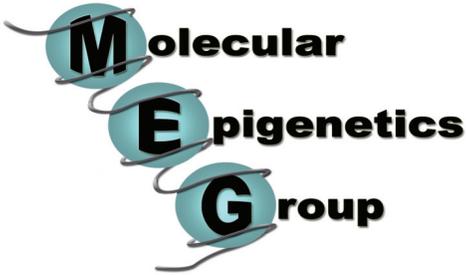


Did you know that there are memories in your genes?

Did you know that some of your gene expression patterns were established before you were born and will be stably maintained for the rest of your life?

This is only a fraction of what we have learned from the study of epigenetics.



Research Strengths & Facilities

What is Epigenetics?

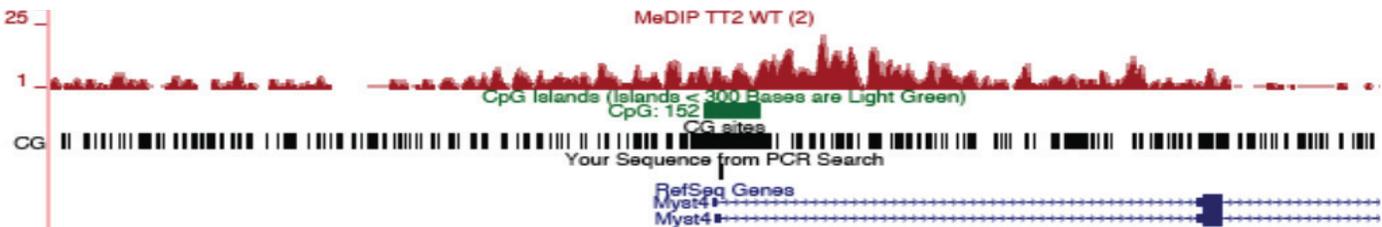
The human genome contains approximately 23,000 protein-coding genes, unique subsets of which are expressed in different cell types. Cells are able to pass their gene expression patterns to daughter cells, and since all cells have the same DNA, the means of passing differences in expression patterns must lie outside the DNA sequence. The study of heritable changes in gene expression is known as epigenetics. The most likely mediators of epigenetic processes include DNA methylation, histone post-translational modifications and non-coding RNA. Epigenetics is a high profile field of research, which has been made a priority for study by both the CIHR (Canadian Epigenetics, Environment and Health Research Consortium) and the NIH (Roadmap Epigenomics Project).

Who We Are

The Molecular Epigenetics Group (MEG) at the University of British Columbia includes over 40 full-time researchers, including approximately 25 graduate students pursuing MSc or PhD degrees in Biochemistry and Molecular Biology, Medical Genetics, or Zoology. MEG researchers use yeast, *Drosophila*, mammalian cell lines and mice to address fundamental questions about the roles of DNA modification and chromatin structure in gene regulation during development. We are equipped with state-of-the-art facilities in the Life Sciences Institute at UBC and our students learn bioinformatics, ChIP-SEQ, gene expression analysis, protein purification, embryonic stem cell-based technologies, mass spectrometric protein identification, and yeast, fly and mammalian molecular genetics. MEG hosts alternating weeks of 'Wing Talks' and 'Chromatin Club' (a series of presentations and discussions of current literature). We also host a more formal epigenetics seminar series known as the 'Waddington Lectures' and an annual retreat. <http://meg.lsi.ubc.ca/>

Graduate Programs

- Biochemistry & Molecular Biology (MSc, PhD)
- Cell & Developmental Biology (MSc, PhD)
- Genome Sciences & Technology (MSc, PhD)
- Medical Genetics (MSc, PhD)
- Zoology (MSc, PhD)





Did you know that many cancers are caused not by DNA mutation, but by changes in how DNA is packaged? Did you know that changes in chromatin structure accompany aging?

Faculty and Research Focus

Hugh Brock: the role of non-coding RNAs in the epigenetic regulation of the Hox genes in *Drosophila*, and the function of Polycomb group proteins in cell cycle control and silencing during development.

Carolyn Brown: the mechanism of human X chromosome inactivation, including how the non-protein coding XIST RNA can associate with the entire chromosome, resulting in establishment of facultative heterochromatin and gene silencing.

Thomas Grigliatti: the molecular function of non-histone chromatin proteins in gene silencing in *Drosophila*, and the use of pharmacogenomics to unravel the basis of complex disorders.

LeAnn Howe: the establishment and maintenance of transcriptionally active chromatin in budding yeast, including the roles played by chromatin-remodelling machines and the post-translational modification of histones.

Louis Lefebvre: the phenomenon of genomic imprinting, an epigenetic system guiding the monoallelic, parent-of-origin dependent expression of specific genes in mammals, including the role of non-coding RNA in regulating the imprinting of gene clusters.

Matthew Lorincz: the interplay between transcription, DNA methylation and histone modifications in the silencing of exogenous and endogenous retroviruses in cells.

Ivan Sadowski: how chromatin regulates the maintenance of the latent pool of HIV infected cells, and how environmental signals regulate transcription, including the stress response genes in yeast and HIV in infected T cells.

Catherine Van Raamsdonk: the use of pigmentation mutants to discover new genes that control melanocyte proliferation and survival, and how boundaries are set during mammalian development.

Recent Publications

Fisher CL, Pineault N, Brookes C, Helgason CD, Ohta H, Bodner C, Hess JL, R. Humphries K, Brock HW. (2010). *Loss-of-function Additional sex combs-like 1 mutations disrupt hematopoiesis but do not cause severe myelodysplasia or leukemia. Blood* 115:38-46.

Oh-McGinnis R, Bogutz AB, Lefebvre L. (2011). Partial loss of Ascl2 function affects all three layers of the mature placenta and causes intrauterine growth restriction. *Dev Biol* 351:277-286.

Van Raamsdonk CD et al. (2010). Mutations in GNA11 in uveal melanoma. *N Eng J Med* 363:2256-2257.

Karimi MM, Goyal P, Maksakova IA, Bileny M, Leung D, Tang JX, Shinkai Y, Mager DL, Jones S, Hirst M, Lorincz M. (2011). DNA methylation and SETDB1/H3K9me3 regulate predominantly distinct sets of genes, retroelements, and chimeric transcripts in mESCs. *Cell Stem Cell* 8:676-687.

Petruk S, Sedkov Y, Johnston DM, Hodgson JW, Black KL, Kovermann SK, Beck S, Canaani E, Brock HW, Mazo A. (2012). TrxG and PcG Proteins but Not Methylated Histones Remain Associated with DNA through Replication. *Cell* 150:922-33.

Maltby VE, Martin BJE, Schulze JM, Johnson I, Hentrich T, Sharma A, Kobor MS, Howe LJ. (2012). Histone H3 lysine 36 methylation targets the Isw1b remodeling complex to chromatin. *Mol Cell Biol* 32: 3479-85

Graduate Studies Admission

UBC Faculty of Graduate Studies establishes common minimum academic requirements. One of the major admission requirements for LSI graduate programs is securing a research supervisor.

Contact

Recruitment & Outreach Coordinator
lsi.grad@ubc.ca
website: grad.lsi.ubc.ca

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The University of British Columbia

UBC is a global centre for research and teaching, consistently ranked among the 40 best universities in the world. Surrounded by the beauty of the Canadian West, UBC embraces bold new ways of thinking that attract exceptional students and faculty. It is a place where innovative ideas are nurtured in a globally connected research community, providing unparalleled opportunities to learn, discover and contribute in one's own way. UBC is a place of mind.