Synthesis and Biological Evaluations of Quinones and Hydroquinones as Anticancer Agents

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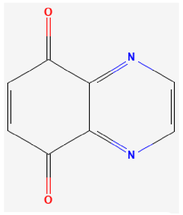
Abstract

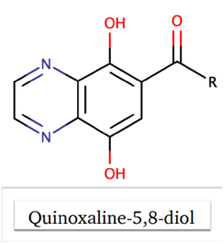
Quinones and hydroquinones exhibit anticancer properties which prompts the synthesis of their analogues to see whether further modifications can result in increased anticancer activity. This research seeks to synthesize quinoxaline-5,8-dione so that it can be used as a starting material for the preparation of quinoxaline-5,8-diol. Afterwards the products are to be assayed for cytotoxic effects on different cancer lines.

Introduction

So far in the newly curated chemical pathway to form quinoxaline-5,8-dione, the starting reactant, dimethoxybenzene, has underwent four of the five necessary reactions. Once the diol has been produced, it will be used as a starting reactant for a photo-Friedel-Crafts reaction to form quinoxaline-5,8-diol using a variety of aldehydes which will be tested for anticancer activity using the MTS assay cancer-line test.



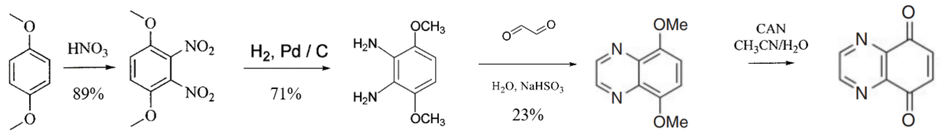
Quinoxaline-5,8-diol



Quinoxaline-5,8-diol

Methods and Results

- Nitration of dimethoxybenzene to form 1,4-dimethoxy-2,5-dinitrobenzene
- Hydrogenation to form 1,2-diamino-3,6-dimethoxybenzene.
- Glyoxal & sodium bisulfite reaction to yield 5,8-dimethoxyquinoxaline
- Organic solvents were evaporated at reduced pressures
- Silica gel column chromatography used to purify 5,8-dimethoxyquinoxaline and quinoxaline-5,8-dione
- Products were identified using NMR
- Bioactivity will be tested in collaboration with the Department of Biomedical Sciences at UTRGV

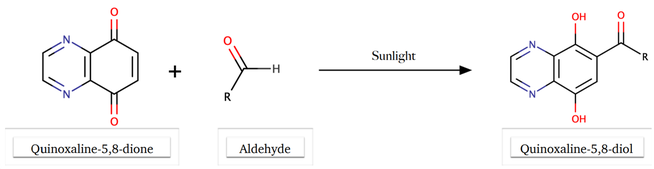


Conclusion

- New pathway quinoxaline-5,8-dione synthesis avoids the formation of the *para* isomer during nitration
- Incorporates a faster hydrogenation reaction (24h -> 5h) with NMR signals to ensure the intermediate is formed
- Glyoxal & sodium bisulfite reaction was used to avoid formation of methyl as the R group so that the dimethoxyquinoxaline and quinoxaline only contain H atoms on the 6 and 7 positions.
- However, percent yield proved to be low on reaction 4; will try to use a different reaction

Future Work

- Quinoxaline-5,8-diol will be synthesized with a variety of aldehydes via photo-Friedel-Crafts acylation and will be tested for anti-cancer activity
- Reactions 3 & 4 will be re-done, using glyoxal trimer dihydrate & CAN to see if a higher yield can be achieved
- The lab will continue to test other derivative molecules



Quinoxaline-5,8-dione | Aldehyde | Quinoxaline-5,8-diol

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