

Careen Khachatoorian, Ph.D.
Toxicologist

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Education and Degrees Earned

- Ph.D. Cell Molecular Developmental Biology, University of California, Riverside, 2020
- Bachelor's Degree in Biotechnology, California State University, Northridge, 2012

Experience Summary (Professional Career)

Paustenbach and Associates
Toxicologist
Orange County Office
November 2022 – Present

- Consultant in toxicology, occupational health, industrial hygiene, risk assessment, state-of-the-art, and safety.
- Expert in new assessment methods (NAMs) in toxicology.
- Currently focused on industrial chemicals, consumer products, pharmaceuticals, pesticides, cosmetics, household products, asbestos, airborne particles, e-cigarettes (vaping), radionuclides, and medical devices.
- Involved in litigation work, interpreting toxicological studies, conducting exposure assessments, assessing mathematical models for dose-response curves, and characterizing risks posed by chemicals in the environment

Study Director
Institute for In Vitro Sciences
Gaithersburg, MD
July 2021 – September 2022

- Assisted commercial clients to develop appropriate in vitro toxicology programs for their product(s) by providing expertise in developing and executing research projects using reconstructed human epidermis and ocular models such as EpiDerm™, EpiOcular™, EpiOral™, and EpiVaginal™ (MatTek Corporation).

- Conducted and closely supervised the commercial contract and maintained a timeline while communicating data, results, and details of the study with study monitors. Wrote reports and summaries of experiments and determine outcomes based on EPA, FDA, and OECD guidelines.
- Trained biologists to conduct assays according to protocols and guidelines. Mentored new study directors. Established new and follow existing SOPs in all assays and procedures. Worked with quality assurance (QA) department to ensure government guidelines and GLP guidelines are followed.
- Managed the following testing programs:
 - OECD Test Guideline 431 “In Vitro Skin Corrosion: Reconstructed Human Epidermis (RHE) Test Method”
 - OECD Test Guideline 439, “In Vitro Skin Irritation: Reconstructed Human Epidermis Test Method”
 - OECD Test Guideline 492 “Reconstructed human Cornea-like Epithelium (RhCE) test method for identifying chemicals not requiring classification and labeling for eye irritation or serious eye damage”
 - Test Guideline No. 442C Key Event-Based Test Guideline for in chemico skin sensitisation assays addressing the Adverse Outcome Pathway Key Event on Covalent Binding to Proteins
 - Office of Pesticide Programs, U.S. EPA “Use of an Alternate Testing Framework for Classification of Eye Irritation Potential of EPA-Regulated Pesticide Products
 - ISO 10993-23 Biological Evaluation of Medical Devices - Part 23: Tests for Irritation
 - ISO 10993-12 Biological Evaluation of Medical Devices — Part 12: Sample preparation and reference materials

Postdoctoral Researcher
University of California, Riverside
Riverside, CA
January 2021 – June 2021

- Analyzed proteins and metabolites secreted from 3D in vitro dermal models (EpiDerm™) exposed to Electronic cigarette refill fluids and flavor chemicals to understand the affected pathways. Explore the underlying transcriptional programs using upstream analysis in Qiagen Ingenuity pathway (IPA).

BSL-2 Lab Technician
Fulgent Genetics
Tempe City, CA
March 2020 – October 2020

- 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. Used Hamilton Microlab VANTAGE Liquid Handling System.

Graduate Student Researcher
University of California, Riverside
Riverside, CA
September 2013 – December 2020

- 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™).
- Followed ISO protocol #10993–5 for 2D MTT cytotoxicity assays.

PUBLICATIONS

Peer-Reviewed Publications

1. Hua M, Luo W, **Khachatoorian C**, McWhirter KJ, Leung S, Martinez T, Talbot P. Exposure, Retention, Exhalation, Symptoms, and Environmental Accumulation of Chemicals During JUUL Vaping. *Chem Res Toxicol*. 2023 Mar 20;36(3):492-507. doi: 10.1021/acs.chemrestox.2c00390. Epub 2023 Mar 3. PMID: 36867872.
2. **Khachatoorian C**, McWhirter KJ, Luo W, Pankow JF, Talbot P. Tracing the movement of electronic cigarette flavor chemicals and nicotine from refill fluids to aerosol, lungs, exhale, and the environment. *Chemosphere*. 2022 Jan;286(Pt 3):131494. doi: 10.1016/j.chemosphere.2021.131494. Epub 2021 Jul 10. PMID: 34392198; PMCID: PMC8787941.
3. **Khachatoorian C**, Luo W, McWhirter KJ, Pankow JF, Talbot P. E-cigarette fluids and aerosol residues cause oxidative stress and an inflammatory response in

- human keratinocytes and 3D skin models. *Toxicol In Vitro*. 2021 Dec;77:105234. doi: 10.1016/j.tiv.2021.105234. Epub 2021 Aug 17. PMID: 34416289; PMCID: PMC8627378.
4. **Khachatoorian C**, Jacob P 3rd, Sen A, Zhu Y, Benowitz NL, Talbot P. Identification and quantification of electronic cigarette exhaled aerosol residue chemicals in field sites. *Environ Res*. 2019 Mar;170:351-358. doi: 10.1016/j.envres.2018.12.027. Epub 2018 Dec 16. PMID: 30623881; PMCID: PMC6410739.
 5. **Khachatoorian C**, Jacob Iii P, Benowitz NL, Talbot P. Electronic cigarette chemicals transfer from a vape shop to a nearby business in a multiple-tenant retail building. *Tob Control*. 2019 Sep;28(5):519-525. doi: 10.1136/tobaccocontrol-2018-054316. Epub 2018 Aug 29. PMID: 30158206; PMCID: PMC6458093.
 6. Poidevin L, Andreeva K, **Khachatoorian C**, Judelson HS. Comparisons of Ribosomal Protein Gene Promoters Indicate Superiority of Heterologous Regulatory Sequences for Expressing Transgenes in *Phytophthora infestans*. *PLoS One*. 2015 Dec 30;10(12):e0145612. doi: 10.1371/journal.pone.0145612. PMID: 26716454; PMCID: PMC4696810.
 7. **Khachatoorian C**, Ramirez RA, Hernandez F, Serna R, Kwok EY. Overexpressed Arabidopsis Annexin4 accumulates in inclusion body-like structures. *Acta Histochem*. 2015 Apr;117(3):279-87. doi: 10.1016/j.acthis.2015.03.005. Epub 2015 Mar 26. PMID: 25818562; PMCID: PMC4409563

Presentations at Scientific Conferences

1. 2022. (March). Human Absorption and Margin of Exposure for Solvents, Nicotine, and Flavor Chemicals During JUUL™ Vaping. Society of Toxicology Annual Meeting, San Diego, California. Poster Presentation.
2. 2021. (March). E-cigarette Fluids and Exhaled Residue Cause an Inflammatory Response in Both Human Keratinocytes and a 3D Skin Model. Society of Toxicology Annual Meeting, Virtual Conference. Poster Presentation.
3. 2020. (March). Transfer, Retention, and Aerosol Exhale Emissions of Flavor Chemicals and Nicotine during Electronic Cigarette Use. Society of Toxicology Annual Meeting, Virtual Conference. Poster Presentation.
4. 2019. (March). Electronic Cigarette Exhaled Aerosol Residue in Field Sites. Society of Toxicology Annual Meeting, Baltimore, MD. Poster Presentation

5. 2018. (October). Electronic Cigarette Exhaled Aerosol Residue in Field Sites. Southern California Society of Toxicology Conference, Irvine, CA. Poster Presentation.
6. 2018. (March). Electronic Cigarette Chemicals Transfer from a Vape Shop to a Nearby Business in a Multiuser Building. Society of Toxicology Annual Meeting, San Antonio, TX . Poster presentation
7. 2015. (October). Evidence that Vape Shops Distribute Electronic Cigarette Aerosol to Adjacent Businesses. Tobacco Control, Research, and Education: Joining Forces to Address New Challenges Conference, Sacramento, CA. Poster Presentation.
8. 2015. (October). Evidence that Vape Shops Distribute Electronic Cigarette Aerosol to Adjacent Businesses. Southern California Society of Toxicology Conference, Carlsbad, CA. Poster presentation.

Certificates

- Society of Quality Assurance - GLP Study Director and Principal Investigator Training
- Good In Vitro Method Practices (GIVIMP) - EU-60: developing in vitro methods and approaches for scientific and regulatory use

Professional Honors/Awards

- March 2021. Society of Toxicology Dermal Tox Specialty Section Graduate Student Abstract Award
- October 2019. Armenian Engineers & Scientists of America Graduate Student Scholarship
- Spring 2019. Certificate of Completion of Science to Policy Program at UCR
- March 2019. Society of Toxicology Exposure Specialty Section Best Abstract Award - Honorable Mention
- 2014. NSF Integrative Graduate Education and Research Traineeship Video Bioinformatics Fellow. University of California, Riverside
- 2013. Dean's Fellowship Award. University of California, Riverside
- 2012. Biology department honors and Cum Laude graduate. California State University, Northridge
- 2010 – 2011. Dean's List. California State University, Northridge

Membership and Service to Professional Societies

- Reviewer for Critical Reviews in Toxicology
- Coalition for Tobacco Free Communities. Riverside, CA

- Armenian Professional Society
- Society of Toxicology
- Graduate Student Mentorship Program. University of California, Riverside
- Armenian Engineers and Scientists of America
- Student Fee Advisory Committee. California State University, Northridge
- National Society of Leadership and Success Sigma Alpha Pi Chapter. California State University, Northridge

Media

- UC Riverside News. Electronic cigarette chemicals can damage and inflame human skin. <https://insideucr.ucr.edu/stories/2021/10/04/electronic-cigarette-chemicals-can-damage-and-inflame-human-skin>
- 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>
- UC Riverside News. Postdoc wins Society of Toxicology conference award <https://insideucr.ucr.edu/awards/2021/03/02/postdoc-wins-society-toxicology-conference-award>
- Mirror-Spectator. AESA 2019 Scholarship Awardee, Careen Khachatoorian. <https://mirrorspectator.com/2020/02/20/aesa-2019-scholarship-awardee-careen-khachatoorian/>
- UC Riverside News. “UCR student researcher takes smoking personally”. <https://news.ucr.edu/articles/2019/02/21/ucr-student-researcher-takes-smoking-personally>
- Reuters. Vaping residue can transfer between rooms. <https://cn.reuters.com/article/us-health-vaping-residue-idUSKCN1LQ1XH>