



SUPERIOR ACCURACY. SUPERIOR SERVICE.

The Data You Need for a Solution You Can Trust

mi
microbialinsights

Microbial Insights provides comprehensive identification and accurate quantification of microbial communities.

MICROBIAL INSIGHTS



A PIONEER

Microbial Insights, Inc. (MI) was established in 1992 based on the revolutionary research of Dr. David C. White, a pioneer in phospholipid fatty acid analysis and one of the original champions of molecular biological tools (MBTs) in environmental remediation and microbiologically influenced corrosion (MIC).

DEDICATED TO INNOVATION

MI was one of the first commercial labs to offer DNA analysis and in 2002 launched CENSUS qPCR for quantification of *Dehalococcoides* (DHC). Since then, MI has developed hundreds of CENSUS qPCR assays and now offers QuantArray®, an advanced qPCR platform for even more cost-effective assessment of microbial processes. Always transferring lab breakthroughs to field applications, MI also offers next generation sequencing, metagenomics, and proteomics analyses.

Bio-Traps®, developed with Dr. Kerry Sublette of the University of Tulsa, are another important innovation. Bio-Traps are passive samplers utilizing Bio-SEP® beads - an engineered composite licensed exclusively by MI that provides a large surface area well suited for microbial growth and MBT analysis. Over time, Bio-Traps have become an integral component of additional innovations.

In 2005, MI began offering Stable Isotope Probing (SIP) which employs a Bio-Trap amended with a ¹³C labeled contaminant of concern to conclusively determine whether *in situ* biodegradation is occurring. By 2007, In Situ

Microcosms (ISMs) combining Bio-Traps with additional passive samplers were launched to provide the microbial, chemical and geochemical evidence needed to screen multiple treatment options.

In 2016, the MI Isotope Laboratory expanded to also provide Compound Specific Isotope Analysis (CSIA), routinely used to evaluate biodegradation at sites impacted by chlorinated solvents. More recently, MI expanded into Petroleum Fingerprinting and Environmental Forensics.

DATA QUALITY AND EXPERIENCE

MI is one of the only laboratories ISO accredited specifically for qPCR analysis of environmental samples (Certification AT-2904) and we have proven our accuracy and precision in independent round robin comparisons against competitors, national laboratories, and academia. There is no substitute for experience. Our scientists have performed extractions on tens of thousands of the most challenging field samples of nearly every matrix imaginable. You name it, we've analyzed it. While every sample is important to us, MI is honored to be trusted with priceless samples from ends of the earth and beyond - King Tut's tomb, the Mogao grottoes on the Silk Road, Antarctic valleys, and even moon rocks!

SERVING OUR INDUSTRY AND COMMUNITY

Leaders serve their industry and community. As an integral member of the ITRC Environmental Molecular Diagnostics Team, MI co-authored guidance documents to foster best practices for MBTs in environmental remediation and our President Dora Taggart was awarded Most Valuable Team Member. Dora is a world-wide MBT ambassador and on the NACE International Task Group for Molecular Microbiological Methods.

MI is a certified Woman Owned Small Business (WOSB) and was presented with the Woman Owned Business Excellence Award by the Knoxville Chamber of Commerce. Through our MI Kids and outreach program, we strive not only to educate kids in science but spark a love of learning with fun, hands-on experiments. In recognition of contributions to the community, Dora was honored to receive Business Person of the Year by the Boys and Girls Club of the Cumberland Plateau. Microbial Insights' staff volunteer as drivers each week for a local nonprofit called The Love Kitchen. The Love Kitchen provides meals, clothing and emergency food packages to homebound, homeless and unemployed people.



ENVIRONMENTAL REMEDIATION



Microbial Insights specializes in molecular biological tools (MBTs) that provide the actionable data site managers need to select and implement effective environmental remediation strategies. With a full spectrum of proven MBTs and extensive experience in the industry, Microbial Insights is a trusted partner of environmental consultants, site owners, regulators, and government agencies around the world.

ISSUE: Leaks, spills and past industrial practices have led to the release of chlorinated solvents, petroleum products, and other pollutants into the environment. Whether through monitored natural attenuation (MNA) or engineered approaches, selecting an effective remediation strategy, evaluating remedy performance and achieving site goals all depend on accurately assessing the processes responsible for contaminant degradation.

PATH TO RESOLUTION: Our MBTs provide the actionable data that leads to cost effective remediation and site closure - accurate quantification of key contaminant degrading microorganisms and functional genes, conclusive evidence of contaminant degradation, and comprehensive characterization of microbial communities.

SUPERIOR CUSTOMER SERVICE

Our goal is not only to provide you with the most accurate data but to make it easy! We are proud to provide solutions for our amazing clients... and we are proud of the fantastic feedback we have received! We work with over 4,500 clients from around the world.

UNPARALLELED ACCURACY

Our MBTs provide accurate quantification of specific contaminant degrading microorganisms and functional genes, characterization of microbial communities, and conclusive evidence of contaminant degradation. The accuracy and precision of our analyses have been repeatedly proven in inter-lab comparisons with competitors, academia, and national laboratories.

EXPERT ANALYSIS

Since 1992, Microbial Insights has been a leader in the industry. Our scientists, experienced and recognized in the fields of molecular biology and environmental remediation, provide expert interpretation of your data making your path to site resolution easier.

COST EFFECTIVE

Our MBT results and analysis help you make informed site management decisions, eliminate unnecessary site activities, and optimize a remediation strategy to cost-effectively reach site goals.

UNBIASED REPORTING

Our analyses and interpretation are 100% unbiased. Microbial Insights does not sell bioaugmentation cultures or treatment products. We provide the MBTs and reporting that help you manage your sites based on the best possible data and analysis.

INNOVATION

We strive to continuously advance the field of molecular microbiology and bring those advancements to the environmental remediation industry through our active R&D program and the Microbial Insights Databases.

ENVIRONMENTAL REMEDIATION and Molecular Biological Tools



Our MBTs provide actionable data to make site management decisions that lead to cost-effective remediation and closure. How? Accurate quantification of specific contaminant degrading microorganisms and functional genes, comprehensive characterization of microbial communities, conclusive evidence of contaminant degradation, and cost-effective screening of remediation strategies.



CENSUS qPCR: DNA based method to accurately quantify specific microorganisms and functional genes such as *Dehalococcoides* (DHC) and vinyl chloride reductase genes (BVC, VCR) that are responsible for contaminant biodegradation.



QuantArray®: Advanced qPCR method to simultaneously quantify a broad spectrum of key microorganisms and functional genes in a single analysis for more comprehensive and cost-effective assessment of biodegradation. QuantArray-Chlor was designed to assess anaerobic and aerobic biodegradation of a variety of chlorinated solvents while QuantArray-Petro targets functional genes responsible for aerobic and anaerobic biodegradation of BTEX, PAHs and other petroleum hydrocarbons.



Next Generation Sequencing (NGS): High-throughput DNA sequencing is used to identify the microorganisms present down to the genus or species level with no prior knowledge of microbial community composition. Knowing “What microorganisms are present?” can provide insight into potential microbial processes.



Stable Isotope Probing (SIP): Stable isotope probing can conclusively determine if *in situ* biodegradation is occurring at your site using a Bio-Trap amended with a ^{13}C labeled contaminant of concern. Similar to a tracer, detection of ^{13}C incorporation into biodegradation end products (microbial biomass and/or dissolved inorganic carbon) is proof positive of *in situ* biodegradation of the contaminant of concern.



Compound Specific Isotope Analysis (CSIA): CSIA can provide conclusive evidence of contaminant degradation including reductive dechlorination of PCE, TCE and daughter products based on isotopic ratios (e.g. $^{13}\text{C}/^{12}\text{C}$, $^2\text{H}/^1\text{H}$, or $^{37}\text{Cl}/^{35}\text{Cl}$) of the compound. CSIA is also commonly employed in environmental forensics to identify contaminant sources and diagnose vapor intrusion.



In Situ Microcosms: Laboratory treatability studies often do not duplicate field conditions and pilot studies are too expensive to be used to screen multiple remediation approaches. *In Situ* Microcosms are field deployed microcosm units containing passive samplers that provide the microbial, chemical, and geochemical data to cost-effectively evaluate multiple remediation options.



Bio-Traps®: Passive sampling devices that are colonized by active microbes over time for better understanding biodegradation potential. Bio-Trap samplers utilize Bio-SEP beads - an engineered composite licensed exclusively by MI that provides a large surface area well suited for microbial growth and MBT analysis.



Environmental Forensics: With Petroleum Fingerprinting, biomarker analysis, and CSIA capabilities, our analytical suite can provide the key lines of evidence to age date, delineate sources, and identify responsible parties in environmental forensics investigations.

MICROBIOLOGICALLY INFLUENCED CORROSION and Molecular Microbiological Methods

Since 1992, Microbial Insights has been the industry leader in molecular microbiological methods (MMMs) for the testing and analysis of Microbiologically Influenced Corrosion (MIC). Our MMMs provide more accurate quantification of MIC-associated microorganisms and comprehensive characterization of microbial communities, giving you the crucial information needed to make informed decisions on MIC threats and mitigation.

ISSUE: Microbiologically influenced corrosion (MIC) impacts nearly all industries and is responsible for an estimated 40% of internal corrosion which results in loss of production, increased operations and maintenance expense, deterioration of equipment, and destruction of assets.

PATH TO RESOLUTION: Our MMMs provide the actionable data needed to accurately assess MIC threats, evaluate the effectiveness of biocides, and assess other microbial processes like souring. How? Our MMMs provide comprehensive identification and much more accurate quantification of MIC-associated microorganisms than MPNs or other culture based methods. Our results and interpretation are 100% unbiased. Microbial Insights does not sell biocides or other treatment solutions. We provide the MMMs and reporting that help you make the most informed decisions to protect your assets, based on the best possible data and analysis.



CENSUS qPCR: A DNA based method to accurately quantify specific microorganisms such as sulfate reducing bacteria (SRB) and methanogens that are commonly implicated in MIC as well as functional genes such as a specific hydrogenase genes (micH) associated with some highly corrosive biofilms.



QuantArray®: Advanced qPCR method to simultaneously quantify a broad spectrum of key microorganisms and functional genes in a single analysis for more comprehensive and cost-effective assessment of MIC and souring.



Next Generation Sequencing (NGS): High-throughput DNA sequencing is used to identify the microorganisms present down to the genus or species level with no prior knowledge of microbial community composition. Knowing “What microorganisms are present?” can provide insight into potential microbial processes causing or exacerbating corrosion.



Phospholipid Fatty Acid Analysis (PLFA): Pioneered by Microbial Insights founder Dr. D.C. White, PLFA analysis is used to quantify total viable biomass and provide a general profile of the microbial community. Phospholipid fatty acids are a main component of the cell membrane (“the skin”) of all microbes.

MMM APPLICATIONS

CENSUS qPCR and next generation sequencing (NGS) provide actionable data to evaluate and control microbial processes - more accurate quantification than cultivation methods like BARTs or bug bottles and comprehensive characterization of microbial communities so you know “Who is there?”.

BIOCIDE EVALUATION

Evaluating the effectiveness of a biocide for controlling MIC and reservoir souring depends on accurate quantification of the microorganisms involved. Use CENSUS qPCR or QuantArray-MIC to quantify Total Bacteria, Total Archaea, and specific microbial groups like sulfide reducing bacteria and archaea (SRB and SRA). Comparison of baseline and post-biocide qPCR results provides an accurate and direct line of evidence to evaluate the effectiveness of biocides and continued monitoring can reveal when additional biocide additions may be warranted. NGS can show if specific populations were resistant to the treatment.

RESERVOIR SOURING

Strategies to combat reservoir souring can include biocides for overall microbial suppression or biocompetitive exclusion by nitrate or perchlorate addition. To evaluate the effectiveness of souring control strategies, use CENSUS qPCR to quantify total Bacteria and key microbial groups like SRB and SRA as well as Nitrate Reducing Bacteria and Perchlorate Reducing Bacteria. With an NGS profile, relative abundances of sulfate reducing genera, heterotrophic nitrate reducing bacteria (hNRB), and nitrate reducing sulfur oxidizing bacteria (NR-SOB) can provide valuable insight into souring control efforts.

PRODUCED WATER

Microbial activity is an important factor in nearly all aspects of produced water management – treatment, storage, disposal and reuse. Use CENSUS qPCR to quantitatively evaluate efforts to control MIC throughout PW infrastructure and to maintain shelf life. In addition, microbial populations not only impact biological treatment but also the effectiveness of chemical treatment, coagulation, flocculation and sedimentation. CENSUS qPCR is also used to evaluate disinfection to reduce microbial populations to acceptable levels prior to any reuse of PW including for hydraulic fracturing.

BIOFUEL TESTING

Biofuels and blends are susceptible to microbial contamination leading to fuel deterioration, MIC particularly in storage tanks, and filter clogging. NGS can identify the microorganisms present in fuels down to the genus level. CENSUS qPCR is used to accurately quantify total Bacteria, total Fungi, or specific fuel contaminating microorganisms like *Cladosporium resinae* to assess contamination and evaluate the effectiveness of biocides or other control measures.

MICROBIAL ENHANCED OIL RECOVERY (MEOR)

MEOR, a method where bacteria, their activity, or their by-products increases oil recovery, is based on alteration of the reservoir microbial community - addition of nutrients to stimulate specific indigenous microorganisms or inoculation with developed cultures. NGS analysis and CENSUS qPCR can be used to directly evaluate whether MEOR activities impacted the microbial community composition and concentrations.



MOLECULAR BIOLOGICAL TOOLS APPLICATIONS IN DIVERSE INDUSTRIES



Microbial processes range from the highly beneficial to those that are destructive or threaten human health. MBTs provide actionable data to better assess and manage all types of microbial processes.

MICROBIAL SOURCE TRACKING (MST) AND WATER QUALITY

Fecal contamination which affects more than 1 in 10 U.S. surface waters can stem from a myriad of potential sources including human (sewer leaks, SSOs, faulty septic systems) and non-human sources (dogs, livestock, wildlife). If you don't know the source, how can you fix the problem?

MI offers a suite of microbial source tracking (MST) qPCR assays to identify fecal contamination sources so that you can implement effective solutions to improve water quality.

INDUSTRIAL AND MUNICIPAL WASTEWATER

Wastewater treatment depends upon having the right microorganisms at sufficient concentrations for optimal operation while problematic organisms can lead to poor settling, foaming and plant upsets.

CENSUS qPCR assays can quantify key microorganisms in wastewater treatment and anaerobic digestion including nitrifiers, denitrifiers, and methanogens. Next generation sequencing (NGS) gives an overall profile letting you identify sludge bulking microbes, PAOs, GAOs, and other organisms of interest.

LANDFILLS

Decomposition of refuse in a municipal solid waste (MSW) landfill is carried out by a succession of diverse microbial communities but unfavorable conditions such as the development of elevated temperatures (ET) can inhibit microbial activity, adversely impact gas production, and increase leachate strength.

CENSUS qPCR assays can quantify not only important microbial groups in refuse decomposition such as methanogens, fermenters and acetogens but also key microorganisms in biological leachate treatment. NGS will provide a comprehensive profile of the community and insight into potential microbial processes.

AGRICULTURE

From breakdown of pesticides to nutrient availability and rhizosphere interactions, microorganisms are instrumental in agricultural productivity and environmental stewardship.

Use CENSUS qPCR to quantify microorganisms responsible for processes in the nitrogen cycle including ammonia oxidizing, nitrogen fixing, and denitrifying bacteria. Use NGS to examine the soil microbial community for plant growth promoting bacteria or genera associated with pesticide degradation.

ART RESTORATION AND CULTURAL PRESERVATION

Microorganisms can grow in almost any environment and their activities can cause aesthetic and even structural damage to works of art and objects of cultural heritage. Not all microorganisms are susceptible to the same antimicrobial treatments. Therefore, thorough and accurate identification of the microorganisms present is a crucial component of selecting an appropriate treatment approach.

Microbial Insights has been trusted to analyze samples in efforts to preserve King Tut's Tomb, the Mogao Grottoes on the Silk Road, the Eames House, and the Salk Institute for Biological Studies.

THE MICROBIAL INSIGHTS DATABASES



Microbiology is part of the world of big data which presents exciting opportunities to put results in context, better understand underlying processes, improve conceptual site models, better predict outcomes, and overall to help you draw confident conclusions and make better decisions.

THE MI QPCR DATABASE V2.0

With CENSUS qPCR and QuantArray results for tens of thousands of field samples from sites around the world, the MI Database is the largest collection of field concentrations of key microorganisms and functional genes.

Putting Microbiology in Context: In practice, biodegradation depends not just on the presence but the actual concentrations of the contaminant degrading microorganisms. The percentile ranks retrieved from the MI Database answer the question “Is that low, medium or high?” by comparing your results to those of the literally thousands of other environmental samples submitted to MI for analysis since we first began offering CENSUS qPCR and QuantArray.



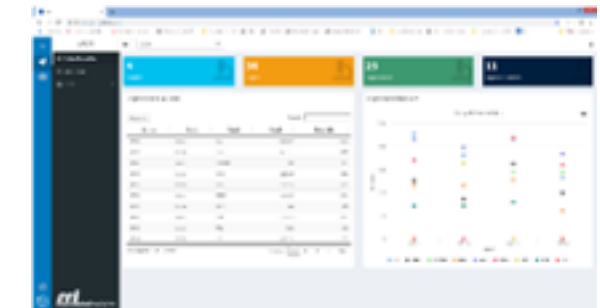
Low, medium or high? Percentiles will tell you.



Download percentile tables directly to Excel.



Customize and export percentile charts.



THE CSIA DATABASE

Compound specific isotope analysis (CSIA) is a powerful tool that can provide conclusive evidence of contaminant degradation, delineate contaminant sources, and provide direct insight into degradation mechanisms.

The CSIA Database allows you to create and download custom CSIA plots that combine your site data with appropriate literature values to simplify interpretation. Manufactured ranges, enrichment factors, and associated references are all continuously updated and compiled into ready to use tables.



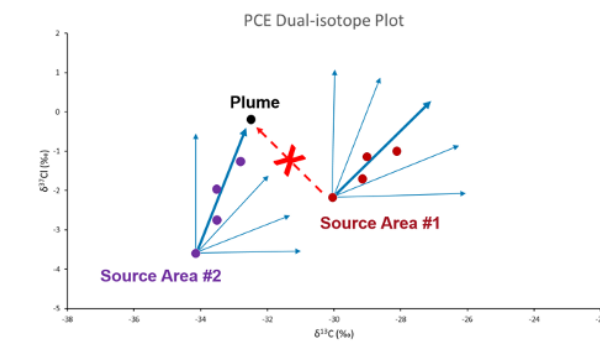
Demonstrate contaminant degradation.



Delineate contaminant sources with Dual Isotope Plots.



Investigate degradation mechanism and extent of degradation with Modified Kuder Plots.



CONTINUOUS INNOVATION



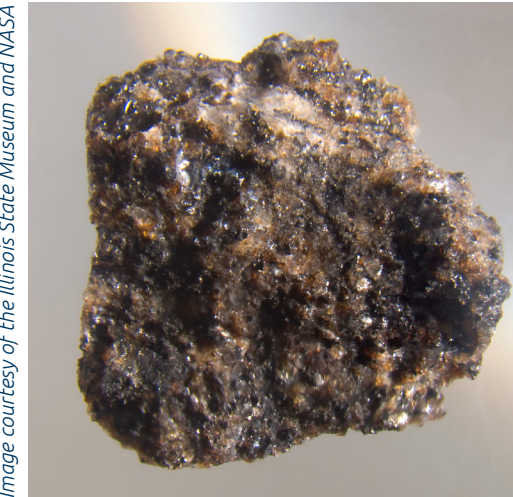
The MI mission is “Actionable data through innovative molecular technologies”. Our data is actionable because it is accurate, precise, and conclusive. Our technologies are innovative because MI remains on the leading edge, transferring laboratory breakthroughs to applications in the field.

RESEARCH AND DEVELOPMENT

Independently or teamed with leading universities, engineering firms and others collaborators, MI is actively engaged in the development and application of the next generation of molecular biological tools. Throughout our history, MI has been honored to have been awarded research grants from some of the foremost funding agencies including:



Image courtesy of the Illinois State Museum and NASA



DIVERSE HABITATS AND UNLIMITED SCOPE

Microorganisms can grow in almost any environment and their activities have such a tremendous impact. As the leader in molecular biological tools, MI scientists have been called upon to analyze samples from the ends of the earth and beyond.

Astrobiology...Is there life beyond Earth and, if so, how can we detect it? MI scientists have analyzed moon rocks! We have also analyzed samples from extreme environments around the world used as Mars analogue sites including Antarctic dry valleys, Arctic permafrost, Lassen Volcanic National Park, Death Valley and the deserts of North and South America.

Estuaries and marine wildlife exhibits...We have performed microbial characterization of natural marine estuaries and popular marine wildlife exhibits.

World heritage and cultural sites...To help combat biodeterioration of these precious artifacts, MI scientists have analyzed samples from the Mogao Grottoes on the Silk Road, the Eames House, the Salk Institute for Biological Studies, and even plaster samples from the Treasure Room of King Tut's Tomb.

The depths of the oceans...Bio-Trap samplers were used to study biodegradation and microbial ecology of the Deepwater Horizon Oil Release and have been deployed in other locations on the ocean floor.

The human microbiome...linking environmental pollutants, gut microbiome composition, and human health.

ADD MICROBIAL INSIGHTS TO YOUR TEAM

Since 1992, Microbial Insights has been dedicated to providing you with state of the art molecular biological tools, the most accurate and precise data in the industry, and exceptional customer service from start to finish.

CONTACT US

We are looking forward to working with you! For more information, please feel free to contact us by phone, email, or by visiting www.microbe.com.

 865.573.8188

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TOP TEN REASONS TO CHOOSE MICROBIAL INSIGHTS

- 10 WE ARE A TRUSTED PARTNER**
Trusted by consultants, industry, academia, governmental agencies and the military
- 9 WE PROVIDE PROOF**
Analyses that can provide conclusive evidence of pollutant degradation
- 8 WE ARE CONSTANTLY INNOVATING**
Active R&D keeps us on the leading edge
- 7 WE ARE UNBIASED**
We don't sell bioaugmentation cultures or treatments, just the most accurate analysis in the industry
- 6 OUR CLIENTS GET FREE ACCESS TO OUR DATABASES**
Put your results in context with the Microbial Insights qPCR and CSIA databases
- 5 WE PROVIDE UNPARALLELED EXPERTISE**
Expert and experienced scientists and engineers
- 4 WE ARE RELENTLESS ABOUT QUALITY ASSURANCE**
Our QA/QC includes all appropriate controls and checks to ensure the integrity of your results
- 3 WE PROVIDE SUPERIOR ACCURACY AND PRECISION**
Industry leading accuracy and precision proven against competitors, academia and national labs
- 2 WE PROVIDE SUPERIOR CUSTOMER SERVICE**
Client focused from bottle orders to reporting and interpretation
- 1 WE ARE CERTIFIED**
One of the only environmental laboratories ISO/IEC 17025 accredited for qPCR (AT-2904)



microbe.com
865-573-8188

Microbial Insights, Inc. USA

Ship samples to:

ATTN: Sample Custodian

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