Stanford

Scott Dixon

Assistant Professor of Biology

Bio

BIO

As a graduate student and short-term postdoctoral fellow at the University of Toronto I studied genetic networks that regulate cell viability in the nematode worm Caenorhabditis elegans (C. elegans) and in the single-celled eukaryotes S. cerevisiae and S. pombe, respectively. As a postdoctoral fellow, I demonstrated that the small molecule erastin inhibits the membrane cystine/glutamate transporter system xc-, depletes the cell of glutathione and activates a novel iron-dependent, oxidative cell death pathway termed ferroptosis. Currently a major goal of my lab is to understand the interaction between intracellular metabolism and cell death. Our research program integrates techniques and model systems including small molecule and proteomic screening, biochemical analysis of protein function and model organism genetics.

ACADEMIC APPOINTMENTS

- Assistant Professor, Biology
- Member, Bio-X
- Faculty Fellow, Stanford ChEM-H
- Member, Wu Tsai Neurosciences Institute

PROFESSIONAL EDUCATION

- B.Sc., Laurentian University , Behavioral Neuroscience (2000)
- Ph.D., University of Toronto , Molecular and Medical Genetics (2007)

LINKS

- My Lab Website: http://www.dixonlaboratory.com/#dixonlab

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My lab is interested in the relationship between cell death and metabolism. Using techniques drawn from many disciplines my laboratory is investigating how perturbation of intracellular metabolic networks can result in novel forms of cell death, such as ferroptosis. We are interested in applying this knowledge to find new ways to treat diseases characterized by insufficient (e.g. cancer) or excessive (e.g. neurodegeneration) cell death.

Teaching

COURSES

2019-20

- Biochemistry & Molecular Biology: BIO 83 (Win)

2018-19

- Biochemistry & Molecular Biology: BIO 83 (Win)
- Frontiers in Biology: BIO 301 (Aut, Win, Spr)

2017-18

- Biochemistry & Molecular Biology: BIO 83 (Win)
- Frontiers in Biology: BIO 301 (Aut, Win, Spr)

2016-17

- Frontiers in Biology: BIO 301 (Aut, Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Daniel Berenson, John Coan, Marisa Hom, Dylan Husmann, Alan Itakura, Brian Perez, Laura Persson, Brian Raftrey

Postdoctoral Faculty Sponsor

Joan Ritho

Doctoral Dissertation Advisor (AC)

David Armenta, Tony Boutelle, Giovanni Forcina, Zintis Inde, Martha Kahlson, Jason Rodencal, Amy Tarangelo

Doctoral (Program)

David Armenta, Giovanni Forcina, Lauren Pope

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)
- Cancer Biology (Phd Program)

Publications

PUBLICATIONS

- **GPX4 at the Crossroads of Lipid Homeostasis and Ferroptosis** *PROTEOMICS*
  Forcina, G. C., Dixon, S. J.
  2019; 19 (18)
- **Kinetic analysis identifies determinants of sensitivity to MEK inhibitor-induced cell death**
  Inde, Z., Han, K., Bassik, M. C., Dixon, S. J.
  AMER ASSOC CANCER RESEARCH.2019
- **GPX4 at the Crossroads of Lipid Homeostasis and Ferroptosis.** *Proteomics*
  Forcina, G. C., Dixon, S. J.
  2019: e1800311
- **Ferroptosis and Brain Injury.** *Developmental neuroscience*
  Magtanong, L., Dixon, S. J.
  2019: 1–14
- **A Genome-wide Haploid Genetic Screen Identifies Regulators of Glutathione Abundance and Ferroptosis Sensitivity.** *Cell reports*
  Cao, J. Y., Poddar, A., Magtanong, L., Lumb, J. H., Mileur, T. R., Reid, M. A., Dovey, C. M., Wang, J., Locasale, J. W., Stone, E., Cole, S. P., Carette, J. E., Dixon, et al
  2019; 26 (6): 1544

- **The Hallmarks of Ferroptosis** *ANNUAL REVIEW OF CANCER BIOLOGY, VOL 3*
  Dixon, S. J., Stockwell, B. R., Jacks, T., Sawyers, C. L.
  2019; 3: 35–54

- **Ferroptosis and Brain Injury**
  Magtanong, L., Dixon, S. J.
  KARGER.2019: 382–95

- **Exogenous Monounsaturated Fatty Acids Promote a Ferroptosis-Resistant Cell State.** *Cell chemical biology*
  Magtanong, L., Ko, P., To, M., Cao, J. Y., Forcina, G. C., Tarangelo, A., Ward, C. C., Cho, K., Patti, G. J., Nomura, D. K., Olzmann, J. A., Dixon, S. J.
  2018

- **Protein palmitoylation and cancer.** *EMBO reports*
  Ko, P., Dixon, S. J.
  2018

- **The p53-p21 pathway inhibits ferroptosis during metabolic stress.** *Oncotarget*
  Tarangelo, A., Dixon, S.
  2018; 9 (37): 24572–73

- **Molecular mechanisms of cell death: recommendations of the Nomenclature Committee on Cell Death 2018** *CELL DEATH AND DIFFERENTIATION*
  Galluzzi, L., Vitale, I., Aaronson, S. A., Abrams, J. M., Adam, D., Agostinis, P., Alnemri, E. S., Altucci, L., Amelio, I., Andrews, D. W., Annicchiarico-Petruzzelli, M., Antonov, A. V., Arama, et al
  2018; 25 (3): 486–541

- **p53 Suppresses Metabolic Stress-Induced Ferroptosis in Cancer Cells** *CELL REPORTS*
  Tarangelo, A., Magtanong, L., Bieging-Rolett, K. T., Li, Y., Ye, J., Attardi, L. D., Dixon, S. J.
  2018; 22 (3): 569–75

- **MLKL Requires the Inositol Phosphate Code to Execute Necroptosis.** *Molecular cell*
  Dovey, C. M., Diep, J., Clarke, B. P., Hale, A. T., McNamara, D. E., Guo, H., Brown, N. W., Cao, J. Y., Grace, C. R., Gough, P. J., Bertin, J., Dixon, S. J., Fiedler, et al
  2018; 70 (5): 936–48.e7

- **The impact of non-genetic heterogeneity on cancer cell death** *CRITICAL REVIEWS IN BIOCHEMISTRY AND MOLECULAR BIOLOGY*
  Inde, Z., Dixon, S. J.
  2018; 53 (1): 99–114

- **Ferroptosis: A Regulated Cell Death Nexus Linking Metabolism, Redox Biology, and Disease** *CELL*
  Stockwell, B. R., Angeli, J., Bayir, H., Bush, A. I., Conrad, M., Dixon, S. J., Fulda, S., Gascon, S., Hatzios, S. K., Kagan, V. E., Noel, K., Jiang, X., Linkermann, et al
  2017; 171 (2): 273–85

- **Ferroptosis: bug or feature?** *IMMUNOLOGICAL REVIEWS*
  Dixon, S. J.
  2017; 277 (1): 150-157

- **Heat stress induces ferroptosis-like cell death in plants.** *journal of cell biology*
  Distéfano, A. M., Martin, M. V., Córdoba, J. P., Bellido, A. M., D'Ippólito, S., Colman, S. L., Soto, D., Roldán, J. A., Bartoli, C. G., Zabaleta, E. J., Fiol, D. F., Stockwell, B. R., Dixon, et al
  2017; 216 (2): 463-476

- **Ferroptosis-like death in plant cells.** *Molecular & cellular oncology*
  Conlon, M., Dixon, S. J.
  2017; 4 (3): e1302906

- **Systematic Quantification of Population Cell Death Kinetics in Mammalian Cells.** *Cell systems*
  Forcina, G. C., Conlon, M., Wells, A., Cao, J. Y., Dixon, S. J.
  2017; 4 (6): 600–610.e6

- **Nanomedicine: An iron age for cancer therapy.** *Nature nanotechnology*
  Tarangelo, A., Dixon, S. J.
  2016; 11 (11): 921-922
- **Global survey of cell death mechanisms reveals metabolic regulation of ferroptosis** *NATURE CHEMICAL BIOLOGY*
  Shimada, K., Skouta, R., Kaplan, A., Yang, W. S., Hayano, M., Dixon, S. J., Brown, L. M., Valenzuela, C. A., Wolpaw, A. J., Stockwell, B. R.
  2016; 12 (7): 497-?
- **Mechanisms of ferroptosis** *CELLULAR AND MOLECULAR LIFE SCIENCES*
  Cao, J. Y., Dixon, S. J.
  2016; 73 (11-12): 2195-2209
- **Emerging roles for lipids in non-apoptotic cell death.** *Cell death and differentiation*
  Magtanong, L., Ko, P. J., Dixon, S. J.
  2016
- **Connectivity Homology Enables Inter-Species Network Models of Synthetic Lethality** *PLOS COMPUTATIONAL BIOLOGY*
  Jacunski, A., Dixon, S. J., Tatonetti, N. P.
  2015; 11 (10)
- **Human Haploid Cell Genetics Reveals Roles for Lipid Metabolism Genes in Nonapoptotic Cell Death** *ACS CHEMICAL BIOLOGY*
  Dixon, S. J., Winter, G. E., Musavi, L. S., Lee, E. D., Snijder, B., Rebsamen, M., Superti-Furga, G., Stockwell, B. R.
  2015; 10 (7): 1604-1609
- **Human Haploid Cell Genetics Reveals Roles for Lipid Metabolism Genes in Nonapoptotic Cell Death.** *ACS chemical biology*
  Dixon, S. J., Winter, G. E., Musavi, L. S., Lee, E. D., Snijder, B., Rebsamen, M., Superti-Furga, G., Stockwell, B. R.
  2015; 10 (7): 1604–9
- **Pharmacological inhibition of cystine-glutamate exchange induces endoplasmic reticulum stress and ferroptosis** *ELIFE*
  Dixon, S. J., Patel, D., Welsch, M., Skouta, R., Lee, E., Hayano, M., Thomas, A. G., Gleason, C., Tatonetti, N., Slusher, B. S., Stockwell, B. R.
  2014; 3
- **Ferrostatins Inhibit Oxidative Lipid Damage and Cell Death in Diverse Disease Models** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Skouta, R., Dixon, S. J., Wang, J., Dunn, D. E., Orman, M., Shimada, K., Rosenberg, P. A., Lo, D. C., Weinberg, J. M., Linkermann, A., Stockwell, B. R.
  2014; 136 (12): 4551-4556
- **The role of iron and reactive oxygen species in cell death** *NATURE CHEMICAL BIOLOGY*
  Dixon, S. J., Stockwell, B. R.
  2014; 10 (1): 9-17
- **Ferroptosis: An Iron-Dependent Form of Nonapoptotic Cell Death** *CELL*
  Dixon, S. J., Lemberg, K. M., Lamprecht, M. R., Skouta, R., Zaitsev, E. M., Gleason, C. E., Patel, D. N., Bauer, A. J., Cantley, A. M., Yang, W. S., Morrison, B., Stockwell, B. R.
  2012; 149 (5): 1060-1072
- **DRUG DISCOVERY Engineering drug combinations** *NATURE CHEMICAL BIOLOGY*
  Dixon, S. J., Stockwell, B. R.
  2010; 6 (5): 318-319
- **Identifying druggable disease-modifying gene products** *CURRENT OPINION IN CHEMICAL BIOLOGY*
  Dixon, S. J., Stockwell, B. R.
  2009; 13 (5-6): 549-555
- **An UNC-40 pathway directs postsynaptic membrane extension in Caenorhabditis elegans** *DEVELOPMENT*
  Alexander, M., Chan, K. K., Byrne, A. B., Selman, G., Lee, T., Ono, J., Wong, E., Puckrin, R., Dixon, S. J., Roy, P. J.
  2009; 136 (6): 911-922
- **Systematic Mapping of Genetic Interaction Networks** *ANNUAL REVIEW OF GENETICS*
  Dixon, S. J., Costanzo, M., Baryshnikova, A., Andrews, B., Boone, C.
  2009; 43: 601-625

- **Significant conservation of synthetic lethal genetic interaction networks between distantly related eukaryotes** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Dixon, S. J., Fedyshyn, Y., Koh, J. L., Prasad, T. S., Chahwan, C., Chua, G., Toufighi, K., Baryshnikova, A., Hayles, J., Hoe, K., Kim, D., Park, H., Myers, et al
  2008; 105 (43): 16653-16658
- **Insulin-like signaling negatively regulates muscle arm extension through DAF-12 in Caenorhabditis elegans** *DEVELOPMENTAL BIOLOGY*
  Dixon, S. J., Alexander, M., Chan, K. K., Roy, P. J.
  2008; 318 (1): 153-161
- **FGF negatively regulates muscle membrane extension in Caenorhabditis elegans** *DEVELOPMENT*
  Dixon, S. J., Alexander, M., Fernandes, R., Ricker, N., Roy, P. J.
  2006; 133 (7): 1263-1275
- **Muscle arm development in Caenorhabditis elegans** *DEVELOPMENT*
  Dixon, S. J., Roy, P. J.
  2005; 132 (13): 3079-3092