

CONCORDIA UNIVERSITY
DEPARTMENT OF CHEMISTRY & BIOCHEMISTRY
CHEMISTRY 498-53 – SECONDARY METABOLISM
COURSE INFORMATION

COURSE FORMAT: Lectures ONLY.

INSTRUCTOR: Brandon Findlay
Office: SP-265.22
Tel.: 848-2424 ext.5315
e-mail: Brandon.Findlay@concordia.ca

OFFICE HOURS:

OUTLINE: This course will examine the biosynthesis and chemical ecology of natural products from plants, bacteria, and fungi. Special emphasis will be placed on natural products built through iterative processes (ie. polyketides and non-ribosomal peptides), as well as those with interesting biological activities.

PREREQUISITES: CHEM 222, CHEM 375, BIO 261. CHEM 324 recommended.

GRADING:

Class participation	5%
Presentation	20%
Midterm Exam	25%
Final Exam	50%

PRESENTATIONS: Each student will give a 20-25 minute presentation on a key advance touching on course material, either in pairs (undergraduates) or alone (graduate students). Students will be evaluated on the quality of their talk and their response to questions from the audience. Asking questions and providing constructive feedback on student presentations will contribute to a student's participation grade.

COURSE OUTLINE:

Part 1. Form

Background

- Cofactors.
- Isotope labeling strategies.
- Enzyme inhibition.

Biosynthesis of steroids and terpenes

- Isoprenyl pyrophosphate.
- Oxidation reactions and formation of terpenes.
- Sesquiterpenes and steroid biosynthesis.

Shikimic acid pathway

- Aromatic amino acids, PLP.
- Alkaloids.
- Ergot acid biosynthesis – LSD.

Fatty acids

- Review: synthesis of saturated and unsaturated fatty acids.

Biosynthesis of polyketides

- T1 – Modular domain structure, genes.
- T1 part 2 – Iterative domains and the ACP (fungal).
- T2 – Oxytetracycline.

Non-ribosomal peptide synthases (NRPS)

- Domain structure – common domains. Peptides.
- Domain structure – complex domains. Beta lactams, vancomycin.

PKS-NRPS hybrids

Part 2. Function.

Natural products that act as structural components.

- Lignin.
- Peptidoglycan.
- Exopolysaccharide matrix - Biofilms.

Signaling molecules

- AI-2, homoserinelactones, A-factor.

Predator avoidance.

- Nicotine, morphine, bacillaene.

Predation and virulence factors.

- Pyocyanin, shigellatoxin.

Antibiotics

- Gentamycin/kanamycin, erythromycin, tetracycline, penicillin, DNA gyrase inhibitor.

Anticancer agents

- Taxol, bleomycin, epothilone, mitomycin.