Stanford

Lucy Erin O'Brien

Assistant Professor of Molecular and Cellular Physiology

Molecular & Cellular Physiology

Curriculum Vitae available Online

CONTACT INFORMATION

- **Administrative Contact**

  Sara Johnson - Administrative Associate

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  Tel 650-725-7785

Bio

ACADEMIC APPOINTMENTS

- Assistant Professor, Molecular & Cellular Physiology
- Member, Bio-X

ADMINISTRATIVE APPOINTMENTS

- Member, Stanford Diabetes Research Center, (2017- present)
- Associate Member, Institute for Stem Cell Biology and Regenerative Medicine, (2013- present)

HONORS AND AWARDS

- Predoctoral Fellowship for Science and Engineering, Department of Defense (1993-1996)
- Predoctoral Fellowship, American Heart Association (1998-2001)

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PROFESSIONAL EDUCATION

- Postdoctoral Scholar, UC Berkeley , Stem Cell Biology
- Ph.D., UCSF , Biomedical Sciences / Cell Biology (2001)

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LINKS

- O'Brien Lab Website: http://www.stemdynamics.org

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Animals live in dynamic environments where external conditions vary at cyclic or irregular intervals. When faced with environmental change, an individual’s physiological fitness requires that its organ systems functionally adapt. One type of organ adaptation occurs through tissue growth and shrinkage, tuning an organ's functional capacity to meet variable levels of physiologic demand. An “economy of nature", adaptive remodeling breaks the allometry of the body plan that was

established during development. Unlike embryonic growth, adult organ remodeling is reversible and repeatable, suggesting that it occurs through different mechanisms. Stem cells are key players in at least some of these mechanisms. But, basic questions remain largely unanswered: How do stem cells sense different levels of functional demand? How do they help translate this information into appropriate changes in organ size?

We have developed the Drosophila midgut as a simple invertebrate model to uncover the rules that govern adaptive remodeling. In adult flies, the midgut is a stem cell-based organ analogous to the vertebrate small intestine. We have found that when dietary load increases, midgut stem cells activate a reversible growth program that increases total intestinal cell number and digestive capacity. The midgut is a uniquely tractable model to study adaptive growth; not only can gene expression be manipulated and lineages traced at single-cell and whole-tissue levels, but complete population counts of all cell types are possible. Our goal is to understand how this nutrient-driven mechanism regulates stem cell behavior for lifelong optimization of organ form and function.

Teaching

COURSES

2018-19

- MCP Bootcamp: MCP 207 (Aut)

2017-18

- MCP Bootcamp: MCP 207 (Aut)

2016-17

- MCP Bootcamp: MCP 207 (Aut)

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STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Susanna Brantley

Postdoctoral Faculty Sponsor

Anna Kim, Aparna Sherlekar Banerjee

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GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Molecular and Cellular Physiology (Phd Program)

Publications

PUBLICATIONS

- **Long-term live imaging of the Drosophila adult midgut reveals real-time dynamics of division, differentiation and loss** *ELIFE*
  Martin, J., Sanders, E., Moreno-Roman, P., Koyama, L., Balachandra, S., Du, X., O'Brien, L.
  2018; 7
- **Beyond the niche: tissue-level coordination of stem cell dynamics.** *Annual review of cell and developmental biology*
  O'Brien, L. E., Bilder, D.
  2013; 29: 107-136

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