

# Advancing the Discovery Process



TWO DECADES  
INTO THE 21ST  
CENTURY, ADVANCES  
IN HEALTHCARE  
CONTINUE TO OFFER  
THE PROMISE OF  
NEW AND BETTER  
THERAPIES FOR  
DISEASE CONTROL  
AND PREVENTION...



In virtually every field of biomedical research and practice, significant progress is being made in obtaining a greater understanding of biological systems and disease.

What does this progress mean?

It means new therapies, better treatment—and, an earlier diagnosis. It means that in some cases people will be able to manage their diseases, and live longer and more fulfilling lives.

That's progress. And thanks to companies like Bio-Rad, it's happening every day. Over the course of the past 65+ years, Bio-Rad has continually provided the healthcare industry

worldwide with useful products that help diagnostic labs obtain faster and better results and help life science researchers accelerate the discovery of new ways to combat, and even eradicate, disease.

**This is how it's done.**

# LEADERSHIP





**BIO-RAD: A GLOBAL LEADER**

Long History of Innovation

Leading Market Positions

Gold Standard Technologies

Complementary Business Mix

# LEADING THE WAY

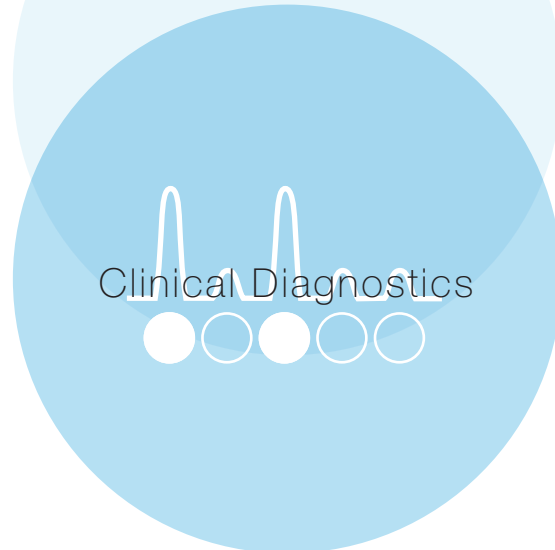
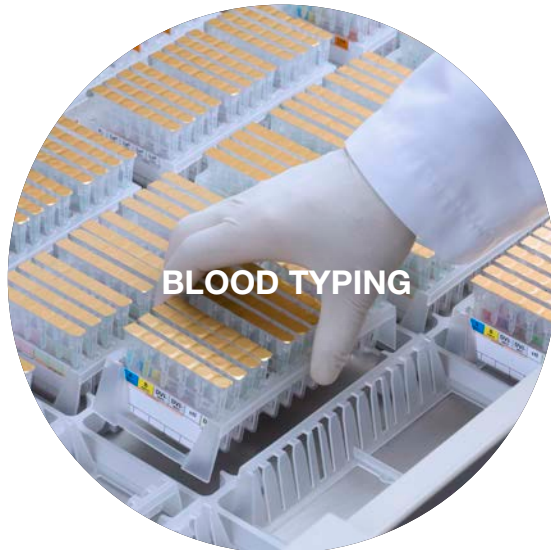
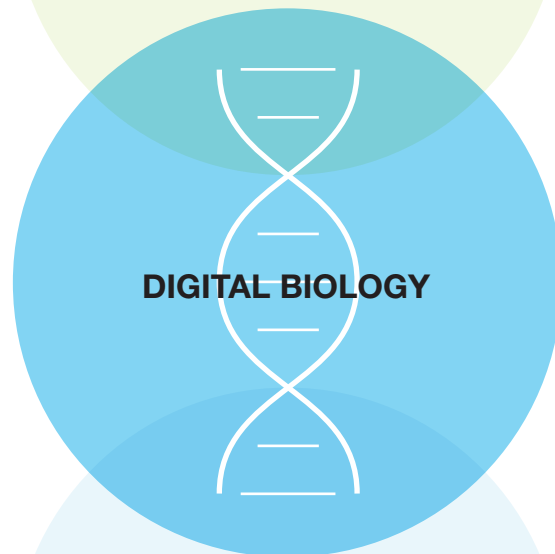
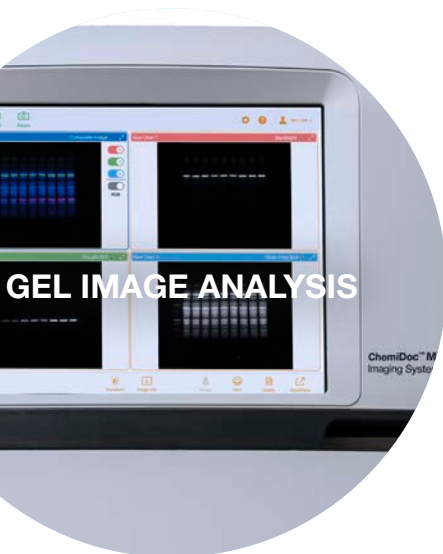
Advancing discoveries that lead to better healthcare since 1952, today Bio-Rad is a global leader in life science research and clinical diagnostics markets.

Bio-Rad's diversified and complementary product offering, its vast worldwide presence, and its key competencies in product development, manufacturing, and distribution,

provide the company with unprecedented leverage to help shape the direction its new products and technologies take.

From cell and digital biology and the study of proteins to the screening and typing of blood as well as diagnostic tests for a variety of diseases, 80 percent of our sales are from products in which we have a leading position in the market.





Applied Markets

Protein Quantification

Gene Expression

Digital Biology

Cell Biology

Protein Purification

# ADVANCING DISCOVERY

For a scientist, every day holds the possibility of uncovering something new or hidden, a deeper understanding of how things work, which can make a difference in our lives in real, tangible, and measurable ways.





## LIFE SCIENCE RESEARCH

Bio-Rad is among the top life science companies in the world, providing instruments, reagents, software, consumables, and content for the areas of cell biology, gene expression, protein purification, protein quantitation, drug discovery and manufacture, food safety and environmental quality, and science education. Our products and solutions are based on technologies to separate, purify, identify, and analyze biological materials.



## FOOD SAFETY

Food may be contaminated in several ways during the four steps of the “Food Production Chain,” from production and processing, to distribution and preparation. Bio-Rad offers food manufacturers and testing labs rapid tests for food safety, water testing, wine quality, and veterinary diagnostics, reducing the time it takes to get results.

The Life Science Group provides researchers with the tools they need to make discoveries in areas closely related to healthcare, helping to answer fundamental questions about proteins, genes, and cells.

#### APPLIED MARKETS

The need for fast, accurate analytical food safety testing has never been greater. Increasing concerns about food quality and safety, a growing interest in healthy and nutritional food additives, expanding regulatory initiatives, and the ability to rapidly share these concerns and issues through social media are some of the key factors fueling the food safety testing market growth around the globe. All of these factors along with a growing world population have placed greater responsibility on food producers and handlers to ensure our food is safe, from farm to fork.

Bio-Rad offers food safety laboratories innovative solutions for a wide range of food testing applications.

Our products are also used for environmental testing and veterinary diagnostics. Water testing products include solutions to test drinking water and monitor public waters such as beaches, rivers, and lakes. Veterinary products are used to ensure animal health.

#### PROTEIN QUANTIFICATION

Quantification is an essential part of protein analysis and is one of the most widely used methods in life science research. Proteins are the active molecules in the human body, responsible for the shape, structure, as well as function and regulation of cells. Separating and analyzing them is key to many applications in biotechnology, from studying the amount, size, and shape of a given protein in living cells to evaluating, diagnosing, and monitoring disease and conditions.

Bio-Rad's offering in this area, which includes electrophoresis, western blotting, imaging systems, and multiplex immunoassays, helps researchers determine which proteins are present and if the amount of specific proteins may have changed as a result of an experiment. These products are used to characterize the proteins involved in diseases and in the regulation and expression of biomarker proteins.



## GENE EXPRESSION

The complexity of how the human body works and what goes wrong when disease occurs requires studying genes, how they are expressed and the corresponding proteins.

Bio-Rad has led the way in Polymerase Chain Reaction (PCR) innovation since our first product was introduced in 1988 and today the company continues to be a leading provider of real-time PCR products. Our products for gene expression analysis encompass a range of instruments, reagents, and consumables used for PCR, as well as products for gene transfer and transfection. Real-time PCR technology, for example, which replicates and amplifies the number of copies of fragments of DNA, can detect the presence of the genetic material of a virus at the early stages.

Not long ago, Bio-Rad introduced the first commercially available droplet-based digital PCR platform that greatly advances the capabilities of PCR, offering researchers the quantification of target molecules with unprecedented precision, sensitivity, and reproducibility.



## DIGITAL BIOLOGY

First introduced for use in translational research, our Droplet Digital PCR technology (ddPCR) has found high medical value in diagnostics, most notably in the area of oncology and liquid biopsy. Its sensitivity, precision, and reproducibility help diagnose early disease, guide therapy decisions and monitor their effects, and detect residual disease status, reporting patient results in hours, rather than weeks.

Offering unrivaled precision and absolute quantification of target DNA or RNA molecules, our portfolio of ddPCR systems includes the QX ONE Droplet Digital PCR System, a fully integrated sample-in-answer-out multiplex platform. Samples that are partitioned into thousands of microfluidic droplet “test tubes” offer extremely sensitive and accurate digital answers for translational research, the biopharmaceutical and clinical diagnostics industries, as well as for environmental monitoring and food safety testing.

In the rapidly growing area of precision medicine and single-cell analysis, our portfolio of applications help researchers study molecular mechanisms—at a single-cell resolution—to analyze and interpret cellular behavior, offering insight into disease, diagnosis, and treatment.



## CELL BIOLOGY

Researchers are increasingly using single-cell genomic tools to study genetic and epigenetic differences in order to better understand regulatory pathways related to gene expression within cells and how they become disrupted during disease. While DNA (deoxyribonucleic acid) provides the instructions for building proteins that carry out a variety of functions within a cell, the epigenome can direct actions such as turning genes on or off and controlling the production of proteins in particular cells. This gives researchers a deeper understanding of the molecular mechanisms influencing cellular processes as well as insight into the heterogeneity among cells that can lead to dysregulation and disease.

As demand for early detection techniques and rapid technological advancements create a significant demand for single cell-analysis, Bio-Rad is there to meet those needs, providing a family of products for studying the function and development of cells in both normal and disease pathways. Our portfolio of products includes instruments, reagents, assays, and content for analyzing the health of cells, counting cells, and sorting and isolating specific populations.



## PROTEIN PURIFICATION

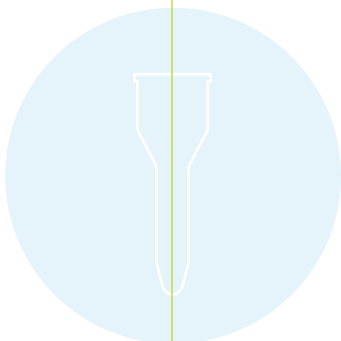
Our analytical grade (AG) ion exchange resins have decades of longevity since they were first introduced. With their ability to separate a mixture based on differences in chemical charges of their components, these resins continue to be used today as a method of purification with applications in clinical diagnostics and life science research.

Today, our line of resins play an important role in a variety of healthcare applications for the purification and characterization of biomolecules such as proteins, antibodies, peptides, and nucleic acids. Our Process chromatography media are used by the pharmaceutical industry as part of the purification process in the manufacture of biological therapeutics to treat a variety of diseases.

The unique and proprietary bead properties used with our high-capacity and high-performance ion exchange resins deliver highly efficient downstream purification of biomolecules, producing greater amounts of purified proteins in the same time or less compared to traditional ion exchange resins.

As the biopharmaceutical industry continues to advance, biomolecules are becoming more complex. Our innovative resins combine multiple purification modalities to help scientists overcome any purification challenge.

# AUTOMATION



# BETTER RESULTS FASTER

For a laboratorian, every day is an opportunity to provide results that help guide clinical decisions in diagnosing, detecting, evaluating, monitoring, and treating diseases and other medical conditions.

If you ask laboratorians what they want in a process or instrument, they will typically say accuracy, automation, fewer steps, a smaller footprint, greater ease of use, and faster time to result. The better they are able to do their jobs, the more quickly results can lead to treatment and the management of disease and other medical conditions. And our Clinical Diagnostics Group does just that, helping labs perform more tests in less time and with less labor, improving productivity and getting results, faster.

## IMMUNOHEMATOLOGY

Bio-Rad is a leading provider of blood typing products, offering a wide variety of platforms, reagents, data management, and connectivity solutions that address different volume blood typing needs. Our automated blood typing and screening systems are based on gel and microplate technologies.

In addition to helping laboratories more efficiently manage their blood testing workload, the systems offer extremely high sensitivity and specificity and are able to identify very rare types of antibodies and red cell antigens in a patient's blood with greater reliability. Used along with our data management and connectivity software, all of Bio-Rad's immunohematology products can be integrated into a seamless system to address the needs of any blood typing lab.

Because every detail matters when it comes to determining compatibility of a donor's and patient's blood, we provide the tools clinicians need to ensure a perfect match. With access to multiple blood sources, we can manufacture a large number of reagent red blood cells with clinically relevant antigen profiles. Our arsenal of monoclonal and polyclonal reagents can identify a wide range of blood types so clinicians are able to dig deeper to discover possible interactions between antibodies and antigens to deliver safe and accurate results.

## DIABETES

Whether one has been newly diagnosed with type 1 diabetes or has been suffering from type 2 for a while, proper monitoring, treatment, and control is helping many individuals afflicted with this disease to manage their condition and live long healthy lives.

For diabetics, who must actively manage their blood glucose level on a daily basis, a critical factor in minimizing long-term complications of this disease is the maintenance of average blood glucose levels over time. Measuring A1c, a subset of "glycosated" hemoglobin protein, on a periodic basis, provides important information regarding diabetic control.

Bio-Rad was the first company to offer a test to the U.S. market that could measure A1c, and today the company offers a series of market-leading products for A1c testing that are considered the gold standard.

The company's products in this area also include a variety of diagnostics instruments, reagents, and screening assays used to monitor and treat not only diabetes, but also genetic disorders and hemoglobin-related diseases (hemoglobinopathies).



## THE CLINICAL DIAGNOSTICS GROUP

As a leading global provider of in-vitro diagnostics supplies, our clinical diagnostic products and systems leverage a broad range of technologies and deliver high-value clinical information in diabetes management; blood virus testing, detection, and blood typing; autoimmune and genetic disorders testing markets; and quality control systems. These products are used to support the diagnosis, monitoring, and treatment of diseases and other medical conditions. Bio-Rad is the world leader in clinical quality control products, services, and information systems that help ensure the accuracy and validity of clinical test results.

Bio-Rad's integrated platforms and solutions allow customers to focus on their work and have confidence in the results.



## AUTOIMMUNE DISEASE

An organism's immune system is a complex biological network of cells, tissues, and organs that work together to protect the body from disease and infection. Immune systems detect a wide variety of pathogens and work to eliminate these invading agents while protecting the organism's own healthy tissue. Autoimmune diseases arise from an abnormal immune response in the body resulting in the immune system attacking healthy cells by mistake.

There are more than 80 types of autoimmune diseases, including Crohn's disease, lupus, rheumatoid arthritis, and even type 1 diabetes. Much work is still to be done to fully understand the cause of autoimmune disease. To make matters worse, these diseases are difficult to diagnose and treat, as many of them have similar symptoms affecting multiple body systems.

Fortunately, improved diagnostics offer new hope. With the help of Bio-Rad's pioneering technology in autoimmune diagnostics, physicians now have access to tools and software to bring the promise of effective treatment closer to reality.

Bio-Rad's integrated platforms and solutions allow customers to focus on their work and have confidence in the results.



## INFECTIOUS DISEASE

Infectious disease encompasses a range of disorders that are caused by organisms such as viruses, bacteria, fungi, or parasites. Some of these diseases can pass from person to person, such as the Human Immunodeficiency Virus (HIV), which continues to be a major global public health issue.

While the number of new HIV infections is down from its peak in the 1980s and testing capacity has increased over time, new infections continue and one in four people with the disease are not aware they are infected. Early detection—and therefore early treatment—is key to managing the virus and preventing new infections. Bio-Rad offers a full range of assays and systems for infectious disease testing and is renowned as a key supplier of HIV and hepatitis assays (screening and confirmatory) for donor screening and diagnostics labs.

In addition, our infectious disease offering includes products in the area of microbiology such as chromogenic media, antibiotic susceptibility testing, and mycology.



## QUALITY CONTROLS

It's a journey that begins the second a sample is drawn from a patient. How it was collected, handled, and stored, the integrity of the instrument, reagents, the laboratorian conducting the test, are all critical in obtaining accurate and reliable results. The potential of an error occurring exists at many of those steps along the way.

That is where quality controls come in, predetermined values that are measured against a patient sample. They offer expected values and results to ensure the most reliable information is provided to the physician or healthcare specialist. If the control delivers expected results, then the patient sample—run the same way—will increase the confidence of the result.

Quality controls are used in conjunction with tests for immunoassay, therapeutic drug monitoring, chemistry, cardiac assessment, immunology, diabetes, coagulation, hematology, blood gas, drugs-of-abuse, and infectious disease testing.

We offer the largest and most comprehensive menu of quality controls and software products in the world. To further enhance quality, Bio-Rad pioneered the idea of using peer data for quality control comparison. Today, Bio-Rad's QC data management solutions connect large peer groups of test systems and assay methods, enabling labs to compare their results in real time with other labs worldwide.

## APPLYING TECHNOLOGY

Multiplex Testing

Ion Exchange Chromatography

Rare Antibodies

Droplets as "Test Tubes"

# SYNERGIES

Bio-Rad continues to seek new opportunities to apply its technologies across the spectrum of customers the company serves.





## LEVERAGING OUR TECHNOLOGIES:

Ideas that flow back and forth between our product groups yield better science and better products for our customers. Some of these shared applications include:

### MULTIPLEX TESTING

We took multiplex testing on beads and developed the technology into test systems that serve both life science researchers and the clinical laboratory. Further collaborations proved beneficial for Bio-Rad and today, the company is a market leader in multiplexing applications for both research and autoimmune testing.

Bio-Rad's vibrant and growing life science research business develops and acquires new technologies and applications for scientific research and quite often discovers ways in which to apply these to diagnostics.

The company began by developing products for life science researchers but early on we discovered that some of our separation technologies had good application in diagnostics. This led to the establishment of a second area of focus for the company, which is today known as the Clinical Diagnostics Group.

Taking life science research technologies and applying them to improve diagnostics is just one of the many ways Bio-Rad leverages its strengths between its two product groups.



### ION EXCHANGE CHROMATOGRAPHY

Basic ion exchange chromatography technology is a core competency within our Life Science Group. This technology also forms the foundation of our high-performance liquid chromatography technology used in our Clinical Diagnostics systems to detect and measure the diabetes monitoring protein known as A1c.

### RARE ANTIBODIES

The sourcing of very specific antibodies is a basic requirement in the development of sophisticated diagnostic tests. Our Life Science and Clinical Diagnostics Groups collaborate on the design and development of these antibodies utilizing the talent and expertise across departments, groups, and geographies.

### DROPLETS AS "TEST TUBES"

Partitioning samples into thousands of microfluidic droplet "test tubes" enables the development of technologies offering highly quantitative, precise answers for healthcare, from translational research and clinical diagnostics, to applied markets including environmental monitoring and food safety testing. Our work developing and commercializing a technology that measures the absolute concentration of DNA in a sample has led us and others to believe there are many important applications of this innovation.



## BIOLOGY GOES DIGITAL

Not long ago, researchers who wished to study biological systems with unprecedented precision and explore complex genetic landscapes had a daunting task. But our Droplet Digital PCR (ddPCR) technology has changed all of that. Scientists can now obtain the absolute measure of nucleic acids in a sample, molecule by molecule.

In 2012, we established the Digital Biology Group to explore the potential of this technology, one that we believed, back then, would go far beyond life science research, offering the potential to discover and validate new disease associations, notably in oncology but also in other disease areas.

And we were right. Using this technology, researchers can preselect patients for treatment based on the type of cancer mutation they may have. Subsequent monitoring of tumor DNA sequences in the blood allows physicians to track disease progression as well as emerging

drug resistance so that adjustments in therapies can be made according to patient response to treatment. In addition, the technology is used in environmental monitoring and food safety testing.

Today, thousands of peer-reviewed publications describe applications of how our ddPCR technology is leading to breakthroughs in cancer biomarker discovery, infectious diseases, genomic alternations, and gene expression, helping to improve health outcomes and save lives.









## INSPIRING THE NEXT GENERATION OF SCIENTISTS

Bio-Rad's Explorer Program has supported teachers in their quest to provide innovative and exciting life science education to their students for over two decades. Our broad spectrum of hands-on, inquiry-based, science education activities based on real-world laboratory research experiences have inspired students of all ages around the globe.

The program offers instructional materials for teachers and other resources and a variety of life science and biotechnology kits for students that connect concepts with techniques and place them into context with real-world scenarios. With introductory, intermediate, and advanced kits addressing different academic levels, students take part in hands-on activities that include capturing and seeing their own DNA, exploring enzyme kinetics to optimize the industrialization of alternative fuels, and using PCR and gel electrophoresis to determine if a food item contains a GMO.

Students learn critical thinking skills while experiencing and learning up-to-date science. Our Bio-Rad Explorer Program has reached over 17 million students so far, and for us, that's just the beginning.

CUSTOMER SUCCESS



Customer Immersion

Hands-on Interaction

Personalized Approach

Worldwide Sales & Support



# CUSTOMER-CENTRIC

At the heart of every Bio-Rad transaction, there's a customer with a name. Bio-Rad prides itself on getting to know its customers to gain a greater understanding of what's important to them—in the physician's office, a lab, or on the bench. In short, we listen.

Developing strong, long-lasting relationships with our customers is one of the defining characteristics of Bio-Rad. For us, it's always personal. From pre-sale introductions to post-sale customer support, our focus is consistently on satisfying our customers' needs.

Better understanding their workflows provides us with valuable insight in our development of new products and technologies. It helps us to learn as much as we can directly from our customers—what works well and what areas could use some improvement. And our commitment extends beyond the lab to more practical matters such as faster product delivery time, improved value, and unparalleled technical support.

An emphasis on human interaction is an outgrowth of the values of Bio-Rad's founders who, from the very beginning, established the importance of respecting people and treating them well, whether customers, employees, or

competitors. Our founders instinctively knew that in order to satisfy customers, the company had to first create a workplace environment that welcomed employees every day and encouraged them to do their best work.

Extending outward to our suppliers and partners, this type of trust and respect allows for direct, unfettered, and honest communication, of wants, needs, and product enhancements—permitting every detail to be explored in the quest for improved products and processes.

## INVOLVED IN THE PROCESS

Product development at Bio-Rad is a collaborative process. We observe what is happening in the market, but more importantly, we listen to feedback we get directly from our customers who tell us—firsthand—what they need for their specific environment: on the bench, in the lab, or in the physician's office. We benefit from this customer-centric approach throughout the product development cycle from our initial observations of their workflows, to product design, and then extensive usability testing on prototypes. Real-time customer feedback in online discussion groups provide us with further insights to make sure we get it right.



## EVERY DAY, EVERY OPERATOR, EVERY TIME

Hands-free, load and walk away so they are free to move on to other tasks, are just a couple of the requirements we hear from our customers, who are often required to do more, with less. Automation also helps to minimize variability that might occur, from operator to operator producing unreliable results. Quick time to results, another factor, offers the benefit of early treatment and may reduce the risk of further transmission. When Bio-Rad introduced a new test for MRSA (methicillin-resistant *Staphylococcus aureus*), a customer said how reading test results at exactly 24 hours after inoculation posed a logistical challenge for microbiology labs. Our engineers broadened that time to between 18 and 28 hours, providing more flexibility for diagnosticians, but even better, more rapid identification of MRSA carriers so that hospitals could more quickly implement appropriate infection control as well as treatment.

## OUR CORE VALUES

Innovation

Involvement

Independence

Integrity

# STAYING THE COURSE

It is said that science is the expression of what can be shown to work reliably and repeatedly. This sense of reassurance is exactly what we at Bio-Rad build into every one of our products, so that researchers and healthcare professionals can focus on their work—and not on whether or not their instruments and tools are working properly.

AS WE HAVE GROWN AND EVOLVED, WE HAVE NEVER LOST SIGHT OF THE PRINCIPLES THAT HAVE BROUGHT US SUCCESS:

Providing useful, high-quality products that advance scientific discovery and improve healthcare

Developing close relationships with our customers and offering support where they are, across the globe

Discovering ways to offer better products that add optimum value

As companies continue to consolidate around us, Bio-Rad remains your stable and trusted partner. Some of our products introduced decades ago still represent the state-of-the-art today, because we continue to enhance them with innovations that improve their value and offer a level of functionality our customers can trust.

As an independent company, Bio-Rad continues to guide its own destiny, which provides us with the freedom, flexibility, and control the organization needs to take advantage of opportunities and make the right decisions—at the right time. As a result, the company is able to respond to dynamic markets, opportunities, and the evolving needs of our customers.



Investing in our  
employees

Operating  
our business  
efficiently

Evolving organically  
and integrating  
complementary  
businesses that add  
to our strengths  
and better serve our  
customers

ADVANCING  
SCIENTIFIC  
DISCOVERY  
& IMPROVING  
HEALTHCARE FOR  
OVER 65 YEARS





From the beginning, Bio-Rad has never strayed from its core mission of making life in the lab easier.

For life science research this means offering products and solutions that simplify processes and improve methods and materials to enable the acceleration of the discovery process. For clinicians, this means providing products that allow results to be delivered faster and more accurately, ultimately improving the quality of patient care.

Our commitment to fostering the budding young scientists of tomorrow is realized through our successful Bio-Rad Explorer Program that offers educators a way to bring the research lab into the classroom.

It all adds up to a place built on the values of innovation, involvement, independence, and integrity. Where we feel the greatest sense of personal satisfaction knowing that together, and as individuals, we are making a difference, helping people lead longer, healthier lives.

**This is Bio-Rad Laboratories.**



Learn more about our products and services by visiting **bio-rad.com** where you can browse our product lines by industry, view related webinars and tutorials, or search our extensive Literature Library for additional information.

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