LaGuardia Community College

Adding a new dimension to undergraduate students research experience

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Students participating in this project:

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Integrating research into course laboratories

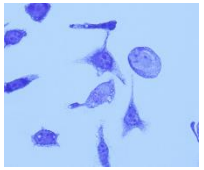
- *Traditional laboratories:*
  1st semester lab course
- *Inquiry based laboratories:*
  2nd semester lab course
- *Research-based laboratories*
  3rd semester : collaborative faculty-students

Linking of faculty research with student lab activities

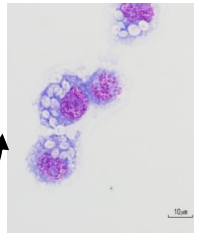
- **Motivation** for students' learning and career options- "in house research"
- **Modelling**
- Reduction in student fear and intimidation factor
- **Natural transition** from traditional, to inquire-based, to research-based labs
- **Student validation** of learning, skills and competence

Exposing students to research in two-year colleges

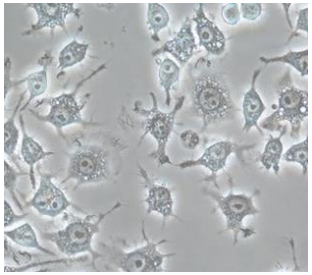
Microscopy



mitosis

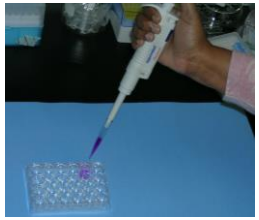


Cell function

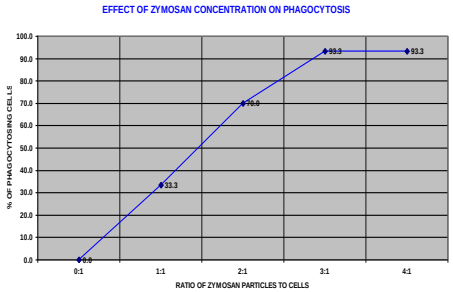


Cell structure

Macrophages

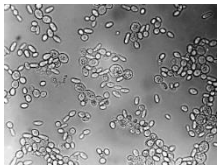


Good Laboratory practices

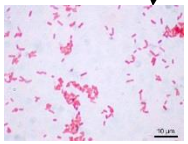


Quantitative reasoning

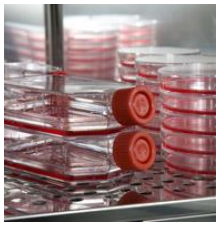
Data collection
Ethics and personal research integrity



Yeast



bacteria



In vitro cell culture

Third phase of research-based laboratories: collaborative faculty-students

- Students at two-year colleges:
  - little opportunity to see faculty interacting in informal settings
  - rarely experience the dynamics of faculty discussions around a research topic, particular experiments, and results
  - Little experience in doing collaborative research involving more than one faculty and several students

What this model can offer students

- Appreciate the enthusiasm and richness of ideas brought to discussions by more than one researcher
- Experience day to day collaboration; possibility of sharing tasks
  - Important for single mothers or students with restricted schedules
  - Stresses the importance of good communication
  - Emphasizes the richness of ideas that stem from hearing multiple point of view

Research-based laboratories collaborative faculty-students

Pilot at LaGuardia

Four students (Elaine Quesada, Sherise Martin, Rezwana Mahmood, and Ana Castillo)

(students have different levels of experience, from no experience at all, to more than one semester participating in some research project)

Two faculty (Dr. Maria Entezari, Dr. Lucia Fuentes)

Logistics

-Setting the schedule

-Introducing group members

-General background on the research topics of each one of the faculty members, including common fields

Working sessions

-Outlining the questions to be addressed

-Establishing experimental design

-Timelines

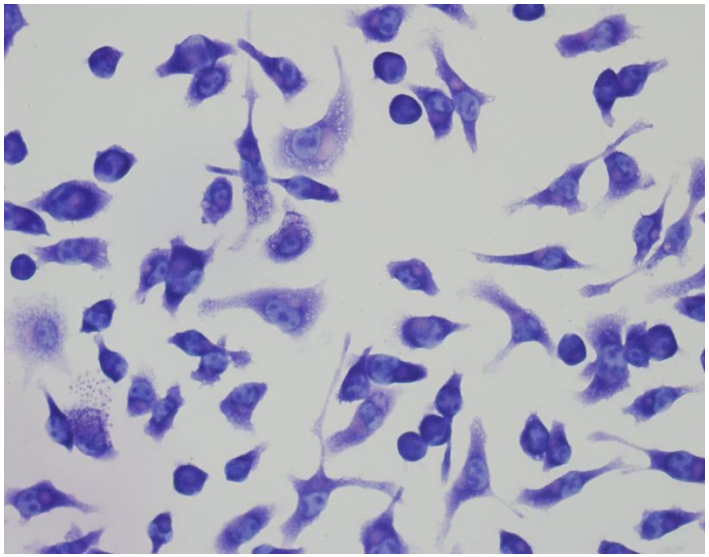
Project

- Macrophages: cells from the immune system which recognize and engulf foreign bodies
  - Microglial cells: macrophages in the Brain
  - RAW-264.7: macrophages from the body cavity of mice

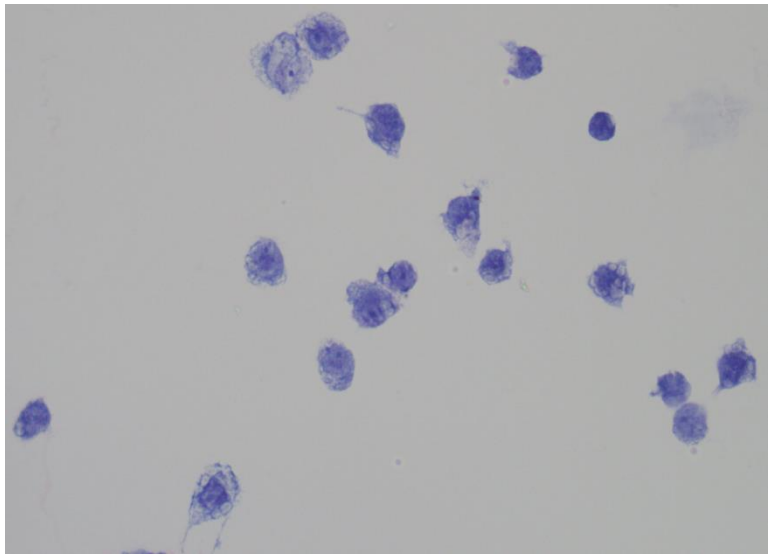
- Zymosan: particles derived from the cell walls of yeast

- How do microglia and RAW cells respond to incubation with zymosan and how does the ratio of the number of zymosan particles to the number of cells affect their response.

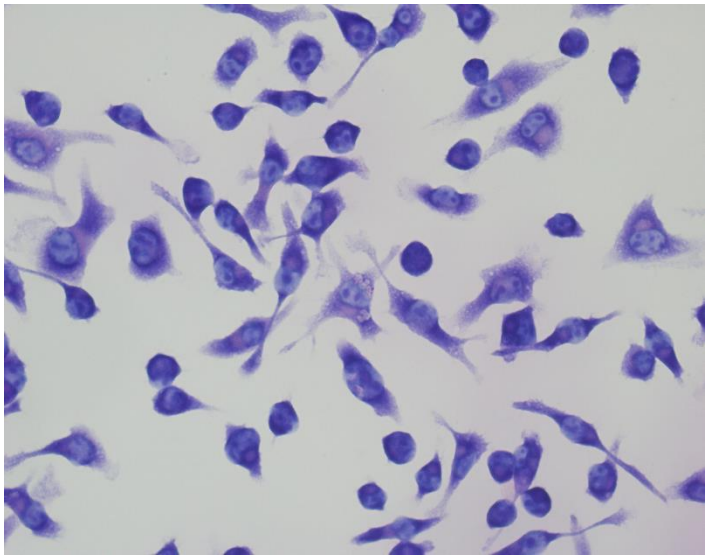
Comparing Immunomodulation in RAW -264.7 and microglia cells

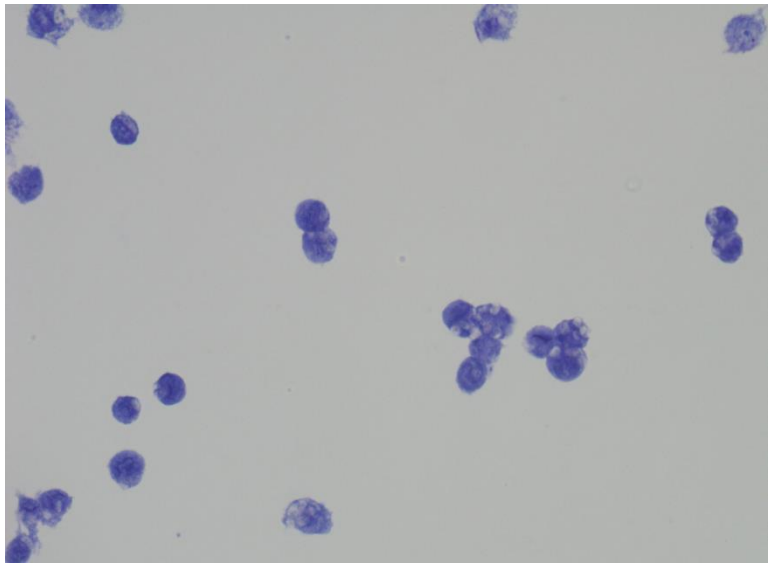


Microglia with zymosan

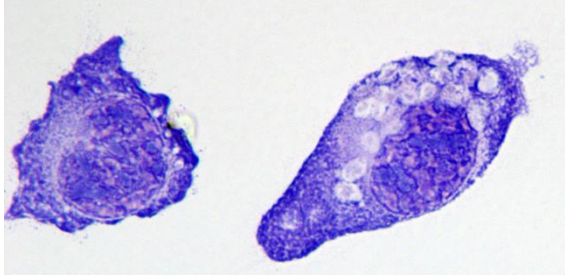


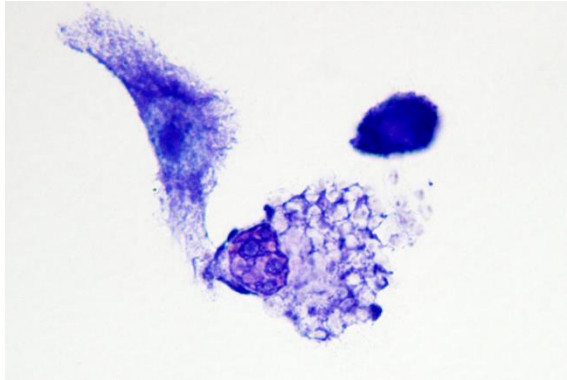
RAW cells with zymosan

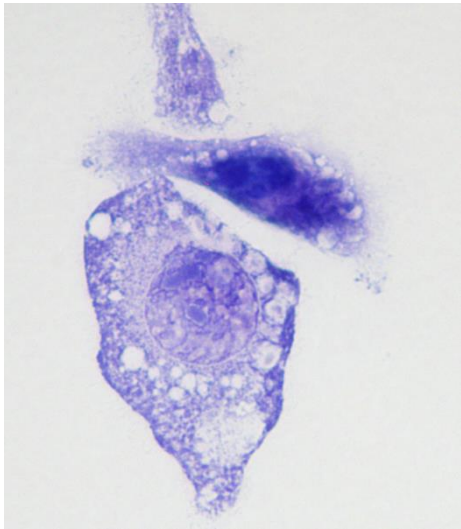




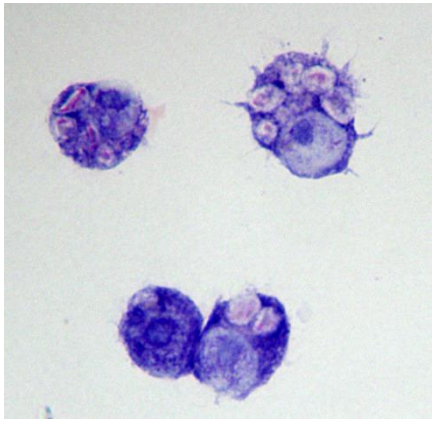
Microglial cells

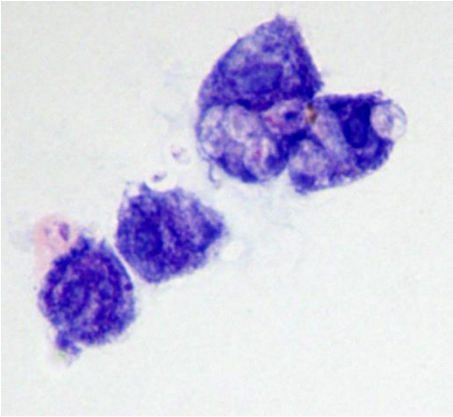


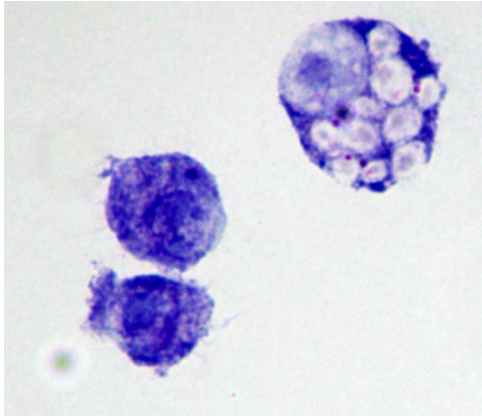




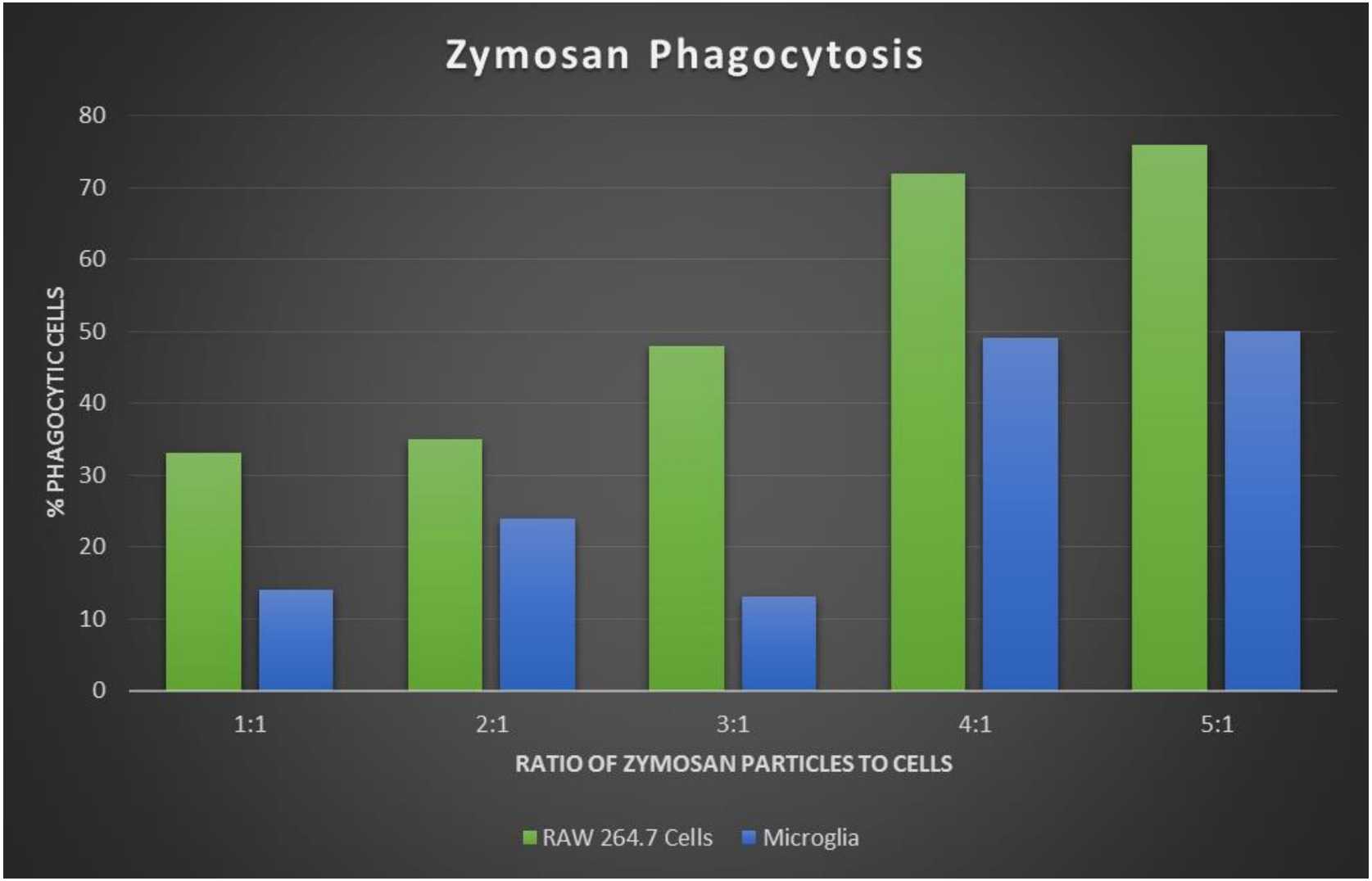
RAW 264.7 cells







Preliminary findings



Collaborative faculty-students research: Students responses to questions about this experience

- *How does your experience of working on a research project compare with labs you have done for other courses?*
- *What was it like getting started?*
- *How do you feel about working in a group?*
- *How do you feel about working with two faculty?*
- *What is the impact on doing this type of research on your future goals and career plans?*

Students responses to questions about this experience

- *How does your experience of working on a research project compare with labs you have done for other courses?*
  - *Course labs seem "fail proof", going through steps, everything is pre-set. With a research project, nothing is really set, you have to think about how you are going to approach the problem.*
  - *Use of instrumentation (microscopes) acquires a different meaning, and you realize you need to know how to use the tools properly.*

Students responses to questions about this experience

- *What was it like getting started?*
  - *A little intimidating, new language and you realize you really don't know anything.*
  - *This was my first experience ever entering a research lab, I had no idea what it was like and had never heard discussions about research.*

Students responses to questions about this experience

- *How do you feel about working in a group?*
  - *It's interesting because when you have a question, you can ask, and everybody helps each other. Also, it's interesting because when Professor Fuentes has a question, she asks Professor Entezari, and vice-versa, and you see the different perspectives.*
  - *You hear questions you may not have thought to ask.*

Students responses to questions about this experience

- *How do you feel about working with two faculty?*
  - *It has been very interesting because in your interactions you transmit your enthusiasm for the science and how you like it, and this makes me feel more enthusiastic*
  - *your personalities work together well so I assume that if you want to work together, you have some rapport, so I think that is important to see that building rapport between two researchers allows for good collaborations*
  - *We learn from both of you from different perspectives, and you both also come from different countries and bring different experiences, so we learn*

Students responses to questions about this experience

- *What is the impact on doing this type of research on your future goals and career plans?*
  - *I definitively want to continue doing research when I go to a 4 year college. I feel like research is something that will enable me to think about problems and how to solve them, no matter what the problem is, even if I'm not in the lab.*
  - *I want to follow my major, which is radiology, but I see myself doing research during the vacations or my free time; the medical field is very interesting to me and research allows me to learn beyond the classroom*

Conclusions and future directions

- Positive experience
- Continue with this pilot project
- Implement future projects and proposals that will allow further exploration of this alternative