Dr. Sherman Hom Cannabis Experience

In 2011 at the New Jersey Department of Health Division of Public Health and Environmental Laboratories, Dr. Hom was the Project Manager that led a team that started the first Cannabis Testing Laboratory in support of the Medical Cannabis Program. The group of analytical chemists validated methods for the quantitation of 8 cannabinoids using HPLC UV-DAD, of various heavy metals using ICP-MS, and of various aflatoxins & ochratoxin A using affinity chromatography & HPLC MS.

From 2019 to 2021, Sherman was the Project Manager of a team that started the Cannabis Microbial Testing Lab and validated qPCR methods to detect shiga toxin producing *E. coli*, *Salmonella* spp., and the four human pathogenic species of *Aspergillus* (*A. flavus, A. fumigatus, A. niger,* and A. *terreus*).

From 2017 to 2021, he led a team that created the first continuously updated Medical Cannabis Testing Regulations by State. Comparative analyses were performed to make general observations and identify gaps & trends in the testing rules. For example in 2019, a literature search identified 25 chemical pesticides that were detected in a cannabis marketed product. Of these 25 pesticides, nine pesticides were not required to be tested by any state, while the other sixteen pesticides were required to be tested by various fractions of the states. Moreover in 2019, sixteen (16) of 27 states (59%) had a unique set of microbial testing regulations.

Dr. Hom is now the Director of Regulatory Affairs at Medicinal Genomics Corporation (MGC), which markets genetics-based cannabis tests and breeding technologies. His primary responsibility is to make recommendations to state, territory, tribal nations, and country regulatory and legislative officials that are tasked with either drafting and/or modifying cannabis, hemp, and psychedelic mushroom required microbial testing regulations and bills to ensure safe products for patients and consumers. Approximately 70% of the US jurisdictions have partially or fully adopted cannabis microbial contamination testing regulations based on scientific principles.

Another major task is to continuously update MGC's Cannabis Microbial Testing Regulations by US State, Washington D.C., Territory, and tribal nations. (https://www.medicinalgenomics.com/cannabis-microbial-testing-regulations-by-state/). Comparative analyses of the microbial testing rules for the cannabis product types (plant material, concentrates, edibles, and infused-products non-edible) by state have been performed to provide information concerning general observations, identify gaps, and trends over the previous 5 years.

A third task is the creation of cannabis standards. Sherman supports the AOAC's Cannabis

Analytical Science Program (CASP), the National Cannabis Laboratory Council, and the Association of Food and Drug Officials Cannabis Committee.

Lastly, Dr. Hom has proposed next steps in providing the genomic data to support a panel of national, regional, state, or country subject matter experts in various fields to engage in a dialogue to propose a consensus set(s) of cannabis microbial contaminant testing rules. The technology to obtain this genomic data has been developed by the MGC R&D team.

Sherman has a B.A. in Biology from the University of California at San Diego, a Ph.D. in Microbiology from University of California at Davis, and was a Postdoctoral Fellow in Molecular Genetics at Department of Biology, The John Hopkins University (Baltimore, MD).

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OBJECTIVE

- To add value to the emerging cannabis, hemp, and psychedelic mushroom industries by working with regulatory and legislative officials tasked with drafting new or amending microbial testing rules and legislation to ensure safe medical plant products for patients and consumers.

EDUCATION

- The Johns Hopkins University. Baltimore, MD. Post-Doctoral Fellow. Molecular Genetics.
- University of California, Davis. Davis, CA. Ph.D. Microbiology.
- University of California, San Diego. La Jolla, CA. B.A. Biology.

SKILLS

- Cannabis Industry
  - ❖ Educating regulatory and legislative officials concerning 1) drafting and/or modifying medical and adult use cannabis microbial testing rules, 2) allowable methods, 3) types of microbes (total counts *vs.* specific pathogens), 4) action levels, and 5) other testing issues, such as Proficiency Testing Programs.
  - ❖ Cannabis microbial testing regulations database management
  - ❖ Performing comparative analyses of microbial testing regulations database to identify industry trends and identify gaps
  - ❖ Subject matter expert on molecular technologies to detect total microbial cells and/or specific pathogens in cannabis manufactured products
- Program/Project Management
  - ❖ Public Health Laboratory Services
    - ➢ Pandemic Activity - Coordinator of all pre-analytical activities in support of SARS-CoV-2 testing at all New Jersey clinical laboratories, which includes NJ Dept. of Health Public Health Laboratory, acute care hospital, and reference laboratories
    - ➢ Microbial Testing of Cannabis Products
    - ➢ Drugs of Abuse Screening Laboratory
    - ➢ Sexually Transmitted Diseases Testing Laboratory
    - ➢ CDC's Laboratory Response Network Laboratory
    - ➢ USDA's Food Emergency Response Network Laboratory
    - ➢ Molecular Diagnostics Laboratory
    - ➢ Molecular Subtyping Laboratory
    - ➢ West Nile Virus Testing Laboratory

        - ➢ US Dept. of Homeland Security BioWatch Testing Program
        - ➢ Client Services Program
            - ✓ Specimen Receiving & Distribution Unit
            - ✓ Central Service Unit
            - ✓ Materials Management Unit
            - ✓ Field Deployable Laboratory Unit
- Lab building design and specifications (including Molecular Core Lab)
    - ❖ Biosafety Level-2 and Level-3 Laboratory design and specifications
- Academic research & development programs in agricultural microbiology
- Industrial research & development programs in bacterial degradative enzyme
- Molecular Biology
    - ❖ Automated high throughput isolation of nucleic acids
    - ❖ Gene bank construction in cosmid and phage vectors
    - ❖ Gene isolation, characterization, and overexpression
    - ❖ Real-time PCR
    - ❖ Instrumentation
        - ➢ Beckman Coulter AU680 Chemical Analyzer, Dynex Technologies DSX ELISA System
        - ➢ Real-time PCR: Cepheid Smart Cycler, ABI 7500 FAST Dx, ABI 7900HT, ABI 7000, and Roche Light Cycler
        - ➢ Automated DNA isolation: Qiagen Biorobot 9604B & Roche MagnaPure Compact
        - ➢ DiversiLab System for molecular subtyping
- Microbiology
    - ❖ Microbiology professor
    - ❖ BioSafety Level-3 laboratory experience
    - ❖ Aseptic techniques
    - ❖ Culturing bacteria (select agents, enterics, bacilli, pseudomonas, *etc.*)
    - ❖ Microscopy (gram, acid fast, spore stains, *etc.*)
    - ❖ Aerobic and anaerobic bacterial physiology
    - ❖ Viruses (T4, P22, lambda, Mu, gamma, EEE, and West Nile)
    - ❖ Immunology (time resolved fluorescence assay)
- Biochemistry
    - ❖ Protein purification
        - ➢ Column Chromatography
        - ➢ Polyacrylamide gel electrophoresis
- Business Development
    - ❖ Creator, writer, and business developer for a successful technical bioremediation newsletter
    - ❖ Consultant in the environmental remediation field

CANNABIS INDUSTRY EXPERIENCE

Medicinal Genomics Corporation, Beverly, MA

Director of Regulatory Affairs. 4/2021 to present.

Primary responsibility is to make recommendations to medical and/or adult use cannabis, hemp, and psychedelic mushroom regulatory legislative officials on drafting new and/or amended testing rules and legislation, especially microbial contamination detection and

speciation testing. Other activities include 1) supporting sales staff by responding to any inquiries concerning regulatory in their sales territory, and 2) participating in AOAC International Cannabis Analytical Science Program Microbial Contaminant Working Group.
NOTE: See 4 additional Cannabis Experiences (see bold font below in next section) from 2011-2013 and 2017-2021 at the NJ Department of Health

PUBLIC HEALTH EXPERIENCE
New Jersey Department of Health, Ewing, NJ.
Research Scientist 1, Division of Public Health and Environmental Laboratories (PHEL). 3/2020 to 4/2021. Project Manager: coordinating all pre-analytical activities in support of SARS-CoV-2 testing at PHEL, all NJ acute care hospitals, and all NJ commercial reference laboratories. Includes 1) leading an 18 day fast track implementation of a 18 staff unit for PHEL specimen collection, packaging, and transport to PHEL and subsequent rapid opening, sorting, accessioning, distribution, and tracking of all received specimens 2) co-leading an ongoing effort of purchasing, receiving, packaging, and shipping specimen collection materials to NJ acute care and commercial labs, and 3) leading a 5 staff solutions unit for supplying specimen collection materials in support of testing activities of NJ underserved populations.

5/2019 to 4/2021. **Project Manager for the Microbial Testing of Cannabis Unit within the Client Services Program.** Directed one Sr. Scientist for the validation of qPCR tests (Medicinal Genomics, Beverly, MA) for the detection of shiga toxin producing *E. coli*, *Salmonella* species, and the four pathogenic strains of *Aspergillus* (*A. flavus, A. fumigatus, A. niger,* and *A. terreus*).

Summers 2017 - 2021. **Directed the development and maintenance of the All-States Cannabis Testing Regulations databases.** Comparative analyses were conducted focusing on microbial and pesticide contamination that yielded an observation in required microbial testing and a gap in required pesticide testing

Summer 2019. **Directed the development of the All-States 3rd party cannabis laboratory testing regulations.** Comparative analyses were conducted that yielded many trends and gaps in these regulations.

7/2015 to 4/2021. Project Manager for the Division of Public Health and Environmental Laboratories (*e.g.,* Cost savings projects, such as managed print services project, state contracted courier services, *etc.*)

12/2011 to 1/2013. **Project Manager - successfully developed a Medicinal *Cannabis* Testing Laboratory to ensure product quality and regulatory compliance.** Tests that were developed, validated, and implemented included profile of 8 cannabinoids by HPLC UV/DAD-MS Ion Trap chromatography, pesticides by GC/MS, Aflatoxins and Ochratoxin by immunoaffinity chromatography-HPLC fluorescence detection, and heavy metals by ICP-MS/MS.

11/2010 to 6/2015. Program Manager and Scientific & Technical Coordinator for Automated Assays Program. Project management for Oral Fluid and Urine Specimens Screening for Drugs of Abuse testing program (180,000 specimens/yr.) for NJ Administrative Office of the Courts and Sexually Transmitted Diseases Laboratory Testing Unit (50,000 specimens/yr.)

8/2002 to 10/2010. Senior administrative/technical scientist for the BioThreat Response Laboratory (BTRL), Food Emergency Response Network Laboratory (FERN), and Molecular Detection Services (MDS) Programs. Responsible for enhancing the BTRL emergency preparedness and response capabilities for a bioterrorism event, other disease outbreak, and public health threat or emergency. Laboratory Units included Sample Processing, Confirmatory & Reference Testing, Bioterrorism Food Safety, and Rapid Methods. Activities included hiring staff, training, complying with the Select Agent Regulation, maintaining proficiency in all Laboratory Response Network test methods, and testing over 30,000 environmental samples for select agents. Participated in technical design and subsequent procurement of the modular BSL-3 facility. Over 5 years, awarded $2.3M research funding from FERN for development of various molecular diagnostic assays for food matrices. Responsible for developing the MDS Program and a Molecular Core Facility. MDS has developed and/or validated rapid molecular detection assays for a variety of bacterial and viral pathogens that cause respiratory, tickborne, and rash illnesses. Specific bacterial pathogens include *Bordetella, Legionella, Mycobacterium, Chlamydia, Borrelia, Ehrlichia, Babesia,* and *Bartonella* species. Viral pathogens include enteroviruses and herpes simplex 1/2. Using the DiversiLab System for rapidly subtyping microbial species, created a library of patterns for 52 Streptococcus pneumonia subtypes. BTRL and MDS Program staff included 1 coordinator, 1 administrative support staff, and 7 technical staff. Served as technical expert for BioWatch program and hired 4 staff. Responsible for bringing in and mentoring first ever Post-Doctoral Fellow (Emerging Infectious Disease Laboratory Fellow funded by APHL) at this laboratory. This PhD molecular epidemiologist is now the Laboratory Director at the North Carolina State Public Health & Environmental Laboratories.

10/2001 to 7/2002. Laboratory Manager for the Rapid Detection Methods of Bioterrorism (BT) Agents. Validated TaqMan PCR assays to detect biothreat agents using the Roche LightCycler real time PCR platform. During Fall 2001 Anthrax Outbreak, upon CDC's request, troubleshot the gamma-phage confirmatory test for CDC. Successfully decreased the incubation time from 16-20 hrs. to 7 hrs. Successfully utilized Gamma Phage Test to confirm over 200 environmental isolates of *Bacillus anthracis.*

1/2001 to 7/2002. Laboratory Manager of the West Nile Virus (WNV) Laboratory Unit responsible for real time PCR testing of approximately 17,500 human, avian, and mosquito samples per year for detection of WNV. Participated in bringing online the ABI 7900 HT real time PCR platform and Qiagen 9604B BioRobot for nucleic acid isolation and assay set up. Modified established TaqMan PCR assay for detection of WNV and decreased assay cost by 40%. Directed development of a duplex real time

PCR TaqMan assay to simultaneously detect West Nile and Eastern Equine Encephalitis viruses.

RESEARCH EXPERIENCE

Henkel Research Corporation, Santa Rosa, CA. Senior Research Scientist, Molecular Genetics Department. 6/1985 to 6/1989. Cloned, characterized, and increased expression of bacterial genes that produced enzymes, such as proteases, lipases, and amylases for the fats & oils and detergents industry. Lipase gene was licensed to a pharmaceutical firm for resolution of racemic mixtures of molecules containing ester bonds to isolate pure active drugs that contained a single isomer. Protease gene was utilized in an industrial production system to produce 3,000 tons of alkaline & heat resistant enzyme per year for inclusion into the company's laundry detergent at a cost saving of $100 million dollars per year since 1990. Also prepared and characterized bacteria-produced biodegradable plastics for possible production of biodegradable containers.

Technical Information Scientist. 6/1989 to 2/1992. Prepared literature & patent search reports for new projects development.

The Johns Hopkins University, Baltimore, MD. Post-Doctoral Fellow in Department of Biology. 12/1982 to 5/1985. Cloned and characterized bacterial genes involved with nitrogen and carbon fixation.

University of California, Davis, Davis, CA. Graduate student in Microbiology. 4/1977 to 12/1983. Thesis: Transposon-induced mutagenesis of *Rhizobium japonicum* (bacterium that forms a nitrogen fixation mutualistic relationship with the soybean plant). Created 10,000 mutants, which opened the genetics for this agronomically important microorganism.
NOTE: This revolutionary mutagenesis system for creating mutants in *R. rhizobium* was used to open the genetics for numerous other difficult to study Gram Negative bacterial systems.

University of Connecticut Medical School, Farmington, CT. Research Assistant. 6/1975 to 8/1976. Created the first liposomes. Isolated and characterized the actin binding protein from human red blood cell membranes.

TEACHING EXPERIENCE

Ramapo College of New Jersey, Mahwah, NJ. Assistant Professor of Biology, School of Theoretical and Applied Science. 9/2000 to 1/2001. Taught majors General Biology (lecture and lab).

Bergen Community College, Paramus, NJ. Adjunct Instructor, Division of Science and Health. 9/2000 to 1220/00. Taught non-majors General Biology (lecture & lab).
Los Angeles Harbor College, Wilmington, CA. Assistant Professor, Department of Biology. 8/1999 to 5/2000. Taught Microbiology (lecture and lab) and non-majors General Biology (lab).

Rio Hondo College, Whittier, CA. Adjunct Instructor, Division of Mathematics and Science. 6/1998 to 8/2000. Taught non-majors General Biology (cell & molecular biology emphasis; lecture and lab).

College of the Canyons, Santa Clarita, CA. Adjunct Instructor, Department of Biology. 8/1998 to 7/1999. Taught non-majors General Biology (organismal & environmental biology emphasis; lecture & lab).

American University of the Caribbean, School of Medicine, St. Maarten, Netherlands Antilles. Adjunct Assistant Professor, Department of Biochemistry & Molecular Biology. 8/1995 to 8/1997. Taught Molecular Genetics.

BUSINESS EXPERIENCE

Environmental Solutions, Santa Rosa, CA. President. 5/1992 to 7/1995. Consulting and field services regarding bioremediation of water, soil, and solid waste.

Cognis, Inc., Santa Rosa, CA. 2/1991 to 4/1992. Technical Information Scientist. Developed bioremediation information products. Developed biotreatment database (7,500 abstracts from journal articles and patents).

PROFESSIONAL PUBLICATIONS

2 patents, 16 articles published in professional journals & books, 10 presentations at scientific conferences, 1 nucleic acid sequence (see below)

HONORS & AWARDS

Who's Who of California and Institute of Oriental Philosophy

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

AOAC International Cannabis Analytical Science Program, Microbiology Work Group 2019-present
ASTM D37 Cannabis Committee 2021-present
New Jersey Cannabusiness Association Laboratory Testing Committee 2021 to present

REFERENCES

Available upon request.

PUBLICATIONS

PATENTS

Wilson, R., B. Ladin, J. Mielenz, S. Hom, D. Hansen, R. Reynolds, C. Paech, N. Kennedy, J. Schlindler, M. Bahn, R. Schmid, & M. Markgraf. 1989. Alkaline proteolytic enzyme and method of production. U.S. Patent Number 5,352,604

S.S.M Hom and J.R. Mielenz. 1988. Lipase gene and its uses. U.S. patent application number 07/216,565.

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Shone, S.M., Dillon, H.J., Hom, S.S., and Delgado, N. 2006. A Novel Real-Time PCR Assay for the Speciation of Medically Important Ticks. *Vector Borne Zoonotic Dis.* 6:152-160.

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Hom, S. 2003. *Science Careers: Personal Accounts from the Experts.* Ed. L. Flowers. Scarecrow Press Inc., Lanham, MD. Pgs. 123-130.

Hom, S., P. Bryant and H.A. Preston. 2002. Detection of West Nile Virus in Mosquito Pools Collected in New Jersey During 2001. *Proc. New Jersey Mos. Control Assoc.* pgs 6-11.

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Maier, R.J. and S.S.M. Hom. 1986. H_2 uptake negative (Hup^-) mutants of *Rhizobium* and their use in the isolation of *hup* genes. In: *Methods of Enzymology: Plant Molecular Biology*, Vol. 118. Eds. A. Weissbach and H. Weissbach; pp 528-536.

Hom, S.S.M., L.A. Graham, and R.J. Maier. 1985. Isolation of genes (*nif/hup* cosmids) involved with hydrogenase and nitrogenase activities in *Rhizobium japonicum.* *J. Bacteriol.* 161:882-887.

Hom, S.S.M., S.L. Uratsu, and F. Hoang. 1984. Transposon Tn5-induced mutagenesis of *Rhizobium japonicum* yielding a wide variety of mutants. *J. Bacteriol.* 159:335-340.

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Shanmugam, K.T., S.T. Lim, S.S.M. Hom, D.B. Scott, and H. Hennecke. 1981. *Redox Control of nitrogen fixation: An overview.* In: *Genetic Engineering of Symbiotic Nitrogen Fixation and Conservation of Soil Nitrogen.* Eds. J.M. Lyons, R.C. Valentine, D.A. Phillips, D.W. Rains, and R.C. Huffaker. Plenum Press, New York, pp 79-93.

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S. Hom, K. May, M. Rashed, and J. Rawson. 2023. *Challenges of Regulating the Cannabis Industry.* CannMed 2023 Innovation and Investment Summit. Marco Island, FL. May 2023.

S. Audino (Moderator), K. Doyle, K, Mueller, J. Wung, H. Krug, and S. Hom. 2022. *Coalescing State Regulatory Needs with Scientific Excellence to Optimize Consumer Safety.* CannMed 2022. Pasadena, CA. May 2022.

CONFERENCE PRESENTATIONS

Hom, S. *2024 Research Spotlight: Known Risks of Cannabis Use and Abilit to Test for Them.* Annual Indigenous Cannabis Industry Association Policy Summit. Washington D.C. November 2024

Hom, S. *Chaos to Consensus" →NEW INFOTECH: Constantly Updated Compendium-Cannabis Microbial Testing Regulations Across 50 States & 5 Territories.* CannMed 2023 Innovation and Investment Summit. Marco Island, FL. May 2023.

Patel, S., Nguy, S., and Hom, S. *Compendium and Comparison of State Medical Cannabis Testing.* 2019 North American Cannabis Summit. Los Angeles, CA. January 2019.

Patel, B.R., Wene, D.J., Hom, S.S., and Parsa, B. *Quantitative Determination of Cannabinoids in Cannabis Plant Material Using High Performance Liquid Chromatography – UV Diode Array-Mass Spectrometry (Trap) Detector.* 2015 Eastern Analytical Symposium & Exposition. Somerset, NJ. November 2015.

Delgado, N., DasGupta, S., Worrell, O., Hom, S., McHugh, L.A., Robertson, C.A., Pitts, S., Cadoff, E., Kirn, T.J. 110th Annual Meeting of the American Society for Microbiology. San Diego, CA. May 2010

Delgado, N., Mediavilla, J., Shone S.M., and Hom, S. *Bordetella pertussis* Identification by Real-Time PCR: A CLIA-Compliant Assay. International Conference on Emerging Infectious Diseases 2006, Atlanta, Georgia, March 2006.

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NUCLEIC ACID SEQUENCE

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