# FOOD 4002

## - Analysis of Food Contaminants -

Course outline

Winter 2021

Trinda Crippin and David McMullin

FOOD 4002

Analysis of Food Contaminants

**Contact information and schedule**

Contacts

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**LAB SCHEDULE**

| **Week starting** | **Laboratory topic** | **Due date** (before 11:59pm) | | |
|---|---|---|---|---|
| | | **Pre-lab** | **LAs[1]** | **Assign[2]** |
| Jan 11 | No lab – Complete lab safety and WHMIS | | | |
| Jan 18 | Exp. 1: Chloramphenicol in honey | Jan 18 | Jan 22 | |
| Jan 25 | Exp. 1: Chloramphenicol in honey | | | Jan 29 |
| Feb 1 | Exp. 2: Deoxynivalenol | Feb 1 | Feb 5 | |
| Feb 8 | Exp. 2: Deoxynivalenol | | | Feb 12 |
| Feb 15 | Reading week; written assignment assigned | | | Mar 29 |
| Feb 22 | Exp. 3: Glycoalkaloids | Feb 22 | Feb 26 | |
| Mar 1 | Exp. 3: Glycoalkaloids | | | Mar 5 |
| Mar 8 | Exp. 4: Phytosterol oxidation products in coffee | Mar 8 | Mar 12 | |
| Mar 15 | Exp. 4: Phytosterol oxidation products in coffee | | | Mar 19 |
| Mar 22 | Lab exam | | | Mar 23 |
| Mar 29 | No lab | | | |

[1] = Learning activities
[2] = Assignments, lab reports and reflection assignments

The first week the students are expected to prepare a pre-lab, watch/read the content provided and complete learning activities such as video quizzes, and smaller assignments. The second week will require for the student to hand in a full lab report and a reflection assignment.

**Evaluation and grading - Mark breakdown**

The overall mark for FOOD4002 and is made up of the following components:

| | |
|---|---|
| Pre-lab questions: | 10% |
| Video quizzes (learning activities): | 10% |
| Written assignment: | 10% |
| Lab reports: | 50% |
| Reflection assignments | 10% |
| Lab exam: | 10% |

Important:
You are required to complete and submit ALL reports for every experiment performed. Regardless of completeness and due date. Failure to hand in all reports will result in an in automatic grade of F for the course.

All late learning activities and assignments will be penalized **10% per day** and will result in a grade of zero after 3 days (unless satisfactory arrangements have been made with the Laboratory Coordinator well in advance of the due date). Weekends are counted as 2 days, therefore resulting in 20% off. All assignments must be handed in during the semester regardless of the date. Otherwise the final grade will result in an incomplete.

**Pre-lab questions**

Pre-labs will be due before 11:59pm on the first Monday of each experiment.

This is to be completed prior to watching the concept videos, to ensure you understand the experiment. You must complete the pre-lab questions to gain access to the concept videos. Pre-lab questions will pertain to: concepts, techniques, reactions, specimens, hazards, calculations and observations needed for this experiment.

**Video quizzes (learning activities)**

Quizzes and critiques will be due before 11:59pm on the first Friday of each experiment.

Video quizzes administered throughout the laboratory videos, can cover anything from the experiment (demonstration in the video), chemical structures, hazards, roles of reagents, working principles, techniques etc.

To be prepared for this quiz, you should be able to: explain the general nature of the experiment, explain the purpose of all reagents and techniques used, and draw conclusions from the results obtained.

**Written assignment**

Select an instrumental method or analytical tool commonly used to examine chemical, microbial, or physical food safety issues. Emphasis should be placed on how the instrument functions and how it helps solve food safety problems. For your selected analytical instrument, demonstrate how it helps solve a specific food safety issue. For example, using LC-MS/MS to quantify regulated potato glycoalkaloids would be suitable (come up with your own food safety issue, the ones covered in class are not allowed).

Confirm your instrumental method and food safety issue with David McMullin prior to March 1, 2021. Assignments are expected to be 10-12 double spaced pages using a standard font (i.e. Times New Roman, font 12). There will be an emphasis on writing style: write in a clear, concise manner with a logical progression. Reference peer-reviewed journal articles, books and reports as appropriate. Page limit does not include references, tables, or figures. A more comprehensive marking scheme will be given when assigned.

**Laboratory Reports**

Laboratory reports are due before 11:59 pm on the Friday of week two for each laboratory experiment.

It is expected that third-year students should be capable of writing reports in a proper scientific manner (third person; past tense; proper citation within the text as well as in the references section; properly labeled tables and figures; one sample of each calculation performed (when appropriate); the genus and species name of microorganisms should be *italicized*).

Each lab report should contain approximately 9-13 pages including references. The important thing is not the number of pages, but rather the content of the report. We hope you will be able to give us all the information necessary in the report without using an excessive number of pages.

Late reports will be penalized **10% per day** and will result in a grade of zero after 3 days (unless satisfactory arrangements have been made with the Laboratory Coordinator well in advance of the due date). Weekends are counted as 2 days, therefore resulting in 20% off. All assignments must be handed in during the semester regardless of the date. Otherwise the final grade will result in an incomplete.

The **full reports** will be graded out of 100 and will include all sections listed below.

The marking scheme for reports will be as follows:

1. Format (5 marks)

Typed; double-spaced; Times New Roman font, size 12
Neatness
Spelling and grammar
Proper use of scientific language (fourth year standing level)

2. Cover page (1 page) (0 marks)

The title of the lab
Name
Date of completion

3. Abstract (1 paragraph) (5 marks)

A brief statement (four to five sentences) describing your objective(s), results and their meaning in the context of food safety. The reader should be able to assess the value of your experiment based on this section. Be concise and include important characterization data (this can include contaminant amounts) and if these amounts are above or below regulatory thresholds.

4. Introduction (2-3 pages) (20 marks)

The introduction is a statement of the fundamental principles of the experiment and discussion of how these principles relate specifically to the experiment. Use references as appropriate in this section (include in text citations). The laboratory manual is not a suitable reference- the primary literature must be consulted (journal articles, text books and book chapters). You may make use of figures or tables in this section to highlight important aspects of the experiment. This section should be 2-3 double-spaced pages, exclusive of tables/figures.

5. Methods (1 page) (15 marks)

This section should be in third person, past tense and should describe all techniques performed. It should also contain information about the materials (e.g., microbial material, plant material, dairy material) and the equipment used in the analysis. Your methods should not be a repetition of the step by step procedure. They are a brief yet precise account of what you did. Do not simply recopy the lab manual protocols. If any steps were changed include these changes (e.g., weighed amounts,

volumes of reagents, reaction times, temperatures, etc.). The lab manual protocols contain technical information that does not belong in a Methods section of a scientific report. Therefore, provide enough detail that another researcher or student could replicate your experiment, but focus on brevity. Avoid unnecessary detail that is not relevant to the outcome of the experiment such as indicating beaker, flask and pipette sizes; indicating that you dipped your spreader in ethanol and flamed off the excess ethanol, etc.

6. Results (2-3 pages depending on amount of data obtained) (20 marks)

This section should include all data collected (in tables and graphs when possible) followed by any calculations performed including statistics such as standard errors. Each table and graph should be numbered. Explain units and abbreviations. List observations for products. Always include physical observations such as colour, texture, consistency, etc. where applicable. Include sample numbers, names, and sample calculations. Include statistics (standard errors and standard deviations), analytical calculations (LOD, LOQ, contaminants amounts), and comparisons to known values or regulatory limits. Show your units- your calculations are meaningless without them. It is highly recommended to briefly explain what each of your calculations are showing. Ensure that this section is clear and easy to follow by the reader.

Figure titles should be placed below the figure, and table titles are to be placed above the table. Both titles should briefly describe the content. You need to state in words the content of your tables and figures. You cannot simply repeat the data from your tables and figures. You must indicate which samples/treatments were better than the others or the control (based on the statistics) and by how much (e.g., 40% less, 2-fold higher, etc.).

7. Discussion (3-5 pages) (20 marks)

This section is not simply a restatement of your results. You must provide analysis and insight in this section to demonstrate your understanding of your findings. Relate your results and observations to the theory and purpose of the experiment. This section is used to explain your results.

- Discuss data mentioned in the results section in detail (reference table and figures) and in terms of the purpose of the experiment. Did you manage to fulfill the purpose and what evidence do you have to support this claim?
    - Your results in the context of food/feed safety must be discussed.
- Reference important primary literature and relevant Canadian and/or International thresholds or guidelines (i.e. maximum limits for chemical contaminants).
    - It is important to compare your results to similar work in the scientific literature by referencing high quality peer-reviewed journal articles.
- Discuss comparisons of different regulatory approaches or thresholds need to be discussed.

- You will need to comment on advantages and limitations of the analytical approach used in the laboratory to address your food safety problem(s). Refresh and explain some basic theory using your results and observations.
    - Discuss other analytical approaches, and their intrinsic advantages and limitations.
- There may be specific points to consider that are addressed in your laboratory manual. You must discuss these points in this section.

8. Conclusion (1 paragraph) (5 marks)

In one paragraph, you should restate the purpose of the experiment and summarize the diagnostic values/data from your discussion section. Comment on the success of the experiment - was the purpose of the experiment fulfilled?

9. References (10 marks)

The mark will be based on the quality of references used (journal articles containing the appropriate information) and the format. Each lab report should contain at least 4 reputable resources.

a. Within the text your references should be in the format: (author(s), date).
Example:
… was previously shown to possess antimicrobial activity (Crippin et al., 2020; Crippin and McMullin, 2019).

b. In the reference list at the end of the report, the format should be: author #1 last name, first name(s) initial(s), author #2 last name, first name(s) initial(s), etc. (Year). Title of article. *Journal Name*, Volume: pages.
Example:
McMullin, D.R., Hoogstra, S., McDonald, K.P., Sumarah, M.W. & Renaud, J.B. (2019). Natural product discovery with LC-MS/MS diagnostic fragmentation filtering: application for microcystin analysis. *Journal of Visualized Experiments*, 147: e59712.

Aiken, A., Miller, J.D. and McMullin, D.R. (2019). Isolation, chemical characterization and hydrolysis of the trichothecene 7α-hydroxy, 15-deacetylcalonectrin (3ANX) from *Fusarium graminearum* DAOMC 242077. *Tetrahedron Letters*, 60: 852-856.

**Reflect and Look Ahead assignment**

Reflection assignments are due before 11:59 pm on the Friday of week two for each laboratory experiment.

At the end of each experiment, you will be asked to complete a short reflection assessment. These reflective assessments help ‘close the learning loop’ on given concepts. Reflecting on

what you have learned and how learning took place will solidify your knowledge and increase your awareness of learning approaches that work for you, such that you can use them again in the future. The reflections may also help you draw connections between different concepts within this course, and beyond. These short assignments will not ask you to explain what you have learned. Instead, they will prompt you to reflect on your learning process in order to review and reflect on the learning experience (the lab experiment) and to look forward.

Assessment questions (online worksheets in cuLearn):

a. In your opinion, what are the two most important points you learned from this week's experiment, learning activities, and assignments?
b. What did you find most challenging about learning these concepts, performing the learning activities and/or preparing the assignment(s)? Why do you think this was challenging for you?
c. In your opinion, how do you think these experiments, activities, and assignments connect to the course?
d. In your opinion, how do you believe you can use this week's experiments, activities, and assignments toward learning in this course going forward?

| | **Not Attempted** | **Beginning** | **Developing** | **Competent** | **Exemplary** |
|---|---|---|---|---|---|
| **Reflection on Learning Process** | Does not describe learning experience.<br><br>0 marks | Describes learning experience.<br><br>2 marks | Describes learning experience with limited insight into how learning occurred.<br><br>4 marks | Examines learning experience to provide insight into how learning occurred.<br><br>6 marks | Examines learning experience to provide insight into how learning occurred and how this may add to previous or future knowledge acquisition.<br><br>8 marks |
| **Clarity** | Does not include enough content to communicate ideas.<br><br>0 marks | Communicates ideas in a way that is unclear and wordy.<br><br>0.5 marks | Communicates ideas in a way that is sometimes unclear and wordy.<br><br>1 mark | Communicates ideas in a way that is mostly clear and concise.<br><br>1.5 marks | Communicates ideas in a way that is clear and concise.<br><br>2 marks |

**Lab Exam**

More information will be provided closer to the examination date. Can expect 5-10 long answer questions.

**Laboratory attendance and participation**

Please note that successful completion of the laboratory work is required to pass the course. In the event that a student misses a scheduled laboratory session, a make-up laboratory may be possible under certain conditions. This is applicable for all evaluations. Among the required conditions:

1. A request for a make-up lab must be made in writing (e.g., by email) to the lab coordinator no later than 24 hours after missing the lab session; and
2. A request for deferral must be fully supported by appropriate documentation, which must include the following form https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf.

**Minimum technological needs:**
In order to use the tools on cuLearn effectively, a desktop or laptop computer and a reliable internet connection are **highly recommended**. In order to access material (slides, videos and other content/resources), connect to live session through BigBlueButton, perform learning activities, and submit assignments, the following is also recommended:
a. The latest version of your web browser(s): Chrome or Firefox are highly recommended. Some functionality of BigBlueButton and other tools are not compatible with other browsers. Safari should be avoided.
b. Make sure you have pop-ups and cookies enabled.
c. The latest version of Java (www.java.com) is also recommended.
d. The recent version of MS Office such as MS Office 365 Pro Plus for Mac or PC (available free for Carleton University students at (https://carleton.ca/its/ms-offer-students/)
e. During live synchronous sessions, a headset, headphones, earphones/earbuds or similar technology are highly recommended.

**Requests for academic accommodation:**
You may need special arrangements to meet your academic obligations during the term. Please see the following link for additional information https://students.carleton.ca/course-outline/. For an accommodation request, the processes are as follows:

**Students with Needs Related to Family Status**: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the following website: https://carleton.ca/equity/.

**Student with Religious Obligations**: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the undergraduate calendar at the following website:
https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/regulations-for-students-with-religious-obligations/.

**Students with disabilities requiring academic accommodations** in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities could include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC, 613-520-6608, every term to ensure that I receive your Letter of Accommodation, no later than two weeks before the first assignment is due or the first in-class test/midterm requiring accommodations. For more details visit the undergraduate calendar at the following website: https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/regulations-for-students-with-disabilities/. Page 7 of 7

**Academic Misconduct:**
The consequences of copying, plagiarism and other forms of cheating are substantial. Students are referred to the 2020/2021 Undergraduate Calendar for information on this topic. The Carleton University Academic Integrity Policy can be found online at https://carleton.ca/registrar/academic-integrity/. It is **your responsibility** to know the contents of these policies, so it is highly recommended that you read them.