

Curriculum Vitae

Gijung Kwak, Ph. D.
Research Associate
Department of Neurosurgery, Medicine Institute for Neuroscience Discovery (UM-MIND)
School of Medicine
University of Maryland Baltimore

Date 01/05/2026

Contact Information

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Foreign Language Korean (Native)

Education

2009 - 2015 B.S., Department of Polymer Science and Engineering, College of Engineering, INHA University, Incheon, Republic of Korea.
2015 - 2020 Ph.D., Department of Nano-Bio-Information Technology, Korea University-Korea Institute of Science and Technology (KU-KIST) Graduate School of Converging Science and Technology, Korea University, Seoul, Republic of Korea (Ick Chan Kwon, Ph.D.).
Title of thesis: RNAi therapeutics delivery strategies with non-viral vectors for targeted cancer therapy
2018 - 2019 Visiting Student Researcher, Department of Bioengineering, College of Engineering, University of California at Berkeley, CA, US (Phillip B. Messersmith, Ph.D.).

Post Graduate Education and Training

2020 - 2023 Postdoctoral Fellow, Center for Nanomedicine, Wilmer Eye Institute, Department of Ophthalmology, School of Medicine, Johns Hopkins University, MD, US (Jung Soo Suk, Ph.D.).
2023 - 2025 Postdoctoral Fellow, Department of Neurosurgery and Medicine Institute for Neuroscience Discovery (UM-MIND), School of Medicine, University of Maryland Baltimore, MD, US (Jung Soo Suk, Ph.D.).

Mandatory Military Service

2011 - 2013 Sergeant (Specialty: Ammunition Management), 6th Ammunition Depot, Republic of Korea Army, Imsil, Jeonbuk-do, Republic of Korea.

Academic Appointments

2025 - present Research Associate, Department of Neurosurgery and Medicine Institute for Neuroscience Discovery (UM-MIND), School of Medicine, University of Maryland Baltimore, MD, US.

Honors and Awards:

2017 Best Poster Award at 2nd International on Bio-Therapeutics Delivery Symposium (BTDS), Republic of Korea.
2017 Best Poster Award at Korean Society for Nanomedicine Conference, Republic of Korea.
2017 Best Poster Award at Korea Institute of Science and Technology (KIST) research program conference, Republic of Korea.
2018 Korea University Graduate School Achievement Award, Republic of Korea.
2018 KIST School Idea Competition Award - Third Place, Republic of Korea.
2019 Student Travel Award at 6th Nano Today Conference, Lisbon, Portugal.
2022 Gene delivery and gene editing (GDGE) Focus Group Award at Controlled Release Society (CRS) Annual Meeting & Expo, Montreal, Canada.
2023 Meritorious Abstract Travel Award at American Society of Gene & Cell Therapy (ASGCT) 26th Annual Meeting, Los Angeles, CA, US.
2024 Meritorious Abstract Travel Award at American Society of Gene & Cell Therapy (ASGCT) 27th Annual Meeting, Baltimore, MD, US.

2025 Center for Advanced Research Training & Innovation (CARTI) Clinical/Translational Research Training Track, University of Maryland School of Medicine (UMSOM)

Professional Society Memberships

2021 - present Member, Controlled Release Society (CRS)
2022 - present Member, Korean American Scientists and Engineers Association (KSEA)
2022 - present Associate Member, American Society of Gene & Cell Therapy (ASGCT)
2024 - present Member, Biomedical Engineering Society (BMES)
2025 - present Member, Society for Neuroscience (SfN)

Administrative Service

Institutional/Local Service

11/18/2025 Judge for poster session, 48th Medical Student Research Day (MSRD), UMSOM
11/21/2025 Panel for breakout session, 13th Annual STEM Symposium, Baltimore City Community College (BCCC)

International Service

2024 Reviewer, *Small* (1 research article)
2024 Reviewer, *Experimental Eye Research* (1 research article)
2024 - 2025 Reviewer, *Biomaterials Research* (5 research articles)
2024 - 2025 Reviewer, *Drug Delivery and Translational Research* (4 research articles)
2025 Reviewer, *Chemical Engineering Journal* (1 research article)
2025 Reviewer, *Materials Today Advances* (1 research article)
2025 Abstract Reviewer, American Society of Gene & Cell Therapy (ASGCT) 28th Annual Meeting
2025 - 2026 Abstract Reviewer, Controlled Release Society (CRS) Annual Meeting & Exposition

Research Activities

My research has focused on developing drug/nucleic acid delivery systems to transfer therapeutic cargo to target cells in major organs, including the brain, lung, eye, and penile tissue, and related diseases. Specifically, I have engineered and optimized non-viral nanoparticles (NPs) composed of synthetic biodegradable/bioreducible polymers or extracellular vesicles (EVs) to provide efficient delivery of drugs and nucleic acids.

Grant Support

Pending Grants

FY2026 PI: 100%
"In vivo chimeric antigen receptor (CAR) macrophage generation to treat glioblastoma"
University of Maryland Greenebaum Comprehensive Cancer Center (UMGCCC), Career Development in Target Discovery & Validation Pilot Award (CDPA)

07/01/2026 – 06/30/2028 PI: 35%
"Region-Specific In Vivo Huntingtin Gene Editing in the Brain to Treat Huntington's Disease"
NIH R21

Completed Grants

09/01/2022 – 08/31/2023 PI: 100%
"Bioreducible nanoparticle-based intravitreal gene delivery for treating retinal diseases"
Postdoctoral Fellowship (Nurturing Next-generation Researchers)
National Research Foundation (NRF) of Korea
Annual Direct Costs: \$32,696
Total Direct Costs: \$32,696

Patents, Inventions, and Copyrights

1. S. H. Kim, I. C. Kwon, K. Kim, H. Y. Yoon, **G. Kwak**, J. Park. assignee: Korea Institute of Science and Technology (KIST), "Therapeutic agent for treating cancer comprising anti-miRNA-albumin composite", granted, patent number: US11015197B2 (US), KR102267479B1 (KR)

2. S. H. Kim, Y. Yang, H. Kim, **G. Kwak**, Y. Jang, assignee: EXOGENIQUE CO., LTD, "Novel use of milk exosome" granted, publication number: KR20210066750A (KR)
3. J. S. Suk, **G. Kwak**, assignee: Johns Hopkins University, "Extracellular vesicle-associated adeno-associated virus vectors for inhaled gene therapy", published, publication number: WO2024030514A1 (PCT)
4. J. S. Suk, **G. Kwak**, K. Zhang, assignee: Johns Hopkins University, "Bio-reducible polymer and use thereof", published, publication number: WO2024049878A2 (PCT)

Publications

First Author (*Co-first Author), Peer-Reviewed Journal Articles

1. **G. Kwak***, S. D. Jo*, D. Kim, H. Kim, M. G. Kim, K. Kim, I. C. Kwon, and S. H. Kim "Synergistic antitumor effects of combination treatment with metronomic doxorubicin and VEGF-targeting RNAi nanoparticles" *Journal of Controlled Release*, 2017, 267, 203-213. DOI: 10.1016/j.jconrel.2017.08.015.
2. **G. Kwak**, D. Kim, G. Nam, S. Y. Wang, I. Kim, S. H. Kim, I. C. Kwon, and Y. Yeo "Programmed Cell Death Protein Ligand-1 Silencing with Polyethylenimine–Dermatan Sulfate Complex for Dual Inhibition of Melanoma Growth" *ACS Nano*, 2017, 11 (10), 10135-10146. DOI: 10.1021/acsnano.7b04717.
3. **G. Kwak***, H. Kim*, J. Park, E. H. Kim, H. Jang, G. Han, S. Y. Wang, Y. Yang, I. C. Kwon, and S. H. Kim "A Trojan-Horse Strategy by In Situ Piggybacking onto Endogenous Albumin for Tumor-Specific Neutralization of Oncogenic MicroRNA" *ACS Nano*, 2021, 15(7), 11369–11384. DOI: 10.1021/acsnano.1c00799.
4. **G. Kwak**, J. Cheng, H. Kim, S. Song, S. J. Lee, Y. Yang, J. H. Jeong, J. E. Lee, P. B. Messersmith, and S. H. Kim "Sustained Exosome-Guided Macrophage Polarization Using Hydrolytically Degradable PEG Hydrogels for Cutaneous Wound Healing: Identification of Key Proteins and MiRNAs, and Sustained Release Formulation" *Small*, 2022, 2200060. DOI: 10.1002/smll.202200060.
5. K. Negron*, **G. Kwak***, H. Wang, H. Li, Y. Huang, S. Chen, B. Tyler, C. G. Eberhart, J. Hanes, and J. S. Suk "A Highly Translatable Dual-arm Local Delivery Strategy to Achieve Widespread Therapeutic Coverage in Healthy and Tumor-bearing Brain Tissues" *Small*, 2023, 2207278. DOI: 10.1002/smll.202207278.
6. **G. Kwak**, O. Gololobova, N. Sharma, C. Caine, M. Mazur, K. Mulka, N. E. West, G. M. Solomon, G. R. Cutting, K. W. Witwer, S. M. Rowe, M. Paulaitis, G. Aslanidi, and J. S. Suk "Extracellular vesicle enhances pulmonary transduction of stably associated adeno-associated virus following intratracheal administration" *Journal of Extracellular Vesicles*, 2023, 12, e12324. DOI: 10.1002/jev2.12324.
7. D. Rao*, **G. Kwak***, H. Wang, C. G. Eberhart, J. Hanes, and J. S. Suk "Bio-reducible gene delivery platform that promotes intracellular payload release and widespread brain dispersion" *ACS Biomaterials Science & Engineering*, 2023, 9, 8, 4567–4572. DOI: 10.1021/acsbmaterials.3c00799.
8. **G. Kwak***, D. Lee*, and J. S. Suk, "Advanced approaches to overcome biological barriers in respiratory and systemic routes of administration for enhanced nucleic acid delivery to the lung" *Expert Opinion on Drug Delivery*, 2023. DOI: 10.1080/17425247.2023.2282535.
9. **G. Kwak**, A. Grewal, H. Slika, G. Mess, H. Li, M. Kwatra, A. Pouloupoulos, G. F. Woodworth, C. G. Eberhart, H. Ko, A. Manbachi, J. Caplan, R. J. Price, B. Tyler, and J. S. Suk "Brain Nucleic Acid Delivery and Genome Editing via Focused Ultrasound-Mediated Blood-Brain Barrier Opening and Long-Circulating Nanoparticles" *ACS Nano*, 2024, 18, 35, 24139–24153. DOI: 10.1021/acsnano.4c05270.
10. M. Kwarta*, **G. Kwak***, H. Li, J. S. Suk, and H.S. Ko. "Polymeric nanoparticle-mediated GBA1 gene therapy in neuroprotective in a preclinical model of Parkinson's disease" *Drug Delivery and Translational Research*, 2025. DOI: 10.1007/s13346-025-01944-3.

Co-Author, Peer-Reviewed Journal Articles

11. H. Kim, J. Jeong, D. Kim, **G. Kwak**, S. H. Kim, and J. B. Lee "Bubbled RNA-Based Cargo for Boosting RNA Interference" *Advanced Science*, 2017, 4, 1600523. DOI: 10.1002/advs.201600523.
12. B. Kim, D. Kim, **G. Kwak**, J. Y. Yhee, I. C. Kwon, S. H. Kim, and Y. Yeo "Polyethylenimine-Dermatan Sulfate Complex, a Bioactive Biomaterial with Unique Toxicity to CD146-Positive Cancer Cells" *ACS Biomaterials Science & Engineering*, 2017, 3 (6), 990-999. DOI: 10.1021/acsbmaterials.7b00207.
13. S. D. Jo, G. Nam, **G. Kwak**, Y. Yang, and I. C. Kwon "Harnessing designed nanoparticles: Current strategies and future perspectives in cancer immunotherapy" *Nano Today*, 2017, 17, 23-37. DOI: 10.1016/j.nantod.2017.10.008.
14. Y. Y. Kang, J. Song, H. S. Jung, **G. Kwak**, G. Yu, J. Ahn, S. H. Kim, and H. Mok "Implication of multivalent aptamers in DNA and DNA–RNA hybrid structures for efficient drug delivery *in vitro* and *in vivo*" *Journal of Industrial and Engineering Chemistry*, 2018, 60, 250-258. DOI: 10.1016/j.jiec.2017.11.011.
15. S. Y. Wang, H. Kim, **G. Kwak**, H. Y. Yoon, S. D. Jo, J. E. Lee, D. Cho, I. C. Kwon, and S. H. Kim

- "Development of Biocompatible HA Hydrogels Embedded with a New Synthetic Peptide Promoting Cellular Migration for Advanced Wound Care Management" *Advanced Science*, 2018, 5(11), 1800852. DOI: 10.1002/advs.201800852.
16. H. Kim, **G. Kwak**, K. Kim, H. Y. Yoon, and I. C. Kwon "Theranostic designs of biomaterials for precision medicine in cancer therapy" *Biomaterials*, 2019, 213, 119-207. DOI: 10.1016/j.biomaterials.2019.05.018.
 17. H. Kim, S. Y. Wang, **G. Kwak**, Y. Yang, I. C. Kwon, and S. H. Kim "Exosome-Guided Phenotypic Switch of M1 to M2 Macrophages for Cutaneous Wound Healing" *Advanced Science*, 2019, 1900513. DOI: 10.1002/advs.201900513.
 18. Y. Jeong, G. B. Kim, Y. Ji, **G. Kwak**, G. Nam, Y. Hong, S. Kim, J. An, S. H. Kim, Y. Yang, H. S. Chung, and I. Kim "Dendritic cell activation by an E. coli-derived monophosphoryl lipid A enhances the efficacy of PD-1 blockade" *Cancer Letters*, 2019, 472, 19-28. DOI: 10.1016/j.canlet.2019.12.012.
 19. S. Y. Wang, H. Kim, **G. Kwak**, S. D. Jo, D. Cho, Y. Yang, I. C. Kwon, J. H. Jeong, and S. H. Kim "Development of microRNA-21 mimic nanocarriers for the treatment of cutaneous wounds" *Theranostics*, 2020, 10(7), 3240-3253. DOI: 10.7150/thno.39870.
 20. W. Um, H. Ko, D. G. You, S. Lim, **G. Kwak**, M. K. Shim, S. Yang, J. Lee, Y. Song, K. Kim, and J. H. Park "Necroptosis- Inducible Polymeric Nanobubbles for Enhanced Cancer Sonoimmunotherapy" *Advanced Materials*, 2020, 1907953. DOI: 10.1002/adma.201907953.
 21. H. Kim, E. H. Kim, **G. Kwak**, S. Chi, S. H. Kim, and Y. Yang "Exosomes: Cell-Derived Nanoplatforams for the Delivery of Cancer Therapeutics" *International Journal of Molecular Sciences*, 2021, 22, 14. DOI: 10.3390/ijms22010014.
 22. D. Chen, S. Liu, D. Chen, J. Liu, J. Wu, H. Wang, Y. Su, **G. Kwak**, X. Zuo, D. Rao, H. Cui, C. Shu, and J. S. Suk "A Two-Pronged Pulmonary Gene Delivery Strategy: A Surface-Modified Fullerene Nanoparticle and a Hypotonic Vehicle" *Angewandte Chemie-International Edition*, 2021, 60, 15225–15229. DOI: 10.1002/anie.202101732.
 23. N. Kim, **G. Kwak**, J. Rodriguez, A. Livraghi-Butrico, X. Zuo, V. Simon, E. Han, S. Shenoy, N. Pandey, M. Mazur, S. E. Birket, A. Kim, S. M. Rowe, R. C. Boucher, J. Hanes, and J. S. Suk "Inhaled gene therapy of preclinical muco-obstructive lung diseases by nanoparticles capable of breaching the airway mucus barrier" *Thorax*, 2021, 77 (8), 812-820. DOI: 10.1136/thoraxjnl-2020-215185.
 24. E. H. Kim, J. Lee, **G. Kwak**, H. Jang, H. Kim, H. Cho, Y. Jang, J. Choi, S. Chi, K. Kim, I. C. Kwon, Y. Yang, and S. H. Kim "PDL1-binding peptide/anti-miRNA21 conjugate as a therapeutic modality for PD-L1high tumors and TAMs" *Journal of Controlled Release*, 2022, 345, 62-74. DOI: 10.1016/j.jconrel.2022.02.031.
 25. H. Kim, H. Park, H. W. Chang, J. H. Back, S. J. Lee, Y. E. Park, E. H. Kim, Y. Hong, **G. Kwak**, I. C. Kwon, J. E. Lee, Y. S. Lee, S. Y. Kim, Y. Yang, and S. H. Kim "Exosome-guided direct reprogramming of tumor-associated macrophages from protumorigenic to antitumorigenic to fight cancer" *Bioactive Materials*, 2022. DOI: 10.1016/j.bioactmat.2022.07.021.
 26. D. Lee, B. Kong, **G. Kwak**, C. Swaby, R. Fanaroff, S. Venkataramana, J. S. Suk. "Clinically translatable anti-fibrotic nanosuspension for inhaled treatment of idiopathic pulmonary fibrosis" *Drug Delivery and Translational Research*, 2025. DOI: 10.1007/s13346-025-01973-y

Protocol article

27. D. Lee*, **G. Kwak***, T. V. Johnson, and J. S. Suk "Formulation and Evaluation of Polymer-Based Nanoparticles for Intravitreal Gene-Delivery Applications" *Current Protocols*, 2022, 2(12), e607. DOI: 10.1002/cpz1.607.

Preprints

28. Y. Zhang, S. Saha, C. Dube, Y. Sun, K. Hudson, A. L. Klibanov, J. Hanes, J. S. Suk, **G. Kwak**, J. F. Mata, and R. Abounader "Focused ultrasound delivery of miR-142-3p for glioblastoma therapy" *FocUS Archive Preprints*, 2024. DOI: 10.31225/osf.io/nakhd
29. S. Saha, Y. Zhang, M. K. Gilbert Jr, C. Dube, F. Hanif, E. Mulcahy, S. Bednarek, P. Marcinkiewicz, X. Wang, **G. Kwak**, K. Hudson, Y. Sun, M. Dinda, T. Saha, F. Guessous, N. Cruickshanks, R. R. Colon, L. Dell'Olio, R. Anbu, B. Kefas, P. Kumar, A. L. Klibanov, D. Schiff, J. S. Suk, J. Hanes, J. Mata, M. Hafner, and R. Abounader "Discovery and therapeutic exploitation of Master Regulatory miRNAs in Glioblastoma" *BioRxiv*, 2025. DOI: 10.1101/2025.04.01.646663

Major Invited Speeches

Local/Regional

1. "Environmentally sensitive polymer-based nanoparticles for intravitreal gene delivery", 33rd Annual Wilmer Research Meeting (WRM) 2022, April 8, 2022, Baltimore, MD, US.

National

2. "Extracellular vesicle-associated adeno-associated virus for inhaled gene delivery", NIH Extracellular RNA Communication Consortium (ERCC) Program Closeout Meeting, May 1-2, 2023, North Bethesda, MD, US.

International

3. "PD-L1 silencing with melanoma-specific nanoparticle for cancer immunotherapy", 6th Nano Today Conference 2019, June 16-20, 2019, Lisbon, Portugal.
4. "Environmentally sensitive polymer-based nanoparticles for intravitreal gene delivery", Controlled Release Society (CRS) 2022 Annual Meeting & Expo, July 14, 2022, Montreal, Canada.
5. "Environmentally sensitive polymer-based nanoparticles for intravitreal gene delivery", American Society of Gene & Cell Therapy (ASGCT) 26th Annual Meeting, May 16, 2023, Los Angeles, CA, US.
6. "Extracellular vesicle-associated adeno-associated virus for inhaled gene delivery", EV Club in International Society for Extracellular Vesicles (ISEV), August 09, 2023, virtual meeting.
7. "Focused ultrasound- and long-circulating nanoparticle-mediated nucleic acid delivery to and genome editing in the brain", American Society of Gene & Cell Therapy (ASGCT) 27th Annual Meeting, May 11, 2024, Baltimore, MD, US.
8. "Focused ultrasound- and long-circulating nanoparticle-mediated nucleic acid delivery to and genome editing in the brain", Biomedical Engineering Society (BMES) 2024 Annual Meeting, October 24, 2024, Baltimore, MD, US.