BIOL695/BIOS703

"CELL COMMUNICATIONS IN CANCER"

FALL 2017 SEMESTER

04:30 PM – 05:45 PM TUESDAY

ROOM 249, BULL RUN HALL (SciTech Campus)

Course Description

This is a one-credit seminar that examines cell-cell communication in cancer. This seminar is divided into two sections. Within the first section general concepts of cell-cell communication will be introduced and their respective role in cancer discussed. The second section will introduce "Pathway Studio", a database and online software by Elsevier that facilitates the exploration of our current knowledge of any biomolecule or disease. Students will receive a trial license for this software and complete an independent research project that will be presented at the end of the semester.

Instructors

Dr. Ancha Baranova; abaranov@gmu.edu; 571-334-1145; 312 Colgan Hall (SciTech Campus)

Dr. Claudius Mueller; cmuelle1@gmu.edu; 703-993-9932; 2045 Institute for Advanced Biomedical Research (SciTech campus)

Dr. Cheadle; c.cheadle@elsevier.com

Class Schedule

SECTION 1: GENERAL CONCEPTS OF CELL COMMUNICATION IN CANCER	
Tuesday, August 29	Dr. Baranova/Dr. Mueller: Introduction & General principles of cell-cell communication
Tuesday, September 5	Dr. Mueller: Cell-cell communication within the tumor microenvironment
Tuesday, September 12	Dr. Mueller: Tumor interclonal cooperation and cell-cell communication during metastasis
Tuesday, September 19	Short Exam of previous lecture material
SECTION 2: STUDENT PROJECTS USING "PATHWAY STUDIO"	
Tuesday, September 19	Dr. Baranova/Dr. Cheadle: Introduction to "Pathway Studio"

Friday, December 1	Presentation of student research projects. Full day meeting starting at 9 am at Elsevier Inc., Rockville, MD.

Grading

Students will be evaluated by one written examination and a research project preformed with “Pathway Studio” and presented at the end of the semester. Both components are weighted as follows to calculate the final course grade:

- Written Exam: 30%
- Project Result and Presentation: 70%

Research project topics

Following are topic ideas that may be addressed as student research projects. This list is not exclusive and only provides topic suggestions. Research projects will have to address cell-cell communication in relation to cancer. This can describe direct tumor cell-cell communication, interactions between tumor cells and the cells of the host microenvironment (fibroblasts, immune cells, endothelial cells, etc.), or host cell interactions that directly impact cancer cell behavior.

1. One of the primary metastatic sites for breast cancer is bone. There, tumor cells stimulate osteoclasts and/or osteoblasts, which in turn enhance tumor cell growth. How is Hedgehog pathway signaling supporting this "vicious cycle" of bone metastasis?
2. In pancreatic ductal adenocarcinoma tumor cells survive in a highly hypoxic and nutrient-poor environment. To be able to do that they recruit the help of surrounding stroma-associated pancreatic stellate cells. Describe how increasing autophagy in these stromal cells supports tumor growth and survival.
3. In the forestomach epithelium fibroblasts release transforming growth factor β (TGFβ), which inhibits tumor cell survival and motility. How does TGFβ signaling intersect with hepatocyte growth factor (HGF) signaling, which is also released by fibroblasts?
4. Epithelial-mesenchymal transition (EMT) is a convenient way for epithelial-derived tumors to use unique mesenchymal cell properties to invade and metastasize. How is transforming growth factor β (TGFβ), as released by fibroblasts, involved in EMT?
5. Inflammatory bowel diseases are associated with an increased risk for colon cancer. Normally, transforming growth factor β (TGFβ) suppresses inflammation by restraining T-cell release of inflammatory cytokines within the intestinal mucosa. How is the expression of Smad7 in T-cells involved in their response to TGFβ and colon tumor formation?
6. Tumors need access to the vasculature to succeed. As the tumor grows, it is increasingly dependent on the establishment of new blood vessels (angiogenesis) to support itself. Describe the communication by which tumor cells get tumor associated fibroblasts to release fibroblast

growth factor 2 (FGF-2), which in turn stimulates angiogenesis by direct action on endothelial cells.

7. Macrophages transfer a specific miRNA (miR-223) to breast cancer cells, which increases their invasiveness. How is this miRNA transferred between the cells and how does it elicit its effect in the breast cancer cells?
8. Atezolizumab inhibits a specific communication pathway between tumor cells and T-cells. Describe the pathway and how inhibition of this type of cell-cell communication could treat cancer.
9. CD90 expression can be induced in breast cancer cells by stromal cells via different kinds of interactions. Describe several possible ways stromal cells can induce CD90 expression in cancer cells and what its effect is in tumor cells.
10. How do IL6 and CXCL7 form a positive feadback loop between cancer and stromal cells?
11. How is arachidonic acid metabolism in stromal cells stimulated by cancer cells, and how does that help the tumor?
12. Collective cell migration and invasion in oral squamous cell carcinoma is stimulated by stromal-cell derived factor (SDF1) and hepatocyte growth factor (HFG). How do cancer cells induce SDF1 and HFG release by stromal cells?
13. Describe how nitric oxide, which can be produced by tumor cells or cells of the surrounding microenvironment, can induce neovascularization (new blood vessel growth into the tumor).
14. Stromal cell release of MMP-3 can cause malignant transformation in epithelial cells. Describe how the exposure of epithelial cells to MMP-3 leads to tumor formation.
15. How does Aspirin interfere with the crosstalk between adipocytes and breast cancer cells?

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Counseling and Psychological Services (CAPS): (703) 993-2380; http://caps.gmu.edu

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