

# Siyeon Rhee Ph.D.

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*Single Cell RNA-Seq, Spatial Transcriptomics, human iPSCs, Congenital Heart Disease Modelling, Mouse Genetics*

## Current Research Interests

- **Identifying angiocrine factors to control cardiomyocyte proliferation and maturation**
  - Established angiogenesis associated non-compaction cardiomyopathy mouse model
  - Used human iPSC-derived cardiomyocytes (proliferation vs maturation)
  - Novel heart explant culture model for studying angiogenesis and cardiomyocyte expansion
- **scRNA-seq and spatial transcriptomics**
  - Investigating the mechanism of human congenital heart disease and heart failure using multi-omics including single cell (sc)RNA-seq, scATAC seq data and spatial transcriptomics
  - scRNA-seq data visualization software development

## Education and Training

2021 Apr – Present

*Instructor, School of Medicine [Stanford University](#)*

*Stanford Cardiovascular Institute, Advisor: Joseph C. Wu, MD, Ph.D.*

*Research Topic: Investigating the mechanism of human congenital heart disease and heart failure using multi-omics, spatial transcriptomics, Developing advanced heart organoids using patient specific human iPSCs.*

2015 Sep – 2021 Mar

*Postdoctoral fellow, Department of Biology [Stanford University](#)*

*Stanford Cardiovascular Institute, Advisor: Kristy Red-Horse Ph.D. HHMI*

*Research Topic: Identifying angiocrine factors using scRNA sequencing, mouse genetics and human iPSCs for congenital heart disease treatment*

2009 Sep – 2015 Aug

*Aug Ph.D., Developmental Biology [University of Massachusetts Amherst](#)*

*Animal Biotechnology & Biomedical Science Program, Advisor: Kimberly D. Tremblay Ph.D.*

*Doctoral Dissertation: Characterization of the Role of Intrinsic and Extrinsic Factors During Murine Endoderm Development*

2006 Sep – 2009 May

*M.S., Food Science [University of Massachusetts Amherst](#)*

*Department of Food Science, Advisor: Yeonhwa Park Ph.D.*

*Research project: Investigated roles of conjugated linoleic acid (CLA) on bone development in obese and ovariectomized mice*

2002 Mar – 2002 Feb

*M.S., Animal Nutrition [Korea University](#), Seoul, Korea*

*Department of Animal Science, Advisor: Yong-Suk Son Ph.D.*

*Research Topic: Investigated roles of monensin (antibiotics) in producing CLA from anaerobic microbes of ruminants*

1995 Mar – 2002 Feb

*B.S., Animal Science [Korea University](#), Seoul, Korea*

*Life Sciences and Biotechnology Division of Life Sciences*

## Peer-Reviewed Publications (\* denotes equal contribution; h-index: 13, i10-index: 15)

Google Scholar: [https://scholar.google.com/citations?hl=en&user=1YF5\\_QQAAAAJ&view\\_op=list\\_works](https://scholar.google.com/citations?hl=en&user=1YF5_QQAAAAJ&view_op=list_works)

### Published manuscripts

1. **Siyeon Rhee\***, Soochi Kim\*, ., Jeesu Kim<sup>#</sup> & Joseph C. Wu<sup>#</sup>. Spatial visualizer of single-cell RNA sequencing data. (Single Cell Embroider) *manuscript in progress*
2. An NKX2-COUP-TFII genomic code targets mucosal vascular addressins to intestinal venules. Theresa Thanh Dinh, ., **Siyeon Rhee**, ., Julian Pan & Eugene Butcher<sup>#</sup> *Under revision*
3. Junil Kim\*, Michalea Mrugala Rothova\*, **Siyeon Rhee**, ., Joshua M. Brickman<sup>#</sup> & Kyoung Jae Won<sup>#</sup>. Nich-specific gene expression using PICseq analysis during mouse embryonic development. *Under revision*
4. **Siyeon Rhee\***, David T. Paik\*, ., Ashby Morrison<sup>#</sup>, Joseph C. Wu<sup>#</sup> and Kristy Red-Horse<sup>#</sup>. Endocardial/endothelial angiocrines regulate cardiomyocyte development and maturation and induce features of ventricular non-compaction. 2021 *European Heart Journal* (IF: 29.983), 2021. July 19. *Highlighted by Stanford News* "What contributes to a spongy, thick heart muscle: Understanding non-compaction of the heart" and other multiple media.
5. Ji-Hye Jung, ., **Siyeon Rhee**, ., Joseph Woo and Phillip C. Yang. Exosomal miR-106a-363 cluster promotes endogenous myocardial repair via Notch3 pathway in ischemic heart injury. *Basic Research in Cardiology* (IF: 11.981) 2021 Mar 18
6. Michael S. Binkley\*, Young-Jun Jeon\*, ., **Siyeon Rhee**, ., Billy W. Loo and Maximilian Diehn. KEAP1/NFE2L2 mutations predict lung cancer radiation resistance that can be targeted by glutaminase inhibition. *Cancer Discovery* (IF: 39.397) 2020 Dec 1.
7. Kyungoh Jung, ., **Siyeon Rhee**, ., June key Chung and Hyewon Youn. Highly Sensitive Identification of Lymphatic and Hematogenous Metastasis Routes of Novel Radiolabeled Exosomes Using Non-invasive PET Imaging. *International Journal of Molecular Sciences*, (IF: 5.923) 2020 Oct 22.
8. David T. Paik\*, Lei Tian\*, Ian M. Williams\*, **Siyeon Rhee**, ., Kristy Red-Horse and Joseph C. Wu. Single-cell RNA-seq unveils unique transcriptomic signatures of organ-specific endothelial cells. *Circulation* (IF: 29.69), 2020 Sep 15.
9. Robert Roth, ., and **Siyeon Rhee**<sup>#</sup>. Single-cell and Spatial transcriptomics approaches of cardiovascular development and disease. *BMB Report* (IF: 4.778), 2020 Aug 15. [\[Corresponding Author\]](#) *Selected as a Cover Image*
10. Jan W. Buikema\*, ., **Siyeon Rhee**, ., Joseph C. Wu and Sean M. Wu. Massive expansion of functional human iPSC-derived cardiomyocytes by concomitant removal of cell-cell contact and glycogen synthase kinase-3 inhibition. *Cell Stem Cell* (IF: 24.633), 2020 July 04.
11. Kyung Oh Jung, ., **Siyeon Rhee**, ., Sanjiv Sam Gambhir, and Guillem Pratx. Whole-body tracking of single cells via positron emission tomograph. *Nature Biomedical Engineering* (IF: 25.671), 2020 Jun 15.
12. Soumyashree Das\*, ., **Siyeon Rhee**, ., Joseph Woo<sup>#</sup> and Kristy Red-Horse<sup>#</sup>. Neonatal mice utilize a unique collateral artery development program to facilitate heart regeneration. *Cell* (IF: 41.582), 2019 Feb 21.
13. Young-Jun Jeon\*, ., **Siyeon Rhee**, ., Ri Cui<sup>#</sup>, and Carlo M. Croce<sup>#</sup>. miRNA-mediated TUSC3 deficiency enhances UPR and ERAD to promote metastatic potential of NSCLC. *Nature Communications* (IF: 14.919), 2018 Nov 30.
14. Kwang-Min Kim, ., **Siyeon Rhee**, ., Ho-Young Lee, and Jayakumar Rajadas. A pattern of brain dysfunction induced by bacterial lipopeptides that alter neuronal activity and network in rodent brains. *Journal of Neuroscience* (IF: 6.074), 2018 Dec 12. *Selected as a Cover Image*
15. Gabriel K. El Sebae, ., **Siyeon Rhee**, ., Jesse Mager and Kimberly D. Tremblay. Single-cell murine genetic fate mapping reveals bipotential hepatoblasts and novel multi-organ endoderm progenitors. *Development* (IF: 5.611), 2018 Sep 19.
16. David T. Paik\*, Lei Tian\*, ., **Siyeon Rhee**, ., Thomas Quertermous and Joseph C. Wu. Large-Scale Single-Cell RNA-Seq Reveals Molecular Signatures of Heterogeneous Populations of Human Induced Pluripotent Stem Cell-Derived Endothelial Cells. *Circulation Research* (IF: 14.467), 2018 Jul 9.
17. Tianying Su\*, Geoff Stanley\*, ., **Siyeon Rhee**, ., Stephen Quake and Kristy Red-Horse. Single cell analysis of early progenitor cells that build coronary arteries. *Nature* (IF: 49.962), 2018 Jul 3.
18. **Siyeon Rhee\***, Jae I. Chung\*, ., Ashby J. Morrison<sup>#</sup> and Kristy Red-Horse<sup>#</sup>. Endothelial deletion of *Ino80* disrupts coronary angiogenesis and causes congenital heart disease. *Nature Communications* (IF: 14.919), 2018 Jan 25. *Highlighted by Stanford News* "The Secret to building a strong heart lies in blood vessels, Stanford researcher find" and other multiple media.

19. Dylan Kessler\*, Hyunkyu Sang\*, ., **Siyeon Rhee**, ., Toshihiko Yamada and Geunhwa Jung. Nucleic adaptability of heterokaryons to fungicides in a multinucleate fungus, *Sclerotinia homoeocarpa*. *Fungal Genetics and Biology* (IF: 3.495), 2018 Jan 11.
20. Aruna Poduri, ., **Siyeon Rhee**, Mike Van and Kristy Red-Horse. Endothelial cells respond to the direction of mechanical stimuli through SMAD signaling to regulate coronary artery size. *Development* (IF: 6.868), 2017 July 22.
21. Llimbek Beketaev, ., **Siyeon Rhee**, ., Jesse Mager and Jun Wang. Cis-regulatory control of Mesp1 expression by YY1 and SP1 during mouse embryogenesis. *Developmental Dynamics* (IF: 3.78), 2015 Sep 18.
22. Jikui Wang, **Siyeon Rhee**, Amrita Palaria and Kimberly D. Tremblay. The anterior portion of the mammalian liver bud requires FGF signals for specification and growth. *Developmental Dynamics* (IF: 3.78), 2014 Oct 9.
23. **Siyeon Rhee**, ., Jesse Mager, and Kimberly D Tremblay. Visceral endoderm expression of Yin-Yang1 (YY1) is required for VEGFA maintenance and yolk sac development. *PLoS One* (IF: 3.24), 2013 Mar 15.
24. Sun-Jin Hur, ., **Siyeon Rhee**, ., Yeonhwa Park. Effects of *trans*-10, *cis*-12 conjugated linoleic acid on body composition in genetically obese mice. *Journal of Medicinal Food* (IF: 2.786), 2008 Jun 3.
25. Yooheon Park, **Siyeon Rhee**, Yeonhwa Park. Comparison of conjugated linoleic acid (CLA) and conjugated nonadecadienoic acid (CNA) with regard to lipid metabolism in mice. *The FASEB Journal* (IF: 5.191), 2009 Apr 1. (Abstract)
26. Yeonhwa Park, Yooheon Park, **Siyeon Rhee**. Conjugated nonadecadienoic acid (CNA) shares similar molecular mechanisms with conjugated linoleic acid (CLA). *The FASEB Journal* (IF: 5.191), 22, 2008 Mar 1. (Abstract)
27. Gang Young Park, ., **Siyeon Rhee**, ., D. Julian McClements and Yeonhwa Park. Influence of encapsulation of emulsified lipids with chitosan on their in vivo digestibility. *Food Chemistry* (IF: 7.514), 2006. Dec 02.
28. Yeonhwa Park, YooHeon Park, **Siyeon Rhee**, Gang Yong Park. Effect of interaction between dietary conjugated linoleic acid (CLA) and calcium on body composition. *The FASEB Journal* (IF: 5.191), 2006 Mar 06 (Abstract)

## Selected Invited Talks / Platform Presentations

1. Endocardial/endothelial angiocrines regulate cardiomyocyte development and maturation and induce features of ventricular non-compaction. *7th Gwangju-Boston Joint Cardiology symposium*, 2021.
2. Single cell analysis reveals angiocrine factors that influence cardiomyocyte proliferation and maturation. *Stanford-K-BioX and SKKU symposium, The first online global symposium in South Korea 2020*. (Symposium organizer)
3. Single cell analysis reveals angiocrine factors that influence cardiomyocyte proliferation and maturation. *Biomedical Sciences Seminar, Seoul National University, South Korea 2019*.
4. Coronary angiogenesis and non-compaction cardiomyopathy. *CVI faculty-postdoc research roundtable, Stanford University 2018*.
5. Endothelial deletion of *Ino80* disrupts coronary angiogenesis and causes left ventricle non-compaction. *2<sup>nd</sup> Annual CVI Postdoctoral Conference, Stanford University 2017*. (Best Talk Award, 1<sup>st</sup> place)
6. Coronary vessel accelerates organ growth and suppresses human heart disease. *Annual Meeting of Korean Life Scientist Association (KOLIS), University of California, San Francisco 2017*.
7. Hepatoblast derived from the anterior and posterior liver bud have distinct molecular requirements and produce different portions of the embryonic liver. *Boston Short Talks Reception of Young Embryologist Network USA, Harvard University 2015*.
8. Hepatoblast derived from the anterior and posterior liver bud have distinct molecular requirements and produce different portions of the embryonic liver. *Annual Meeting of New England Bioscience Society, Harvard University 2015*.
9. Visceral endoderm expression of Yin Yang 1 is required for VEGFA maintenance and yolk sac development. *Northeast Regional Meeting of the Society for developmental Biology. Marine Biological Laboratory, Woods Hole 2013*.
10. Yin Yang 1 in visceral endoderm is essential for yolk sac angiogenesis. *Veterinary and Animal Science Department Retreat, University of Massachusetts Amherst 2012*.
11. YY1 plays an important role in visceral endoderm polarity but is not essential for endoderm organogenesis. *Northeast Mouse User Meeting, University of Connecticut 2011*.

## Awards, Honors and Scholarships

- 2018 Scholarship Award, *Santa Cruz Developmental Biology Meeting*, Santa Cruz, CA
- 2017 Best Talk Award, *2<sup>nd</sup> Annual CVI Postdoctoral Conference*, Stanford, CA
- 2015 [Outstanding Student Award, New England Bioscience Society, Boston, MA](#)
- 2013 Poster Award, 2<sup>nd</sup> place, *Activated Egg Symposium*, Boston, MA
- 2012 Travel Grant Award for *Annual Meeting of Society of Developmental Biology*, Montreal, Canada
- 2010 Poster award, 1<sup>st</sup> place, *Northeast Regional Meeting of the Society for Developmental Biology*, Woods Hole, MA
- 2004 Poster award, 1<sup>st</sup> place, *Annual Meeting of Animal Science Society* in Korea

## Leadership

- 2016 – Present Founder and Representative Operating Committee in K-BioX (4126 members), [www.kbiox.org](http://www.kbiox.org)
- 2015 – 2016 President of Korean Life Scientist Association (KOLIS), [Stanford University](#)
- 2008 – 2009 President of Korean Graduate Student Association, [University of Massachusetts Amherst](#)
- 1999 – 2000 President of Student Association in Animal Science Department, [Korea University](#)

## Advising / Mentorship

- 2007 – Current *Graduate Student (4), Undergraduate Students (9), High School Students (4)*