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## Mark C. Krause

Mr. Krause is currently the laboratory and technical director for Krause Analytical, LLC. He has extensive experience and expertise in the application and interpretation of chromatographic and spectroscopic methods of analysis to samples from a wide variety of sources. He has over 40 years of direct experience in environmental chemistry, food residue analysis, semiconductor, bioanalytical, pharmaceutical and trace forensic analysis.

Mr. Krause is well-versed in the application of USEPA, APHA, ASTM, AOAC, ASA, FDA and NIOSH methods to the analysis of samples of environmental and public health concern. His expertise encompasses all facets of laboratory operation, both from a management as well as a technical nature. He consults to other laboratories in the areas of laboratory operations management, chromatographic and spectroscopic methods optimization and information management systems. He has installed several laboratories in the U.S. as well as abroad and trained the support personnel that staff them

In the environmental industry Mr. Krause has an in-depth knowledge of the environmental regulations, including the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), the National Pollutant Discharge Elimination System (NPDES), the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and applicable state level regulations. He has worked in the environmental field for nearly 40 years. He is intimately familiar with the requirements of these regulations regarding analytical testing and the production of high quality, court defensible data. He has been actively involved in routine testing as well as the creation and modification of analytical methods for analysis of compounds of environmental concerns where no acceptable approved methods exist, and is well published in the field of analytical testing.

In the food testing and food safety arena Mr. Krause has extensive experience in the FDA detention without physical examination (DWPE) program, the Food Safety Modernization Act (FSMA) and the Foreign Supplier Verification Program (FSVP). He routinely provides official DWPE as well as field screening support services to clients in the following areas:

- Residue analysis, including pesticides/herbicides, aflatoxins and veterinary residues
- Microbiology, including *salmonella*, *listeria*, and *e. coli*
- Elemental analysis, including trace elements in food and cookware
- Elemental speciation for arsenic including organic/inorganic speciation
- Synthetic color analysis
- Preservatives and other chemical additives
- Amino acid analysis, including PDCAAS
- Nutritional labeling requirements, including translation, preparation and verification of labels



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Mr. Krause has been actively involved in both chemical and microbiological testing of food and food products for over a decade. He is well-versed in the use and application of a wide range of chromatographic and spectroscopic techniques, including liquid chromatography with both mass spectrometry as well as selective detectors (fluorescence, ultraviolet, conductance, and refractive index), gas chromatography with both mass spectrometry as well as selective detectors (flame ionization, Hall ECD, flame photometric, electron capture, chemiluminescence, atomic emission and infrared), ion chromatography with both mass spectrometry and conductance as well as elemental and spectroscopic methods such as UV spectroscopy, FT-infrared spectroscopy, inductively coupled plasma with both mass spectrometry as well as emission spectroscopy. He is also versed in many specialized techniques, such as thin layer chromatography, selective ion electrode analysis, gravimetry and titrimetry. He has experience with classical enrichment and selective media use in microbiology as well as use of PCR techniques for presumptive and confirmational analysis.

Mr. Krause has been a principal in five private laboratory operations since 1985, as well as previously serving as laboratory director and senior chemist for various government and private environmental laboratories. He has developed proprietary petroleum fingerprinting techniques and has consulted widely in typing, sourcing and tracing petroleum contamination in the state of Texas. He has developed proprietary, accelerated testing methods for product stability testing as well as multiple custom methods for bioanalytical and pharmaceutical support services.

2016 to present  
Laboratory Director/COO  
Chief Technical Director  
Krause Analytical, LLC  
Austin, TX

Serves in the capacity of laboratory director and chief technical resource for an analytical testing laboratory. Krause Analytical offers a variety of services, including legal expert support for petroleum storage (PST) and risk reduction (TRRP) programs, analytical consulting services, FDA Detention Without Physical Examination (DWPE) and Food Safety Modernization (FSMA) analyses, semiconductor and process control support, bioanalytical and pharmaceutical support services and forensic analysis. Duties include production and validation of analytical data, consulting, expert testimony, methods development, basic research, client contact, project management and general business operations.



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## **Expert testimony**

Defendant's expert in a defective product suit  
Data review, sampling and analysis, expert testimony  
Currently in federal court in Texas

Defendant's expert in a wrongful death case  
Data review, medical data interpretation and consulting  
Currently awaiting trial

Plaintiff's expert in a property value diminution case – environmental contamination  
Chemistry and regulatory data review, sample analysis  
Case is not yet filed

Defendant's expert in a Superfund/PRP case  
Data review, regulatory review and interpretation  
Case dropped by state

Defendant's expert for a cannabinoid/hemp retail store  
Expert witness, chemistry and regulatory  
Currently awaiting trial date

Defendant's expert in a deceptive trade practices suit  
Expert witness, chemistry and plant physiology  
Currently in federal court

Defendant's expert in a capital murder trial  
Data review and expert witness  
Defendant found guilty

Plaintiff's expert for a pipeline leak and diminution of property value  
Laboratory services and expert witness  
Settled out of court

Plaintiff's expert for a pipeline leak and diminution of property value  
Provided laboratory services and expert witness  
Court found for the Plaintiff

Plaintiff's expert in a class action suit against a nutraceutical manufacturer for deceptive labeling  
Laboratory services and expert witness  
On-going



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Plaintiff's expert for a large oilfield storage tank rupture and land contamination  
Laboratory services and expert witness  
Settled out of court

Defendant's expert for a gas plant cleanup operation involving fuel typing and aging  
Laboratory services and expert testimony  
Settled out of court

Plaintiff's expert for pipeline scale formation and improper disposal of NORM scale  
Data review and expert witness  
On-going

Plaintiff's expert against a nutraceutical manufacturer for deceptive labeling  
Laboratory services and expert testimony  
Suit withdrawn

Defendant's expert in a marital misconduct case involving clothing stains  
Laboratory services  
Settled out of court

Plaintiff's expert against anaesthesia purification and supply manufacturer  
Laboratory services/methods development/expert witness  
Settled out of court

Defendant's expert for a wrongful death case involving anaesthesia  
Laboratory services  
Court found for plaintiff

Defendant's expert for a large underground plume at a gas plant involving fuel typing and aging  
Laboratory services and expert testimony  
Settled out of court

Plaintiff's expert in a convenience store transaction – fuel typing and aging  
Laboratory services and expert testimony  
Court found for Plaintiff

Plaintiff's expert in a medical malpractice suit involving improper manufacturing practices  
Laboratory services/methods development and expert testimony  
Settled out of court

Plaintiff's expert in a watershed rights and contamination hearing  
Expert testimony  
Hearing examiner found for plaintiff



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Defendant's expert in a watershed violation case  
Laboratory analysis and expert testimony  
State dropped charges

Defendant's expert in a stormwater violation case involving contamination of adjacent property  
Laboratory analysis and expert testimony  
Settled out of court

Plaintiff's expert in an IO/OP PST case involving fuel typing, aging and migration  
Laboratory analysis and expert testimony  
Court found for Plaintiff

Defendant's expert in a very large environmental discrimination lawsuit.  
Expert testimony  
Settled out of court

Defendant's expert in an explosives manufacturer's plant closure.  
Laboratory analysis and expert testimony  
Court found for defendant

Plaintiff's expert in a personal injury case involving mixed chlorine products  
Laboratory analysis and expert testimony  
Suit withdrawn based on laboratory findings.



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### **Environmental projects and property transactions**

133 convenience stores closed and transferred with closure letters

Reclamation of a brownfield property and construction of a pharmacy on the property.

47 convenience stores purchased – due diligence investigation

Sale of a large semiconductor manufacturing facility – due diligence with closure letter

Acquisition of a parking facility – due diligence with closure letter

Cleanup of approximately 8000 m<sup>3</sup> of hydrocarbon contaminated soil by bioremediation

Installation of a drilling mud bioremediation facility in Mexico.

Bioremediation of a Mexican beach contaminated with tar

Multiple brownfield bioremediations and closures.

### **Analytical Consulting**

Development of testing methodology for greenhouse growers to determine optimum harvest points for cannabis

Development of handheld spectroscopic systems for plant infections in greenhouse operations

Support in the construction of a DOE-funded experimental CO<sub>2</sub> removal plant; installation of the laboratory and training of personnel

Laboratory installation and training in support of a CaCl<sub>2</sub> plant in the Caribbean

Laboratory installation and training in support of a metals refiner in Mexico

Laboratory installation and training in support of a peanut supplier in Mexico

Construction and training of a mobile laboratory for chromatographic air analysis



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### **Food testing/food safety**

#### *Major DWPE projects:*

Canned peppers for pesticides – over 400 samples analyzed

Corn flour for aflatoxins – over 200 samples analyzed

Peanut products for aflatoxins – over 60 samples analyzed

Frozen vegetables for pesticides – over 200 samples analyzed

Fresh papaya for pesticides – over 100 samples analyzed

Natural flavor candies for lead – over 50 samples analyzed

Arsenic in apple juice – over 50 samples analyzed

Dried chiles for pesticides – over 100 samples analyzed

Herbal teas for *Salmonella*; fresh fruit for *Salmonella* and *Listeria*

#### *Non-DWPE food projects:*

HAACP program development for several food suppliers in Mexico

Pesticide multiresidue screens – over 1000 performed since 2012

Routine microbiological testing for a frozen food plant in central Texas

Field sample analysis for a large fruit supplier in Mexico

Field sample/screening sample analysis for a large supermarket chain in Texas

Corn analysis for multiresidue pesticides and aflatoxins for a large tortilla supplier

New products development for a peanut-based food supplier in Mexico, including migration of the product line to gluten-free products.

Development of a method for the analysis of synthetic water-soluble colors by HPLC-MS

Development of a method for the analysis of sodium copper chlorophyllin by HPLC



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### **Pharmaceutical analytical support**

Development of a method to assess acid-derived formation of formaldehyde leading to degradation of the API in non-aqueous formulations

Development of a method to determine elemental dissolution from syringe parts in non-aqueous formulations.

Development of a method for the analysis of low levels of zinc in saliva.

Development of a GC-MS method for the analysis of residual solvents in pharmaceutical grade phosphoric acid.

Development of a HPLC-MS method for the chiral speciation of isomers of clopidogrel bisulfate

Determination of stability of a wide variety of active components and excipients in speciality formulations using both ICH stability methodology as well as highly accelerated testing methodology.

Development of a HPLC-MS method for the assessment of the degradation products of synthetic opioids in non-aqueous formulations.

Development of purity assay methods for sevoflurane.

Development of a HPLC-MS method for the quality control determination of the purity of natural extracts of *Calendula Officinalis*

Development of a HPLC-MS method for the analysis of tadalafil in natural products

Development of a HPLC-MS method for the analysis of icariin in natural products

Development and validation of a HPLC-MS method for the analysis of methacholine in saline

Development and validation of a HPLC-MS method for the analysis of methacholine impurities in saline.

Development of a HPLC-MS method for the determination of impurities in an experimental diabetes drug.

Development of a GC-MS method for the analysis of skin-absorbed isopropanol and acetone in whole blood.





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### Forensics projects

Determination of cause of staining on polished concrete walls surrounding a swimming pool. \$3M insurance claim, successfully denied by insurer

Determination of the cause of failure of a post-tension parking garage. Insurance claim, settled.

Multiple cases involving adulteration of fuel causing engine damage. Insurance claims, insurer successfully denied claims based on laboratory data.

Determination of cause of failure of support beams and structure surrounding penthouse hot tub. Insurance claim, settled.

Multiple cases involving determination of source of water surrounding houses and commercial buildings.

Determination of source of smoke damage in houses. Insurance claims following a forest fire; successfully denied 7 of 10 claims based on analytical data.

Determination of source of blood staining on clothing and sofa. Lawsuit threatened, withdrawn based on analytical data

Trace levels of mycotoxins measured in “contaminated” houses.



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### **Prior work experience**

2001-2016

Owner/managing partner  
Austin Analytical, LLC  
Austin, TX

Owner/operator of a full-service testing laboratory in Austin, TX. Provided routine testing services to consultants and industry throughout Texas, forensic services, FDA DWPE testing and support services, pharmaceutical testing and consulting, regulatory and expert chemistry testimony.

1993-2001

Owner/managing partner  
ChemSOLVE Corp/SolQuim  
Austin, TX

Owner/operator of an environmental testing laboratory in Austin, TX. Provided routine environmental testing services to consultants and industry throughout Texas.

1992

Analytical consultant

Consultant to various environmental laboratories, ranging from technical to operational consulting. Methods development, personnel training, quality assurance system development.

1988-1992

Principal/Technical director  
AnalySys, Inc.  
Austin, TX

Founder and principal technical resource for an environmental testing laboratory, offering a wide range of environmental testing capabilities. Major projects included several Part B full applications for major oil refineries in Texas.

1986-1988

Principal/Director of fixed based laboratory operations  
Cubix Corporation  
Austin, TX



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Laboratory director for an environmental consulting laboratory, offering both fixed based conventional laboratory services as well as mobile air testing capabilities.

1983-1985

Laboratory Director  
Underground Resource Management, Inc.  
Austin, TX

Laboratory director for a captive environmental laboratory of a medium-sized engineering consulting firm.

1979-1983

Senior Chemist  
Motorola, Inc.  
Austin, TX

Research chemist for support operations for a semiconductor facility. Responsible for methods development and implementation for process, environmental and ambient monitoring. Developed a series of non-destructive tests that were moved to the process line, including thin film analysis for elemental composition (Si/P, Si/N/H, Si/As and Si/B). Responsible for implementation of a plant-wide O<sub>2</sub> monitoring program in inert gas supplies. Process troubleshooting including wafer and packaging failure analysis.

1978-1979

Laboratory Director  
NAPP, Inc./LACE Engineering  
Austin, TX

Laboratory director for an engineering consulting firm specializing in air monitoring and process methods. Quality assurance director for air monitoring equipment manufacturing facility. Primary chemist.

1976-1978

Laboratory Analyst II  
Guadalupe-Blanco River Authority  
Seguin, TX

Bench analyst in a water/wastewater analytical laboratory, responsible for a variety of routine testing including chemical, biochemical and microbiological testing.



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### **Education**

Texas Lutheran College - B.S. Chemistry/Spanish – 1978

The University of Texas - Graduate Studies in chemistry 1978-1979

The University of Texas – Graduate Studies in environmental engineering 1981-1982

### **Professional Activities**

The American Institute of Chemists, Sustaining Fellow

The American Chemical Society, member

Association of Official Analytical Chemists, member

Texas Commission on Environmental Quality review committees

- TX-1005
- TX-1006
- TRRP-13 Guidance