# Ian Gwoncheol Park

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## EDUCATION

**Florida State University** **Tallahassee, FL, USA**
*Doctoral student*, Department of Nutrition and Integrative Physiology *Aug. 2022 – Present*
(Advisor: Ravinder Nagpal)

**Sejong University** **Seoul, Korea**
*Master of Engineering,* Department of Food Science and Biotechnology *Sep. 2018 – Aug. 2020*

- GPA: 4.5/4.5 (Advisor: Hakdong Shin)
- Thesis: Impact of Coffee Consumption on Gut Microbiota: A Prospective Korean Cohort Study
- Research Assistant Scholarships (2018-2020)

*Bachelor of Engineering,* Department of Food Science and Technology *Mar. 2013 – Aug. 2018*

- GPA: 4.2/4.5, graduated a semester early with a *Magna Cum Laude*
- Academic Excellence Scholarships (2013, 2016-2018)

## RESEARCH INTERESTS

**Identifying the modulation factors that stratify gut microbiome and their effects**

- Differences in function by human gut microbiota modulation factors
- Correlation between the factors of gut microbiota modulation and health conditions

**Understanding the host health-gut microbiota-diet interaction**

- Prospective cohort study / *in vitro* fecal incubation model system
- Diet-induced changes on gut microbiome and gut microbiota targeted dietary strategies to reduce disease risks
- Predicting changes in gut microbiota according to the diet or disease using machine learning strategies

## RESEARCH EXPERIENCES

**Sejong University Industry Academy Cooperation Foundation** **Seoul, Korea**
*Researcher* *Mar. 2021 – Jul. 2022*
"Development of a prediction model-based machine learning for changes in the Korean gut microbiome structure and ecological niches according to prebiotic materials" (Funding: National Research Foundation of Korea)

- Optimized machine learning algorithms (SVM, Random Forest, ANN, etc.) for microbiome data.

"Evaluation of the synbiotic effects of Dongchimi (Korean radish water kimchi)"

- Assessed the viability of *Leuconostoc* and *Lactobacillus* derived from Dongchimi in the *in vitro* fecal incubation model.
- Compared the viability of *Leuconostoc* and *Lactobacillus* based on the presence and amount of radish.

**Sejong University Industry Academy Cooperation Foundation** **Seoul, Korea**
*Technology Licensing Office (TLO) Researcher* *Sept. 2020 – Feb. 2021*
"Optimization and evaluation of *in vitro* fecal incubation model"

- Adjusted and evaluated the compositions of basal mediums, fecal storage conditions, and experimental conditions for stable culture of gut microbiota
- Tested the reliability of *in vitro* fecal incubation model by introducing substances with verified effects on gut microbiota.

**Sejong University Graduate School** **Seoul, Korea**

*Teaching Assistant, Food Molecular Biology and Lab.* *Sept. 2018 – Dec. 2019*

- Provided lectures on the experimental methods of food molecular microbiology and bioinformatics techniques to students.

*Teaching Assistant, Microbiological Food Safety and Lab.* *Mar. 2021 – Jul. 2021*

- Provided lectures on the experimental methods of food microbiology and basic microbial techniques to students

**Food Microbiology and Microbiome Lab (Prof. Hakdong Shin)** **Seoul, Korea**

*Undergraduate Research Student* *Nov. 2016 – Aug. 2018*

- Optimized the standardized protocol proposed by the Earth Microbiome Project (EMP).
- Established a genome analysis process from DNA extraction to genomic characteristic comparison.

## PUBLICATIONS (SCI/SCIE)

**In Progress**

1. **Park, G.**, Jung, K., Lim, S., Shin, H.* (2022) "Long-term radiation exposure to the soil induces changes in microbial community." *In progress.*
2. **Park, G.**, & Shin, H.* (2022) "Stool frequency is significantly associated with gut microbiome." *Journal of Microbiology*, *In progress.*
3. Jeong, Y., **Park, G.**, Song, Y., & Shin, H.* (2022) "Strategies for the economic production of natural edible black pigment using *Aspergillus niger.*" *In progress.*
4. **Park, G.**, & Shin, H.* (2022) "Impact of brewed coffee consumption on gut microbiome and correlation with quantitative changes in coffee." *In progress.*
5. Ahn, S., Jang, D., Kim, S. J., Charton, C., Kim, G., Oh, S., **Park, G.**, Lee, J. H., Shin, H.*, Kim, H.* (2022) "Machine learning approach for pathotype classification of diarrheagenic *Escherichia coli* using genomic information" *In progress*

**Submitted/Under Review**

6. Kim Y., Jung, S., **Park, G.**, Shin, H., Heo, S. C., & Kim, Y.* (2022) "β-carotene inhibits cancer cachexia by regulating the adipose tissue dysregulation and gut microbiota." *The journal of Nutrition, Under review.*
7. Shin, H., Martinez, K. A., Henderson, N., Jay, M., Schweizer, W., Bogaert, D., **Park, G.**, Bokulich, N. A., Blaser, M. J., & Dominguez-Bello, M. G.* (2021) "Partial convergence of the human vaginal and rectal maternal microbiota in late gestation and the early post-partum." *npj Biofilms and Microbiomes*, *Under review.*

**Published**

8. Kim, H., Shin, J., Kim, Su., Kim, Si., Cho, B., Park, S., **Park, G.**, Shin, H., Park, M.*, Kim, J.* (2022) "*Bifidobacterium bifidum* BGN4 and *Bifidobacterium longum* BORI promotes neuronal rejuvenation in aged mice" *Biochemical and Biophysical Research Communications*, 603, 41-48.
9. Kim, G., **Park, G,** Kang, S., Lee, S., Park, J., Ha, J., Park, K., Cho, M*., & Shin, H.* (2021) "Evaluation of applicability of male-specific coliphage-based detection methods for microbial contamination tracking." *Journal of Microbiology and Biotechnology*, 31, 12.
10. Kim, H., Kim, S., Park, S., **Park, G.**, Shin, H., Park, M. S., & Kim, J.* (2021) "Administration of *Bifidobacterium bifidum* BGN4 and *Bifidobacterium longum* BORI improves cognitive and memory function in the mouse model of Alzheimer's disease." *Frontier in Aging Neuroscience*, 13, 499.
11. Kim, G., Bae, J., Kim, M. J., Kwon, H., **Park, G.**, Kim, S. J., Choe, Y., Kim, J., Park., S. H., Choe, B. H., Shin, H.*, & Kang, B.* (2020) "Delayed establishment of gut microbiota in infants delivered by cesarean section." *Frontiers in Microbiology*, 11, 2099.

## CONFERENCE PRESENTATIONS

1. **Park, G.**, Shin, H.*, "Synbiotic effect of Dongchimi (radish water kimchi) on gut microbiota based on *in vitro* Korean fecal incubation model." Korean Society for Lactic Acid Bacteria and Probiotics (2021 Fall Symposium), Seoul, Korea (2021) – Poster presentation

2. Kim Y., Jung, S., **Park, G.**, Shin, H., Heo, S. C., Kim, Y.*, "Anti-cancer cachexia effects of β-carotene via regulating adipose tissue metabolism and gut microbiota." Korean Society of Cancer Prevention (2021 Symposium), e-Conference (2021). – Poster presentation

3. **Park, G.**, Shin, H.*, "Amelioration effects of *Bifidobacterium* species administration against induced changes of gut microbiome caused by coffee consumption." Korean Society of Food Science and Technology (2021 KoSFoST International Symposium and Annual Meeting), Daejeon, Korea (2021) – Poster presentation.

4. **Park, G.**, Shin, H.*, "Genotypic characteristics of community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) isolated in Korea through *in silico* analysis." Korean Society of Food Science and Technology (2021 KoSFoST International Symposium and Annual Meeting), Daejeon, Korea (2021) – Poster presentation.

5. **Park, G.**, Shin, H.*, "Longitudinal microbial profiling reveals the influence of personal stool frequency on gut microbiome." The Korean Society for Microbiology and Biotechnology (48$^{th}$ Annual Meeting & International Symposium), Busan, Korea (2021) – Poster presentation.

6. **Park, G.**, Jung, K., Lim, S., Shin, H.*, "Long-term radiation exposure to the soil induces changes in microbial community." The Korean Society for Microbiology and Biotechnology (47$^{th}$ Annual Meeting & International Symposium), e-Conference (2020) – Poster presentation.

7. **Park, G.**, Shin, H.*, "The effect of coffee consumption on gut microbiome depends on personal stool frequency." Korean Society of Food Science and Technology (2020 KoSFoST International Symposium and Annual Meeting), Gwangju, Korea (2020) – Poster presentation.

8. **Park, G.**, Shin, H.*, "Daily consumption of brewed type coffee induces changes on gut microbiome and these changes are dose-dependent." Federation of Korean Microbiological Societies (2019 Annual Meeting), Seoul, Korea (2019) – Poster presentation.

9. **Park, G.**, Shin, H.*, "Daily consumption of brewed type coffee or instant coffee mix shows similar effect on the composition of gut microbiota." Korean Society of Food Science and Technology (2019 KoSFoST International Symposium and Annual Meeting), Incheon, Korea (2019) – Poster presentation.

10. **Park, G.**, Shin, H.*, "Effect of daily consumption of brewed coffee on the composition of gut microbiota in Korean young adults." The Korean Society for Microbiology and Biotechnology (2019 Winter Symposium), Pyeongchang, Korea (2019) – Oral & Poster presentation.

11. **Park, G.**, Shin, H.*, "Genomic analysis of *Staphylococcus aureus* Sau09 isolated from Korea." The Korean Society for Microbiology and Biotechnology (2018 Winter Symposium), Pyeongchang, Korea (2018) – Poster presentation

## PROJECT EXPERIENCES

**Effect of probiotics (*Lactobacillus* spp.) and its derivatives on gut microbiota using *in vitro* fecal incubation model**
*Funded by CJ CheilJedang* *Jun. 2020 – Jan. 2021*

- Evaluated and verified *in vitro* fecal inoculation model using substances with well-known effects on the gut microbiota.
- Treated live and dead *Lactobacillus* spp. cells in *in vitro* fecal incubation model and analyzed their effects on gut microbiota.

**Effect of coffee and mannan-oligosaccharide (MOS) on gut microbiota using *in vitro* fecal incubation model**
*Funded by Dongsuh foods Co.* *Jun. 2020 – Jan. 2021*

- Treated oral/stomach/intestinal digestive enzymes on various types of coffee and MOS to simulate the digestive process in the gastrointestinal tract
- Treated enzyme-treated materials in *in vitro* fecal incubation model and analyzed their effects on gut microbiota.

**Development and commercialization of a natural black food colorant derived from black *Aspergillus* sp.**
*Funded by the Ministry of Agriculture, Food and Rural Affairs* *May 2019 – May 2020*

- Established culture conditions and selected strain that can produce the blackest pigment.
- Analyzed genomic characteristics of *Aspergillus niger* ATCC 16513 after full-genome sequencing.
- Identified the type of black pigment produced by *A. niger* ATCC 16513 and its biosynthetic pathway.

**Genome analysis of foodborne pathogens and development of bioinformatics program**
*Funded by the Ministry of Food and Drug Safety* *Feb. 2019 – Jun. 2022*

- Discovered specific biomarkers of *Staphylococcus aureus* isolated from Korea through comparative genomic analysis.
- Identified the genotypic characteristic of community-associated methicillin-resistant *S. aureus* (CA-MRSA).

**Improvement of male-specific coliphage (MSC) detection method and investigation of MSC concentration for shellfish produced in major seas in Korea**
*Funded by the National Institute of Fisheries Science* *Apr. 2018 – Jun. 2022*

- Evaluated the distribution of male-specific coliphage (MSC) densities in shellfishes collected from major seas in Korea and identified viral community profiles through viral metagenomic analysis.
- Designed novel primers that detect viruses commonly found in shellfishes where MSC was identified and can be a marker for seafood contamination.

**Precision/Standardized metagenomics studies for evaluation of gut microbiome changes by consumption of coffee and its application using *in vitro* Korean gut microbiota model system**
*Funded by OTTOGI Co.* *Jan. 2018 – Dec. 2020*

- Identified the Korean gut enterotype using the R script.
- Analyzed the dose-dependent effects of Coffee (Brewed & Instant mix) consumption on gut microbiota by gut enterotype.
- Identified Alleviating effects of *Bifidobacterium* species against induced changes of gut microbiome caused by coffee consumption using the *in vitro* fecal incubation model.

**Metagenomics tracking studies for evaluation of gut microbiome changes by consumption of makgeolli and genomic characterization of novel makgeolli-derived probiotics strains having colonization ability**
*Funded by the Ministry of Science and ICT* *Jun. 2017 – Aug. 2018*

- Analyzed the effects of Makgeolli (traditional Korean fermented alcoholic beverage) on gut microbiota.
- Identified lactic acid bacteria (LAB) derived from Makgeolli with good viability in the gut environment using the microbial source-tracking analysis, and isolated LAB from fecal samples.

## JOINT RESEARCH PROJECTS

**Effects of administration of *Bifidobacterium bifidum* BGN4 and *Bifidobacterium longum* BORI on cognitive, memory function, and neuronal rejuvenation in the mouse model**
(BIFIDO Co., Korea) 2021

- Identified the changes in gut microbiome after administration of *B. bifidum* BGN4 and *B. longum* BORI in a mouse model of Alzheimer's disease and in young and aged mouse models.

**Anti-cancer cachexia effects of β-carotene via regulating adipose tissue metabolism and gut microbiota** 2021
(Ewha Womans University, Seoul, Korea)

- Identified the effect on the gut microbiota of β-carotene administration and its dose-dependency in CT26-induced cancer cachexia mouse.

**Partial convergence of the human vaginal and rectal maternal microbiota in late gestation and the early post-partum**
(Rutgers University, New Jersey, U.S.) 2020

- Modified, updated, and visualized the analysis results using the latest bioinformatics tools.

**Changes in soil microbiome resulting from gamma irradiation** 2019
(Korea Atomic Energy Research Institute, Daejeon, Korea)

- Identified changes in three-domain microbial communities according to irradiation.

- Detected microorganisms susceptible to or resistant to radiation by measuring the correlation between relative abundance and radiation dose.

**Differences in the fecal microbiota of neonates born at home or in the hospital** 2018
(New York University, New York, U.S.)
- Visualized and confirmed the final analysis data (technical support is mentioned in acknowledgments of article "Differences in the fecal microbiota of neonates born at home or in the hospital" by Combellick, J. L., Shin, H., Shin, D., Cai, Y., Hagan, H., Lacher, C., Lin, D. L., McCauley, K., Lynch, S. V., & Dominguez-Bello, M. G.* (2018), *Scientific Reports*, 8(1), 1-9.')

## PROFICIENCY IN SKILLS

**Technical:**
- Earth Microbiome Project (EMP) protocol (DNA extraction, 16S *rRNA* amplification, Sequencing)
- *in vitro* fecal incubation model system (basal medium preparation, fecal inoculation, target material treatment, 96-well plate-based incubation)
- Prospective cohort study (subject recruitment, diet control, fecal sample management)
- Aerobic/anaerobic bacteria culture, Fungi culture, MIC/MBC test
- RT-PCR, GC-FID (SCFA quantification), HPLC, FT-IR

**Bioinformatics:**
- Microbiome data analysis tools (QIIME2, PICRUSt2, LEfSe, ALDEx2, ANCOM, Cytoscape, Enterotyping, Source tracking/FEAST)
- Comparative genomic analysis tools (CLC, A5 assembler, SPAdes, RAST server, Pan-genome analysis, ANI-tree, RNAmmer, Strainseeker, ARTEMIS, CARD, VFDB)
- Python (Jupyter notebook), R

**Figure visualization:** Adobe Photoshop, Inkscape

## AWARDS & HONORS

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| 2021 | *Young Scientist Award for Poster Presentation*, Korean Society for Lactic Acid Bacteria and Probiotics |
| 2019, 2020 | *Best Poster Award*, Korean Society of Food Science and Technology |
| 2019 | *Excellent Oral Presentation Award*, Korean Society for Microbiology and Biotechnology |

## ADDITIONAL INFORMATION

**Military Service: Republic of Korea Air Force** **Cheongju, Korea**
*Sergeant, Korea Air Force Academy* *Dec. 2013 – Dec. 2015*