

Art Petronis
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Report 2010-2015

SUMMARY

- All (but one) papers published (and submitted to) in the journals with IF 9 or higher. Four papers in the *Nature* series journals.
- External funding >\$10M (grants which were received or ended after 2010); four active major grants (2012-2019) for the total of nearly \$5M from CIHR, NIH, and Brain Canada.
- Over 40 national and international presentations.
- Seven graduate students receive training in the lab. Three of them are CIHR Vanier Scholars.
- Since 2010, my papers have been cited 2,600+ times.

PUBLICATIONS

Refereed papers:

1. **Petronis A.** Epigenetics as a unifying principle in etiology of complex diseases and traits. *Nature*, 465(7299):721-7; 2010.
2. Vedadi M, Barsyte-Lovejoy D, Liu F, Rival-Gervier S, Allali-Hassani A, Labrie V, Wigle TJ, Dimaggio PA, Wasney GA, Siarheyeva A, Dong A, Tempel W, Wang SC, Chen X, Chau I, Mangano TJ, Huang XP, Simpson CD, Pattenden SG, Norris JL, Kireev DB, Tripathy A, Edwards A, Roth BL, Janzen WP, Garcia BA, **Petronis A**, Ellis J, Brown PJ, Frye SV, Arrowsmith CH, Jin J. A chemical probe selectively inhibits G9a and GLP methyltransferase activity in cells. *Nat Chem Biol*. 2011; 7(8):566-74.
3. Kaminsky Z, Tochigi M, Jia P, Pal M, Mill J, Kwan A, Ioshikhes I, Vincent JB, Kennedy JL, Strauss J, Pai S, Wang SC, **Petronis A.** A multi-tissue analysis identifies HLA complex group 9 gene methylation differences in bipolar disorder. *Mol Psychiatry*. 17(7):728-40; 2012
4. Labrie V, Pai S, **Petronis A.** Epigenetics of major psychosis: progress, problems, and perspectives. *Trends in Genetics* 28(9): 427-35, 2012.
5. Cortese R, Kwan A, Lalonde E, Bryzgunova O, Bondar A, Wu Y, Gordevicius J, Park M, Oh G, Kaminsky Z, Tverkuviene J, Laurinavicius A, Jankevicius F, Sendorek D, Haider S, Wang SC, Jarmalaite S, Laktionov P, Boutros PC, **Petronis A.** Epigenetic markers of prostate cancer in plasma circulating DNA. *Human Molecular Genetics* 21(16): 3619-31; 2012.
6. Khare T, Pai S, Koncevicius K, Pal M, Kriukiene E, Liutkeviciute Z, Irimia M, Jia P, Ptak C, Xia M, Tice R, Moréra S, Nazarians A, Belsham D, Wong AHC, Blencowe BJ, Wang SC, Kapranov P, Kustra R, Labrie V, Klimasauskas S, **Petronis A.** 5-hmC in the brain:

abundance in synaptic genes and differences at the exon-intron boundary. *Nature Structural and Molecular Biology* 19(10):1037-43, 2012.

7. Kriukienė E, Labrie V, Khare T, Urbanavičiūtė G, Lapinaitė A, Koncevičius K, Li D, Wang T, Pai S, Ptak C, Gordevičius J, Wang SC, **Petronis A**, Klimašauskas S. DNA unmethylome profiling via covalent capture of CpG sites. *Nature Communications*, 23; 4:2190, 2013.
8. Oh G, Wang SC, Pal M, Chen ZF, Khare T, Tochigi M, Ng C, Yang YA, Kwan A, Kaminsky ZA, Mill J, Gunasinghe C, Tackett JL, Gottesman II, Willemsen G, de Geus EJ, Vink JM, Slagboom PE, Wray NR, Heath AC, Montgomery GW, Turecki G, Martin NG, Boomsma DI, McGuffin P, Kustra R, Petronis A. DNA modification study of major depressive disorder: beyond locus by-locus comparisons. *Biological Psychiatry*. 2015; 77(3):246-55.

Submitted for publication:

9. Oh G, Ebrahimi S, Wang S-C, Cortese R, Kaminsky ZA, Gottesman II, Burke JB, Plassman BL, **Petronis A**. Epigenetic assimilation in the aging human brain.
10. Pal M, Ebrahimi S, Oh G, Khare T, Zhang A, Kaminsky ZA, Wang S-C, **Petronis A**. High precision DNA modification analysis of *HCG9* in major psychosis.
11. Ptak C, Mak D, Gagliano SA, Shamsi M, Oh G, Knight J, Boutros PC, **Petronis A**. Allele-specific DNA modification: relevance to GWAS of complex traits.

Books

- **Petronis A**, Mill J (eds). Brain, Behavior and Epigenetics. Series: Epigenetics and Human Health. Springer, 2011; 317p.

Invited talks

- **2010**
 1. University of British Columbia, Brain Research Institute, Vancouver BC, Canada. January 15, 2010.
 2. International Human Epigenome Consortium. Paris, France. January 25-26, 2010.
 3. The 8th Annual Scientific Meeting of the Broad Foundation. Los Angeles, California, USA. February 18, 2010.
 4. Johns Hopkins University, Baltimore, MD, USA. March 23, 2010.
 5. Third Annual Canadian Human Genetics Meeting. Saint-Sauveur, Québec, Canada. April 18-21, 2010.
 6. Epigenetics and the Environment: Implications for Behavior and Disease. Symposium on Epigenetics. Lund, Sweden. May 3-4, 2010.
 7. XXVIII European Conference on Psychosomatic Research (ECPR), and XIII Annual Scientific Meeting European Association for Consultation-Liaison Psychiatry and Psychosomatics (EACLPP). Innsbruck, Austria. June 30-July 3, 2010.
 8. 4th International Symposium on Schizophrenia of the Goettingen Research

Association for Schizophrenia (GRAS). Max Planck Institute of Experimental Medicine. September 17, 2010. Goettingen, Germany.

9. Gairdner Epigenetics symposium. October 29, 2010. Toronto, Canada.
 10. Howard Hughes Medical Institute symposium on Epigenomics. Dec 12-14, 2010. Washington DC, USA.
- **2011**
 11. Environmental Epigenomics and Disease Susceptibility. Keystone conference. North Carolina USA Mar 27-Apr 1, 2011.
 12. 1st Canadian Conference on Epigenetics. London, Ontario. May 4-7, 2011.
 13. The relevance of epigenetics to brain disorders. A Tribute to Dr. Erminio Costa. University of Illinois at Chicago, Department of Psychiatry, College of Medicine. Chicago IL USA. May 4-5, 2011.
 14. Biennial Meeting of the International Society for Research on Child and Adolescent Psychopathology. Chicago, IL, USA. June 15-18, 2011.
 15. Epigenetics and regulation of gene expression. 4th Weissenburg symposium – Biriciana. Weissenburg, Germany. June 20-22, 2011.
 16. The Barn Meeting on Epigenetics and CNS disease. Hoffman-La Roche Ltd. Uto Kulm, Zurich, Switzerland. June 23-25, 2011.
 17. The 61st American Society of Human Genetics and the 12th International Society of Human Genetics meeting. Montreal Quebec, Canada. October 11-15, 2011.
 18. Department of Genetics, University of Chicago. Chicago IL, USA. November 1, 2011.
 19. Epigenetics of Autism Spectrum Disorders: Current knowledge, existing opportunities and future directions. Washington DC, USA. December 8, 2011.
 - **2012**
 20. Epigenetics: Bench to Bedside. European Union COST program. Riga, Latvia. April 26-27, 2012 (keynote speaker).
 21. 16th International Congress on Parkinson Disease and Movement Disorders. Dublin, Ireland. June 17-21, 2012.
 22. Epigenetic regulation: from mechanism to intervention. MRC Clinical Sciences Centre. London, UK. June 20-22, 2012.
 23. Institute of Psychiatry. King's College London. London UK. June 28, 2012.
 24. Albert Einstein College of Medicine of Yeshiva University. Bronx, New York, USA. August 10, 2012.
 25. Agricultural Biotechnology Center – Godolo. Budapest, Hungary. September 26, 2012.
 26. Epigenetics: Opportunities for Sleep and Circadian Research. Philadelphia, PA, USA. October 3-5, 2012.
 27. Epigenomics of Common Diseases. Johns Hopkins University, Baltimore MD, USA. October 12 – 15, 2012.
 28. Postgenomic methods of analysis in biology, and laboratory and clinical medicine. Kazan Federal University, Kazan, Russia. November 22-24, 2012.

- **2013**

29. 13th Annual Toronto Psychopharmacology Update. Department of Psychiatry, University of Toronto, Toronto. March 2, 2013.
30. Neuropsychiatry and Inflammation: epigenetic target discovery beyond oncology. 3rd Oxford Symposium on Epigenetic Mechanisms in Health and Disease. University of Oxford, UK. March 14-15, 2013.
31. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), Bethesda, MD, USA. March 29, 2013.
32. Epigenetics and Human Disease. 6th Annual Pfizer Frontiers in Human Disease Symposium. New York NY, USA. April 16-17, 2013.
33. 68th Annual Scientific Convention of the Society of Biological Psychiatry. San Francisco, California, USA. May 16-18, 2013.
34. Annual Meeting of Behavioral Genetics Association. Aix Marseille, France. June 28-July 2, 2013.
35. The Canadian Academy of Health Sciences meeting. Ottawa, Canada. September 19-20, 2013.
36. Kaunas Medical University, the Lithuanian University of Life Sciences, Kaunas, Lithuania. November 6, 2013.

- **2014**

37. Kaunas Medical University, the Lithuanian University of Life Sciences, Kaunas, Lithuania. May 23, 2014.
38. Epigenetics and regulation of gene expression. 5th Weissenburg symposium – Biriciana. Weissenburg, Germany. September 15-17, 2014.
39. Sackler Colloquium, The National Academy of Sciences of USA. Washington DC. March 28-29, 2014.
40. 27th Congress of the European College of Neuropsychopharmacology. Berlin, Germany October 18-21, 2014.
41. Genomics: power and promise. Genome Canada and the Gairdner Foundation. Ottawa, Canada November 24-26, 2014.
42. Innovations in Psychiatric Care: From Neuron to Clinical Practice. Canadian Psychiatric Association. Toronto: Nov. 7, 2014; Montréal: Nov. 21, 2014; Vancouver: Nov. 28, 2014.

Research Awards

- John Dewan Prize, Ontario Mental Health Foundation, 2013.
- Senior Research Fellow, Ontario Mental Health Foundation, 2009-2012.

Review Activities. Funding agencies

- PsychENCODE: Identification and Characterization of Non-coding Functional Elements in the Brain, and their Role in the Development of Mental Disorders (RFA-MH-14-020).
- Canadian Institutes of Health Research (Behavioral Sciences B committee).

- National Institutes for Health, Genetics of Health and Disease Study Section (GHD) 2012.
- Canadian Institutes of Health Research (Sex, Gender, and Health committee, 2012).
- National Institutes for Health ZDA1 SXC-E 12 1, NIDA Cutting-Edge Basic Research Awards (CEBRA) (R21) December 02, 2011.
- National Institutes for Health (2010/03 ZDA1 GXM-A (13) 1 NIDA CEBRA R21; 2010/10 ZRG1 BDCN-N (04) M).
- National Institutes for Health (2010/01 ZDA1 GXM-A).

Other scientific activities (speaker, consultant), including teaching

- Chair, Epigenetics session. Third Annual Canadian Human Genetics Meeting. Saint-Sauveur, Québec, Canada. April 18-21, 2010.
- Consultant, Affymetrix, Santa Clara, California, USA. February 17, 2010.
- Lecturer, MSC1010Y MSc/PhD Seminar Course. Institute of Medical Science, University of Toronto, Toronto, Canada.
- Lecturer, Workshop on Schizophrenia and Related Disorders. Cold Spring Harbour Laboratory, NY, USA. June 6-12, 2012.
- Lecturer, Single Cell Analysis. Cold Spring Harbour Laboratory, NY, USA. June 6-19, 2012.
- Lecturer, Genetics of Complex Human Diseases. Cold Spring Harbour Laboratory, NY, USA. August 7-13, 2012.
- Lecturer, the Neuroscience School of Advanced Studies. Neuroepigenetics Course (coordinator: A. Guidotti). Cortona, Italy. June 1-9, 2013.
- Participant, the NIH Common Fund meeting Epigenomic Surrogates for Difficult to Access Tissues. Bethesda MD. USA. August 28, 2012.
- Lecturer, the University Program in Genetics and Genomics (UPGG). Duke University, NC, USA. March 13, 2012.
- Lecturer, Summer Undergraduate Research Program, University of Toronto. Medical Science Building, Toronto. July 20, 2012.
- Lecturer, CIHR workshop Epigenetics, Environment and Health. Niagara on the Lake, Ontario, Canada. April 7-9, 2010.

Consultant of biotechnology companies

- Sigma – Aldrich, Sigma Life Sciences. St. Louis, Missouri, USA. 2010-2012.
- ThermoFisher USA. 2011-2014.

Audiotalks

- Epigenomics of complex disease. In: Issa, J. (ed.) DNA Methylation: The Biomedical & Life Sciences Collection, Henry Stewart Talks Ltd, London (online at <http://hstalks.com/?t=BL1082744-Petronis>).

Graduate student thesis supervision

Park, M.	MSc student	Epigenetics and cancer	Graduated 2011
Ptak, C.	PhD student	Genetic – epigenetic interactions	Graduated 2012
Oh, G.	PhD student	Epigenetics and complex disease	Graduated 2014
Pal, M.	PhD student	Epigenomics of DNA recombination	2008-
Kwan, A.	PhD student	Epigenetics and disease	2010-
Ebrahimi, S.	PhD student	Epigenetic-genetic interactions	2012-
Constantinof, A.	MSc student	Epigenomics of lactase persistence	Graduated 2014
Jeremian, R.	Msc student	Meiotic mapping in disease (John Strauss,co-supervisor)	2010-
Kosowan, J.	MSc student	Animal models and epigenetics (Albert Wong, co-supervisor)	Graduated 2014
Nair, Akhil	MSc student	Circadian epigenomics	2013-
Oh, Edward	PhD student	Epigenomics of complex traits	2015-

Gabriel Oh, Sasha Ebrahimi and Andrew Kwan are Vanier Scholars.

Postdoctoral fellow and student supervision

Name	Position	Topic	Duration
Khare, T.	PDF	Epigenetics of type 1 diabetes	2006-
Jia, P.	PDF	Fine mapping of epigenetic factors	2006-
Cortese, R.	PDF	Epigenomics of cancer	2008-2013
Tochigi, M.	PDF	Epigenomics of schizophrenia	2008-2010
Mak, D.	PDF	Bioinformatics and epigenomics	2009-2014
Kaminsky, Z.A.	PDF	Epigenetics of psychosis	2008-2010
Labrie, V.	PDF	Chemical epigenomics	2010-
Pai, S.	PDF	Bioinformatics and epigenomics	2010-2014
Koncevicius, K.	Visiting student	Bioinformatics and epigenomics	2009-
Shamsi, M.	PDF	Bioinformatics and epigenomics	2009-2010
Sritharan, K.	PDF	Microfluidics	2009-2011
Weaver, I.	PDF	Epigenetic-genetic interactions	2010-2012
Gordevicius, J.	Visiting PDF	Bioinformatics and epigenomics	2011-

M.Sc. and Ph.D. Committee memberships

Student	Project title:
Sarah Figley (PhD candidate)	VEGF gene therapy for spinal cord injury. PhD transfer examination (external examiner), July 17, 2009.
Anna Gavryushova	The temporal relationship between DNA replication and DNA methylation of endothelial-enriched genes (2008-2011).
Erick Ling (PhD candidate)	Notch pathway blockade in human glioblastoma stem cells defines heterogeneity and sensitivity to neuronal lineage commitment. Institute of Medical Sciences, U Toronto. Nov 23, 2011 (chair of the defence meeting).
Jean-Sebastian Doucet (MSc candidate)	Animal model of prophylaxis and prevention of schizophrenia: prenatal seasonal influenza vaccine and postnatal valproate (examiner). July 3, 2012.

GRANTS (as PI)

Current:

The Ontario Brain Epigenomics Platform
Brain Canada
2015-2018
\$900,000

Divergent meiotic recombination in bipolar disorder (R01MH105409)
National Institute of Mental Health (NIMH)
2014-1018
\$986,000 USD

Epigenomics of major depression: dissecting environmental, heritable, and stochastic contributions
Canadian Institutes of Health Research (CIHR)
2014-2019
\$ 1,180,000

Epigenomics of schizophrenia (MOP-119451)
Canadian Institutes of Health Research (CIHR)
2012-2017
\$1,876,137

Epigenetic study of abiraterone response
MARS Innovation
2014-2015
\$150,000

Expired before March 2015:

Epigenetic studies of schizophrenia (MOP-77689)
Canadian Institutes of Health Research (CIHR)
2008-2011
\$ 880,591

DNA methylome analysis in bipolar disorder (1R01MH088413-01)
National Institute of Mental Health (NIMH)
2009-2014
\$4,230,879

Epigenomic studies of twins discordant for Crohn's disease (MOP-97789)
Canadian Institutes of Health Research (CIHR)
2008-2013
\$643,203

DNA methylome study in type 1 diabetes (1DP3DK085698-01)
National Institute of Diabetes, Digestive and Kidney Diseases (NIDDK)
2009-2014
\$3,148,780

Approaches for genomic mapping of 5-hydroxymethylcytosine, a novel mark in mammalian DNA (5R21HG005758-02)
National Institutes of Health (NIH)
2010-2013
\$85,493

Epigenomic studies of single cells
Krembil Foundation
2009- 2014
\$1,200,000