BIOC5915.03 — Scientific Communication in Biochemistry and Molecular Biology II

Transcript Title: Biochem Communications II

Instructor: Dr. David Waisman **E-mail:** david.waisman@dal.ca **Office LocationTupper:** 11-L2

Time and place: Winter Term 2025 Beginning January 8th

Tuesday from 1:05 – 2:25. Classes are online unless notified otherwise.

Course Description:

This course provides students with experience in the oral presentation of scientific data and organizing a scientific symposium. Interactive faculty and peer feedback are used to hone student skills, emphasizing both clarity of presentation and the ability of students to discuss specialist topics in general terms.

Format: Symposium (including practice, organization, and presentation) and attendance at Department Seminars

Credit Hours: 3

General Learning Outcomes: By the end of this course, it is expected that students should be able to:

1. Prepare and deliver an oral scientific presentation to a peer audience.
2. Appraisal of scientific presentations to determine features that enhance or deter from the communication of the science.
3. Present scientific data by critically analyzing the seminars of others.
4. Summarize the objectives and results of a published scientific study in a format similar to a scientific journal abstract.
5. Critically evaluate a scientific publication.
6. Organize an oral presentation session for a scientific meeting.

Course Material and Assigned Readings:

Course prospectus, class material, links to papers discussed in class, and other assigned readings are available for download from the course website (http://www3.biochem.dal.ca/5915/).

Course Organization:

Part 1 applies and hones presentation skills. Students select a scientific topic of their choice and prepare individual presentations (specific guidelines for topic selection are provided). Through a 5-10 minute 'sales pitch' talk, each student first convinces their BIOC 5915 classmates and instructor that their selected topic is exciting and worthwhile. Then, the students present a practice seminar to the class, and

the students will critique each other's presentations using the seminar evaluation form. Afterward, an afternoon symposium is presented to the Department (and Faculty), with each student presenting 15 minutes in length, including a 5-minute question period. Emphasis is on clarity of presentation and the ability to discuss the topic in general terms. Each student writes an abstract summarizing their presentation and a "News and Views" summary of their paper, highlighting its significance and content. Two faculty members evaluate the News and Views. Finally, as a group, the students organize the symposium, generate a symposium abstract booklet, and disseminate notices of the symposium and the booklet, in advance of the symposium date, to relevant departments at Dalhousie University. The symposium presentation of each student is evaluated by at least two faculty members, excluding the course instructor. It is based on the clarity of the presentation, the ability to discuss the topic in general terms, and the answer to questions based on background reading relevant to the topic.

Part 2
This aspect runs throughout the term and provides opportunities to evaluate seminars by experienced speakers in the Departmental Seminar program. The critique form has been simplified to focus on the key messages you glean from each talk while providing opportunities to comment on what you did and did not like about the presentation. By critiquing the seminar presentations, the student will learn how to fine-tune their presentations to maximize clarity and promote the flow of ideas. These critiques are designed to develop the ability to fine-tune one's presentations to optimize clarity and encourage the flow of ideas.

Schedule for Winter 2024

Part 1 – Tuesday 1:05 - 2:25 PM
January 7 -(1/2 h) Introduction, topic selection advice & abstract requirements
January 14 - Elements of giving a good talk-DMW
January 21 - 'Sales pitch' talks: 5-10 minutes
January 28 - Practice I –
January 28- Symposium abstracts emailed to the instructor
February 4 - Practice II –
February 11 -Practice III –
February 17-21, no classes (Study Break)
February 25-Practice IV –
March 4- Practice V- *News and Views* emailed to the instructor.--
March 11- Open practice and PowerPoint testing – via Microsoft Teams
March 18– **GRADUATE STUDENT SYMPOSIUM** – TBA

Part 2
January 8- April 3. (Wednesdays 4:00-5:00) Biochemistry Seminars.
Critiques of all three Departmental seminars must be completed by March 11.

COURSE EVALUATION
Evaluation components: Presentations, written abstract, news and views summary of the paper, and seminar critiques.
Course evaluation: Final grades as per the Dalhousie University grading protocol https://www.dal.ca/campus_life/academic-support/grades-and-student-records/grade-scale-and-definitions.

html. The following grading scheme is used to ensure that minimum standards are met and that students perform consistently throughout the course. *NOTE: A total grade of > 70% is required in each of the course parts for a passing grade.

90% for Part 1

20%-*News and Views* style analysis of the paper to be presented at the symposium (average of two faculty members' evaluations).
60% = presentation at the symposium (average of two faculty members' evaluations).
10% = abstract (graded by instructor)

10% for Part 2 = critiques of departmental seminars – see guidelines below

Guidelines for Symposium Topics and Talks

1. Each student chooses a scientific topic and designs a presentation on that topic as part of a mini-symposium by the course participants.
2. Each topic is based on a 2024 research paper published in the journal, Nature, Science, or Cell.
3. The overall topic permits an in-depth understanding needed to prepare the talk and answer questions posed by the audience and faculty evaluators.
4. As a group, the course participants determine whether the symposium follows a specific theme or covers diverse topics, in each case focusing on exciting/interesting new discoveries.
5. Each student prepares a **200-250-word** abstract for their topic suitable for compilation into a symposium abstract booklet. A selection of key references (Nature format), including the primary paper, accompanies each abstract and is placed at the bottom of the page.
6. Course participants evaluate each other's abstracts and practice talks.
7. Course participants organize the symposium, including compilation and distribution of the abstract booklet and a notice, advertising the symposium to members of relevant departments at Dalhousie University sufficiently in advance of the symposium to promote attendance.
8. The length of each talk, the amount of time allotted for questions at the end of each talk, and the order in which the talks are given are determined by the course participants in consultation with the course instructor (with eight students and a maximum of 4 h available, talks of 10 minutes with 5-10 minutes for questions could be accommodated with a short break in the middle of the session).

Guidelines for Abstract of paper- Describe the topic in simple terms that the readers will understand. **1**. Describe the key research question or hypothesis. **2**. Summarize why this research is unique. **3**. Summarize how the researchers attacked the research question. **4**. Summarize the major findings, and **5**. the impact of the research. The abstract should answer the following--What was done/discovered, why it was done, how it was done, and what is the significance of the research. The reference to the paper should be included at the end. Use the journal Nature format–length, 200-250 words. The abstract must be emailed to the instructor **on or before January 28**.

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Guidelines for *News and Views* analysis of the student's symposium publication

The *News and Views* articles are intended to inform nonspecialist readers about new scientific advances. Your *News and Views* paper should consist of 2 pages, single-spaced text, 12-point Times Roman font, plus a third page consisting of a single figure (graphical abstract with figure legend). Your News and Views article should highlight the importance of the paper and provide a synopsis in terms of what had been known previously, what was discovered and how it was discovered, why this publication is not merely an incremental advance, and how it has advanced the field. The references, in Nature format, should be placed on the bottom of page 3. For specific examples, see the end of the document. This is marked by the seminar evaluator after editing (not marked) by Dr. Waisman.

Guidelines for Critiques of Seminars. A portion of your grade for this course is based on the critiquing of seminars. **Three** (3) seminars are critiqued for a grade in this part of the course. To pass the course, all three seminar evaluations must be submitted to the instructor **on or before March 11.** It is highly recommended that these critiques be emailed to the instructor within several days after the seminar presentation.

Critiques must be for original research seminars (not journal club or group meeting presentations), of departmental seminars in Biochemistry & Molecular Biology. Note that attendance at departmental seminars is expected of *all* Biochemistry & Molecular Biology graduate students. For critiques of seminars outside the Department, the seminar must be related to the general theme of a graduate degree in Biochemistry & Molecular Biology (i.e., thinking about biomolecule(s) at the molecular and/or submolecular level). If you have a degree requirement (e.g., TA activity or a class) that conflicts with the Wednesday 4 PM seminar slot, tell the 5915 instructor so that arrangements can be made.

Seminar evaluations should be provided for speakers at various levels: evaluations will be based on seminars given by faculty members and some by graduate students.

Your completed evaluation forms are submitted by email to Dr. Waisman at the end of the seminar or, at the latest, within one week of the seminar in question. A critique must be analytical and detailed to count for credit – that is, a critique consisting only of a phrase such as “pretty PowerPoint slides and good speaking dynamics” would not result in a passing grade. Your evaluations are confidential and will not be available to the speaker. Recognize the added value: keep in mind what you do and don’t like about the presentations given by others as you design your own seminars.

Dalhousie University is located in Mi’kma’ki, the ancestral and unceded territory of the Mi’kmaq. We are all Treaty people.

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COURSE POLICIES ON MISSED OR OVERDUE ASSIGNMENTS

A student who misses an evaluation component of the course due to illness must notify the instructor, course coordinator, or department office prior to the scheduled time or due date for that component. The student must also complete a Student Declaration of Absence form (available on the course website) or provide alternate verification of the absence to their instructor via instructor e-mail within three (3) calendar days following the last day of absence. An alternative due date will be established by the instructor and shall normally be within seven calendar days after the original due date. Absence for non-medical reasons is not ordinarily acceptable unless prearranged with the instructor. A missed evaluation component for which no satisfactory arrangement has been made will be given a mark of zero. All attempts will be made to accommodate requests for extensions of deadlines where illness or personal crisis, i.e., extenuating circumstances that would affect the student's ability to fulfill the criteria for the award of credit points or to perform to the best of the student's ability in assessment events, have occurred. It is the student's responsibility to notify the instructor and/or the course coordinator of any extenuating circumstances and to request an extension.

If weather-related events and other natural disasters are serious enough for the university to be closed, classes will be canceled, and the schedule will be adjusted to accommodate the missed date(s).

DEPT. OF BIOCHEMISTRY & MOLECULAR BIOLOGY POLICY ON PLAGIARISM

What is plagiarism?

"Dalhousie University defines plagiarism as the presentation of the work of another author in such a way as to give one's reader reason to think it to be one's own. Plagiarism is a form of academic fraud."[†] The Department is committed to protecting honest students against the devaluation of their work by students who resort to plagiarism.

Some examples of plagiarism include (but are not restricted to):

Submitting as your own work any material created, in whole or in part, by someone else, **including material created in collaboration with other students**, unless specifically allowed by the course instructor and credited appropriately.

Paraphrasing extensively or copying from sources such as the Internet, journal articles, or books (including textbooks) without crediting the original author or source.

Using another student's laboratory data, unless specifically allowed by the course instructor and credited appropriately.

Submitting, in whole or in part, any work that has been submitted in another course, or re-submitting the same work in different years of the same course.

How can plagiarism be detected?

If required by the Instructor, work submitted for credit must be submitted in electronic as well as hard copy form. Submissions may be screened by one or both of the following methods:

A pattern recognition program that compares all submissions with one another as well as submissions from previous years. Every individual has a unique pattern of writing. This program will detect submissions that are derived from a common source, even if words or phrases have been changed.

A third-party computer-based assessment system that compares submissions against a large database, including previous submissions and Internet sources.

What are the consequences of plagiarism?

"Plagiarism is a serious academic offense which may lead to loss of credit ['F' in a course], suspension or expulsion from the University or even the revocation of a degree."† **At Dalhousie University, the Department is obligated to refer any cases of suspected plagiarism to the Senate Discipline Committee**, which will then conduct a hearing to evaluate the innocence or guilt of students alleged to have committed an act of plagiarism.

† http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.html

How can accusations of plagiarism be avoided?

You can avoid accusations of plagiarism by:

9. Preparing all submissions independently and ensuring that they are expressed in your own unique writing style.
10. Never share any written or electronic material with other students. You may discuss ideas with other students, but you may not work with another student while preparing materials you are planning to hand in.
11. Acknowledging any material paraphrased extensively or copied from sources such as the Internet, journal articles, or textbooks. Paraphrasing of short phrases from the course textbook need not be acknowledged.
12. Guarding all your work, both drafts, and final submissions, to ensure that no one else can copy it. If you provide access to your work and someone copies it, then you may have to appear before the Senate Discipline Committee to establish that you are the original creator of the work. If you suspect that someone has taken any of your work, notify your course instructor immediately.
13. Using only laboratory data that you actually collected in the lab. Altering laboratory data is not permitted.

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate (https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx)

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's center of expertise for student accessibility and accommodation. The advising team works with students who request an accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached or would be inappropriate, procedures exist for formal dispute resolution.
Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness.
Statement: (http://www.dal.ca/cultureofrespect.html)

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on the Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office (Rm 3037, McCain Building), e-mail (elders@dal.ca) or leave message (902-494-6803).
Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)
https://www.dal.ca/academics/important_dates.html

University Grading Practices
https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health Services: https://www.dal.ca/campus_life/health-and-wellness/health-services/services.html

Counselling: https://www.dal.ca/campus_life/health-and-wellness/counselling.html

Student Advocacy: https://www.dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Research Lab Safety https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab_policy_manual_2007.pdf

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

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EXAMPLE OF A NEWS AND VIEWS ARTICLE

ATG9A facilitates lipid movement from its storage organelles

Adithi Pisapati

An autophagy protein – ATG9A has now been indicated to have a non-canonical role in transferring lipids from lipid droplets to autophagosomes and mitochondria, accentuating its significance in a non-autophagic process. Autophagy is a catabolic process adopted by the body to rid itself of the damaged cells, hence maintaining cellular homeostasis [1] . This process begins with the formation of a tiny phagophore which then encircles cellular components to form the autophagosome. Phagophore expansion is an essential step of this process which involves the recruitment of phospholipids being delivered by multiple transportation proteins and enzymes such as flippases, floppases, and scramblases [2] . ATG9A is a scramblase that non-specifically and bi-directionally transfers phospholipids between two membrane leaflets promoting a rapid phagophore expansion until it matures into an autophagosome capable of fusion with the lysosome [3] . This multispanning membrane protein exists as a single protein in C. elegans and yeast whereas in humans, it exists in the form of two paralogs named ATG9A and ATG9B, the latter's expression being limited to the placenta and neuroendocrine cells [4] . Vesicular tubular clusters (VTC) in mammals are compartments of the cells that enable cargo trafficking between the Endoplasmic Reticulum (ER) and the Golgi Apparatus. Earlier localization studies of ATG9A protein indicate its confinement to these vesicular tubular clusters along with the trans-Golgi network (TGN) [5] . Upon autophagic stimulation, ATG9A distributes and diverts its traffic among these compartments, where it advances phagophore nucleation and expansion. However, it remained unknown whether ATG9 performs its function while remaining attached to these compartment structures or after its transfer to the expanding phagophore. Electron microscopy analyses of ATG9 revealed that it comprises a network of internal cavities proposed to expedite phospholipid transport between the bilayers. A thorough structural examination of this protein, however, failed to provide any evidence of ATG9 participation in lipid transport in vivo. To address this question, Mailler et al. provided promising data demonstrating the requirement of ATG9A for the intracellular transport of lipids from the lipid droplets to not just the expanding phagophores but also to the mitochondria for beta-oxidation and subsequent energy production. The authors of this paper largely depended on advanced imaging and microscopy techniques to study the cellular functioning and localization of this autophagy protein. Firstly, a knockout model of ATG9A was developed in HeLa cells which then were stained using multiple lipid dyes such as BODIPY. A comparison between wild type and knockouts indicated a significant increase in the size of lipid droplets along with increased droplet accumulation in the knockouts, which the authors interpreted as a consequence of either lowered autophagic degradation of lipid droplets or non-autophagic export of lipids to the autophagosome. To confirm the role of the ATG9 family in lipid homeostasis, a plasmid encoding ATG9A-GFP was transfected into the cells, which restored both lipid droplet number and size. Although an amino acid identity of just 38% exists between the two paralogs, it was also noted that ATG9B functioned similarly to ATG9A. One of the mainspring observations that Mailler and colleagues made was the localization of ATG9A to the mitochondria upon starvation. As previously established through lipid studies, the fate of lipids entering the cells is to either involve in the formation of triglycerides or move to the mitochondria where they are oxidized. The authors pulsed the cells for 16 hours using the fluorescent analog of fatty acid known as Red C12 and then chased them for 24 hours in a starvation

medium or complete medium. In ATG9A KO cells, lipid droplets from the complete medium failed to redistribute themselves to the mitochondria in the starvation medium, an event otherwise observed in healthy WT cells implying that ATG9 is required for the mobilization of lipids to the mitochondria. Next, moving further, the authors looked for changes in mitochondrial respiration rate or oxygen consumption rates (OCR) using a sea horse analyzer. As expected, the basal OCR of KO was significantly reduced compared to the WT. Excess Red C12 as a source of FA increased the oxygen consumption of WT but not the knockouts implying the alterations caused in energy metabolism due to the absence of ATG9A. Reinisch et al. proved the significance of their study by using state-of-the-art techniques such as correlative light-electron microscopy to demonstrate that ATG9A works in collaboration with another transmembrane scramblase TMEM14b, which is situated on the endoplasmic reticulum [6]. Lipid droplets which ATG9 attaches to enable lipid mobilization, were seen to be present in the vicinity of the endoplasmic reticulum as well as the mitochondria. These observations confirming the confluence of the organelles at the site of phagophore formation provide reassuring evidence that ATG9A has a non canonical role of lipid transportation for mitochondrial beta-oxidation. Finally, the hypothesis was studied in an animal model of ATG9 KO in C. elegans. All eleven exons and introns of ATG9 were deleted by improved CRISPR cas 9 in the hypodermal cells of the organisms. Every knockout displayed a larger lipid droplet size in these cells. Although an increased diameter of the droplets was observed, there was no significant increase in the number or accumulation of these lipid droplets. Taken together, these findings show that depletion of ATG9 expands the lipid pool indicating its prominence in lipid droplet homeostasis. Another important finding provided by the authors was that these phenotypic observations did not result from an inhibition of lipophagy. This was proved by no changes in lipid droplet size and/or number upon knockdown of ATG7, a critical component of core autophagic machinery. Even though this Nature paper throws light on some of the key aspects and interrelation of autophagy and lipid homeostasis, many questions remain answered, which could pave the way for future exploration. It would have been interesting to see the effect and role of lipases such as ATGL (Adipose triglyceride lipase), if it is stimulated or inhibited by ATG9. This lipase has previously been known to promote autophagy by controlling lipid droplet catabolism through SIRT1 (Sirtuins) [7]. Apart from staining and microscopy, which provided a fundamental basis for the paper, it would be intriguing to delve into some mRNA and protein expression levels when the protein is localized to different organelle membranes. Along with ATGL, peroxisome proliferator-activated receptor-alpha (PPAR-$\propto$), which regulates the expression of various genes involved in fatty acid beta-oxidation [8], would be worth mentioning as it might provide a signaling reason or support of the concept apart from the microscopic or localization version.

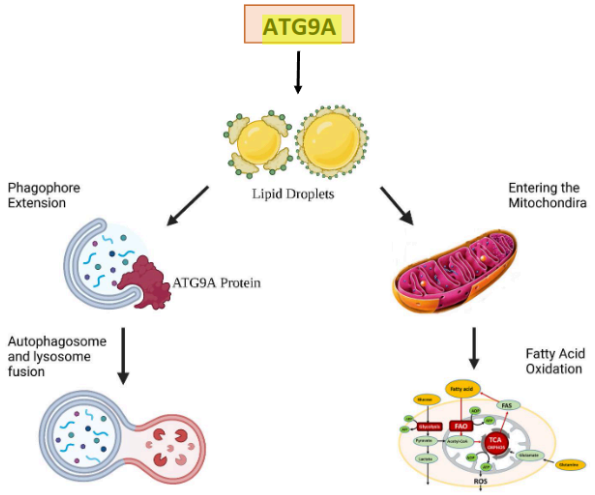

Figure 1: Figure is a graphical representation of the canonical and non-canonical roles of ATG9A. The established function of ATG9A is to deliver lipids to the expanding phagophore and is explained in the left part of the diagram. The other non-autophagy related role that is the mobilization of lipids from the lipid droplets to the mitochondria for oxidation and subsequent energy production is shown by the right part of the diagram.

References

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EXAMPLE OF AN ABSTRACT (SUMMARY)

ACSL4 dictates ferroptosis sensitivity by shaping cellular lipid composition

Sebastian Doll, at al.[8]

Ferroptosis, a recently discovered mode of cell death, is an iron-dependent pathway that occurs as a consequence of lipid peroxidation.[1–4] Previously, the regulation of ferroptosis has been known to be controlled by a single pathway catalyzed by glutathione peroxidase 4 (GPX4), which reduces toxic lipid hydroperoxides into lipid alcohols.[2,5,6] Inducing ferroptosis by targeting different regulators of the GPX4 pathway has been of significant therapeutic interest.[5,7] As previous studies have found that cancer cells treated with GPX4 inhibitors exhibit varying levels of resistance to ferroptosis induction, Doll *et al.* (2019) hypothesized that an unidentified anti-ferroptosis pathway may exist that is GPX4-independent.[2,3,6,8] An expression cloning technique in a ferroptosis-resistant cell line was used to identify ferroptosis suppressor protein 1 (FSP1) as an anti-ferroptotic protein.[2] The cell viability in overexpressed FSP1 or mock cells was analyzed upon treatment with GPX4 inactivator, Ras selective lethal molecule 3 (RSL3).[2] In contrast to the mock cells, the FSP1 overexpression cells continued to proliferate upon GPX4 inactivation, thereby confirming the FSP1 pathway as GPX4-independent.[2] A G2A mutation of the FSP1 N-terminal myristylation site revealed that N-myristylation is essential in targeting FSP1 to the plasma membrane.[2,3] This mechanism of FSP1 activity involves the reduction of ubiquinone to ubiquinol, which targets lipid peroxyl radicals to suppress lipid peroxidation.[2,3] Various human cancer cell lines were treated with RSL3 alone or in combination with a potent FSP1 inhibitor, iFSP1, to evaluate their sensitivity to ferroptosis induction.[2] As expected, the targeting of both regulatory pathways was required to effectively induce ferroptosis.[2] These findings demonstrate that FSP1 is a potent suppressor of lipid peroxidation and ferroptosis, and can effectively protect against cell death in the absence of GPX4.[2] Moreover, the discovery of this pathway provides a highly promising target for inducing ferroptosis in cancer cells.[2]

Laura McGary

References:

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Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.