

Institute for In Vitro Sciences, Inc.
30 W. Watkins Mill Road, Suite 100
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Curriculum Vitae

Careen Khachatoorian

Education

- December 2020** Ph.D. (Cell, Molecular, Developmental Biology), University of California, Riverside (UCR), Riverside, California, USA
- December 2012** B. Sc. (Biotechnology minor in Chemistry) California State University, Northridge (CSUN), Northridge, California, USA

Professional Affiliations

- 2018 – 2020** Coalition for Tobacco Free Communities Riverside, CA
- 2018 – 2020** Armenian Professional Society
- 2015 – Present** Society of Toxicology
- 2013 – 2014** Graduate Student Mentorship Program at UCR
- 2013 – Present** Armenian Engineers and Scientists of America
- 2012 – 2012** Student Fee Advisory Committee at CSUN
- 2011 - 2013** National Society of Leadership and Success Sigma Alpha Pi Chapter at CSUN

Experience

- 2021 – Present **Toxicologist I, Study Director**
Institute for In Vitro Sciences
- Assist commercial clients to develop appropriate *in vitro* toxicology programs for their products. Interact with industry, animal welfare groups and government as necessary to discuss use of *in vitro* methods. Study Director for *in vitro* toxicology assays: screening assays using three dimensional reconstructed tissues such as EpiDerm™ and EpiOcular™ (MatTek Corporation). Also responsible for Skin Irritation Testing using EpiDerm™ tissues and Bovine Corneal Opacity and Permeability (BCOP) assay. Participate in identifying, developing, and commercializing novel *in vitro* toxicology assays. Producing manuscripts detailing IIVS' scientific activities. Assist in producing Background Review Documents detailing the performance characteristics and predictive capacity of various *in vitro* assays. Organizing and/or participating in other IIVS programs as assigned.
- 2021 **Postdoctoral Researcher**
University of California, Riverside
- Advisor: Dr. Prue Talbot
Analyzed proteins and metabolites secreted from 3D *in vitro* dermal models (EpiDerm™) exposed to refill fluids and flavor chemicals to understand pathways affected. Explore the underlying transcriptional programs using upstream analysis in Qiagen Ingenuity pathway (IPA). First author scientific publications and figures were independently designed, executed, interpreted, and

written. Collaborated with peers across various departments and academic institutions to further strengthen research. Constructed and presented findings frequently to group members and collaborators. Presented oral and poster presentations on research findings at conferences virtually.

2014 – 2020

Graduate Student Researcher
University of California, Riverside

Advisor: Dr. Prue Talbot

Dissertation: Identification, Quantification, and Cytotoxicity of Electronic Cigarette Exhaled Aerosol Residue (ECEAR)

Performed exposure and toxicity assessments for nicotine, flavor chemicals, and refill fluid chemicals. Identified and quantified flavor chemicals and nicotine in refill fluids and aerosols created with various topographies. Then, analyzed the transfer efficiency of nicotine and flavor chemicals from refill fluid to aerosols. Recruited human participants and collected exhaled aerosols for chemical analysis. Used GC-MS, LC-MS, and HPLC to analyze chemicals in refill fluid and ECEAR. Mathematically modeled flavor chemical and nicotine retention in those participants to determine human health risks. Used controlled laboratory settings for human participants to smoke electronic cigarette (ECs) into an exposure chamber to form ECEAR. Tested the toxicity of refill fluids and ECEAR using MTT, LDH, ELISAs, ROS assays, and microscopy techniques. Worked with 2D (mouse neural stem cells, human keratinocytes, human palatal mesenchyme, human lung fibroblasts) and 3D cell cultures (EpiDerm™). Determined cellular apoptosis/death using flow cytometry techniques with annexin-5 and propidium iodide stains. Determined cellular increases in ROS using MitoSox™ Superoxide indicator for live cell imaging and CellRox™ stains with fluorescence microscopy. Determined ROS increases using ROS-Glo™ H₂O₂ assay with plate luminescence. Analyzed mitochondrial morphology using MitoTracker™ probes using fixed and live cell imaging. Sampled and determined concentrations of nicotine, secondary products, and tobacco specific nitrosamines in ECEAR samples from various field sites (EC user home, vape shop, business located next to a vape shop). First author scientific publications and figures were independently designed, executed, interpreted and written. Collaborated with peers across various departments and academic institutions to further strengthen research. Constructed and presented findings frequently to group members and collaborators. Presented oral and poster presentations on research findings at conferences across the country. Maintained and serviced the lab and all equipment including GC-MS, microscopes, scales, fridge, and freezers. Autoclaved equipment and supplies used in clean rooms. Used aseptic techniques in culturing rooms and hoods. Wrote policy memos and Op-Eds for the Science 2 Policy program to disseminate scientific literature to the community and legislatures about the harms of flavors in E-Cigs and the residue in vape shops.

2020

BSL-2 Lab Technician
Fulgent Genetics

Extracted DNA from nasopharyngeal and buccal COVID samples. Operated and maintained QIAcube HT, Apostle COVID-19 Viral RNA Isolation Automation System, and Applied Biosystems QuantStudio 6 Flex for real-time PCR system with 384 well plate. Used Hamilton Microlab VANTAGE Liquid Handling System. Adhered to the lab's quality control policies, documented all quality control activities, instrument and procedural calibrations and maintenance performed. Learned and assisted with troubleshooting skills and be able to

identify problems that may adversely affect test performance or reporting of test results.

2012 - 2013

**Undergraduate Researcher
California State University, Northridge**

Advisor: Dr. Ernest Kwok
Identified and characterized intracellular organelles in *Arabidopsis thaliana* mutantized cells. Transfected wild type *Nicotiana tobacco* and *Arabidopsis thaliana* with fluorescently tagged protein. Used epifluorescence microscope (Zeiss Axio Imager 2 with ApoTome and Axio Observer) to identify localization of fluorescently tagged protein. First author scientific publication and figures were independently designed and written.

2012

**NSF-Sponsored Undergraduate Researcher
University of California Riverside: Center for Plant Cell Biology**

Advisor: Dr. Howard Judelson
miRNA gene silencing technology to reduce a highly expressed gene in *Phytophthora infestans*. Ribosomal promoter assays to find the most effective promoter for a low expression gene. Development, gene function and pathogenicity research.

Publications

- November 2020** Careen Khachatoorian, Wentai Luo, Kevin J. McWhirter, James F. Pankow, Prue Talbot. "Tracking the Movement of Electronic Cigarette Flavor Chemicals and Nicotine from Refill Fluids to Aerosol, Lungs and Exhale." BioRxiv. (2020) doi: 10.1101/2020.11.13.382309
- December 2018** Careen Khachatoorian, Peyton Jacob III, Amy Sen, Yifang Zhu, Neal L. Benowitz, Prue Talbot. "**Electronic Cigarette Exhaled Aerosol Residue Chemicals in Field Sites.**" Environmental Research. 170 (2019):351-358. doi: 10.1016/j.envres.2018.12.027
- August 2018** Careen Khachatoorian, Peyton Jacob III, Neal L. Benowitz, Prue Talbot. "**Electronic Cigarette Chemicals Transfer from a Vape Shop to a Nearby Business in a Multiple-Tenant Retail Building.**" Tobacco Control. 2018; 0:1-7. doi:10.1136/tobaccocontrol-2018-054316
- December 2015** Laetitia Poidevin, Kalina Andreeva, Careen Khachatoorian, and Howard S. Judelson. 2015. "**Comparisons of Ribosomal Protein Gene Promoters indicate Superiority of Heterologous Regulatory Sequences for Expressing Transgenes in *Phytophthora infestans*.**" PLoS ONE 10 (12): e0145612. doi:10.1371/journal.pone.0145612
- April 2015** Careen Khachatoorian, Rigoberto A. Ramirez, Fernando Hernandez, Raphael Serna, and Earnest Y. Kwok. 2015 "Overexpressed Arabidopsis Annexin4 Accumulates in Inclusion Body-like Structures." Acta Histochemica 117 (3): 279-287. doi: 10.1016/j.acthis.2015.03.005

Posters

- March 2021** E-cigarette Fluids and Exhaled Residue Cause an Inflammatory Response in Both Human Keratinocytes and a 3D Skin Model
Society of Toxicology Virtual Conference
- March 2020** Transfer, Retention, and Aerosol Exhale Emissions of Flavor Chemicals and Nicotine during Electronic Cigarette Use

March 2019	Society of Toxicology Virtual Conference Electronic Cigarette Exhaled Aerosol Residue in Field Sites
October 2018	Society of Toxicology Conference in Baltimore, MD Electronic Cigarette Exhaled Aerosol Residue in Field Sites
March 2018	Southern California Society of Toxicology Conference in Irvine, CA Electronic Cigarette Chemicals Transfer from a Vape Shop to a Nearby Business in a Multiuser Building
October 2015	Society of Toxicology National Conference in San Antonio, TX Evidence that Vape Shops Distribute Electronic Cigarette Aerosol to Adjacent Businesses Tobacco Control, Research, and Education: Joining Forces to Address New Challenges Conference in Sacramento, CA
October 2015	Evidence that Vape Shops Distribute Electronic Cigarette Aerosol to Adjacent Businesses Southern California Society of Toxicology Conference in Carlsbad, CA

Presentations

February 2021	Identification, Quantification, and Cytotoxicity of Electronic Cigarette Exhaled Aerosol Residue (ECEAR) Thirdhand Smoke Consortium
September 2018	Electronic Cigarette Exhaled Aerosol Residue in Field Sites UCR CMDDB Program in Riverside, CA
October 2017	Evidence that Vape Shops Distribute Electronic Cigarette Aerosol to Adjacent Businesses Southern California Society of Toxicology Conference in San Diego, CA
August 2012	Improving Tools for Manipulating Genes in <i>Phytophthora infestans</i> UCR, Center for Plant Cell Biology

Media

2021	Tobacco-Related Disease Research Program News “Postdoc wins Society of Toxicology conference award” https://www.trdrp.org/news/khachatoorian-postdoc-wins-society-toxicology-conference-award.html
2020	Mirror-Spectator AESAs 2019 Scholarship Awardee, Careen Khachatoorian https://mirrorspectator.com/2020/02/20/aesa-2019-scholarship-awardee-careen-khachatoorian/
2019	UC Riverside News “UCR student researcher takes smoking personally” https://news.ucr.edu/articles/2019/02/21/ucr-student-researcher-takes-smoking-personally
2018	Reuters Vaping residue can transfer between rooms https://cn.reuters.com/article/us-health-vaping-residue-idUSKCN1LQ1XH