

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.
Director of Stanford CVI, President of America Heart Association
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

*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: 14, i10-index: 18)

Google Scholar: https://scholar.google.com/citations?hl=en&user=1YF5_QQAAAAAJ&view_op=list_works

Cardiovascular and Single Cell Biology [Selected]

1. **Siyeon Rhee***, Soochi Kim*, ., Jeesu Kim[#] & Joseph C. Wu[#]. Spatial visualizer of single-cell RNA sequencing data. *Manuscript In Progress*
2. Lek Wen Tana, ., **Siyeon Rhee**, ., Howard Chang and Joseph C. Wu. Single-cell Technologies in Cardiovascular Research. *Under Revision Nature Cardiovascular Research*
3. Seongje Hong, **Siyeon Rhee** and Kyung Oh Jung. *In Vivo* Molecular and Single Cell Imaging *BMB Report* (IF: 4.778), *Accepted*
4. Mark Chandy, ., **Siyeon Rhee**, ., Julian Pan and Joseph C. Wu[#]. Novel Cannabinoid Receptor 1 Antagonist Genistein Attenuates Marijuana-Induced Vascular Dysfunction. *Cell* (IF: 41.582), 2022 Apr 29
5. **Siyeon Rhee**[#]. & Joseph C. Wu[#]. Vein to Artery: The First Arteriogenesis in the Mammalian Embryo. *Cell Research* (IF: 25.683), 2022 Feb 10.
6. Thanh Theresa Dinh, ., **Siyeon Rhee**, ., Junliang Pan and Eugene C Butcher. An NKX-COUP-TFII genomic code for mucosal vascular addressins and organ morphogenesis. 2022 1 1. *BioRxiv*, *Submitted to Nature Cell Biology*
7. **Siyeon Rhee***, David T. Paik*, ., Ashby Morrison[#], Joseph C. Wu[#] and Kristy Red-Horse[#]. Endocardial/endothelial angiogcrines regulate cardiomyocyte development and maturation and induce features of ventricular non-compaction. 2021 *European Heart Journal* (IF: 29.983), 2021 July 19. *Accompanied Editorial The endothelial niche in heart failure: from development to regeneration* 2021 Nov 1.
8. 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.
9. David T. Paik*, Lei Tian*, ., **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.
10. Robert Roth, ., and **Siyeon Rhee**[#]. 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*
11. 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.
12. Soumyashree Das*, ., **Siyeon Rhee**, ., Joseph Woo[#] and Kristy Red-Horse[#]. Neonatal mice utilize a unique collateral artery development program to facilitate heart regeneration. *Cell* (IF: 41.582), 2019 Feb 21.
13. 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.
14. 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.
15. 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.
16. **Siyeon Rhee***, Jae I. Chung*, ., Ashby J. Morrison[#] and Kristy Red-Horse[#]. Endothelial deletion of *Ino80* disrupts coronary angiogenesis and causes congenital heart disease. *Nature Communications* (IF: 14.919), 2018 Jan 25.
17. 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.
18. **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.

Early Embryo Developmental Biology

1. Junil Kim, ., ., **Siyeon Rhee**, ., Joshua M. Brickman and Kyoung Jae Won. Neighbor-specific gene expression revealed from physically interacting cells during mouse embryonic development. 2021/12/2. [BioRxiv, Under Revision in PNAS](#)
2. 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.
3. 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.
4. 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.

Cancer Biology and Other Collaborations (Neuroscience and Food Science)

1. Jae-Eun Lee, ., **Siyeon Rhee**[#] and Tae-Hyung Kim[#]. Untold story of human cervical cancers – HPV-negative cervical cancer [Under Revision \[Co-corresponding Author\]](#)
2. 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.
3. 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.
4. Young-Jun Jeon*, ., **Siyeon Rhee**, ., Ri Cui[#], and Carlo M. Croce[#]. miRNA-mediated TUSC3 deficiency enhances UPR and ERAD to promote metastatic potential of NSCLC. [Nature Communications](#) (IF: 14.919), 2018 Nov 30.
5. 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*
6. Dylan Kessler*, Hyunkyung 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.
7. 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.
8. 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.

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. [2nd Annual CVI Postdoctoral Conference, Stanford University 2017](#). ([Best Talk Award, 1st 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.

Patents

- 2022 Scholarship Award, *Santa Cruz Developmental Biology Meeting*, Santa Cruz, CA
 2022 Best Talk Award, *2nd Annual CVI Postdoctoral Conference*, Stanford, CA
 In process [Outstanding Student Award, New England Bioscience Society, Boston, MA](#)

Awards, Honors and Scholarships

- 2018 Scholarship Award, *Santa Cruz Developmental Biology Meeting*, Santa Cruz, CA
 2017 Best Talk Award, *2nd Annual CVI Postdoctoral Conference*, Stanford, CA
 2015 [Outstanding Student Award, New England Bioscience Society, Boston, MA](#)
 2013 Poster Award, 2nd place, *Activated Egg Symposium*, Boston, MA
 2012 Travel Grant Award for *Annual Meeting of Society of Developmental Biology*, Montreal, Canada

 2010 Poster award, 1st place, *Northeast Regional Meeting of the Society for Developmental Biology*, Woods Hole, MA

 2004 Poster award, 1st place, *Annual Meeting of Animal Science Society* in Korea

Leadership

- 2016 – Present Co-Founder and Representative Operating Committee in Stanford K-BioX and K-BioX (6,044 members), 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 (5), Undergraduate Students (10), High School Students (5)*