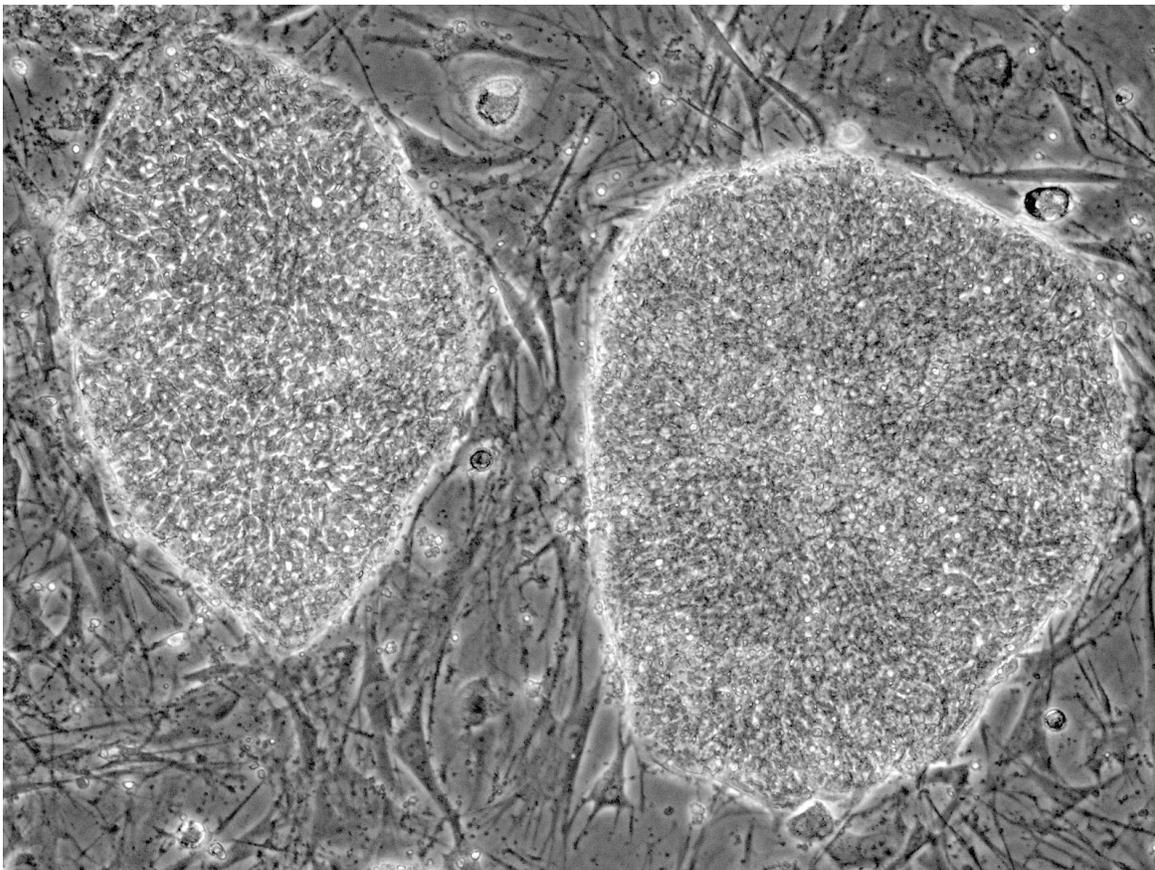


PHYSIOLOGY 4510A

Understanding pluripotency: The physiology of stem cell fate and function

Fall 2017

SYLLABUS



Two human embryonic stem cell colonies each containing thousands of embryonic stem cells surrounded by a feeder layer of mitotically-inactivated mouse embryonic fibroblasts (MEFs) that secrete factors that help maintain these cells proliferating in the undifferentiated state (Image from Dr. Betts).

1. Course Information

Physiology 4510A: Understanding pluripotency: The physiology of stem cell fate and function

Fall Term 2017

The fundamental goal of pluripotent stem cell biology is to understand how the self-renew and differentiation capabilities of these extraordinary cells are regulated to produce cells capable of differentiating into a wide range of functional cell types. This course will examine a variety of current topics within the field of pluripotent stem cell physiology. In particular, we will focus on the basic biology of embryo-derived stem cells and their potency. We will briefly cover pre- and post-implantation embryo development, focusing on cell fate determination and the cell lines derived from these developmental stages. We will discuss how these embryo-derived cell lines are isolated and tested, what factors allow for their expansion, how they can be genetically manipulated and what intrinsic and extrinsic factors regulate their self-renewal and cellular differentiation characteristics. We will also discuss pluripotent stem cells derived by somatic cell nuclear transfer and cellular reprogramming technologies. An understanding of this physiology will enable students a thorough understanding of stem cell function and cell fate determination to assess whether regenerative medicine is feasible with pluripotent cells along with gaining the ability to critically evaluate the ethical issues that surround this field.

Lectures:

2 hr classes (~1 hr didactic lecture, ~1 hr problem-based learning exercises / informal class discussions and exercises)

Thursdays, 2:30-4:20, Western Active Learning Space (WALS, Room 66 UCC)

Requisites:

Suggested Prerequisite(s): Physiology 3120, 3130Y and Physiology 3140A (or equivalent).

Senate regulation regarding the student's responsibility regarding requisites:

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours*
Dr. Dean H. Betts [Course Co-Coordinator]	dean.betts@schulich.uwo.ca	DSB 2022	661-2111 ext. 83786	After Lectures
Dr. Cheryle A. Séguin [Course Co-Coordinator]	cheryle.seguin@schulich.uwo.ca	DSB 0035A	661-2111 ext. 82977	After Lectures
Ian Tobias [TA [#]]	itobias@uwo.ca	DSB 2027	-	After Lectures

* or by appointment; [#] TA = teaching assistant

OWL:

Students with OWL issues should see: <https://owl.uwo.ca/portal/site/owldocs>

3. Course Syllabus

Course Objectives:

The main objective of this course is to introduce students to the basic molecular, biochemical and morphological events that regulate pluripotent stem cell biology. Additional objectives are: to improve the students' ability to read and understand primary scientific literature, to write about science effectively to a lay audience and to provide students with an opportunity to conceptually translate their knowledge of stem cell biology to solve biological problems by designing novel experiments. The course material will include didactic lecturing, but also utilized a flipped classroom approach for students to conduct in-class exercises to properly examine primary research journal papers, to learn how to write scientific and lay articles and how to properly design hypothesis driven experiments. Students will be expected to come prepared to discuss the content of research articles in class as well as independent work outside of the lectures. The lectures will focus mainly on the factors and signaling pathways that govern development of the early embryo, embryo-derived stem cells concentrating on the biology, utility and ethical issues that surround pluripotent stem cell technologies.

A student who has met the objectives of the course will be able to:

- explain the basic concepts of stem cell self-renewal and pluripotency and how these features are evaluated in the stem cell field

- apply their understanding of the basic concepts and fundamental mechanism that regulate pluripotent stem cells as it relates to developmental biology to solve problems/questions
- navigate, understand and critically evaluate published stem cell research literature
- debate current ethical issues that surround pluripotent stem cell biotechnologies
- create testable hypotheses and proper experimental design (scientific method) to solve problems/create new knowledge
- apply current techniques/technologies currently being utilized in pluripotent stem cell research to develop experimental designs to test these hypotheses

Method of Presentation:

The material of the course will be presented in the form of didactic lectures and a partial flipped classroom platform that includes problem based learning exercises and informal class discussions, exercises and debates.

Methods of Evaluation:

Students will be expected to:

- Actively participate in regular classroom discussions and debates
- Read assigned scientific papers *prior to* class
- Utilize current scientific literature in preparing assignments
- Prepare a scientific lay article
- Apply their learned basic science knowledge of the stem cell field to propose experiments to solve scientific problems/questions
- Write, in short answer essay format on quizzes, mid-term and final examinations

Course Learning Outcomes:

Upon successful completion of this course, students will be able to:

- demonstrate a detailed knowledge and critical understanding of key concepts and regulatory mechanisms governing pluripotent stem cell function by describing

concepts, applying and integrating ones' knowledge, and critically evaluating and reflecting upon major theories, practices and ethical issues in the field

- demonstrate a strong understanding of the scientific methodologies behind pluripotent stem cells by formulating hypotheses, designing experiments, analyzing and interpreting data and making reasoned conclusions and improvements in experimental design in light of published work
- interpret figures and proper figure descriptions along with identifying the strengths and weaknesses of information and the various research techniques used
- perform literature searches and be able to evaluate and critique current literature in pluripotent stem cell physiology and generate a clear and concise written layperson article
- explain and apply different stem cell models and technologies (e.g. knockout vs. knock-in, genome editing approaches etc.) with varying experimental procedures (Western vs. real time RT-qPCR etc.) to interpret the scientific literature encompassing the pluripotent stem cell field
- demonstrate the ability to critically evaluate, manage, reflect on, integrate and apply their pluripotent stem cell knowledge in solving problem based learning exercises and examination questions
- develop convincing arguments to effectively debate complex ideas and relevant scientific and / or ethical issues to be made aware of that scientific knowledge changes, has different interpretations and that ethical issues are not always simple choices between two differing views

Physiology 4510A
Understanding pluripotency: The physiology of stem cell fate and function

Lecture Schedule*

Thursdays, 2:30-4:20 Western Active Learning Space (WALS, Room 66 UCC)

DATE	TOPIC (Instructor)
7 Sept.	Course Introduction; Fundamental principles of “stemness”; pre- and post-implantation embryo development as it relates to embryo-derived stem cells and cell fate determination (Betts)
14 Sept.	Cell Differentiation/Lineage Restriction (Séguin)
21 Sept.	Embryonic Stem Cells and Pluripotency (Séguin)
28 Sept.	Extracellular Signals to Direct Stem Cell Differentiation (Séguin)
05 Oct.	Intracellular Signals to Direct Stem Cell Differentiation (Séguin)
19 Oct.	Somatic Cloning and Epigenetic Reprogramming in Mammals (Betts)
26 Oct.	Induced Pluripotent Stem Cells (Betts)
02 Nov.	In class mid-term test (questions based on first 7 lectures)
09 Nov.	Systems Biology Approaches (e.g. RNA-seq; ChIP; microarray; proteomic)/Genetic manipulation of pluripotent stem cells (e.g. genome editing, knockdown, transgenic approaches) (Betts/Tobias)
16 Nov.	“Jigsaw” readings and presentations of important pluripotent stem cell papers (Betts and Séguin)
23 Nov.	Ethical Issues Surrounding Pluripotent Stem Cells (Betts), In class activity to play “decide” ethics kit on stem cells
30 Nov.	Cell-Based Therapies from Pluripotent Stem Cells (Betts)
07 Dec.	Design your own pluripotent stem cell based therapy (Betts) and Course Review (Betts and Séguin)

*** Select journal papers and outline for these lectures will be made available on the course OWL site at least the week prior to each lecture**

4. Course Materials

Textbook: None required

Suggested Textbooks:

1. Atala A, Lanza R. Handbook of Stem Cells. Volume 1: Pluripotent Stem Cells and Cell Biology (2nd ed). Elsevier Academic Press; 2012.
2. Lanza RP, Langer RS, Vacanti J. Principles of tissue engineering (ed 3rd). Amsterdam; Boston: Elsevier Academic Press; 2007.
3. Gilbert SF, Singer SR. Developmental biology (ed 6th-8th). Sunderland, Mass.: Sinauer Associates; 2003-2006.
4. Gilbert, SF. Developmental Biology (ed 6th). Available online at: <http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=dbio.TOC&depth=2>

Supplemental Information: Published journal articles will be provided for downloading from WebCT as required reading for lectures. Students are encouraged to peruse the scientific literature and read review and/or primary research articles in the stem cell biology field. Examples of such journals:

Cell Stem Cells

Cellular Reprogramming

Current Stem Cell Research

Development

Journal of Cell Science

Journal of Biological Chemistry

Nature journals

Proc Natl Acad Sci U S A

Science

Stem Cells

Stem Cell Reports

Stem Cells and Development

5. Evaluation:

Component	Date	% of Final Mark
Assignment 1 - Ethics Cartoon	Sept. 21 nd , 2017	5%
Assignment 2 - Layperson Article	Oct. 19 th , 2017	10%
Mid-term test (<i>in class</i>)	Nov. 2 rd , 2017	30%
Jigsaw Presentation and group work	Nov. 16 th , 2017	10%
Design your own therapy (<i>in class</i>)	Dec. 7, 2017	5%
Final exam	TBA (Dec 10 – 21, 2017)	40%
		100%

The mid-term (2 hours) and final exam (3 hours) will consist of short answer essay questions developed from lectures, assigned readings/exercises and other presented material. There will be a few practice exam questions provided before the midterm and final exams. The final exam (3 h) will be cumulative, with emphasis on the second half of the course.

6. Additional Information/Statements

Statement on Use of Electronic Devices

Electronic devices will not be allowed during tests and examinations.

Statement on Academic Offences

“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

All assigned written work required in the course may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Absence from course commitments

A. Absence for medical illness:

A. Absence for medical illness:

Students must familiarize themselves with the Policy on Accommodation for Medical Illness for Undergraduate Students, located at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/appealsundergrad.pdf

The policy is also accessible from the Medical Accommodation Policy link at

http://www.uwo.ca/arts/counselling/procedures/medical_accomodation.html

Statement from the Academic Counselling Office, Faculty of Science (for Science and BMSc students)

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Academic Counselling Office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their

instructor once the accommodation has been approved by the Academic Counselling Office and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Academic Counselling Office immediately. For further information, please see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services.

The form can be found at:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

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The form can be found at the student centre website:

<https://student.uwo.ca/psp/heprdweb/?cmd=login>

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform_15JUN.pdf

B. Absence for non-medical reasons:

Appropriate documentation must be submitted by the student directly to the appropriate Faculty Dean's Office and **not** to the instructor for **non-medical** absences from quizzes, assignments and the final exam is required. It will subsequently be the Dean's Office that will determine if accommodation is warranted. The accommodation will be in the form of a make-up assignment, make-up quiz, make-up exam or re-weighting, which may involve written exams being replaced by oral exams.

C. Special Examinations

A Special Examination is any examination other than the regular final examination, and it may be offered only with the permission of the Dean/Academic Counselling Office of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents.

A Special Examination must be written at the University or an Affiliated University College no later than 30 days after the end of the examination period involved. To accommodate unusual circumstances, a date later than this may be arranged at the time permission is first given by the Dean/Academic Counselling Office of the Faculty. The Dean/Academic Counselling Office will consult with the instructor and Department Chair and, if a later date is arranged, will communicate this to the Office of the Registrar.

If a student fails to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean/Academic Counselling Office in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination normally will be the scheduled date for the final exam the next time the course is offered.

When a grade of Special (SPC) or Incomplete (INC) appears on a student's record, the notations will be removed and replaced by a substantive grade as soon as the grade is available.

This link http://www.uwo.ca/univsec/pdf/academic_policies/exam/definitions.pdf includes a table of the Special Exam dates and clearly indicates that if an exam is missed it is deferred until the scheduled date of the final exam the next time the course is offered.

Support Services:

Registrarial Services: <http://www.registrar.uwo.ca>

Academic Counselling (Science and Basic Medical Sciences):
http://www.uwo.ca/sci/undergrad/academic_counselling/index.html

USC Student Support Services: <http://westernusc.ca/services/>

Student Development Services: <http://www.sdc.uwo.ca>

Student Health Services: <http://www.shs.uwo.ca/>

Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

Assignments

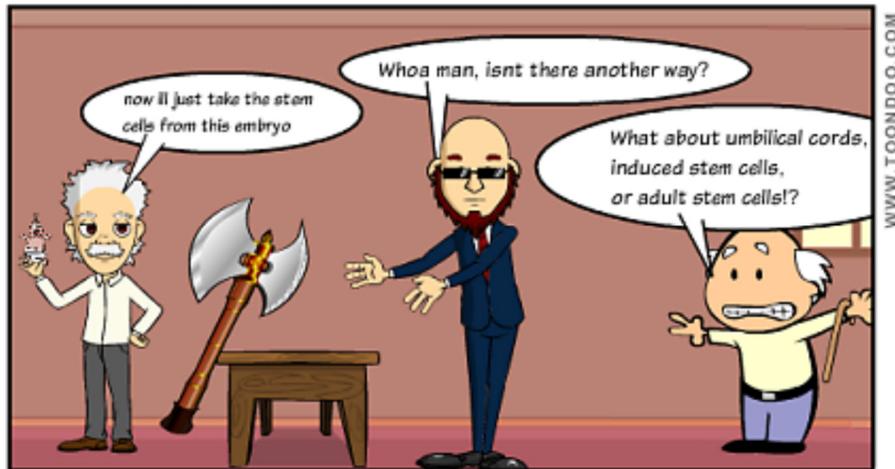
Assignment #1 – Creating a Stem Cell Cartoon or Comic Strip

Worth: 5% of final grade

Take some time to become familiar with the free cartoon & comic strip writing software “ToonDoo” <http://www.toondoo.com/> or other online cartoon site

Examples:

STEM CELL RESEARCH - BY BIPAPA



ASSYMETRICAL!!! - BY DBETTSI



Each individual will need to register on “ToonDoo” to set up a name and password to access the free online software and add to the product or create new alternative ideas at any time.

First you’ll need to brainstorm ideas about stem cells suitable for developing into a cartoon or comic strip on pluripotent stem cell concepts and/or their surrounding ethical issues. This brainstorming can be carried out individually or as a group using online resources and discussion with your group members. You can choose to put either a positive or a negative spin on your product.

Each student must also submit a 100 - 200 words rationale/explanation of your comic strip. This rationale should introduce your topic providing expert support for your chosen stem cell concept or ethical view presented in the cartoon/comic strip. *Explain*, using reasoning, how you or someone else can relate to this topic/view and then, use expert explanations to back that personal view up.

A selection of the cartoon/comic strip submissions will be shown in a whole class session.

Learning Outcomes for this assessment task:

- To discuss key issues relating to stem cell research and learn collaboratively.
- To develop visual communication skills using the ToonDoo application.

Course Learning Outcomes relevant to this task:

- To be able to define the basic characteristics of different types of stem cells and discuss their applications in medicine.
- To be able to express the implications of stem cell technologies on individuals, families, societies and humankind.
- To be able to recognize the positions taken by different individuals, organizations and cultures with respect to stem cell technologies; and able to represent viewpoints other than their own.

Due: September 21st, 2017

Name: _____

Mark: _____

Rubric for Stem Cell Cartoon:

	Outstanding (10)	Good (8)	Needs Improvement (6)
Completeness (10%)	creates an elaborate story	creates a story, but does not elaborate the details	does not finish the cartoon story
Writing Skills and clarity (10%)	cartoon is well organized and situation/concept is clearly conveyed	situation/concept is clearly conveyed	necessary information or elements omitted to properly convey situation/concept
Creativity (20%)	ideas are original, humorous, and sophisticated	ideas are original and humorous	ideas are not original
Visual Appeal (10%)	uses multiple backgrounds, characters, and props in correct sizing and amount for story	uses some backgrounds, characters, and props	does not use background, characters, or props
Use of Scientific Terms (20%)	often and correctly uses scientific vocabulary	correctly uses scientific vocabulary	either never uses or misuses scientific terms
Understanding of Scientific Concepts (30%)	clearly demonstrates implications of the use and/or application of stem cell issue or concepts	indicates the implications of the use and/or application of stem cell issue or concept	does not implement the use and/or application of stem cell issue or concept
	explains how stem cell research is applied and how it used to address a clinical problem and/or create an ethical issue	describes how stem cell research is applied and how it used to address a clinical problem and/or create an ethical issue	states how stem cell research is applied and how it used to address a clinical problem and/or create an ethical issue
	promotes discussion on the effectiveness of stem cell research and its application in solving a clinical or ethical problem	illustrates the effectiveness of stem cell research and its application in solving a clinical or ethical problem	states the effectiveness of stem cell concepts/issues and its application in solving a problem or creating an ethical issue

Assignment #2 – Layperson Newspaper / Magazine Article

An Opinion Editorial - Layperson Article Assignment (Due: October 20th, 2016)

The Globe & Mail has hired you as a scientific writer for their newspaper. You are expected to contribute articles that are scientifically accurate and written in a manner that will be understood by the lay public who do **not** hold a strong biological science background.

Your first assignment is to write a newspaper article on a recent scientific discovery (past 24 months) relevant to the pluripotent stem cell field. Who they are? What did they do? How did they do it? When? Where? Why did they do it? What is its significance to the scientific field; to the public?

Worth: **15%** of final grade

Format for Assignment:

- Please check with professors for the appropriateness of your chosen journal article at least two weeks prior to the due date for the assignment
- Hand in an **electronic copy** of no more than 750-1000 word typed article, font size no less than 12 points, double-spaced.
- Make sure that your name and student I.D. number is on your assignment and that you have numbered the pages you submit.
- Your paper will be graded on both scientific and grammatical accuracy and for its “layness”. Please *see* assessment rubric.

Resources:

Good examples of lay science articles can be found in Time magazine, Macleans and any national newspaper. Examples are on our OWL class site.

Find scientific articles in the developmental biology/organogenesis fields from the various journals/resources available through the University of Western Ontario Library and/or PubMed (NCBI): <http://www.ncbi.nlm.nih.gov/pubmed/>

Suggested List of Journals (but you can also search papers by topic):

Developmental Biology

Developmental Cell

Development

Cell Journals

Cell Stem Cells

Genes & Development

The International Journal of

Nature journals

Proc Natl Acad Sci U S A

Science

Stem Cells

Stem Cells and Development

Due: October 19th, 2017

Guidelines for writing an Opinion Editorial Lay Newspaper Article

Effective communication of scientific facts is essential to increase the public's awareness of science and scientific discoveries. Writing an Opinion Editorial of a recent published journal article or any previous significant advances in science for a nonprofessional person will help develop your understanding of current research into the area of organogenesis and embryo development. It will also introduce you to a form of communication of scientific facts in the media as well as improve your written communication skills.

A Scientific Opinion Editorial is an opinion article through which writers express their views and inform readers on a timely issue in science. Editors look for pieces that cover subjects and make arguments that have not been articulated somewhere else. Editors also look for timeliness, cleverness, and strength of argument, freshness of opinion, clear writing and newsworthiness. Personal experiences and first-person narrative can improve the effectiveness of these articles particularly when they humanize and/or bring a larger idea or issue to life.

Tips for writing an opinion editorial article:

1. Title: Does it engage your audience?
2. Limit your writing to one idea or issue.
3. Clearly state your opinion at the beginning of the article. Then support it with factual information and concrete examples.
4. Use language familiar to the average reader (Engaging plain English). Your language must be clear and understandable to a target audience with a reading age of ~12 years. Perform a Flesch reading ease (FRE) test (*see below*).
5. Do not use passive sentences. Active voice is used when the focus is on the action.
6. It is better to have short, statement sentences than long complicated ones and shorter paragraphs than long ones.
7. **No** references, figures or tables are required.
8. It should be brief (approximately 750 words). Make an argument quickly and compelling backing it up with evidence.
9. Controversy is good, but keep your argument reasonable.
10. It should avoid jargon. You are speaking to an audience that may not be as familiar with the biological terms as you are.
11. It should be exclusive. Meaning that the more original the piece the greater the impact.
12. You must express your opinion about this research and the findings. This must be your own opinion.

Check *readability statistics* in Word document. The Flesch Reading Ease (FRE) scale is a 100-point scale (with 0 = very hard and 100 = easy) with plain English being 63.5. Other text metrics assess the percentage of text written in the passive voice, and the number of paragraphs, sentences per paragraph, words per sentence and characters per word.

To do this: In spelling and grammar (Word) preferences make sure "grammar with spelling" and "show readability statistics" check boxes are selected. Run Spelling and Grammar tool and the text metrics will come up at the end of the grammar/spell check.

Assessment rubric for Opinion Editorial – Layperson Article:*

	Grades (/15)				
	15-14	13-11	10-8	8-6	5-3
Content (70%)	<ul style="list-style-type: none"> Key facts and ideas of the article are very clearly stated Sufficient background is provided to enable very clear understanding of key ideas Key ideas are plausible and innovative 	<ul style="list-style-type: none"> Key facts and ideas of the article are clearly stated Background is provided to enable clear understanding of key ideas 	<ul style="list-style-type: none"> Key facts and ideas of article are stated Some background is provided to enable understanding of key ideas, but details are lacking 	<ul style="list-style-type: none"> Key facts and ideas of article are stated Background is insufficient to enable understanding of key ideas 	<ul style="list-style-type: none"> Key facts and ideas of the article and not stated Background is insufficient to enable clear understanding of key ideas
Requirements of an opinion editorial (20%)	<ul style="list-style-type: none"> Argument flows in a very cohesive and logical manner Argument conforms very well to the structure and length of an Opinion Editorial Argument very clearly addresses the needs of the intended audience Argument is consistent throughout 	<ul style="list-style-type: none"> Argument is cohesive and logical throughout Argument conforms well to the structure and length of an opinion editorial Argument clearly addresses the needs of the intended audience Argument is consistent throughout 	<ul style="list-style-type: none"> Argument mostly cohesive and logical Argument conforms adequately to the structure and length of an Opinion Editorial Argument generally addresses the needs of the intended audience Argument is consistent throughout 	<ul style="list-style-type: none"> Argument is mostly logical Argument conforms poorly to the structure and length of an Opinion Editorial Argument generally addresses the needs of the intended audience, but it is not consistent throughout 	<ul style="list-style-type: none"> Argument lacks cohesion and/or logic Argument conforms very poorly to the structure and length of an Opinion Editorial Argument poorly addresses the needs of the intended audience Argument is not consistent throughout
Quality of writing (10%)	<ul style="list-style-type: none"> Grammar, sentence structure, and spelling are of a publishable standard throughout 	<ul style="list-style-type: none"> Grammar, sentence structure, and spelling are of a high standard 	<ul style="list-style-type: none"> Grammar, sentence structure, and spelling are of a satisfactory standard 	<ul style="list-style-type: none"> Grammar, sentence structure and spelling are of a poor standard 	<ul style="list-style-type: none"> Grammar, sentence structure and spelling are of an unacceptable standard

*Adapted from Poronnik and Moni (2006). The Opinion Editorial: teaching physiology outside the box. *Adv Physiol Educ* **30**: 73-82; Moni et al. (2007). Using explicit teaching to improve how bioscience students write to the lay public. *Adv Physiol Educ* **31**: 167-175.

In-class Exercise – Jigsaw reading and presentation of important pluripotent stem cell papers

Jigsaw instructions:

1. Students will be divided into 4-6 jigsaw “expert” groups. Each “expert” group will be assigned one article to read and prepare a 1-2 page summary and presentation.
2. Each student reads the assigned article.
3. After reading the article each student will meet in their “expert” group to discuss the main points of the article and prepare a short 1-2 page summary that will form the basis of a paper presentation. They will rehearse the presentation they will each make to their “teaching” group.
4. Students will be placed into “teaching” groups. A “teaching group” consists of students who each read the 4-6 different articles.
5. Each students presents her or his article to the group. Students in the group should ask clarification questions.

Papers:

1. Yamanaka, 2008: Generation of Pluripotent Stem Cells from Adult Mouse Liver and Stomach Cells.
2. Eggen, 2008: iPS Generated from Patients with ALS can be Differentiated into Motor Neurons.
3. Jaenisch, 2007: Treatment of Sickle Cell Anemia Mouse Model with iPS Cells Generated from Autologous Skin.
4. Plath, 2008: The Many Ways to Make an iPS cell.
5. Yamanaka, 2008: Generation of Induced Pluripotent Stem Cells without Myc from Mouse and Human Fibroblasts.
6. Others? Metabolism paper (primed to naïve); differentiation paper (Melton?) ; rat iPSC into mouse embryos – miPSCs into rat embryos (chimeras)

Considerations for paper summary and presentation:

- 1. Identify the BIG Question.** Not specifically what the paper is about but what general problem the entire research field trying to solve.
- 2. Summarize the background in five sentences or less.**
- 3. Identify the specific question(s) the authors are trying to solve with this research.** Identify the hypothesis/hypotheses that this research paper is testing.
- 4. What approaches were employed to answer the specific question(s)?** What were the cell and/or animal model(s) utilized? What were the specific experiments? Use flowcharts, if you find them helpful.
- 5. Summarize the results focusing on the two most convincing pieces of data that supports the hypothesis.**
- 6. Conclusion/importance** of study highlighting any strengths and/or weaknesses in the study and propose any future studies.

The presentation format can include a combination of a summary sheet, powerpoint/keynote lecture and/or white board “chalk talk” going over the key aspects of the paper listed above. Presentations are limited to 10 minutes plus 5 minutes for questions/discussion.

Peer Evaluation:

Students will be expected to evaluate each other for peer performances in the “expert group” and for their presentations in the “teaching groups”. These evaluations will be based upon quantity and quality of each students’ contribution to group discussion and contributions in formulating the paper summary and presentation along with the clarity and effectiveness of the paper presentation.

Due date: In class presentations November 16th, 2017