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Original Research Article

Synthesis, and in vitro evaluation of benzene sulfonamide derivatives for antimicrobial and disinfectant properties: Part-I

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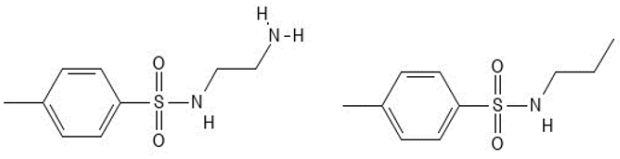
ABSTRACT

The synthesis of benzene sulfonamide derivatives has been reported here for the antimicrobial and disinfectant properties. The synthesis was performed by known literature procedure. P-Toulene sulfonyl chloride was reacted with ethylene diamine to yield to the desired compounds. The synthesis of these agents is reported in part -I of the paper. In subsequent parts the antimicrobial activity and disinfectant properties shall be reported.

1. Introduction

Benzene sulfonamide is a versatile moiety with several properties. Some of them include antimycobacterial.[1] antitubercular,[2] antibacterial[3] and antiviral,[4] etc properties. The synthesis of Benzene sulfonamide moieties is reported here from p-toulene sulfonyl chloride and ethylene diamine and to variate the reaction, with propylamine to yield compounds 1 and 2 respectively. The structure of these compounds have been reported in the Figure 1.



Compound 1 (AV2) Compound 2 (AV1)

Figure 1:

2. Materials and Methods

TLC was performed on 524nm Merk TLC plates. All chemicals were of synthetic grade and 98% purisis grade. TLC was eluted with 3 different solvents to check the purity of the compounds and visualized in Iodine chamber and further in UV chamber. The 1H-NMR was performed on Bruker 400 MHZ NMR before which FT-IR was performed on Perkin Elmer spectrophotometer. The synthetic scheme for the claimed compounds has been shown in Figure 2. The compounds were synthesized by sulfonamide formation reaction.[5]

2.1. Synthetic scheme

1. 4- methyl-N-(ethanamine)-benzenesulfonamide **(AV1)**: Equimolar quantities of p-toluene sulfonyl chloride and 1-propanamide were stirred at room temperature for 3 hrs vigorously in round bottom flask and magnetic bead on hot plate mantle with magnetic stirrer.
2. **FT-IR (λ, cm^{-1}):** 3454.9 (-NH_2 str.), 3108.7 (-N-H-H str), 3085.3 (-NH-H bending), 3001.7 (-SO_2 str), 2994.3, 2998.6 (-SO_2 bending), 1592.5 (CH_2-NH_2

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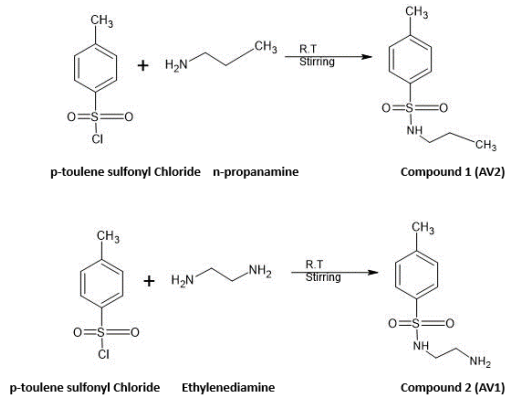

Figure 2:

str.), 1586.8 (CH_2-NH_2 str), 1256.7, 1182.5, 1155.0, 1121.6, 1099.2, 1078.4, 1002.6, 934.0, 879.0, 798.0, 664.0, 553.0, 362.0, 283.0, 146.0 (-CH-Aromatic).

3. **^{1}H-NMR (δ shift in ppm)**: 2.32 (3H, s) (-CH3), 2.87 (2H, t, J = 7.0 Hz) (-NH2), 3.52 (2H, t, J = 7.0 Hz) (CH2), 7.31 (2H, ddd, J = 8.0, 1.8, 0.4 Hz) (-CH Ar), 7.70 (2H, ddd, J = 8.0, 1.5, 0.4 Hz) (-CH Ar).
4. **4- methyl-N-propylbenzenesulfonamide(AV2) :** Equimolar quantities of p-toluene sulfonyl chloride and 1-propanamide were stirred at room temperature for 3 hrs vigorously in round bottom flask and magnetic bead on hot plate mantle with magnetic stirrer.
5. **FT-IR (λ, cm^{-1}):** 3047.4 (-NH Str), 3001.7(-SO_2NH Str), 2994.3 (-SO_2), 2998.6 (-CH Ar), 1592.5 (-NH-CH_2), 1586.8 (-CH_2), 1296.3, 1268.5, 1256.7, 1182.5, 1155.0, 1121.6, 1099.2, 1078.4, 1002.6, 934.0, 879.0, 798.0, 664.0, 553.0, 362.0, 283.0, 146 (1296-146,-CH Ar)
6. **^{1}H-NMR (δ shift in ppm):** 0.96 (3H, t, J = 7.0 Hz) (-CH3), 1.62 (2H, tq, J = 7.5) (-NH2), 3.52 (2H t, J=7.0 Hz) (-CH2), 2.32 (3H, s) (-CH3), 3.28 (2H, t, J = 7.5 Hz) (-CH2), 7.31 (2H, ddd, J = 8.0, 1.8, 0.4 Hz) (-CH Ar), 7.69 (2H, ddd, J = 8.0, 1.5, 0.4 Hz) (-CH Ar).

3. Results and Discussion

3.1. IR data

4- methyl-N-(ethanamine)-benzenesulfonamide (AV1)

FT-IR (λ, cm^{-1}): 3454.9 (-NH_2 str.), 3108.7 (-N-H-H str), 3085.3 (-NH-H bending), 3001.7 (-SO_2 str), 2994.3, 2998.6 (-SO_2 bending), 1592.5 (CH_2-NH_2 str.), 1586.8 (CH_2-NH_2 str), 1256.7, 1182.5, 1155.0, 1121.6, 1099.2, 1078.4, 1002.6, 934.0, 879.0, 798.0, 664.0, 553.0, 362.0, 283.0, 146.0 (-CH-Aromatic)

4-methyl-N-propylbenzenesulfonamide (AV2)

FT-IR (λ, cm^{-1}): 3047.4 (-NH Str), 3001.7(-SO_2NH Str), 2994.3 (-SO_2), 2998.6 (-CH Ar), 1592.5 (-NH-CH_2), 1586.8 (-CH_2), 1296.3, 1268.5, 1256.7, 1182.5, 1155.0, 1121.6, 1099.2, 1078.4, 1002.6, 934.0, 879.0, 798.0, 664.0, 553.0, 362.0, 283.0, 146 (1296-146 , -CH Ar)

1H-NMR data

4- methyl-N-(ethanamine)-benzenesulfonamide (AV1): 2.32 (3H, s) (-CH_3), 2.87 (2H, t, J = 7.0 Hz) (-NH_2), 3.52 (2H, t, J = 7.0 Hz) (-CH_2), 7.31 (2H, ddd, J = 8.0, 1.8, 0.4 Hz) (-CH Ar), 7.70 (2H, ddd, J = 8.0, 1.5, 0.4 Hz) (-CH Ar).

4-methyl-N-propylbenzenesulfonamide (AV2): 0.96 (3H, t, J = 7.0 Hz) (-CH_3), 1.62 (2H, tq, J = 7.5) (-NH_2), 3.52 (2H t, J=7.0 Hz) (-CH_2), 2.32 (3H, s) (-CH_3), 3.28 (2H, t, J = 7.5 Hz) (-CH_2), 7.31 (2H, ddd, J = 8.0, 1.8, 0.4 Hz) (-CH Ar), 7.69 (2H, ddd, J = 8.0, 1.5, 0.4 Hz) (-CH Ar).

4. Conclusion

From the IR and 1H-NMR data of the compounds, it was confirmed that the compounds were synthesized in Part-I of this paper. Further the evaluation of the compounds shall be done in Part-II of the paper.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Hussain R, Habib T, Ikram R, Muddassar M. Studies on the synthesis of benzene sulfonamides, evaluation of their antimicrobial activities, and molecular docking. *Latin Am J Pharm*. 2020;39(1):38–46.
2. Shingare RM, Patil YS, Sangshetti JN, Patil RB, Rajani DP, Rajani SD. Benzene sulfonamide pyrazole thio-oxadiazole hybrid as potential antimicrobial and antitubercular agents. *Res Chem Intermediates*. 2018;44:4437–53.
3. Ali AT, Mosa MN, Alshaheen ZG, Muhammad-Ali MA. Characterization and Antibacterial Evaluation of Oxoazetidin-Benzene Sulfonamide Derivatives as a Hybrid Antimicrobial Agents. *Syst Rev Pharm*. 2020;11(2):487–94.
4. Zhou D, Xie D, He F, Song B, Hu D. Antiviral properties and interaction of novel chalcone derivatives containing a purine and benzenesulfonamide moiety. *Bioorganic Med Chem Lett*. 2018;28:2091–8.
5. Ashfaq M, Shah SS, Najjam T, Shaheen S, Rivera G. Synthetic routes of sulfonamide derivatives: a brief review. *Mini-Rev Organic Chem*. 2013;10:160–70.

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