Dalhousie University

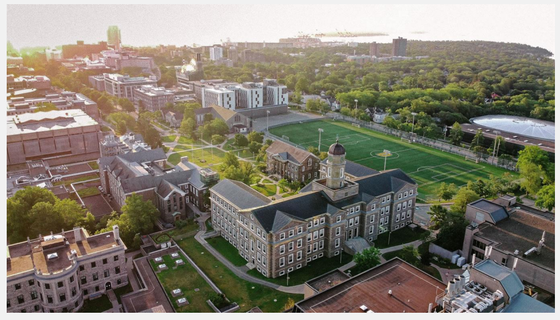
Halifax, Nova Scotia
Canada

Oliver Williams, Chemistry

Dalhousie University

Dalhousie University (aka Dal) is located in central Halifax, NS. The student body is made up of over 20,000 students, with Dalhousie known widely for its research intensity and STEM programs.

The Chemistry faculty is one of the strongest in Canada, with a total of 22 research labs operating at the university, ranging in area of study from biochemistry (Bearne Lab) to main group, to flash photolysis chemistry.



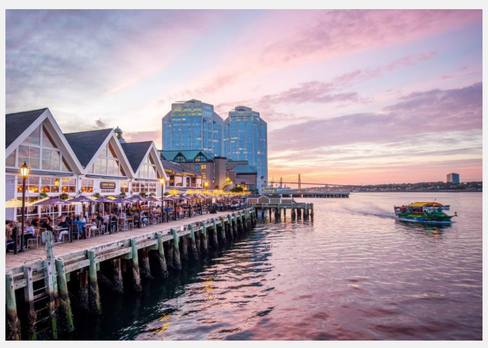


There is a new-ish exchange society as of 2024, which hosts a variety of events about once a month (pub intro night, ice skating etc.)

Make sure to take advantage of O-Week (freshers' week) with plenty of events to meet other exchange students

Halifax & Nova Scotia

Halifax is a popular student city, with six universities and over 32,000 students. The city is walkable (for North America!) and has a reliable bus service, although accommodation can be *very* tricky to find if you leave it late.





Nova Scotia is the larger of Canada's two 'island provinces', which makes it more condensed than any other province. Nearby highlights include:

- Cape Breton National Park
- Kejimkujik National Park
- Lawrencetown Beach
- Peggy's Cove
- Lunenburg
- Cape Smokey for ski-ing in winter

Travel & Transport

Halifax makes a great base for further travel in the rest of North America. During the year, I managed to visit all but two of the Canadian provinces, as well as 17 US states.

Dalhousie has 'reading week' breaks, which are a great opportunity to get further afield. Although you could fly cross-country, it's worth experiencing the Canadian landscape by car.

All that you need to rent a car as a group is:

- Someone with a driving license (any country)
- Somone with a credit card (or sometimes EU debit)

And for cheaper trips, the Dalhousie Outdoors Society allows free rental of all equipment (tents, sleeping bags, etc.), as well as organised trips and plenty of climbing.





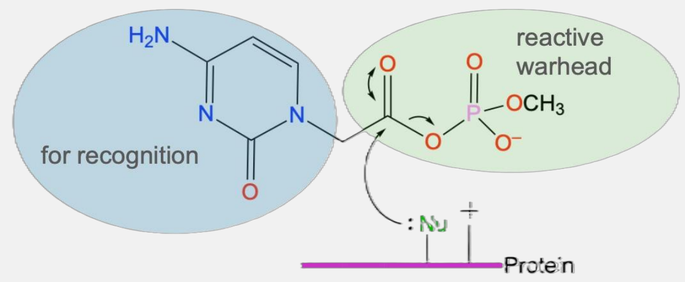
References

1. L. C. McGary, G. L. Regan, S. L. Bearne, *Biochim. et Biophys. Acta. Prot. and Proteom.*, 2023, **1871**, 6, 140945.
2. S. S. Bosch, S. Lunev, F. A. Batista, M. Linzke, T. Kronenberger, A. S. S. Dömling, M. R. Groves, C. Wrenger, *ACS Infect. Dis.*, 2020, **6**, 5, 986-999.
3. R. Katritzky, T. Narindoshvili, *Org. Biomol. Chem.*, 2008, **6**, 3171-3176.

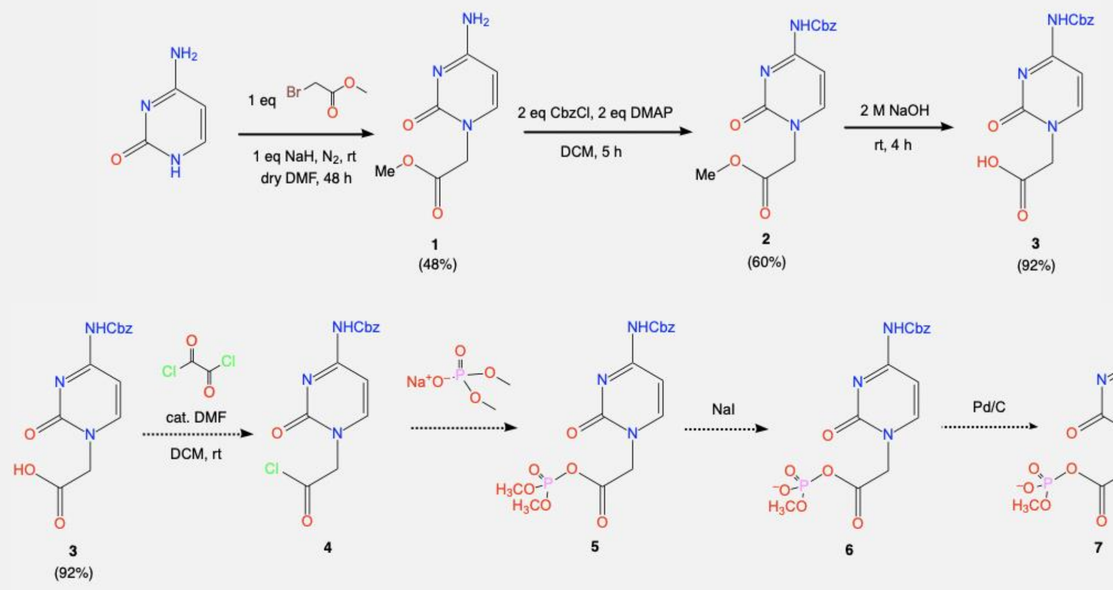
Research Project:
Synthesis of a Methyl Acyl Phosphate Cytosine Analogue

My research project was performed as a part of the Bearne lab, a biochemistry lab focused on enzymology and protein studies.

Introduction
Cell over proliferation is a key problem in the treatment of a variety of diseases, both pathogenic and cancerous. CTP Synthase is the enzyme facilitating the biosynthesis of cytosine, a vital building block of DNA.
In previous studies, the methyl acyl phosphate group was found to bind irreversibly to CTP Synthase, and CTP was found to be the best fot within the active site of CTP synthase.
The aim of my project was to synthesise a methyl acyl phosphate analogue of cytosine, to inhibit CTP Synthase such that the cytosine pool is depleted in pathogenic cells.



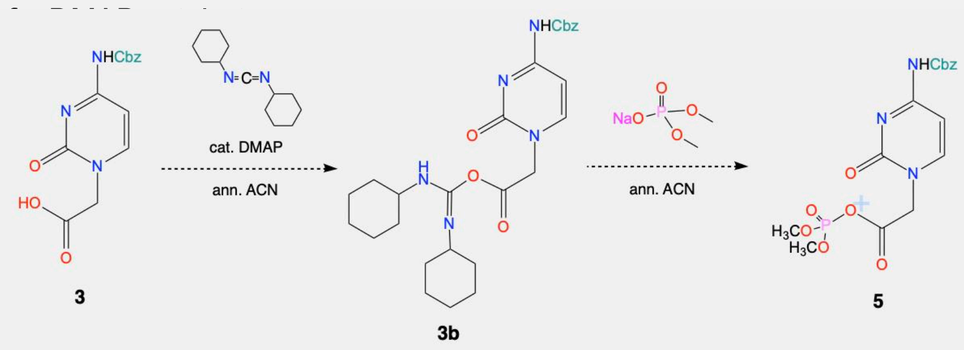
The synthetic scheme below was proposed:



Results & Conclusion
Molecules **1**, **2**, and **3** were synthesized successfully, with respective yields of 48%, 60% and 92% respectively. In the case of molecule **3** this is a higher yield than previously achieved in the literature.

The step to activate the carboxylic acid proved complex, and a variety of synthetic conditions were employed, but I was confident that molecule **4** was produced, although without significant separation to determine a yield.

Molecule **5** was synthesized in a greater yield on reaction of molecule **3** with DCC, and this reaction was shown to be flexible across two solvents and both with and without the presence



It was concluded that this synthetic pathway is the most valuable for further research.

The SYA Experience

Studying abroad for a year has been the best decision I've ever made. I got the opportunity to meet people that I never expected to and make memories with them that I'll never forget.





Even if it's not in Halifax, I couldn't recommend taking an SYA any more highly!