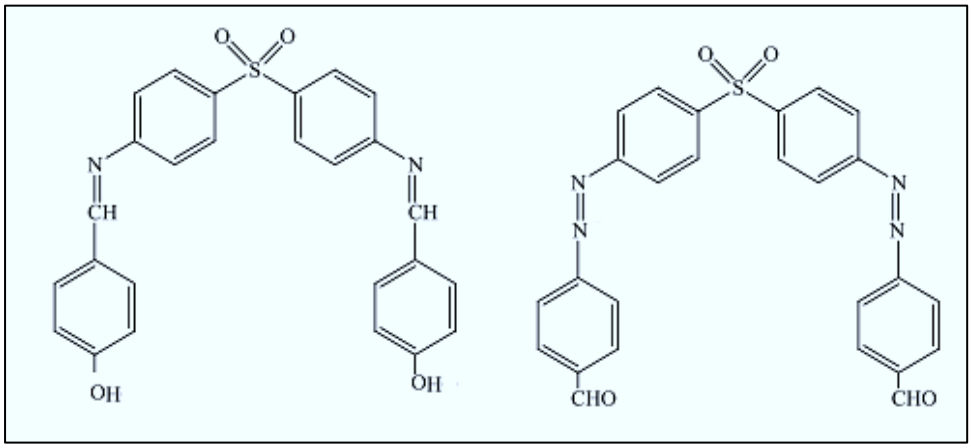

Figure 6. Antibacterial dapsone derivatives.

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Sulfonamides are competitive enzyme inhibitors, and therefore, their inhibition is reversible. This is apparent in specific systems, like *Staphylococci, Pneumococci, and Gonococci*, which eventually attain resistance via integrating supplementary PABA. The added PABA offering in the group in Figure 7.

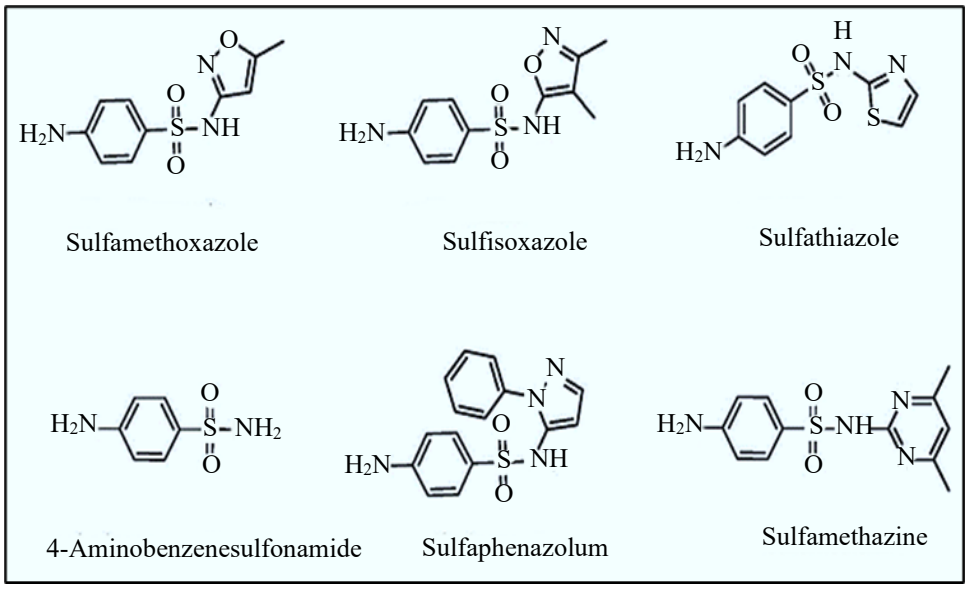

Figure 7. Types of sulfa-drugs.

Sulfonamides have been particularly effective against intestinal infections and can be obtained using a prodrug. Succinyl sulfathiazole, for example, is a prodrug of sulfathiazole. The succinyl moiety contains an acidic group, meaning that the prodrug is dissociated in the slightly alkaline environment of the intestine (Figure 8) [40, 41], construction of prontosil.

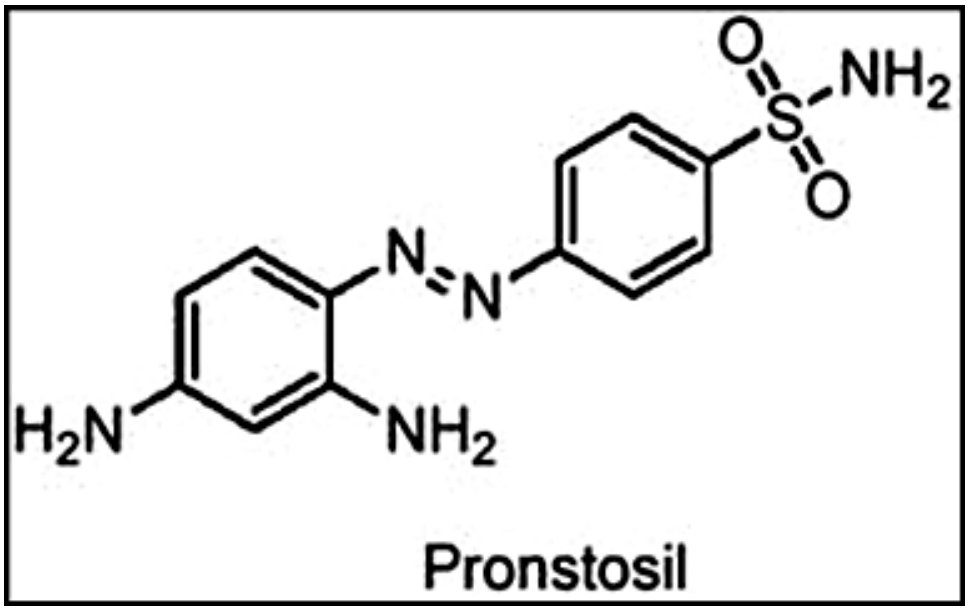

Figure 8. Prontosil drugs.

Chemo-Pharmaceutical Uses of Dapsone Compounds

It is unclear whether co-administration with pyrimethamine is beneficial in preventing malaria. Dapsone is also effective and safe in people with moderate to severe or refractory cutaneous lupus erythematosus (Figures 9, 10) [42], some drugs of sulfa-group.

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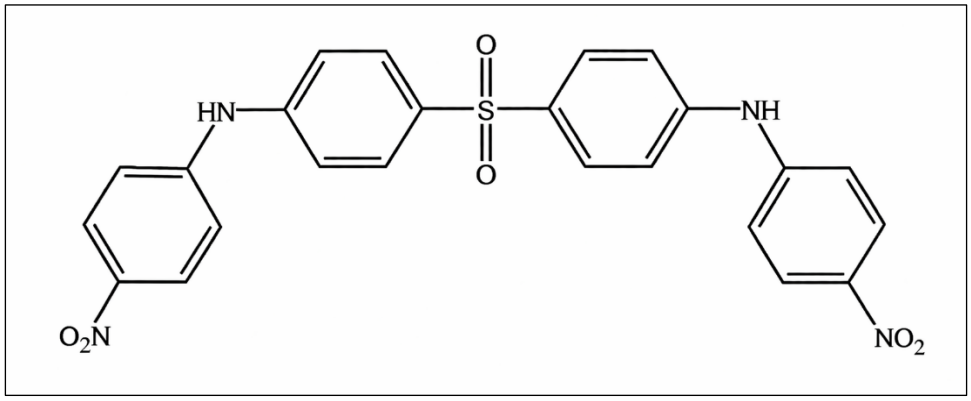

Figure 9. Dapsone derivative as antimalarial.

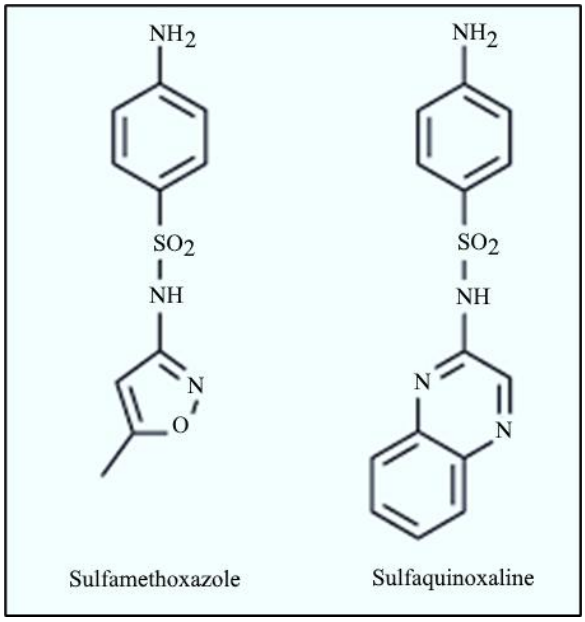

Figure 10. Dapsone in structures of drugs.

Their Applications in Agrochemical Toxicology

Note that sulfonamides do not effectively kill bacterial cells, but they do inhibit their growth and reproduction. This creates the body's natural immunity adequate time to transact with their traces and oust them from the body. Antibacterial mediators that restrain cell progress are classified as bacteriostatic (Figures 11–14) [39, 40], various treatments as a chelate.

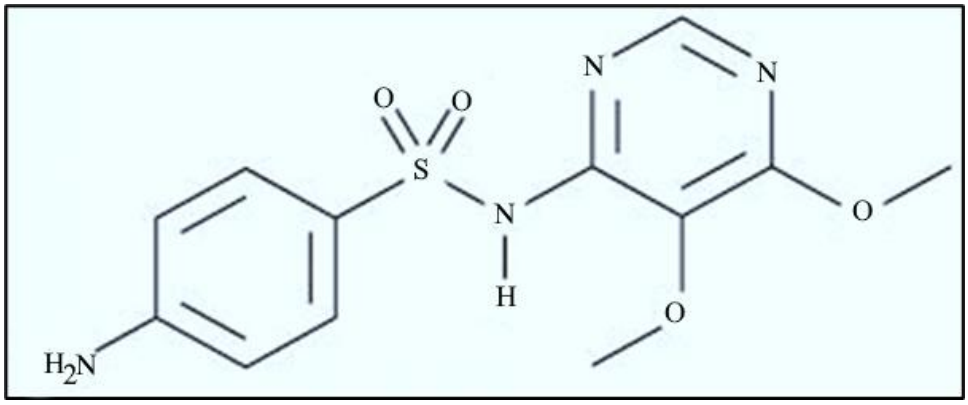

Figure 11. SO_2-structure as auto-inflammatory.

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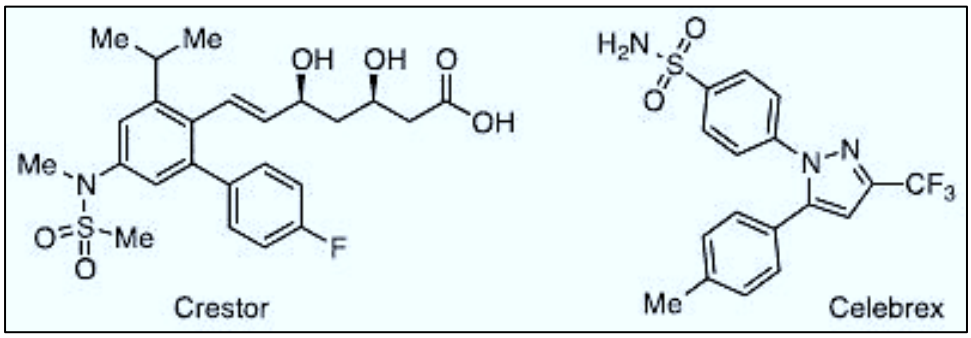

Figure 12. SO_2-structure as antineoplastic.

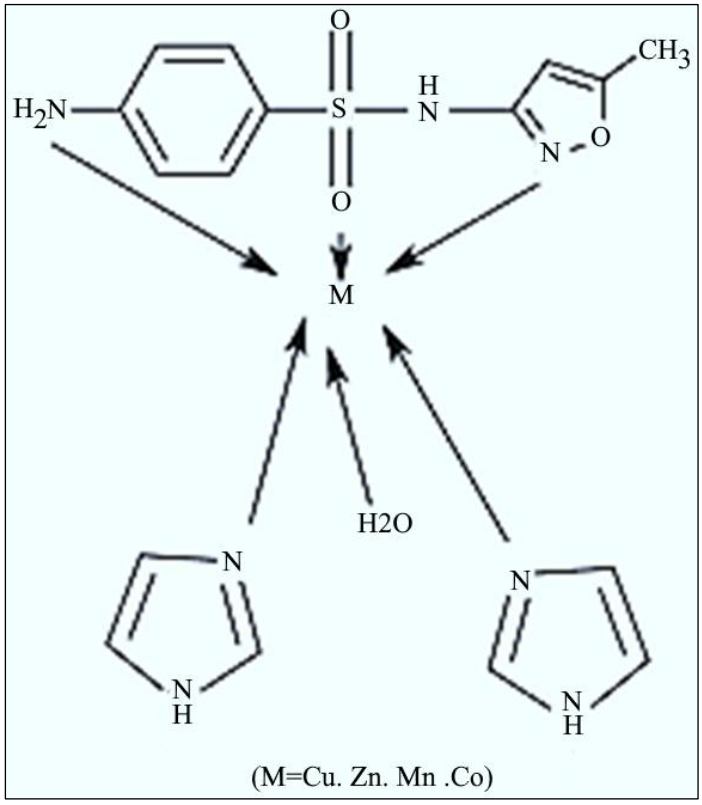

Figure 13. SO_2 structure as a chelate.

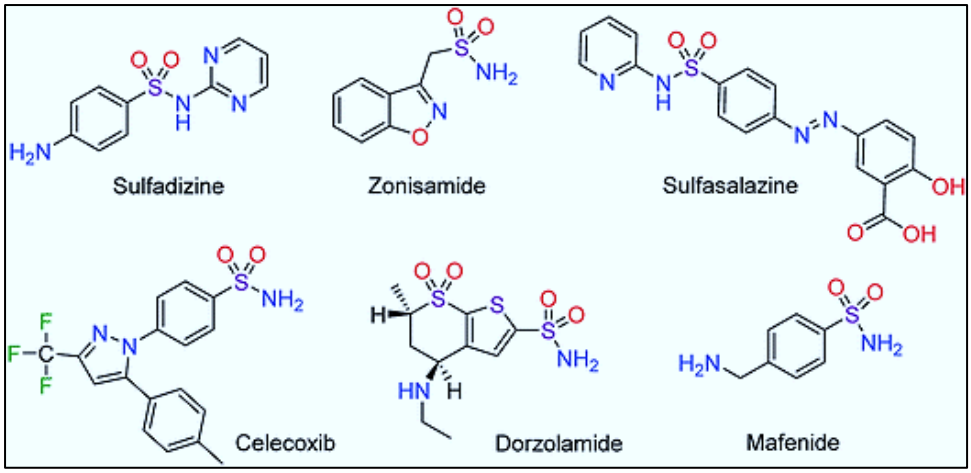

Figure 14. Structures of SO_2 treatments.

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The Mechanics of the Influence of Dapsone as an Anti-Inflammatory in the Organization

Purulent infections are a major cause of the spread of cancerous tumors in the body, as the inflammation spreads to cells adjacent to the inflamed area. Sulfa drugs and dapsone compounds work to reduce the level of inflammation, thus reducing the purulent infection and subsequently decreasing the size of cancerous tumors [43]. This is how they treat inflamed cells.

CONCLUSIONS

Dapsone is considered effective and safe for adjunctive therapy that replaces glucocorticoids in patients with idiopathic thrombocytopenic purpura, often through danazol or like it in combination with anti-fissionable antibodies. It is an effective and reliable second-line medication for frequently occurring chronic idiopathic urticaria in patients for whom antihistamines and other first-line treatments have stopped entirely.

REFERENCES

1. Florian R, Tom L, Petrick E. Exploring the supramolecular interactions and thermal stability of dapsone:Bipyridine cocrystals by combining computational chemistry with experimentation. Cryst Growth Des. 2023;23(6):4638–4654.
2. Guo C, Zhang Q, Zhu B, Zhang Z, Ma X, Dai W, et al. Drug–drug cocrystals provide significant improvements of drug properties in treatment with progesterone. Cryst Growth Des. 2020;20(5):3053–3063.
3. Bianfei X, Singa W, Yanjie Z, Jingwen W, Henry H, Chenguang W, et al. Extended release of highly water soluble isoniazid attained through cocrystallization with curcumin. Cryst Growth Des. 2020;20(3):1951–1960.
4. Altagracia M, Monroy-Noyola A, Osorio-Rico L, Kravzov J, Varado-Calvillo R, Manjarrez-Marmolejo J, et al. Dapsone attenuates kainic acid-induced seizures in rats. Neurosci Lett. 1994;176(3):52–54.
5. Anderson R, Gatner EM, van Rensburg CE, Grabow G, Imkamp FM, Kok SK, et al. In vitro and in vivo effects of dapsone on neutrophil and lymphocyte functions in normal individuals and patients with lepromatous leprosy. Antimicrob Agents Chemother. 1981;19(8):495–503.
6. Anderson R. Enhancement by clofazimine and inhibition by dapsone of production of prostaglandin E2 by human polymorphonuclear leukocytes in vitro. Antimicrob Agents Chemother. 1985;27(12):257–362.
7. Ashurst JV, Wasson MN, Hauger W, Fritz WT. Pathophysiologic mechanisms, diagnosis, and management of dapsone-induced methemoglobinemia. J Am Osteopath Assoc. 2010;110(3):16–20.
8. Deng A, Zhang Y, Huang Y, Zhang M, Lou B. Preparation, crystal structures, and oral bioavailability of two cocrystals of emodin with berberine chloride. Cryst Growth Des. 2018;18(12):7481–7488.
9. Beiguelman B, Pisam RC. Effect of DDS on phytohemagglutinin-induced lymphocyte transformation. Int J Lepr Other Mycobact Dis. 1974;42:412–415.
10. Berlow BA, Liebhaber MI, Dyer Z, Spiegel TM. The effect of dapsone in steroid-dependent asthma. J Allergy Clin Immunol. 1991;87:710–715.
11. Bernstein JE, Lorincz AL. Sulfonamides and sulfones in dermatologic therapy. Int J Dermatol. 1981;20:81–88.
12. Bissinger EM, Heinke R, Spannhoff A, Eberlin A, Metzger E, Cura V, et al. Acyl derivatives of p-aminosulfonamides and dapsone as new inhibitors of the arginine methyltransferase hPRMT1. Bioorg Med Chem. 2011;29:3717–3731.
13. Blasum C. Untersuchung zur beinflussung der interleukin-8-spiegel in lipopolysaccharid-stimulierten vollblut gesunder probanden durch in der dermatologie angewandte antiinflammatorische pharmaka mit antioxidativer potenz [thesis]. Dresden: Technical University, University Hospital, Department of Dermatology; 1998.
14. Boehm I, Bauer R, Bieber T. Urticaria treated with dapsone. Allergy. 1999;54:765–766.
15. Bonney RJ, Wightman PD, Dahlgren ME, Sadowski SJ, Davies P, Jensen N, et al. Inhibition of the release of prostaglandins, leukotrienes and lysosomal acid hydrolases from macrophages by selective inhibitors of lecithin biosynthesis. Biochem Pharmacol. 1983;32:361–366.

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16. Booth SA, Moody CE, Dahl MV, Herron MJ, Nelson RD. Dapsone suppresses integrin-mediated neutrophil adherence function. J Invest Dermatol. 1992;98:135–140.
17. Mahmood N. The various preparation methods in synthetic chemistry. 1st ed. Evincepub Publishing House; 2019.
18. Novikov EM, Castañeda R, Fonari MS, Timofeeva TV. A 1:1 flavone cocrystal with cyclic trimeric perfluoro-o-phenylenemercury. Acta Crystallogr E Crystallogr Commun. 2024;80(7):717–720.
19. Mahmood N. Reactions and mechanisms. 1st ed. IJMRA Publication; 2018.
20. Matheus ME, de Almeida Violante F, Garden SJ. Isatins inhibit cyclooxygenase-2 and inducible nitric oxide synthase in a mouse macrophage cell line. Eur J Pharmacol. 2007;556:200–206.
21. Perro A, Reculusa S, Bourgeat-Lami E, Duguet E, Ravaine S. Synthesis of hybrid colloidal particles: From snowman-like to raspberry-like morphologies. Colloids Surf A Physicochem Eng Asp. 2006;284:78–83.
22. Mahmood N. Synthesis and biological study of hetero (atoms and cycles) compounds. Der Pharma Chemica. 2016;8(6):40–48.
23. Pera-Titus M, Leclercq L, Clacens JM, De Campo F, Nardello-Rataj V. Pickering interfacial catalysis for biphasic systems: From emulsion design to green reactions. Angew Chem Int Ed. 2015;54(7):2006–2021.
24. Mahmood N. Survey on methods of preparation and cyclization of heterocycles. Int J Chem Mol Eng. 2020;6(2):19–36.
25. Fan Z, Tay A, Pera-Titus M, Zhou WJ, Benhabbari S, Feng X. Pickering interfacial catalysts for solvent-free biomass transformation: Physicochemical behavior of non-aqueous emulsions. J Colloid Interface Sci. 2014;427:80–90.
26. Casagrande C, Fabre P, Raphael E, Veyssie M. Janus beads: Realization and behavior at water oil interfaces. Europhys Lett. 1989;9(3):251–255.
27. Mahmood N. Synthesis and chemical identification of macro compounds of (thiazol and imidazol). Res J Pharm Tech. 2015;8(1):78–84.
28. Yang L, Yue J, Zhou B, Zheng S. Purification, characterization and study of blue fluorescent substance in caffeine. J Chem Technol Biotechnol. 2024;99(5):1225–1239.
29. Mahmood N. The various preparation methods in synthetic chemistry. 2019.
30. Nagham MA. Synthesis of antifungal chemical compounds from fluconazole with (pharma-chemical) studying. Res J Pharm Biol Chem Sci. 2017;8(3):564–573.
31. Mehta SL, Manhas N, Raghubiz R. Molecular targets in cerebral ischemia for developing novel therapeutics. Brain Res Rev. 2007;54:34–66.
32. Mahmood N. Review on (azo, formazane, sulfazane)-compounds. Int J Innov Sci Eng. 2019;10:19–45.
33. Faria J, Ruiz MP, Resasco DE. Phase-selective catalysis in emulsions stabilized by Janus silica-nanoparticles. Adv Synth Catal. 2010;352(14–15):2359–2364.
34. Naumann d'Alnoncourt R, Csepei LI, Hävecker M, Girgsdies F, Schuster ME, Schlögl R, et al. The reaction network in propane oxidation over phase-pure MoVTeNb M1 oxide catalysts. J Catal. 2014;311:369–385.
35. Mahmood N. Experimental methods for preparation of Mannich bases, formazan, normal and cyclic sulfur compounds. 1st ed. Evince Pub Publishing House; 2018.
36. Antia C, Baquerizo K, Korman A, Alikhan A, Bernstein JA. Urticaria: A comprehensive review: Treatment of chronic urticaria, special populations, and disease outcomes. J Am Acad Dermatol. 2018;79(4):617–633.
37. Liang SE, Hoffmann R, Peterson E, Soter NA. Use of dapsone in the treatment of chronic idiopathic and autoimmune urticaria. JAMA Dermatol. 2019;155(1):90–95.
38. Mahmood N. Alternative methods in organic synthesis. 1st ed. Eliva Press SRL; 2020.
39. Mokrani T, van Reenen A, Amer I. Molecular weight and tacticity effect on morphological and mechanical properties of Ziegler–Natta catalyzed isotactic polypropylenes. Polimeros. 2015;25(6):556–563.
40. Mahmood N. Survey on methods of preparation and cyclization of heterocycles. Int J Chem Mol Eng. 2020;6(2):10–27.

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41. Rasool SR, Mahmood N, Al-Zuhairi AJ. Guanine substituted heterocyclic derivatives as bioactive compounds. Biochem Cell Arch. 2020;20(Suppl 2):3651–3655.
42. Wasaf AAK. Studying of thermal, spectral and liquid crystal properties of new monomers for Schiff base reaction. Al-Harf J. 2024;(20).
43. Dub PA, Gordon JC. The role of the metal-bound N–H functionality in Noyori-type molecular catalysts. Nat Rev Chem. 2018;2(12):396–408.

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