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A mini-Review on the Microwave assisted synthesis and Biological Evaluation of Thiazolidinone Derivatives

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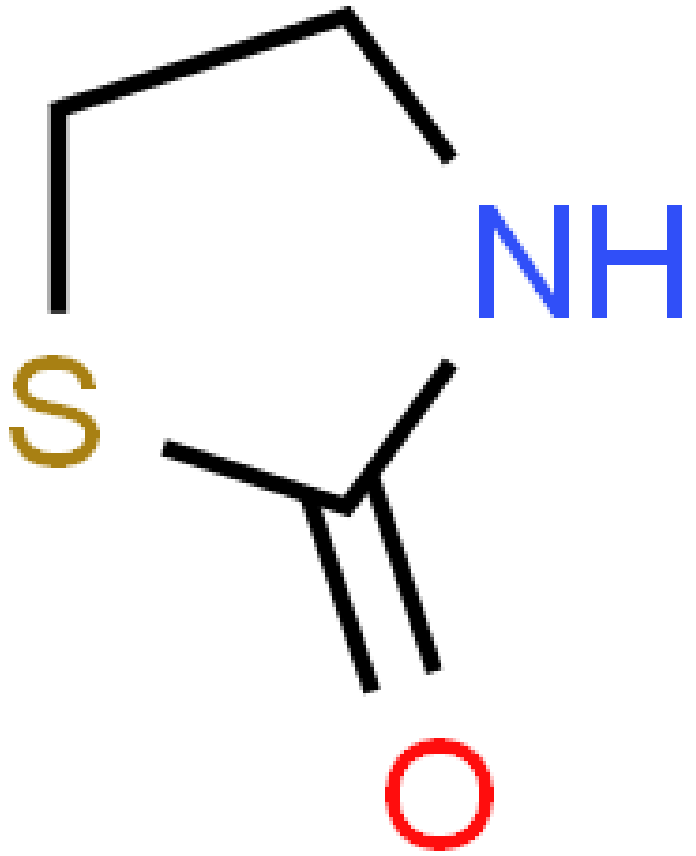
Introduction

A heterocyclic compound is a cyclic compound that has atoms of at least two different element as members of its rings. [Bansal, R.K., 2020.]

So, Thiazolidinone is a heterocyclic compounds because it contain {S} and {N} beside carbon

Structure



[Jain, A.K., Vaidya, A., Ravichandran, V., Kashaw, S.K. and Agrawal, R.K., 2012.]

Physical properties of Thiazolidinones

Thiazolidinones are a class of compounds with varying physical properties. They can be solids or liquids, have melting points ranging from 100°C to 250°C, and are generally soluble in organic solvents. Thiazolidinones are stable but can degrade under harsh conditions. They can be white, off-white, yellow, or orange, and are typically odorless or have a mild odor.

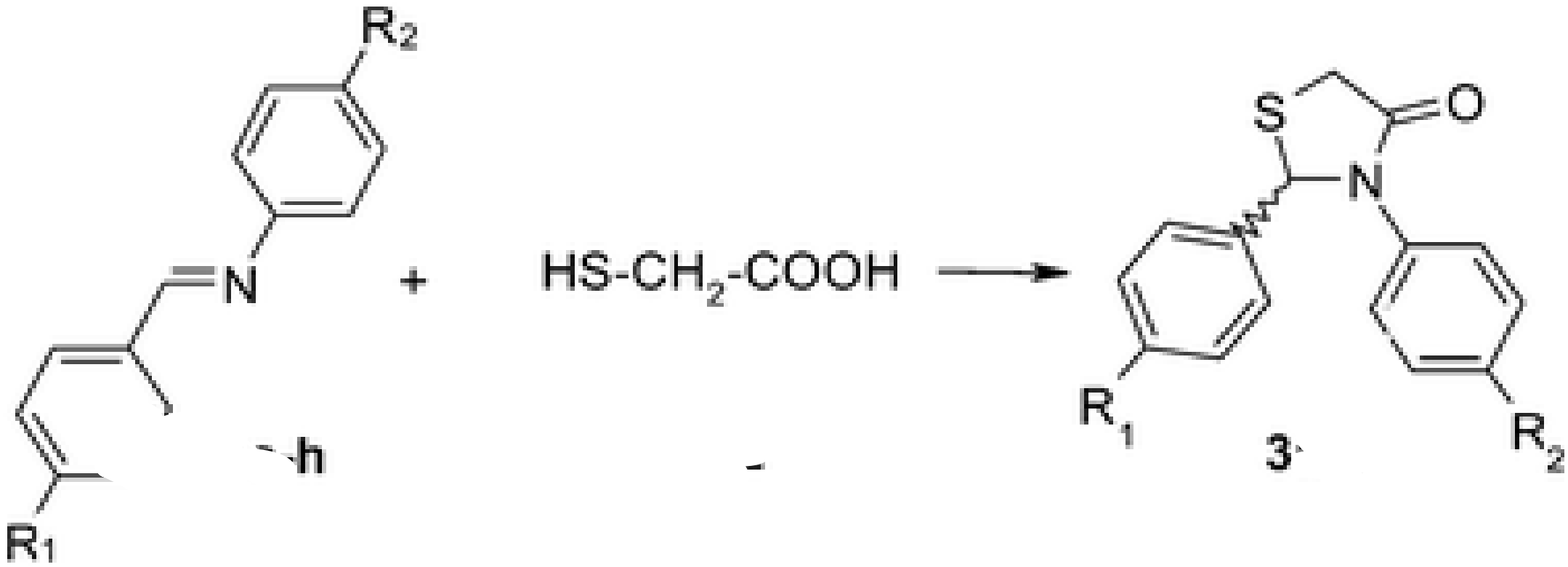
Siddiqui, N.A. and Siddiqui, M.S., 2011. Thiazolidinones: A biologically active compounds. *Mini reviews in medicinal chemistry*, 11(12), pp.1132-1144.

Microwave-assisted synthesis

Microwave-assisted synthesis accelerates chemical reactions using microwave irradiation, offering advantages like shorter reaction times and higher yields. This method has been used to synthesize Thiazolidinone derivatives efficiently.

Kappe, C. Oliver. "Microwave-assisted synthesis in water as solvent." *Chemical Society Reviews* 39, no. 4 (2010): 1433-1442.

Synthesis of Thiazolidinone

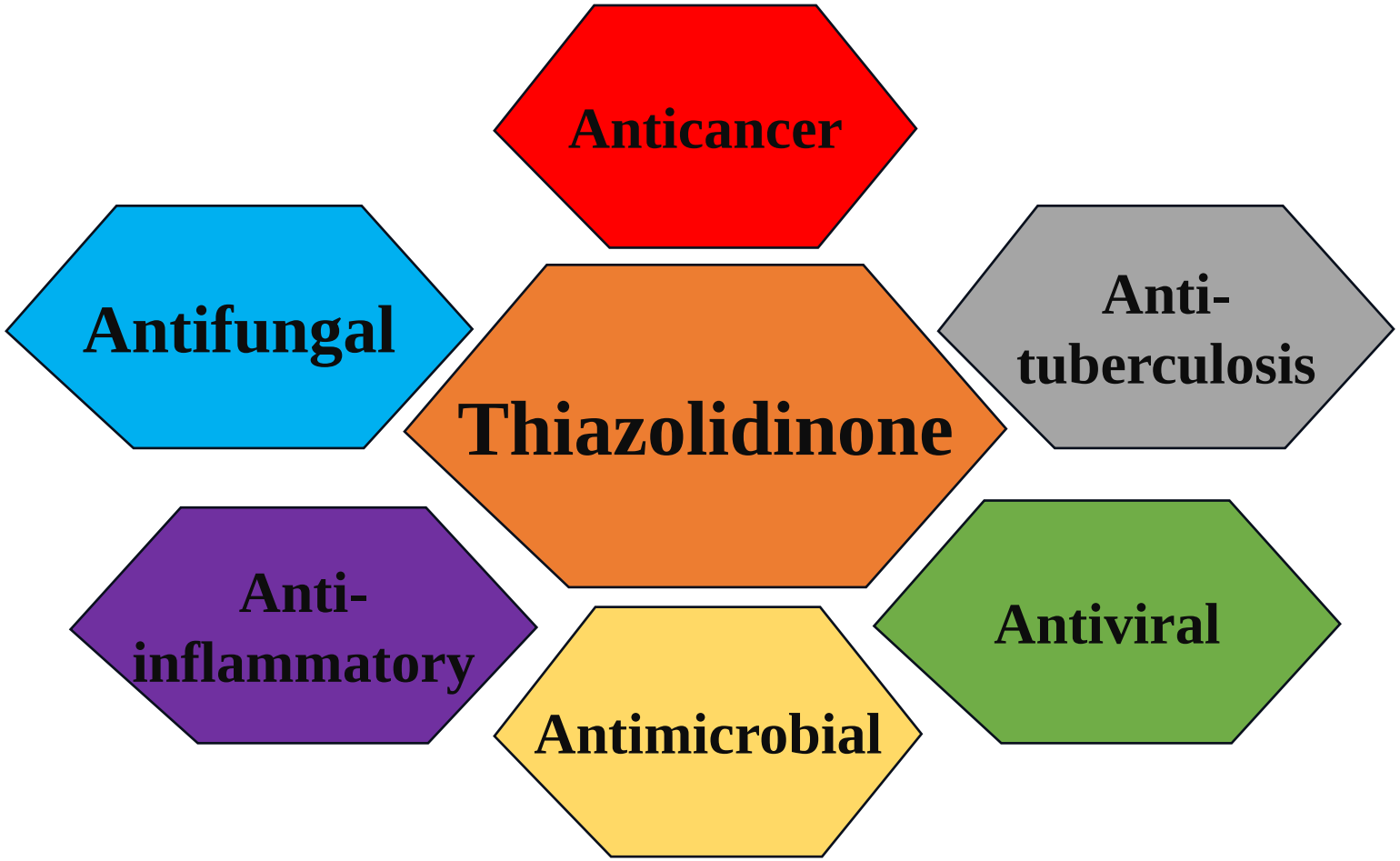


Benzylidene-anilines Mercaptoacetic acid 1,3-thiazolidin-4-ones

[Bolognese, A., Correale, G., Manfra, M., Lavecchia, A., Novellino, E. and Barone, V., 2004.]

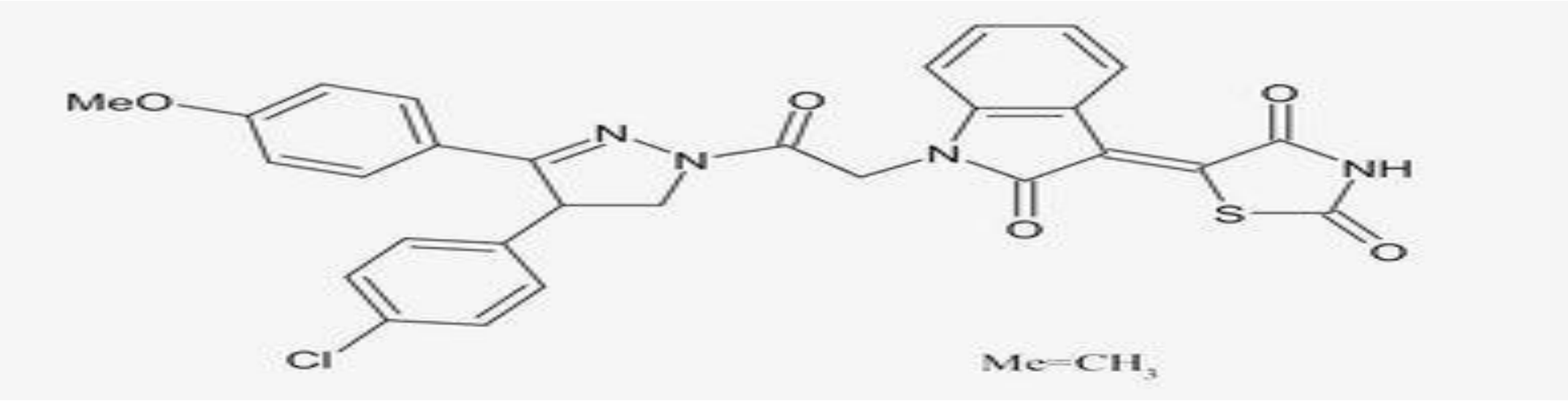
Biological evaluation

Thiazolidinones are known to possess a variety of physiological properties;



Anticancer Activity

Thiazolidinone derivatives have shown promising anticancer activity by inhibiting various cancer cell lines' growth and inducing apoptosis, Example:



Several uses and applications of Thiazolidinone derivatives

Thiazolidinones are versatile compounds with many applications:

- **Agrochemicals**
- **Material science**
- **Photophysics**
- **Metal ion sensing**
- **Catalysis**
- **Dyes/pigments**

(Auti, P.S., George, G. and Paul, A.T., 2020)

Chemical properties of Thiazolidinone derivatives

Thiazolidinone derivatives are versatile compounds that can undergo various chemical reactions, including cyclization, substitution, and condensation reactions. They exhibit acid-base properties, chelate with metal ions, and act as both electrophiles and nucleophiles. Their solubility properties vary depending on their structure.

(Kumar, P. et al. 2013) (Satyanarayana, D. et al. 2012) (Reddy, K. R. et al. 2012).

Unleashing Thiazolidinone Derivatives: Exploring Structure-Activity Relationships and Biological Evaluation.

- Electron-withdrawing groups (e.g., Cl, Br) enhance potency on the thiazolidinone ring.
- Substituents on the phenyl ring (electron-donating groups) increase potency.
- Linker length and flexibility impact molecular orientation and target binding.
- Additional functional groups (e.g., hydroxyl, carbonyl) improve target interactions.
- Stereochemistry influences pharmacological profiles.
- Rigidifying elements enhance molecular rigidity for optimal target interaction.
- The balance of hydrophobic/hydrophilic properties affects solubility and binding affinity.

References

- Bansal, R.K., 2020. *Heterocyclic chemistry*. 3rd ed. New Delhi : New Age International, pp.1-2
- Larhed, M. and Hallberg, A., 2001. Microwave-assisted high-speed chemistry: a new technique in drug discovery. *Drug discovery today*, *6*(8), pp.406-416.
- Siddiqui, N.A. and Siddiqui, M.S., 2011. Thiazolidinones: A biologically active compounds. *Mini reviews in medicinal chemistry*, 11(12), pp.1132-1144.
- Kappe, C. Oliver. "Microwave-assisted synthesis in water as solvent." *Chemical Society Reviews* 39, no. 4 (2010): 1433-1442.
- Bolognese, A., Correale, G., Manfra, M., Lavecchia, A., Novellino, E. and Barone, V., 2004. Thiazolidin-4-one formation. Mechanistic and synthetic aspects of the reaction of imines and mercaptoacetic acid under microwave and conventional heating. Organic & biomolecular chemistry, 2(19), pp.2809-2813.
- Qian, Y., Hu, W., Ma, Y., et al. (2021) 'Design, synthesis, and anticancer activity of novel thiazolidinone derivatives', *Bioorganic Chemistry*, 106, p. 104488.

- Auti, P.S., George, G. and Paul, A.T., 2020. Recent advances in the pharmacological diversification of quinazoline/quinazolinone hybrids. *RSC advances*, *10*(68), pp.41353-41392.
- Kumar, P. et al. (2013). Thiazolidinone derivatives: a potent antimicrobial agent. *International Journal of Pharmaceutical Sciences and Research*, 4(3), 959-972.
- Satyanarayana, D. et al. (2012). Synthesis and Antimicrobial Evaluation of Novel Thiazolidinone Derivatives. *Der Pharma Chemica*, 4(2), 522-529.
- Reddy, K. R. et al. (2012). Synthesis, Characterization and Antimicrobial Activity of Novel Thiazolidinone Derivatives. *Der Pharma Chemica*, 4(5), 2170-2175.
- Hernandez, F.J., Kalra, N., Wengel, J. and Vester, B., 2009. Aptamers as a model for functional evaluation of LNA and 2′-amino LNA. *Bioorganic & medicinal chemistry letters*, 19(23), pp.6585-6587.

Thank You