Curriculum Vitae

ZHIGUO ZHANG
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EDUCATION

1984 – 1988	National University of Defense Technology B.S. Department of Applied Chemistry
1989 – 1992	Dalian Institute of Chemical Physics, Chinese Academy of Sciences Ph.D. candidate Physical Chemistry
1994 – 1998	University of Utah Ph.D. Department of Biochemistry

RESEARCH EXPERIENCE

1988 – 1989	Research Technician, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, People's Republic of China
1998 – 2003	Postdoctoral Fellowship, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY. Dr. Bruce Stillman, advisor. Research topic: Epigenetic inheritance in *S. cerevisiae*.
2003 – 2009	Senior Associate Consultant, Department of Biochemistry and Molecular Biology, Mayo Clinic Rochester, Rochester, Minnesota.
2009-present	Consultant, Mayo Clinic
2003 –2008	Assistant Professor of Biochemistry and Molecular Biology, College of Medicine, Mayo Clinic
December 2008-2012	Associate Professor of Biochemistry and Molecular Biology, Mayo Clinic
June 2012-present	Professor of Biochemistry and Molecular Biology, Mayo Clinic
August 2003 – present	Full Faculty Privileges in Biochemistry and Molecular Biology, Mayo Graduate School

HONORS and AWARDS

1984 – 1988	Four year scholarship, University of Defense Technology, China
1988	Outstanding Graduates Award, University of Defense Technology, China
1998	James W. Prahl Award for Outstanding Graduate Student, University of Utah, School of Medicine
1999 – 2002	Postdoctoral Fellow, Cancer Research Fund of Damon Runyon-Walter Winchell Foundation
July 1 2009	Scholar, Leukemia and Lymphoma Society

TEACHING

Courses

08/02/2004 – present	Genome Biology, Mayo Graduate School of Medicine, Rochester, Minnesota
2004 –present	Cellular Pharmacology of Agents that Target Cancer and AIDS, faculty facilitator, Mayo Graduate School of Medicine, Rochester, Minnesota
09/2006, 9/2008	Cancer Biology, Mayo Graduate School of Medicine, Rochester, Minnesota
12/2011	Cancer Biology, Mayo Graduate School of Medicine, Rochester, Minnesota

Thesis Committees

2003 – 2006	Tessa Davis (M.D./Ph.D. student) Thesis Committee Member
2008-2010	Anand Patel (M.D./Ph.D. student) Thesis committee member
2008-2009	Nelmary Hernandez Alcarado (Ph.D. candidate) Thesis committee member
2010-present	Krista Bledsoe, Thesis committee member

Other Committee Services

2005-2008 BMB Annual Report Committee with Dr. Dev Mukhopadhyay.

2011-present: BMB Education Committee, member

2011-present: Epigenomics Committee member, Center of Individualized Medicine

2011-present Director of Epigenomic Development Laboratory, Center of Individualized Medicine

2012-present, BMB Executive Committee, member

2012-present, BMB Academic Promotion Committee, member

2013- Mayo Clinic Space and Equipment Subcommittee, member,

Graduate Students

2007 – 2010	A. M. Fazly (Now a postdoctoral fellow in UMass)
2008 – 2011	Rebecca Burgess (now a postdoctoral fellow at UT SW)
2012-present	Jameson Dahlin (MD/Ph.D.)
2012-present	Jong-Sun Lee

Rotation Graduate Students

2006	Ruilin Zhang
2008	Hopp Katharina
2009	Jason Tan
2009	Angela McCleary-Wheeler
2010	Blake Fechtel, MD/Ph.D.
2011	Andrew Harrison, MD/Ph.D.
2011	Jong-Sun Lee
2012	Yuan Gao
2012	Liang Cheng
2012	Stephanie Safgren

Summer Undergraduate Research Students

2004	Fiorella Ghisays, now a graduate student at Washington University, St. Louis
2006	Michelle Zeman, now a graduate student at Stanford University

2006	Amber Andrews (unknown)
2007	Erika Cline, now a graduate student at University of Michigan
2009	Xiaoge Guo now a graduate student at Duke University

PROFESSIONAL SOCIETIES AND SERVICES

Membership

1998-present	American Association for the Advancement of Science
1998-present	American Society for Biochemistry and Molecular Biology

Grant reviewer

2005 and 2006	Ad Hoc Grant Reviewer for National Science Foundation
2006	Ad Hoc Grant Reviewer for National Institute of Environmental Health Sciences
2008	Ad Hoc Grant Reviewer for National Institute of General Medicine (MGC)
2008	Ad Hoc grant reviewer for NIH Road Map for Epigenomics
2009	Ad Hoc Grant Reviewer for National Institute of General Medicine (MGA)
2009	Ad Hoc grant reviewer for NSF
2009	Ad Hoc grant reviewer for Department of Science and Technology, China
2009	Ad Hoc grant reviewer for NIH challenge grant
2011	Ad Hoc grant reviewer for National Science Foundation, China
2011	Ad Hoc Grant Reviewer for National Institute of General Medicine (MGA)
2012	Ad Hoc grant reviewer for National Science Foundation, China
2012	Grant reviewer for the State of South Carolina
2013	Ad Hoc grant reviewer for National Institute of Environmental Science

Internal grant reviewer:

2006, 2010, 2011	Eagle grants
2008	Cancer Center early Career Award
2009	Mayo-Kendal Fellow
2011	Breast SPORE pilot projects

Journal Reviewer

PNAS, Science, Genetics, DNA Repair, PLOS Biology, Molecular and Cellular Biology, Nature Medicine, Cancer Cell, Eukaryotic Cells, Oncogene, BBA, Cell Research, EMBO J, EMBO reports, Biochemistry, Molecular Cell, Journal of Cell Biology, MCB, JCB, BBA, Gene and TIBS

FUNDING

ACTIVE FUNDING

1. 2R01 GM72719 Zhang, Z. (PI) 09/20/2005-08/31/2015
Funding agency: NIH/NIGMS
Title: Function of CAF-1 in Epigenetic Inheritance
Goal: The goal of this grant is to determine mechanisms by which CAF-1 functions with its modulators and effectors in epigenetic silencing using yeast as a model system.

2. R01 GM 81838-1 Zhang, Z. (PI) 04/2008 – 03/2016
Funding agency: NIH/NIGMS
Title: Histone Acetylation Couples DNA Replication to Nucleosome Assembly
Goals: The goal of this grant is to define molecular mechanisms by which H3-K56 acetylation function in nucleosome assembly and thereby maintains genome stability.

3. 01/07/2009-6/30/2014: Scholar Award from the Leukemia and Lymphoma Society.

4. R01 CA157489-A1 Zhang, Z. (PI) 01/2012-01/2017

Title: The Role of a Histone H4 Phosphorylation in drug resistance.
The goal of this grant is to study how Pak2 mediated epigenetic changes in gene expression contributes to the development of resistance to temozolomide, a chemotherapeutic drug for glioblastoma.

5. R01 GM099722-01: Zhang, Z. (PI) 4/2012-01/2016

Title: Identification and characterization genes involved in X-chromosome inactivation.
The goal of this proposal is to identify genes involved in X-chromosome inactivation using shRNA genome wide screen and characterize candidate genes to determine how they are involved in X-chromosome inactivation in mice.

COMPLETED FUNDING

1. Eagles Fund 07/2005 – 06/2006

Functional Studies of Modifications on Histones H3 and H4 Associated with CAF-1 in Yeast Cells
The goal of this project is to determine the function of the modifications on H3 and H4 associated with CAF-1 in silencing.

2. John W. Anderson Foundation 01/2006 – 12/2007
The role of CAF-1-associated Histone H3 Modification in DNA Damage Response

3. Brain Cancer Spore 2006 – 2007
CA 108961-02RDP4
Developmental Research Project Award
Histone Modifications as Prognostic Markers for Gliomas
The goal of this grant is to study alterations on histone modifications in gliomas.

4. University of Minnesota-Mayo Clinic partnership grant 2008-2010
Title: Identification and optimization of small molecules against Rtt109 for anti-fungal infection.
The goal of this proposal is to perform high-throughput screen for inhibitors against Rtt109 and to optimize these compounds for antifungal infection. A patent was filed based on this grant.

5. Breast Cancer SPORE 2009-2010.
Developmental Research Project Award.
Identification and characterization genes involved in silencing of BRCA1.
The goal of this project is to determine how BRCA 1 is silenced in breast cancer cells.

PATENT APPLICATION
Title: Inhibitors against Rtt109 as anti-fungal agents.
US Serial Number: 61/499,940
Inventors at Mayo Clinic: Zhang Z, Han J, Zhou H, Limper A, Kottom T

PUBLICATIONS (*co-corresponding author) Impact factor (IF) is base on 2010.

1. Realini C, Jensen CC, **Zhang Z**, Johnston SC, Knowlton JR, Hill CP, Rechsteiner M. Characterization of recombinant REGalpha, REGbeta, and REGgamma proteasome activators. **J Biol Chem** 1997, 272:25483-92. (**IF=5.3**)

2. Knowlton JR, Johnston SC, Whitby FG, Realini C, **Zhang Z**, Rechsteiner M, Hill CP. Structure of the proteasome activator REGalpha (PA28alpha). **Nature** 1997, 390:639-43. (**IF=36.1**)

3. **Zhang Z**, Clawson A, Realini C, Jensen CC, Knowlton JR, Hill CP, Rechsteiner M. Identification of an activation region in the proteasome activator REGalpha. **PNAS** 1997, 95:2807-11. (**IF=9.8**)

4. **Zhang Z**, Realini C, Clawson A, Endicott S, Rechsteiner M. Proteasome activation by REG molecules lacking homolog-specific inserts. **J Biol Chem** 1998, 273:9501-9. (**IF=5.3**)

5. **Zhang Z**, Clawson A, Rechsteiner M. The proteasome activator 11 S regulator or PA28. Contribution By both alpha and beta subunits to proteasome activation**. J Biol Chem** 1998, 273:30660-8. (**IF=5.3**)

6. **Zhang Z**, Krutchinsky A, Endicott S, Realini C, Rechsteiner M, Standing KG. Proteasome activator 11S REG or PA28: recombinant REG alpha/REG beta hetero-oligomers are heptamers. **Biochemistry** 1999, 38:5651-8. (**IF=3.2**)

7. **Zhang Z**, Shibahara K, Stillman B. PCNA connects DNA replication to epigenetic inheritance in yeast. **Nature** 2000, 408:221-5. (**IF=36**)

8. **Zhang Z**, Hayashi MK, Merkel O, Stillman B, Xu RM. Structure and function of the BAH-containing domain of Orc1p in epigenetic silencing. **EMBO J** 2002, 21:4600-11. (**IF=10**)

9. Huang SB, Zhou H, Katzmann D, Hochstrasser M, Atanasova E, **Zhang Z**. Rtt106p is a histone chaperone involved in heterochromatin-mediated silencing. **PNAS** 2005, 102:13410-5. (**IF=9.8**)

10. Zhou H, Madden BJ, Muddiman DC, **Zhang Z**. Chromatin assembly factor 1 interacts with histone H3 methylated at lysine 79 in the processes of epigenetic silencing and DNA repair. **Biochemistry** 2006, 45:2852-61. (**IF=3.2**)

11. Collins SR, Miller KM, Maas NL, Roguev A, Chu CS, Schuldiner M, Gebbia M, Cheng B, Han J, Recht J, Fillingham J, Ingvarsdottir K, Shales M, Erkmann JA, Ding H, Xu H, Andrews B, Ingles C, Boone C, Emili A, Kaufman PD, Allis CD, Berger SL, Brown GW, Hieter P, **Zhang Z**, Toczyski DP, Weissman JS, Greenblatt JF, Krogan NF. Genetic interactions reveal the functional relationships within, between protein complexes involved in chromosome biology. **Nature** 2007, 446:806-810. (**IF=36**)

12. Han JH, Zhou H, Horazdovsky B, Zhang KL, Xu RM, **Zhang Z**. Rtt109 acetylates histone H3 lysine 56 and functions in DNA replication. **Science** 2007, 315:653-5. (**IF=31**). **This paper has been highlighted in Nature Review Molecular Biology.**

13. Huang S, Zhou H, Tarara J, **Zhang Z**. A novel role for histone chaperones CAF-1 and Rtt106p in heterochromatin silencing. **EMBO J** 2007, 26:2274-83. (**IF=10**)

14. Han J, Zhou H, Li Z, Xu RM, **Zhang Z**. The Rtt109-Vps75 histone acetyltransferase complex acetylates non-nucleosomal histone H3. **J Biol Chem** 2007, 282:14158-64. (**IF=5.3)**

15. Han J, Zhou H, Li Z, Xu RM, **Zhang Z**. Acetylation of lysine 56 of histone H3 catalyzed by Rtt109 and regulated by Asf1 is required for replisome integrity. **J Biol Chem** 2007, 282:28587-96. (**IF=5.3**)

16. Li[1*] Q, Zhou[1*] H, Wurtele[2] H, Davies[1] B, Horazdovsky[1] B, Verreault[2] A*, **Zhang[1] Z***, Acetylation of histone H3 lysine 56 regulates CAF-1 dependent nucleosome assembly. **Cell** 2008 134:244-55 (Co-corresponding authors). (**IF=32.4**). **This paper was previewed and highlighted in Cell.**

17. Burgess R, Jenkins R, **Zhang Z.** Epigenetic Changes in Gliomas. **Cancer Biol. Ther**. 2008, 7: 2642. (**IF=2.9**)

18. Wurtele, H., Li, Q., Zhou, Z., **Zhang, Z**., Verreault, A., Histone acetylation and chromatin assembly, **Med Sci (Paris)** 2009, 121-122. (Not known)

19. Yuan, J. Pu, M., **Zhang. Z.**, Lou, Z. Histone H3-56 acetylation is important for genome stability in mammals. **Cell Cycle** 2009, 8:1747-1753. (**IF=5**)

20. Burgess, R., Guy, M., **Zhang, Z**., Fuelling transcriptional silencing with Gas1. **PNAS** 2009, 106: 10879-80. (**IF=9.8**)

21. Falbo, K. B., Alabert, C., Katou, Y., Wu, S., Han, J., Wehr, T., Xiao, J., He, X., **Zhang, Z.,** Shi, Y., Shirahige, K., Pasero, P., Sheng, X., Involvement of a chromatin remodeling complex in DNA damage tolerance in DNA replication. **Nature Structural and Molecular Biology** 2009, 16:1167-72. (**IF=13.9**)

22. Li, Q., Fazly A. Zhou, H., Huang, S., **Zhang, Z.,*** Stillman, B.* Elp3 modulates transcriptional silencing and DNA damage response via distinct mechanisms. (co-corresponding authors). **PLOS Genetics** 2009, 5: e1000684. (**IF=9.5**)

23. Burgess R, Zhou H, Han J, **Zhang Z**. (2010) A role for Gcn5 in replication-coupled nucleosome assembly. **Molecular Cell** 2010, 37:469-480. (**IF=14.2**). **This paper was highlighted in Molecular Cell.**

24. Han J, Li Q, McCullough L, Kettelkamp C, Formosa T, **Zhang Z.** (2010) Ubiquitylation of FACT by the cullin-E3 ligase Rtt101 connects FACT to DNA replication. **Genes Dev** 2010, 24:1485-90. (IF=12.9**). This paper was highlighted in Faculty 1000.**

25. Kottom TJ, Han J, **Zhang Z**, Limper AH. Pneumocystis carini expresses an active Rtt109 histone acetyltransferase. **Am. J. Respir. Cell Mol. Biol.** 2011, 44: 768-76. (**IF=4.3**)

26. Burgess RJ, **Zhang Z**. Roles for Gcn5 in promoting nucleosome assembly and maintaining genome integrity. **Cell Cycle** 2010, 9: 2979-2985. (**IF=5**)

27. Burgess R and **Zhang Z** Histone, histone chaperones and nucleosome assembly. **Protein and Cell** 2010, 1:607-612. (New journal, unknown)

28. Su D, Hu Q, Zhou H, Thompson JR, Xu RM, **Zhang Z***, **Mer G***. Structure and histone binding properties of the Vps75-rtt109 chaperone-lysine acetyltransferase complex. **J. Biol. Chem.** 2011, 286:15625-15629. (co-corresponding authors) (**IF=5.3**)

29. Kang B, Pu M, Hu, G. Wen W, Dong Z, Zhao, K, Stillman B, **Zhang Z** Phosphorylation of H4 Ser 47 promotes HIRA-mediated nucleosome assembly. **Genes Dev** 2011, 25: 1359-64. (**IF=12.9**).

30. Li, Q, Burgess, R. and **Zhang, Z.** All roads lead to chromatin: multiple pathways for histone deposition. **BBA** 2011, In press. (**IF=4.7**)

31. Lau AT, Lee SY, Xu YM, Zheng D, Cho YY, Zhu F, Kim HG, Li SQ, **Zhang Z**, Bode AM, and Dong Z. Phosphorylation of histone H2B serine 32 is linked to cell transformation. **J Biol Chem**. 2011, 286:26628-37. (**IF=5.3**)

32. Chan, K, Zhang, H, Malureanu, L, van Deursen J, and **Zhang Z**. Diverse factors are involved in maintenance of X-chromosome inactivation **PNAS** 2011, 108: 16699-16704. (**IF=9.8**)

33. Li Q and **Zhang Z** Linking DNA replication to heterochromatin silencing and inheritance. Invited review. **ABBS** 2012. In press. **(IF=1.5**)

34. Zhang H, Han J, Kang B, Burgess R and **Zhang Z** Human histone acetyltransferase HAT1 preferentially acetylates H4 molecules in H3.1-H4 dimer over H3.3-H4 dimer (2012) **J Biol Chem**, 287:6573-6581. (**IF=5.3**)

35. Su, D, Hu, Q, Li, Q, Thompson J, Cui G, Fazly A, Davies B, Botuyan M, **Zhang Z*,** and Mer G*. Structural basis for recognition of H3K56-acetylated histone H3-H4 by the chaperone Rtt106 (2012) **Nature,** 483: 104-107. (co-corresponding authors). (**IF=36**)

36. Fazly, A, Li, Q, Hu Q, Mer G, Horazdovsky, B, and **Zhang Z**. Histone chaperone Rtt106 promotes nucleosome formation using $(H3\text{-}H4)_2$ tetramers (2012) **J Biol Chem**, 287:10753-60.

37. Chan K and **Zhang Z**, Leucine-rich repeat and WD repeat-containing protein 1 is recruited to pericentric heterochromatin by trimethylated lysine 9 of histone H3 and maintains heterochromatin silencing (2012) **J Biol Chem** 287:15024-3 (**IF=5.3**)

38. Burgess R, Zhou H, Han J, Li Q and **Zhang Z.** A role for the F-box containing protein, Dia2, in transcriptional silencing **Plos Genetics** (2012) 8:e1002846 (**IF=9.5**)

39. Winkler D, Zhou H, Dar M, **Zhang Z*** and Luger K* Yeast CAF-1 assembles H3-H4 tetramers prior to deposition (2012) Nuclei Acid Res 40:10139-49 (co-corresponding authors) **(IF=7.8)**

40. Burgess R and **Zhang Z** Histone chaperones in nucleosome assembly and human diseases (2013) **Nat Struct Mol Biol** 20:14-22 (review). (**IF=12.7**)

41. Liu CP, Xiong C, Wang M, Yu Z, Yang N, Chen P, **Zhang Z**, Li G, Xu RM (2012) Structure of the variant histone H3.3-H4 heterodimer in complex with its chaperone DAXX **(**2012) **Nat Struct Mol Biol** 19:1287-92 (**IF=12.7**)

INVITED SEMINARS AND TALKS AT CONFERENCES

06/2005 Ninth Annual Buffalo DNA Replication and Repair Symposium, Buffalo, New York

01/2006 Keystone Symposium on Epigenetics and Chromatin Remodeling in Development, Keystone, Colorado

07/2006 Midwest Chromatin, Transcription and Nuclear Dynamics, Iowa City, Iowa

12/2006 28th Annual International Asilomar Chromatin and Chromosome Conference, Pacific Grove, California

01/2007	Cancer Center, University of Minnesota, Minneapolis, Minnesota
03/2007	Department of Biochemistry, Hong Kong University, Hong Kong, China
03/2007	Department of Biochemistry, Hong Kong University of Science and Technology, Hong Kong, China
03/2007	Institute of Biophysics, Chinese Academy of Science, Beijing, China
04/2007	Hormel Institute of Biological Sciences, University of Minnesota, Austin, Minnesota
06/2007	Penn State Summer Symposium on Chromatin and Epigenetic Regulation of Transcription, University Park, Pennsylvania
07/2007	FASEB Summer Research Conferences on Chromatin and Transcription, Snowmass Village, Colorado
09/2007	DNA Replication and Genome Stability, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York
12/2007	Department of Biochemistry, University of Rochester, Rochester, New York
06/2008	Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences, Shanghai, People's Republic of China
07/2008	DNA Replication and Genome Integrity 2008, Salk Institute, La Jolla, CA
08/2008	Keynote Speaker, Graduate Student Symposium, University of Utah, Salt Lake City, Utah
09/2008	Eukaryotic Interest Group in the Society of General Microbiology, Trinity College, Dublin, Ireland
03/2009	Chromatin: Histones, Nucleosomes, Chromosomes and Genomes conference at Singapore
03/2009	Institute of Biophysics, Chinese Academy of Science, Beijing, China
03/2009	National Institute of Biological Sciences, Beijing, China
06/2009	Chromatin, Replication and Chromosomal Stability Conference at Copenhagen, Denmark
09/2009	DNA Replication and Genome Stability, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York
04/2010	Epigenetic and Chromatin meeting at Cold Spring Harbor Asia meeting, Suzhou, China
09/2010	Dept. of Biochemistry, Biophysics & Molecular Biology, Iowa State University

12/2010	Department of Biochemistry and Molecular Biology, Georges Washington University Medical School
8/2011	National Institute of Biological Sciences, Beijing, China
8/2011	Tsinghua University, Beijing, China
8/2011	Department of Cancer Biology, Cleveland Clinic.
9/2011	DNA Replication and Genome Stability, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York
2/2012	Department of Biochemistry and Molecular Biology, Southern Illinois University
03/2012	Department of Biochemistry, University of Alabama
04/2012	Epigenetic and Chromatin meeting at Cold Spring Harbor Asia meeting, Suzhou, China
10/2012	Department of Biochemistry, University of Columbia
2/2013	Department of Pharmacology and Cancer Biology, Duke University