Synthesis of Bicyclic Lactams From Simple Caprolactams To Contribute To Targeting Antibiotic Resistance

Background

Antibiotics are used to treat some bacterial infections. However, antibiotic resistance is becoming of increasing concern. Antibiotic resistance can occur for several reasons and misuse has resulted in 'superbugs', which are strains of bacteria that have developed resistance to antibiotics, such as MRSA (methicillin-resistant Staphylococcus aureus), (National Health Services, 2019). Superbug infections are an epidemic concern as they are challenging to treat and often result in disability or death (National Health Services, 2019). Research into new antibiotics is imperative, so we can find a way to treat resistant infections and prevent deaths.

Objectives

This project focused on synthesising compounds which will later undergo Dieckmann cyclisation and be tested for antibiotic activity. Three main compounds were focused on over the course of seven weeks. Many experiments and procedures were conducted, included some overnight processes.

One of the compounds we intended to synthesise was one that had never before been produced.

Methodology

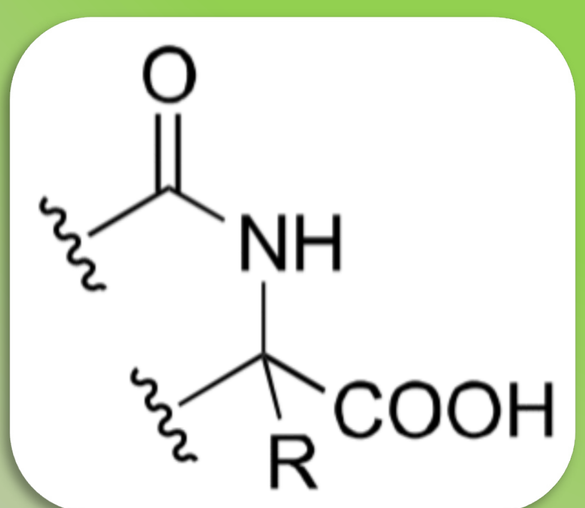
Saponification was a key procedure used to obtain one particular compound. Extraction and reflux techniques were also used to obtain results.

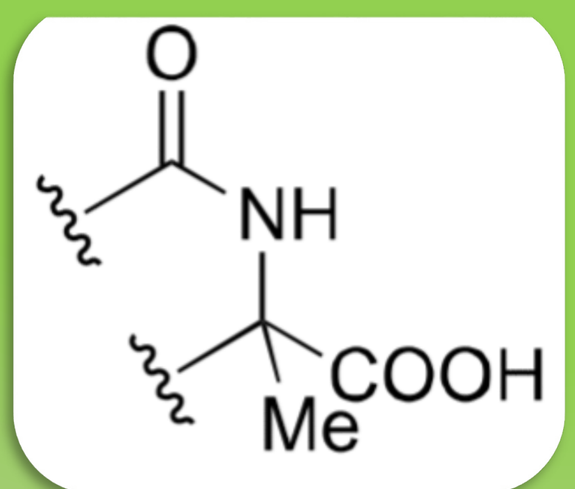
In addition, high frequency pressure from an ultrasonic bath was used to obtain any product adhering to glassware, in order to maintain a high product yield.

Column chromatography was used to obtain a purified compound from a mixture. Furthermore, thin-layer chromatography was used to identify the fractions collected from the column. The column produced many fractions with a successful compound yield.

An NMR spectrum was produced for every compound created and these were all analysed.

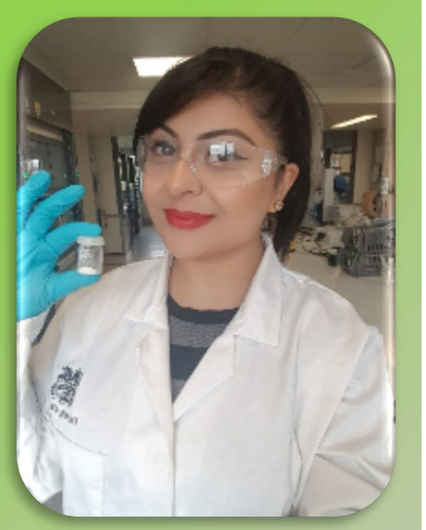
When preparing an NMR sample, it was often challenging to find a solvent that would dissolve the compound. It was important to systematically work through appropriate solvents and form an educated guess of what to try next.





Outcomes

Three compounds were successfully created and one was purified using a chromatography column.
A new compound which has never before been synthesised was produced, which has the potential to be used in future research into targeting antibiotic resistance.



References

National Health Services (2019) *Antibiotic resistance*. London: National Health Services. Available from https://www.nhs.uk/conditions/antibiotics/antibiotic-antimicrobial-resistance/# [accessed 31 August 2019].
Pixabay (2016) *Drugs* [image]. Available from https://pixabay.com/photos/headache-pain-pills-medication-1540220/ [accessed 31 August 2019].

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