

Ling Qi

Web Bio

Information

Biography

Biographical Statement

Ling Qi is an Associate Professor of the Division of Nutritional Sciences at Cornell University. He graduated magna cum laude from Fudan University with a BS degree in Microbiology in 1997. He received a PhD degree in Immunology in Dr. Suzanne Ostrand-Rosenberg's laboratory at UMBC in 2001 and performed his postdoctoral studies with Dr. Carol Greider at Johns Hopkins University (2001-2004) and with Dr. Marc Montminy at Salk Institute (2004-2007). He became a Leukemia and Lymphoma Society Postdoctoral Fellow in 2002 and Juvenile Diabetes Research Foundation Postdoctoral Fellow in 2005. In 2008, he was a recipient of the Junior Faculty Award from the American Diabetes Association and Young Investigator Award from the American Federation for Aging Research. In 2011, he received the Bio-Serv Award from the American Society for Nutrition. In 2012, he was awarded the Career Development Award by the American Diabetes Association. The [Qi laboratory](#) investigates the role of endoplasmic reticulum (ER) stress and inflammation in obesity, type-1 and type-2 diabetes and inflammatory bowel diseases. Funding support for the laboratory has been provided by American Diabetes Association (ADA), American Heart Association (AHA), American Federation for Aging Research (AFAR), Howard Hughes Medical Institute (HHMI), Juvenile Diabetes Research Foundation (JDRF), National Institute for Alcohol Abuse and Alcoholism (NIAAA) and National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Work from the laboratory has been published in Cell Metabolism, Developmental Cell, PNAS, Diabetes, Cell Reports, J Bio Chem, Biochem J and etc. Finally, Dr. Qi teaches one 4-credit very popular undergraduate course "Nutrient Metabolism" - NS3310 with over 120 students every spring.

Department Website Summary

Ling Qi is an Associate Professor of the Division of Nutritional Sciences at Cornell University. His laboratory investigates the role of endoplasmic reticulum (ER) homeostasis and inflammation in human health and disease. He teaches an upper class Nutrition course NS3310.

Teaching

Teaching and Advising Statement

I am indebted to the teachers who inspired me throughout my career. When I teach

and train undergraduate students, my goal is to emulate my past teachers. Although undoubtedly teaching takes away my time from research, I have enjoyed teaching and interaction with undergraduate students as well as graduate students. At Cornell, I have taught up-level human nutrition class NS3310 entitled “Nutrient Metabolism” and lectured in various graduate courses. I feel that not only my teaching has influenced and inspired a younger generation, but also my research have benefited from teaching, in part, because it drives me to be at the cutting-edge of many different but related topics in nutrition and metabolism.

Since taking over this required upper class level course in 2011, I have spent many many hours into planning, preparing, lecturing, evaluating, meeting with students in various outside-of-class settings and etc. I have been very excited to teach this course, to care for each student about their learning outcomes, and to inspire students to be interested in the subject of nutrition , nutrient metabolism and diseases. I conduct three surveys during the semester to gauge the learning outcome and progress. Students’ feedback has been very positive and are improving each year. It was wonderful to read students’ feedbacks, just quoting a few here: “This course is awesome! I enjoyed a lot!”, “Dr. Qi should be recommended for every teaching award..., because this class has changed my life for the better.”, “This course is fantastic!” and “A perfect ending for my time at Cornell!”. They made everything worthwhile.

In May 2014, I received the SUNY Chancellor’s Award for Excellence in Teaching.

In terms of advising, I meet with my advisees twice every semester and stay connected with them throughout their undergraduate period. I provide help and advice whenever they need. I write reference letters to help advance their careers. Importantly, I advise and provide help to many students who are not my assigned advisees. I view advising as a responsibility and duty, not as a job.

Professional

Current Professional Activities

- 2007- Member, American Diabetes Association
- 2009- Member, American Society of Nutrition
- 2011- Member, American Society for Microbiology
- 2011- Member, American Society for Biochemistry and Molecular Biology

- 2008- Reviewer for journals: Cur Mol Med, Diabetes, PNAS, PLoS ONE, J Mol Med, J Clin Invest, Cell Metabolism, J Hepatology, British Journal of Nutrition, Science,

- 2010- Ad hoc reviewer for grant agencies: Alzheimer’s Association, Italian Ministry of Health (2010, 2011), NIH IPOD study section (09/10, 06/11, 02/13), NIH Special Emphasis Panel ZRG1 EMNR-R (4/2014), NIH MCE study section (6/14, 10/14), and NIH CADO study section (2/14, 2/15)

- 2012-2015 Member, Advisory committee for graduate field of Biochemistry, Molecular and Cell Biology, Cornell University

Research

Current Research Activities

Our laboratory explores the physiological role of (a) stress and (b) inflammatory responses in the context of metabolic disorders including obesity and diabetes. Our goal is to uncover new findings, to break new grounds, to delineate the etiology and pathogenesis of human diseases, and eventually to help develop therapeutic strategies. In the past 5 years, using genetic, biochemical, immunological and molecular biology approaches, we have published over 35 manuscripts, and made several important discoveries and produced new insights into the pathogenesis of these diseases. Below briefly details the research accomplishments from my own laboratory in two distinct areas of research:

ER homeostasis: The ER is a diverse organelle with multiple specialized functions including the folding and maturation of secretory and membrane proteins. Disruption of ER homeostasis has been implicated in the pathogenesis of many human diseases including diabetes, neurodegeneration and aging. One of the fundamental questions in the ER field is what is the function of UPR and ERAD under physiological and pathological settings. In the first paper from the lab, we showed that XBP1s-mediated signaling pathways is critical for adipocyte differentiation. We recently developed a method to quantitate levels of ER stress in tissues under physiological and pathophysiological conditions. We now can quantitate the amount of ER stress based on the ratio of phosphorylated to total IRE1a protein levels. This study is significant as it has solved a huge challenge in the field. We are addressing many outstanding questions in vivo using this tools. Moreover, using proteomic screening, we recently identified a novel cytosolic regulator of UPR sensor activation, nonmuscle myosin IIB, suggesting for the first time that coordination between the ER and cytosol is required for ER stress response. Finally, we are in the process of delineating the physiological role of ER-associated degradation in cell- and tissue-type specific manner.

Representative publications: Sha et al. Cell Metabolism 2009 and 2010; Chen et al. Biochem J. 2010; Yang et al. PLoS ONE 2010; Xue, et al. J Biol Chem. 2011; He et al. Dev. Cell. 2012; Yang et al. J Biol Chem 2013; Sha et al. Diabetes 2013; Sun et al. PNAS. 2014; Sha et al. Cell Metabolism 2014.

Inflammation: One of the fundamental questions in the immunometabolism field is how inflammation is initiated and how inflammation affects metabolism and metabolic syndrome. We reported the role of immature myeloid cells and extracellular ATP in this process. We recently identified unique immune cell populations in adipose tissue that link HFD feeding to inflammation. We established a novel paradigm “HFD NKT inflammation metabolic regulation” (shown in the box). We showed that upon acute and long-term HFD, natural killer T (NKT) cells are activated and promote macrophage polarization in adipose tissue and improve glucose homeostasis via the IL-4/STAT6 signaling axis. Importantly, our data reveal unexpectedly pronounced immunological events in adipose tissue within days following acute HFD feeding. Lastly, in recent efforts, we are delineating the role of TLR signaling in vivo and reported a

surprising finding that chronic Western diet intake causes lethal pulmonary damage in TLR2/4-deficient mice. This effect is likely mediated through the change in gut microbiota. **Representative publications:** Xia et al. J Biol Chem 2011; Sun et al. Diabetes 2012; Ji et al. J Biol Chem 2012a and 2012b; Ji and Sun et al. Cell Reports 2014.

In summary, in the last 7 years at Cornell, we have demonstrated our productivity and innovation with over 35 publications. It is worth to mention that we started everything from scratch. What is especially exciting for me is the unique niche and tools that have been developed, the research directions we are now taking, and the dedication and motivation of the students/fellows in the laboratory.

Extension

Education

Education

B.S., Fudan University, Shanghai, China (1993-1997)

Ph.D., University of Maryland (1997-2001)

Postdoctoral training, Johns Hopkins University (2001-2004) and Salk Institute (2004-2007)

Courses

Courses Taught

NS3310 (100%): Nutrient Metabolism

Guest lecture in NS6320 Regulation of Macronutrient Metabolism

Guest lecture in VETMI7050: Advanced Immunology

Websites

Related Websites

<http://www.human.cornell.edu/dns/qilab/index.cfm>

Administration

Administrative Responsibilities

2014-2016
University

Advisory council, College of Human Ecology, Cornell

Publications

Selected Publications

TRAINING PERIOD (1999-2007)

1. Ostrand-Rosenberg, S., Pulaski, B., Clements, V., **Qi, L.**, Pipeling, M., Hanyok, L. 1999. Cell-based vaccines for the stimulation of immunity to metastatic cancers. *Immunological Reviews* 170: 101-14
2. **Qi, L.** and Ostrand-Rosenberg, S. 2000. MHC Class II presentation of endogenous tumor antigen by cellular vaccines depends on the endocytic pathway but not H2-M. *Traffic* 1: 152-160.
3. **Qi, L.**, Rojas, J., Ostrand-Rosenberg, S. 2000. Tumor cells present MHC class II-restricted nuclear and mitochondrial antigens and are the predominant antigen presenting cells in vivo. *J. Immunol.* 165: 5451-5461 PMID:11067897
4. **Qi, L.** and Ostrand-Rosenberg, S. 2001. H2-O inhibits presentation of bacterial superantigens, but not endogenous self-antigens. *J. Immunol.* 167: 1371-8
5. Ostrand-Rosenberg, S., Clements, V., Dissanayake, S., Pulaski, B., and **Qi, L.** 2002. Immunological targets for the gene therapy of cancer. In *Gene therapy of cancer, II*. E. Latteime, and S. Gerson, eds. Academic Press, San Diego. Part II, 128-138.
6. **Qi, L.**, Strong, M.A., Karim, B.O., Armano, M., Huso, D.L., and Greider, C.W. 2003. Short telomeres and ataxia-telangiectasia mutated (ATM) deficiency cooperatively increase telomere dysfunction and suppress tumorigenesis. *Cancer Res.* 63: 8188-96. PMID:14678974
7. Dolan, B.P., Phelan, T.P., Ilkovitch, D., **Qi, L.**, Wade, W.F., Laufer, T.M., and Ostrand-Rosenberg, S. 2004. Invariant chain and the MHC class II cytoplasmic domains regulate localization of MHC class II molecules to lipid rafts in tumor cell-based vaccines. *J. Immunol.* 172: 907-14.
8. **Qi, L.**, Strong, M.A., Karim, B.O., Huso, D.L., and Greider, C.W. 2005. Telomere fusion to chromosome breaks reduces oncogenic translocations and tumor formation. *Nature Cell Biology.* 7: 706-11. PMID:15965466
9. Koo, S.H.¹, Flechner, L.¹, **Qi, L.** Zhang, X., Screatton, R.A., Jeffries, S., Hedrick, S., Xu, W., Boussouar, F., Brindle, P., Takemori, H., and Montminy, M. 2005. The CREB coactivator TORC2 is a key regulator of fasting glucose metabolism. *Nature.* 437: 1109-11 (¹, contribute equally) PMID: 16148943
[Highlighted in Faculty 1000](#)
10. **Qi, L.***, Heredia, J.*, Altarejos, J.Y., Screatton, R., Goebel, N., Niessen, S., MacLeod, I.X., Liew, C.W., Kulkarni, R., Bain, J., Nelson, M., Evans, R.M., Yates, J., and Montminy, M. 2006. TRB3 links the E3 ubiquitin ligase COP1 to lipid metabolism. *Science.* 312: 1763-6 PMID:16794074 [Highlighted in Faculty 1000](#) (*, equal contribution)
11. **Qi, L.***, Saberi, M. *, Zmuda, E., Wang, Y., Altarejos, J., Zhang, X., Dentin, R., Hedrick, S., Bandyopadhyay, G., Hai, T., Olefsky, J. and Montminy, M. (2009). Adipocyte CREB promotes insulin resistance in obesity. *Cell Metabolism* 9,

INDEPENDENT PERIOD (2007-2014)

2009

12. Sha, H.B.,* He, Y.*, Chen H., Wang, C., Zenno, A., Shi, H., Yang, X., Zhang, X., and **Qi, L.** 2009. The IRE1-XBP1 pathway of the unfolded protein response is required for adipogenesis. *Cell Metabolism*. 9, 556-564. PMID: PMC2963107 [Highlighted in Faculty 1000](#) (*, equal contribution)

2010

13. Chen, H., and **Qi, L.** 2010. SUMO modification regulates transcriptional activity of XBP1. *Biochem. J.* 429, 95-102. PMID: PMC2964647

14. Yang, L., Xue, Z., He, Y., Sun, S., Chen, H., and **Qi, L.** 2010. A Phos-tag-based approach reveals the extent of physiological endoplasmic reticulum stress. *PLoS ONE*. 5: e11621. PMID: PMC2905412

15. Francisco, A.B., Singh, R., Li, S., Vani, A.K., Yang, L., Munroe, R.J., Diaferia, G., Cardano, M., Biunno, I., **Qi, L.**, Schimenti, J.C., and Long, Q. 2010. Deficiency of SEL1L in mice leads to systemic ER stress and embryonic lethality. *J. Biol. Chem.* 285: 13694-13703. PMID: PMC2859532

16. Zeng, L., Liu, Y. P., Sha, H., Chen, H., **Qi, L.**, and Smith, J.A. 2010. XBP1 couples ER stress to augmented IFN- induction via a cis-acting enhancer in macrophages. *J. Immunol.* 185: 2324-30. PMID: PMC2916979

17. Zmuda, E. J., **Qi, L.**, Zhu, M., Mirmira, R., Montminy, M. and Hai, T. 2010. The role of ATF3, an adaptive-responsive gene, in high fat diet induced diabetes and pancreatic beta cell dysfunction. *Mol. Endo.* 24: 1423-33. PMID: PMC2903910

18. Liew, C.W., Bochenski, J., Kawamori, D., Hu, J., Leech, C.A., Wanic, K., Malecki, M., Warram, J., **Qi, L.**, Krolewski, A.S., and Kulkarni, R.N. 2010. The tribbles protein interacts with ATF4 to regulate insulin exocytosis in human and mouse beta-cells. *J. Clin. Invest.* 120: 2876-88. PMID: PMC2912176

19. Lichtenstein, L., Mattijssen, F., de Wit, N. J., Georgiadi, A., Hooiveld, G. J., van der Meer, R., He, Y., **Qi, L.** Koster, A., Tamsma, J.T., Tan, N. S., Muller, M., and Kersten, S. 2010. Angptl4 protects against severe pro-inflammatory effects of dietary saturated fat by inhibiting lipoprotein lipase-dependent uptake of fatty acids in mesenteric lymph node macrophages. *Cell Metabolism*. 12: 580-92. PMID: PMC3387545

20. He, Y., Sun, S., Sha, H., Liu, Z., Yang, L., Xue, Z., Chen, H. and **Qi, L.** (2010) Emerging Roles of XBP1, a sUPeR transcription factor. *Gene Expression*. 15: 13-25. PMID: PMC3374844

21. **Qi, L.**, Yang, L. and Chen, H. 2011. Detecting and quantitating physiological ER stress in mammals. *Methods in Enzymology*. 490: 137- 46. PMID: PMC3374842

2011

22. Sha, H., He, Y., Yang, L. and **Qi, L.** 2011. Stressed Out About Obesity: IRE1-XBP1 Pathway in Metabolism. *Trends Endocrinol Metab.* 22: 374-381. PMID: PMC3163776
23. Francisco, A.B., Singh, R., Sha, H., Yan, X., **Qi, L.**, Lei, X. and Long, Q. 2011. Haploid insufficiency of suppressor enhancer Lin12 1 like (SEL1L) predisposes mice to high fat diet-induced hyperglycemia. *J. Biol. Chem.* 286: 22275-82. PMID: PMC3121373
24. Xia, S., Sha, H.B., Yang, L., Ji, Y., Ostrand-Rosenberg, S. and **Qi, L.** 2011. Gr-1⁺ CD11b⁺ myeloid-derived suppressor cells suppress inflammation and promote insulin sensitivity in obesity. *J. Biol. Chem.* 286: 23591-9. PMID: PMC3123122
25. Xue, Z., He, Y., Ye, K., Gu, Z., Mao, Y. and **Qi, L.** 2011. A Conserved Structural Determinant Located at the Interdomain Region of Mammalian IRE1. *J. Biol. Chem.* 286:30859-66. PMID: PMC3162446
26. Mao, T., Shao, M., Qiu, Y., Huang, J., Zhang, Y., Song, B., Wang, Q., Jiang, L., Liu, Y., Han, J., Cao, P., Li, J., Gao, X., Rui, L., **Qi, L.**, Li, W. and Liu, Y. 2011. PKA Phosphorylation Couples Hepatic IRE1 to Glucagon Signaling in Glucose Metabolism. *Proc. Natl. Acad. Sci. USA.* 108: 15852-7. PMID: PMC3179066

2012

27. Ji, Y., Sun, S., Xu, A., Bhargava, P., Lam, K., Gao B., Lee, C., Kersten, S., and **Qi, L.** 2012. Activation of Natural Killer T Cells Promotes M2 Macrophage Polarization in Adipose Tissue and Improves Systemic Glucose Tolerance via the Interleukin-4 (IL-4)/STAT6 Protein Signaling Axis in Obesity. *J. Biol. Chem.* 287: 13561-13571 PMID: PMC3340139
28. Sun, S., Ji, Y., Xia, S. and **Qi, L.** 2012. The ATP-P2X₇ Signaling Axis is Dispensable for Obesity-Associated Inflammasome Activation in Adipose Tissue. *Diabetes.* 61: 1471-8. PMID: PMC3357307
29. Sun, S., Ji, Y., Kerstern, S. and **Qi, L.** 2012. Mechanisms of Inflammatory Responses in Obese Adipose Tissue. *Annu. Rev. Nutr.* 32: 261-86 PMID: PMC4041712 [Highlighted in Faculty 1000](#)
30. Ji, Y., Sun, S., Xia, S., Yang, L., Li, X., and **Qi, L.** 2012. Short-Term High-fat-Diet Challenge Promotes Alternative Macrophage Polarization in Adipose Tissue via Natural Killer T Cells and Interleukine-4. *J. Biol. Chem.* 287: 24378-86. PMID: PMC3397864
31. Yang, Z., Wang, X., He, Y., **Qi, L.**, Yu, L., Xue, B., and Shi, H. 2012. The full capacity of AICAR to reduce obesity-induced inflammation and insulin resistance requires Myeloid Sirt1. *PLoS One.* 7 (11): e49935. PMID: PMC3503857
32. He, Y., Beatty, A.*, Han, X.*, Ji, Y., Ma, X., Adelstein, R., Yates, J. R., Kempthues, K., and **Qi, L.** 2012. Novel Role of Non-Muscle Myosin IIB in IRE1 Signaling Upon ER Stress. *Dev. Cell.* 23: 1141-1152 PMID: PMC3547290 [Highlighted in Faculty 1000](#) (*, equal contribution)

2013

33. Stanya, K.J., Jacobi, D., Liu, S., Bhargava, P., Gangl, M.R., Inouye, K, Barlow, J.L., Ji, Y., Mizgerd, J.P., **Qi, L.**, Shi, H., McKenzie, A.N.J., Lee, C.H. 2013. Direct control of hepatic glucose production by Interleukin-13 in mice. *J Clin Invest.* 123: 261-71 PMID: PMC3533296
34. Duplan, E., Giaime, E., Viotti, J., Sevalle, J., Corti, O., Brice, A., Ariga, H., **Qi, L.**, Checler, F., and da Costa, C.A. 2013. ER-stress-associated functional link between parkin and DJ-1 via a transcriptional cascade involving the tumor suppressor p53 and the spliced X-box binding protein XBP-1. *J Cell Sci.* 126: 2124-33 PMID: 23447676
35. Yang, L., Sha, H., Davisson, R., and **Qi, L.** 2013. Phenformin activates unfolded protein response in an AMPK-activated protein kinase (AMPK)-dependent manner. *J Biol Chem.* 288: 13631-8 PMID: PMC3650398
36. Iwata, T.N., Cowley, T.J., Sloma, M., Ji, Y., Kim, H., **Qi, L.**, and Lee, S.S. 2013. The Transcriptional Co-Regulator HCF-1 Is Required for INS-1 beta-cell Glucose-Stimulated Insulin Secretion. *PLoS ONE* 8:e78841. PMID: 24250814

2014

37. Sha, H., Yang, L., Liu, M., Liu, F., Kersten, S. and **Qi, L.** 2014. Adipocyte XBP1s promotes adiponectin multimerization and systemic glucose homeostasis. *Diabetes.* 63: 867-79 PMID: 24241534 PMID: PMC3931404

Commented in [Nature Reviews Endocrinology \(2014\) 10: 66](#)

38. Sun, S.*, Shi, G.*, Han, X., Francisco, A.B., Ji, Y., Mendoca, N., Liu, X., Locasale, J., Duhamel, G., Kersten, S., Yates, J., Long, Q. and **Qi, L.** 2014. Sel1L is Indispensable for Mammalian ERAD, ER Homeostasis and Survival. *Proc. Natl. Acad. Sci. USA.* 111: E582-591 PMID: 24453213 PMID: PMC3918815 [Highlighted in Faculty 1000](#) (*, equal contribution)
39. **Qi, L.** 2014. Tipping the balance in metabolic regulation: regulating regulatory T cells by co-stimulation. *Diabetes.* 63: 1179-81 PMID: 24651799 PMID: PMC3964503
40. Xia, S, Li, X., Cheng, L., Han, M., Zhang, M., Liu, X., Xu, H., Zhang, M., Shao, Q., and **Qi, L.** 2014. Chronic Intake of High Fish Oil Diet Induces Myeloid-Derived Suppressor Cells to Promote Tumor Growth. *Cancer Immunol Immunother.* 63: 663-73 PMID: 24691944
41. An, D., Lessard, S.J., Toyoda, T., Lee, M.Y., Koh, H.J., **Qi, L.**, Hirshman, M.F. and Goodyear, L.J. 2014. Overexpression of TRB3 in muscle alters muscle fiber type and improves exercise capacity in mice. *American Journal of Physiology Regulatory, Integrative and Comparative Physiology.* 306: R925-33. PMID: 24740654 PMID: PMC4159733
42. Mattijssen, F., Georgiadi, A., Andasarie, T., Szalowska, E., Zota, A., Kronen-Herzig, A., Heier, C., Ratman, D., De Bosscher, K., **Qi, L.**, Zechner, R., Herzig, S., and Kersten, S. 2014. Hypoxia inducible lipid droplet associated

(HILPDA) is a novel peroxisome proliferator-activated receptor (PPAR) target involved in hepatic triglyceride secretion. *J Biol Chem.* 289: 19279-293 PMID: 24876382

43. Ji, Y.*, Sun, S.*, Goodrich, J.K., Poole, A.C., Kim, H., Ley, R.E., Duhamel, G. and **Qi, L.** 2014. Diet-induced alterations in gut microflora contribute to lethal pulmonary damage in TLR2/TLR4 deficient mice. *Cell Reports.* 8: 137-49 PMID: PMC4103790 (*, *equal contribution*)

44. Sha, H., Francisco, A., Sun, S., Ehrhardt, N., Xue, Z., Guber, R., Panhwar, M.S., Liu, L., Brenna, T.J., Hang, S., Xue, B., Kersten, S., Bendadoun, A., Peterfy, M., Long, Q. and **Qi, L.** 2014. The ER-associated degradation adaptor protein Sel1L regulates LPL secretion and lipid metabolism. *Cell Metabolism.* 20: 458-470 PMID: PMC4156539