

## Curriculum Vitae

**Ryuya Fukunaga, Ph.D.**

2015-06-12

### PROFESSIONAL APPOINTMENT

Assistant Professor  
Department of Biological Chemistry  
Johns Hopkins University School of Medicine

### PERSONAL DATA

725 N. Wolfe St., 521A Physiology Building  
Baltimore, MD 21205  
Tel: 410-955-3790  
Fax: 410-955-5759  
Email: fukunaga@jhmi.edu

### EDUCATION AND TRAINING

- |           |                                                                                                                        |
|-----------|------------------------------------------------------------------------------------------------------------------------|
| 1998-2002 | B.S., Department of Biophysics and Biochemistry<br>University of Tokyo, Japan                                          |
| 2002-2007 | Ph.D., Department of Biophysics and Biochemistry<br>University of Tokyo, Japan                                         |
| 2007-2009 | Postdoctoral Fellow, Department of Molecular and Cellular Biology<br>University of California, Berkeley                |
| 2009-2013 | Postdoctoral Fellow, Department of Biochemistry & Molecular Pharmacology<br>University of Massachusetts Medical School |

### PROFESSIONAL EXPERIENCE

- |              |                                                                                                         |
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| 2013-present | Assistant Professor, Department of Biological Chemistry, Johns Hopkins<br>University School of Medicine |
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### RESEARCH ACTIVITIES

#### Peer reviewed research publications

1. **Fukunaga R**, Fukai S, Ishitani R, Nureki O, Yokoyama S, "Crystal Structures of the CP1 Domain from *Thermus thermophilus* Isoleucyl-tRNA synthetase and Its Complex with L-Valine" *J. Biol. Chem.* 279, 8396-8402, (2004)
2. **Fukunaga R**, Yokoyama S, "Crystallization and preliminary X-ray crystallographic study of the editing domain of *Thermus thermophilus* isoleucyl-tRNA synthetase complexed with pre- and post-transfer editing-substrate analogues" *Acta Crystallogr. D*, 60, 1900-1902, (2004)

3. **Fukunaga R**, Yokoyama S, "Crystallization and preliminary X-ray crystallographic study of leucyl-tRNA synthetase from the archaeon *Pyrococcus horikoshii*" *Acta Crystallogr. D*, 60, 1916-1918, (2004)
4. **Fukunaga R**, Yokoyama S, "Crystal Structure of Leucyl-tRNA Synthetase from the Archaeon *Pyrococcus horikoshii* Reveals a novel editing domain orientation" *J. Mol. Biol.* 346, 57-71, (2005).
5. **Fukunaga R**, Ishitani R, Nureki O, Yokoyama S, "Crystallization of Leucyl-tRNA synthetase complexed with tRNA<sup>Leu</sup> from the archaeon *Pyrococcus horikoshii*" *Acta Crystallogr. F*, 61, 30-32, (2005).
6. **Fukunaga R**, Yokoyama S, "Structural basis for non-cognate amino acid discrimination by the valyl-tRNA synthetase editing domain" *J. Biol. Chem.* 280, 29937-29945, (2005)
7. **Fukunaga R**, Yokoyama S, "Aminoacylation complex structures of leucyl-tRNA synthetase and tRNA<sup>Leu</sup> reveal two modes of discriminator base recognition for 3'-end relocation toward the editing domain" *Nat. Struct. Mol. Biol.* 12, 915-922, (2005)
8. Tukalo M, Yaremchuk A, **Fukunaga R**, Yokoyama S, Cusack S, "The crystal structure of leucyl-tRNA synthetase complexed with tRNA<sup>Leu</sup> in the post-transfer-editing conformation" *Nat. Struct. Mol. Biol.* 12, 923-930, (2005)
9. Kuratani M, Ishii R, Bessho Y, **Fukunaga R**, Sengoku T, Sekine S, Shirouzu M, Yokoyama S, "Crystal structure of tRNA adenosine deaminase TadA from *Aquifex aeolicus*" *J. Biol. Chem.*, 280, 16002-16008, (2005)
10. **Fukunaga R**, Yokoyama S, "Structural basis for substrate recognition by the editing domain of isoleucyl-tRNA synthetase" *J. Mol. Biol.* 359, 901-12, (2006)
11. Sasaki H, Sekine S, Sengoku T, **Fukunaga R**, Hattori M, Utsunomiya Y, Kuroishi C, Kuramitsu S, Shirouzu M, Yokoyama S, "Structural and mutational studies of the amino acid-editing domain from archaeal/eukaryal phenylalanyl-tRNA synthetase" *Proc. Natl. Acad. Sci.* 103, 14744-9, (2006)
12. Yanagisawa T, Ishii R, **Fukunaga R**, Nureki O, Yokoyama S, "Crystallization and preliminary X-ray crystallographic analysis of the catalytic domain of pyrrolysyl-tRNA synthetase from the Methanogenic archaeon *Methanosarcina mazei*" *Acta Crystallogr. F*, 62, 1031-3, (2006)
13. **Fukunaga R**, Yokoyama S, "Structure of the AlaX-M trans-editing enzyme from *Pyrococcus horikoshii*" *Acta Crystallogr. D*, 63, 390-400, (2007)
14. **Fukunaga R**, Yokoyama S, "Crystallization and preliminary X-ray crystallographic study of alanyl-tRNA synthetase from the archaeon *Archaeoglobus fulgidus*" *Acta Crystallogr. F*, 63, 224-8, (2007)
15. **Fukunaga R**, Yokoyama S, "Structural insights into the first step of RNA-dependent cysteine biosynthesis in archaea. Structural basis of phosphoserine ligation to tRNA for genetic code evolution" *Nat. Struct. Mol. Biol.*, 14, 272-9, (2007)
16. **Fukunaga R**, Yokoyama S, "The C-terminal domain of the archaeal leucyl-tRNA synthetase prevents misediting of isoleucyl-tRNA<sup>Ile</sup>" *Biochemistry*, 1, 46, 4985-96, (2007)

17. **Fukunaga R**, Yokoyama S, "Structural insights into the second step of RNA-dependent cysteine biosynthesis in archaea: crystal structure of Sep-tRNA:Cys-tRNA synthase from *Archaeoglobus fulgidus*" *J. Mol. Biol.*, 29, 370, 128-41, (2007)
18. Yanagisawa T, Ishii R, **Fukunaga R**, Kobayashi T, Sakamoto K, Yokoyama S, "Crystallographic studies on multiple conformational states of active-site loops in pyrrolysyl-tRNA synthetase" *J. Mol. Biol.*, 2, 378, 634-52, (2008)
19. **Fukunaga R**, Harada Y, Hirao I, Yokoyama S, "Phosphoserine aminoacylation of tRNA bearing an unnatural base anticodon" *Biochem Biophys Res Commun.*, 1, 372, 480-5, (2008)
20. Yanagisawa T, Ishii R, **Fukunaga R**, Kobayashi T, Sakamoto K, Yokoyama S, "Multistep engineering of pyrrolysyl-tRNA synthetase to genetically encode *N*-(*o*-Azidobenzoyloxycarbonyl) lysine for site-specific protein modification" *Chem. Biol.*, 15, 1187-97, (2008)
21. **Fukunaga R**, Doudna JA, "dsRNA with 5' overhangs contributes to endogenous and antiviral RNA silencing pathways in plants" *EMBO J.*, 28, 545-55, (2009)
22. Naganuma M, Sekine SI, **Fukunaga R**, Yokoyama S, "Unique protein architecture of alanyl-tRNA synthetase for aminoacylation, editing, and dimerization" *Proc. Natl. Acad. Sci.*, 106, 8489-94, (2009)
23. Cenik ES, **Fukunaga R**, Lu G, Dutcher R, Wang Y, Tanaka Hall TM, Zamore PD, "Phosphate and R2D2 Restrict the Substrate Specificity of Dicer-2, an ATP-Driven Ribonuclease" *Mol. Cell*, 42, 172-84, (2011)
24. **Fukunaga R**, Han BW, Hung JH, Xu J, Weng Z, Zamore PD, "Dicer Partner Proteins Tune the Length of Mature miRNAs in Flies and Mammals" *Cell*, 151, 533-46, (2012)
25. **Fukunaga R**, Colpan C, Han BW, Zamore PD, "Inorganic phosphate blocks binding of pre-miRNA to Dicer-2 via its PAZ domain" *EMBO Journal*, 18, 371-84, (2014)
26. Yanagisawa T, Ishii R, Hikida Y, **Fukunaga R**, Sengoku T, Sekine SI, Yokoyama S, "A SelB/EF-Tu/aIF2 $\gamma$ -like protein from *Methanosarcina mazei* in the GTP-bound form binds cysteinyl-tRNACys" *J. Struct. Funct. Genomics.* 16, 25-41, (2015)

#### Peer reviewed reviews

1. **Fukunaga R**, Zamore PD, "A universal small molecule, inorganic phosphate, restricts the substrate specificity of Dicer-2 in small RNA biogenesis." *Cell Cycle*, 13, 1671-6, (2014)

#### Book chapters

1. **Fukunaga R**, Zamore PD, "Loquacious, a Dicer Partner Protein, Functions in Both the microRNA and siRNA Pathways" *The Enzymes*, 32, 37-68, (2012)

#### Meeting reports

1. Ameres SL, **Fukunaga R**, "Riding in silence: a little snowboarding, a lot of small RNAs." *Silence*, 1(1):8, (2010)

## Patents

1. Sekine SI, **Fukunaga R**, Yokoyama S, Hirao I, Harada Y, "MODIFIED tRNA CONTAINING UNNATURAL BASE AND USE THEREOF", US patent 8,715,984. May 6, 2014
2. Yokoyama S, **Fukunaga R**, Sekine SI, "Mutant SepRS, and method for site-specific introduction of phosphoserine into protein using the same", US patent 8,178,301. May 15, 2012

## Extramural Research Funding

### Ongoing Research Support

15SDG23220028      Fukunaga (PI)      01/01/2015 – 12/31/2018  
American Heart Association  
Regulatory mechanisms in small RNA silencing  
Role: PI

H1405      Fukunaga (PI)      01/01/2015 – 12/31/2015  
W.W. Smith Charitable Trust  
SNP in MiRNA and Cardiovascular Diseases  
Role: PI

## EDUCATIONAL ACTIVITIES

### Teaching

2013    Instructor, "Current Topics in Biological Chemistry", Johns Hopkins University  
School of Medicine, Baltimore, MD

2014    Instructor, "Current Topics in Biological Chemistry", Johns Hopkins University  
School of Medicine, Baltimore, MD

### Thesis Committees

2014      Jay Shi, Neuroscience BA/MS Program, Master Thesis Defense Committee  
member

2014-present    Joshua Schwartz, Biochemistry, Cellular and Molecular Biology Program,  
Dissertation Committee member

2014-present    Mohammad Heydarian, Biological Chemistry Program, Dissertation Committee  
member

## **ORGANIZATIONAL ACTIVITIES**

### **Ad Hoc Peer reviewer**

*Molecular Cell, Genetics, Hepatology*

### **Professional Societies**

2011-present RNA Society, member

2014-present American Heart Association, member

## **RECOGNITIONS**

### **Awards and honors**

2004-2007 Research fellowship of the Japan society for the promotion of science for young scientists

2005 Research fellowship of SPring-8 for young scientists

2005 Travel award to attend the 21st international tRNA workshop

2007-2009 Research Postdoctoral Fellowship of the Japan Society for the Promotion of Science for Research Abroad

2009 Wellcome Trust Advanced Course on *Drosophila* Genetics and Genomics

2010-2012 Research Fellowship of King Trust Postdoctoral Fellowship

2015-2018 American Heart Association National Scientist Development Award

### **Invited talks**

2011 RIKEN Yokohama Institute, Japan

2011 Institute of Molecular and Cellular Biosciences, University of Tokyo, Japan

2011 Institute of Integrated Medical Research, Keio University School of Medicine, Japan

2011 Department of Biophysics and Biochemistry, University of Tokyo, Japan

2012 RIKEN Yokohama Institute, Japan

2012 Institute of Integrated Medical Research, Keio University School of Medicine, Japan

2012 Department of Biophysics and Biochemistry, University of Tokyo, Japan

2013 Center for RNA Biology, University of Rochester Medical Center, Rochester, NY

- 2013 College of Biological Sciences, University of California Davis, Davis, CA
- 2013 The Institute of Molecular Biology, University of Oregon, Eugene, OR
- 2013 Department of Biological Chemistry, Johns Hopkins University School of Medicine, Baltimore, MD
- 2013 The 8th Microsymposium on Small RNAs, Institute of Molecular Biotechnology Vienna, Austria
- 2013 Japan RNA conference 2013, Matsuyama, Japan
- 2013 Department of Cell Biology, Johns Hopkins University School of Medicine, Baltimore, MD
- 2014 Department of Biology, Johns Hopkins University, Baltimore, MD