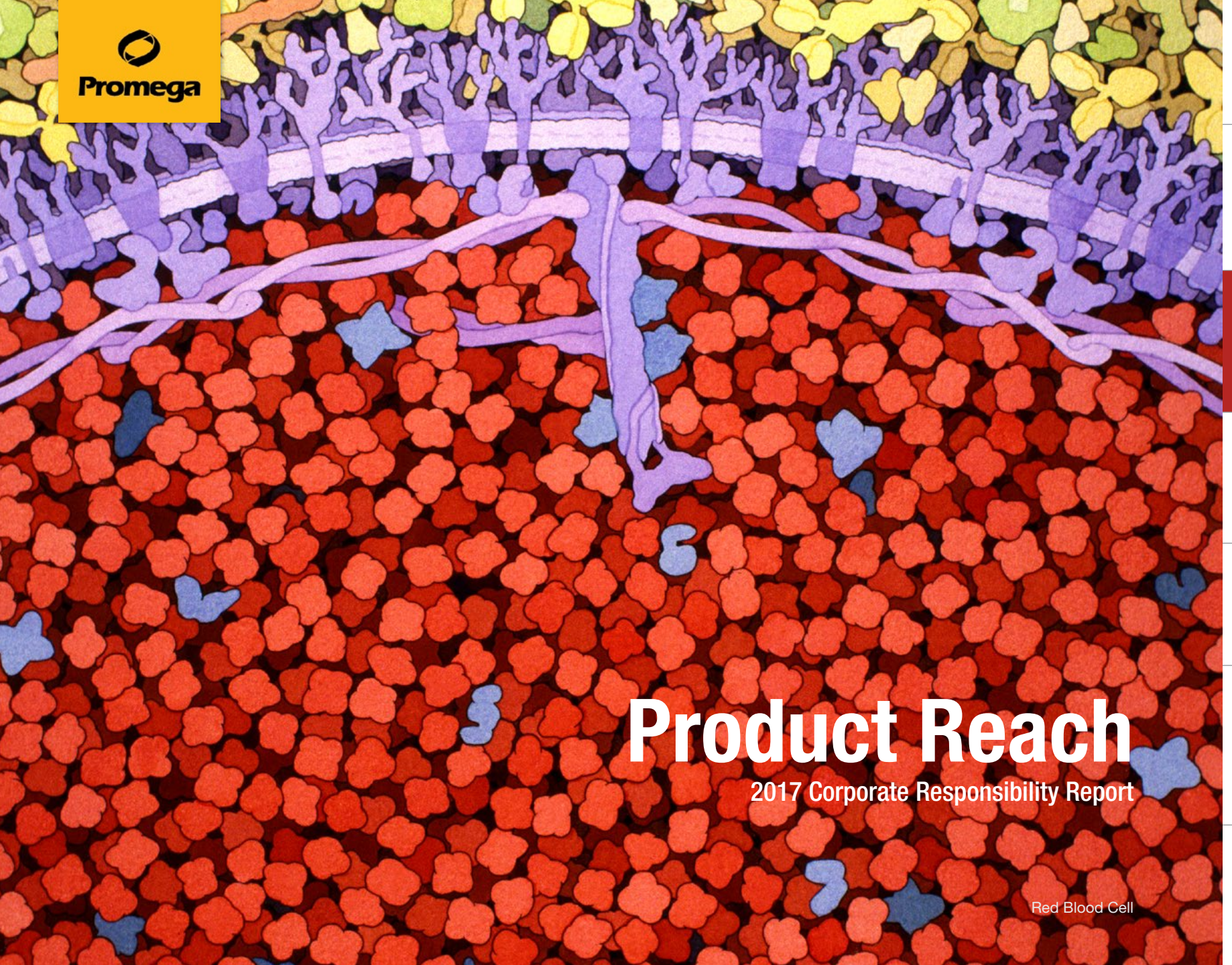
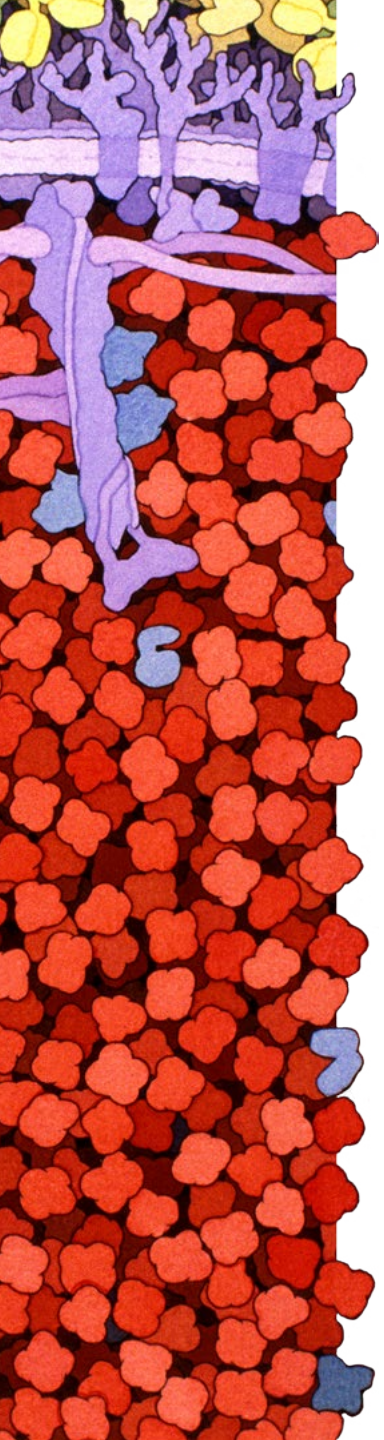


Promega

Product Reach

2017 Corporate Responsibility Report

Red Blood Cell



Product Reach

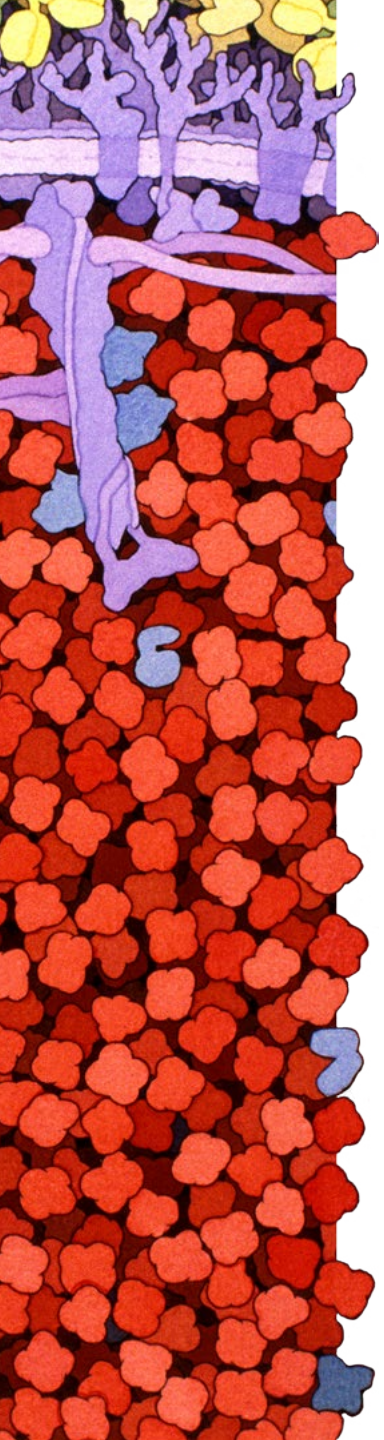
> *"Promega's innovation driven by our scientific curiosity is focused on creating discovery tools that address the key challenges in the search for diagnostics and therapies to improve the quality of life."*
>
> —Thomas Livelli, Vice President, Life Sciences

The biotechnology era started when researchers discovered that they could freely access DNA and create predictable recombinant molecules. For Promega, that era started by offering quality restriction enzymes that could cut DNA in specific ways. That early work in enzyme production was the cornerstone to quality that now allows Promega to offer Current Good Manufacturing Practice (cGMP) enzymes for use in clinical diagnostic assays.

Building on internal transcription and translation capabilities, Promega expanded the tools available to our customers including: coupled transcription and translation systems, amplification systems (PCR), DNA sequencing, and other tools for genomics and cell biology research. Some of these tools were applied to solve specific unmet needs in civil society including forensic human identification.

In addition to the fundamental in vitro tools and applications, Promega pioneered the applied use of bioluminescence enabling high throughput live-cell analytics. Drug discovery customers adopted Promega technology in reporter gene and cell viability assays as the gold standard in drug candidate screening. Oncology, infection, inflammation, neurodegenerative, and rare disease research segments each have examples of drugs developed using Promega bioluminescent technologies in the discovery process. In recent years this technology has greatly enhanced the development of new biologic based drugs for cancer treatment. Promega cellular analysis products have become so successful that many pharmaceutical companies now partner directly with Promega to create individually customized solutions for their unique needs.

Because of high-quality, reliable "tool kits" at their disposal, researchers have more freedom to focus on specific questions at the forefront of scientific discovery or clinical practice. The end result is better science, using better tools, for faster answers.



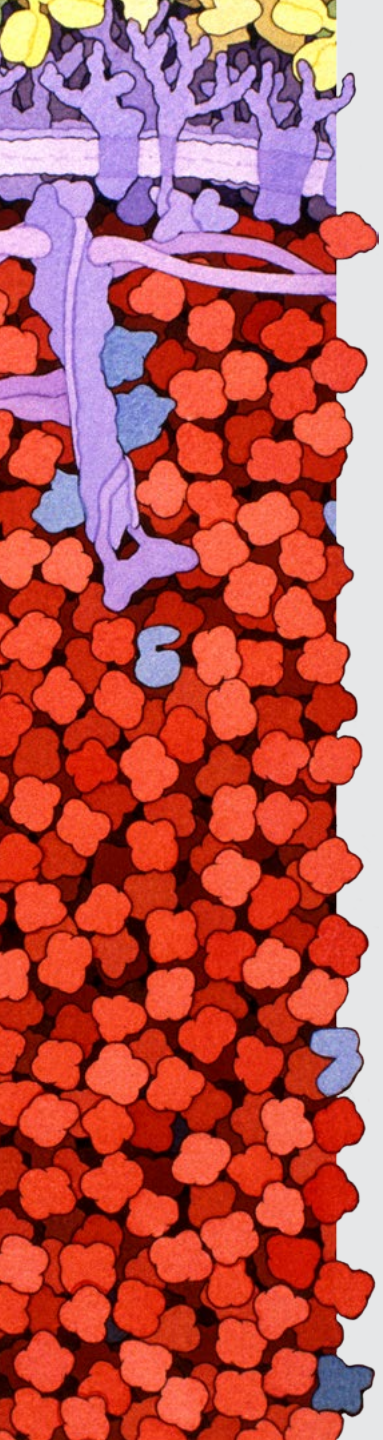
Customer Focus

Forensics and Paternity Laboratories

Forensics and paternity laboratories deal with tremendous caseloads and tight turnaround times. Dependable results, throughput, and reliable product supply are critical in this setting. These labs use limited, and often challenging samples to develop law enforcement leads from crime scenes. Sexual assault evidence kit backlogs and property crime samples are some of the more challenging samples for labs to process. Promega offers a **menu of tools** for forensic and paternity labs for each step in the forensic workflow, from pre-processing and differential extraction to quantification, STR amplification, and analysis. The new Promega custom **Casework Direct Kit** is designed for rapid processing of swabs from casework samples, cuttings of sexual assault swabs, or cuttings of stained fabric prior to quantification of human DNA. The streamlined protocol will enable crime labs to more efficiently and effectively address these difficult samples.

In addition, forensics and paternity labs help bring closure to families whose loved ones are missing or lost in mass disasters, and even help exonerate those who have been wrongly convicted of a crime. Researchers and analysts need to know that they will get optimal and reliable results from the valuable and often irreplaceable samples. Launching soon, the **Spectrum CE System** will enable more efficient STR analysis and enhanced workflow flexibility, built with input from analysts throughout the field. More than ever before, labs will be able to receive more information from challenging sample types, save time with increased sample processing capacity, and experience the flexibility to add samples during runs. All of this will be available with the same high level of service and support that customers have come to expect from Promega.

Promega has worked with forensic and paternity laboratories for more than 30 years and supports their challenging workflow by providing products for efficient DNA extraction through discriminating STR analysis.



Solving Challenging Human Identify Cases

Case One:

It can be agonizing for the families of crime victims when investigations go cold, leaving no leads and the possibility of closure elusive. That very scenario was playing out in China for the families of loved ones killed in three unrelated homicides from 2004, 2009 and 2010. In each case, there was little concrete evidence, no suspects, and diminishing hope that anyone would ever be convicted for the heinous crimes.

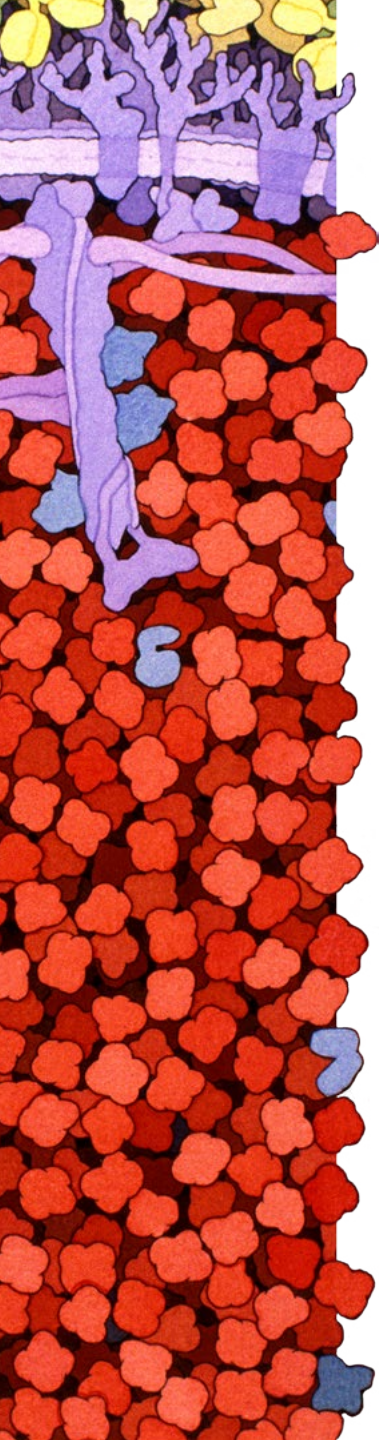
Then just last year, a DNA laboratory in the province of Qinghai made a startling discovery. After applying the **Powerplex® 21 and Powerplex® Y23 Systems** from Promega, analyses of the DNA data in China's National Database led to three independent potential DNA matches. The advanced chemistry of these Powerplex® kits provided the data needed to link DNA evidence isolated from the three homicide cases from years before. All three suspects were subsequently arrested and sentenced, and the families of those victims obtained closure for which they had been waiting.

Case Two:

On October 23, 2016, three explorers unexpectedly stumbled upon bone remains in a dried-up salt lake, deep in the desert in the Qinghai Province of China. Next to the remains rested a knapsack, which contained a newspaper and several personal letters. From these valuable clues, investigators were able to piece together that the owner of the sack might have originally been from Bazhong, in the Sichuan Province, a distance of greater than 1000 kilometers.

Genetic analysts extracted DNA from bone remains and then used the Promega Powerplex 21® system to analyze the DNA. This information matched to a potential DNA profile in their database and led to a potential identity – a missing person named Zhong Hua Li who had left home in 1960, never to be seen again. Investigators succeeded in tracking down Mr. Li's wife, now 88 years of age, along with their two daughters. Using DNA extracted from blood samples from these living relatives, a comparison to the DNA isolated from the bone remains confirmed Mr. Li's identity, even though he had died 55 years earlier. Finally this family found closure, and a long-standing investigation into the disappearance of this man was forever closed.

Genetic analysts work together to determine the identity of bone remains using Powerplex®.



Government and Academic Research Laboratories

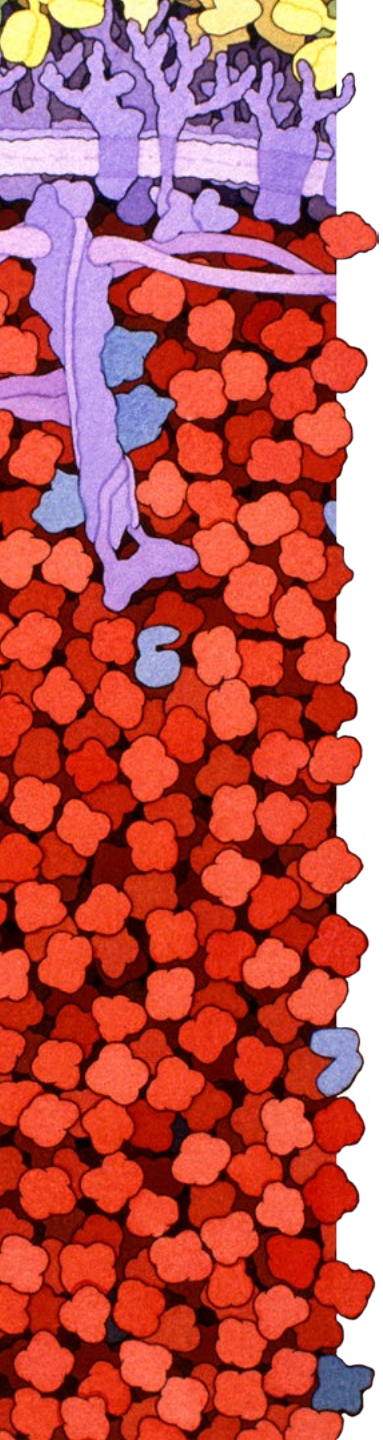
Basic researchers in academic laboratories or government research centers are often early adopters of new technologies that are later incorporated into industrial settings. The ability to miniaturize or automate such technologies is important because it allows these scientists to focus exclusively on, and streamline, their research processes. Promega continues to develop improved technologies for routine DNA and RNA isolation, analysis and amplification, and protein and cellular biology that support researchers seeking to understand fundamental principles of biology.

Virginia Pearson, elephant scientist and conservationist

Helping Scientists in the fields of Africa

While Promega has received many requests for donations over the years, one of the more interesting ones came from Virginia Riddle Pearson, elephant scientist. She was conducting fieldwork tracking strains of the herpes virus within elephant populations in South Africa and Botswana. The nature of her work required that she use a portable field lab (a tent) while she collected and analyzed samples. These conditions proved difficult in ensuring the quality of her samples and she needed a polymerase that could be transported for several days at room temperature. Enter GoTaq® G2 Taq polymerase from Promega. This donation from Promega allowed Virginia to continue successfully conducting experiments and pursuing her work. In a thank you note, she wrote, "The sequence results using Promega's GoTaq G2 are providing superior data, so critical for the future survival of elephants in the wild."

Ms. Pearson is currently working as a visiting scientist at the Fox Chase Cancer Center and continues to work towards identifying the variety of herpesvirus strains native to the elephant population. She has been comparing sequence results from saliva and blood samples she collected to test their efficiency as a pre-diagnostic tool for pathogenic herpesvirus treatment in the elephant population. Her current product of choice is **GoTaq® G2 Hot Start Green Master Mix**, which she describes as "my workhorse!"



Pharmaceutical and Biotechnology Industries

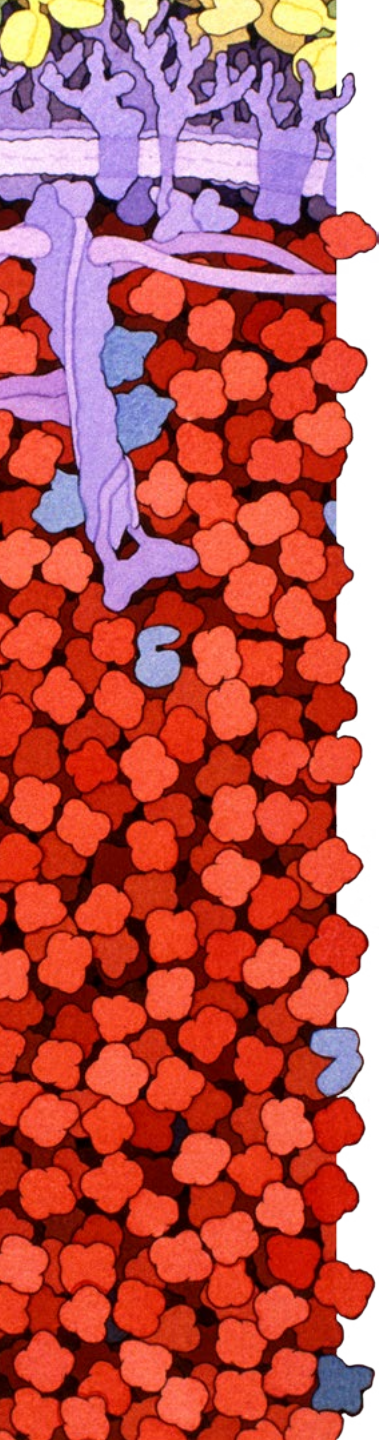
Scientists developing **small molecule drugs** within the pharmaceutical industry need reliable assays and reagents because they often screen up to hundreds of thousands of compounds at a time. Screening requires assay technologies that generate in vitro data predictive of in vivo results so that expensive failures such as “false positives” and off-target effects are avoided. As small molecule drug discovery has moved toward phenotypic screening, there is a new challenge identifying the specific target of the small molecule that produces the desired phenotypic change. Once the protein target of the small molecule is identified, scientists must be able to measure the drug’s activity, such as affinity and drug-target residence time. The **Promega NanoBRET™ Target Engagement Assay** enables measurement of compound binding at select target proteins in intact cells, in real time.

Scientists in the biopharma industry need the best analytical tools to functionally and structurally characterize large molecule “biologic” therapeutics. Promega has a suite of bioluminescent, cell-based reporter bioassays that are used in the discovery and development phases of biologics. Cancer immunotherapy has a bright future in the war on this pervasive class of diseases, and Promega has a rapidly expanding portfolio of such bioassays. In addition, Promega has generated many proprietary enzymes used in the structural characterization of biologics by mass spectrometry.

Applied Biotechnology and Agriculture

Today, biotechnology tools once used solely by researchers are used in applications to **test food and water**. Applications include tests for purity, bacteria and other elements to ensure safe products and authenticate quality claims.

For plant and food analysis, we provide sample preparation tools that can be used to extract DNA for use in pathogen and GMO testing for nearly all food matrices. Promega DNA purification chemistry is considered to be a reference standard in authenticity determination of meat products, and has been used by the European Union Reference Laboratory for Animal Proteins in feeding stuffs (EURL) to develop a Standard Operating Procedure for the extraction of DNA for downstream PCR-based detection methods for food testing. In water and hygiene analysis, our ATP bioluminescence expertise is already very well adopted. Several groups have published methods using the **BacTiter-Glo™** luminescent ATP-based assay for the assessment of water quality and



biofilm formation. The Water-Glo™ luminescent ATP-based assay builds on this with new applications to detect microbes in seawater desalination, drinking water and other industrial process applications to reduce energy consumption and improve plant operational efficiency. The Water-Glo™ luminescent ATP is in final development stages and currently offered through the Promega **Custom Assay Services** system.

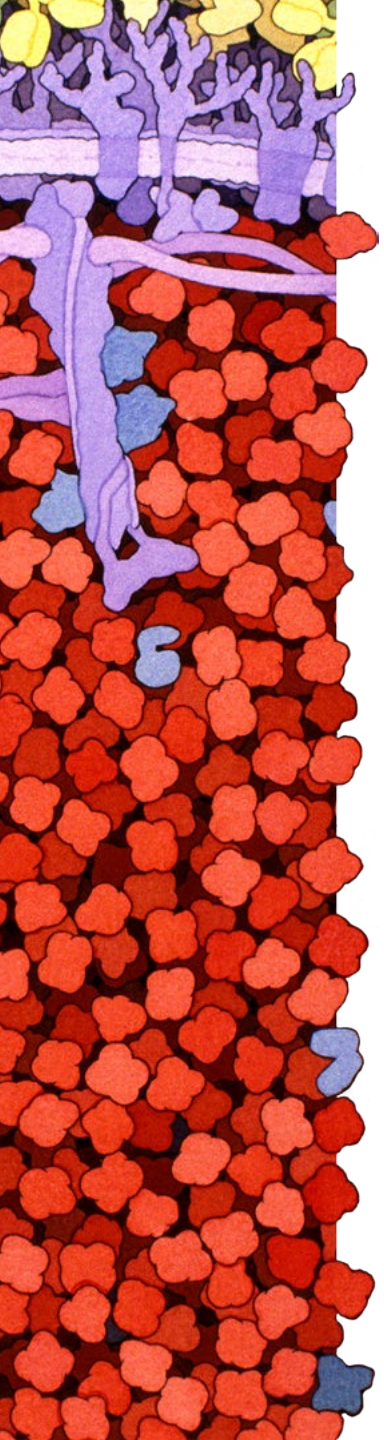
The tools Promega offers make microbial contamination detection in crude oil and heavy fuels possible, thus reducing the use of bactericidal chemicals in those processes. The number and variety of projects is expanding significantly in areas such as minerals, microtox, or dairy product testing, and continues to grow as the quality of Promega products gains more and more visibility.

An employee for the city of Zurich uses Water-Glo™ technology to ensure the highest quality drinking water for residents.

Ensuring Water Quality in Zurich

Zurich, Switzerland, built at the confluence of the River Limmat and Lake Zurich, is known for its excellent quality drinking water that flows from the city's water taps, as well as from its 1,200 public fountains. Yet water quality is something that must be examined to ensure quality and public health. For many years, the Wasserversorgung Zurich (City of Zurich Water Utility) monitored microbial contaminations of the water supply using traditional microbiologic methods that took days to report a result. Promega is the global leader in creating tools to detect adenosine triphosphate (ATP) in living cells. ATP is an essential element in all living cells and organisms, so even the slightest change in ATP levels acts as an early warning system to help assess microbial load and the possible presence of dangerous pathogens in water. However, until recently, no one was able to provide a tool that could quickly analyze ATP levels in up to 96 samples containing a broad range of water-borne bacteria in less than 90 minutes.

In 2016, these techniques were implemented in a collaboration between Promega and the City of Zurich Water Utility using the new Water-Glo™ technology. ATP levels in complex mixtures of naturally occurring bacteria are difficult to detect. The Water-Glo technology uses a novel lysis and detection reagent combination to reach levels of detection 10-100 times lower than similar methods. Typically, processing multiple samples of water has involved using multiple culture plates and extensive hands-on labor. Now the 96-well plate method facilitates water quality monitoring of hundreds of sampling points in Zurich's water treatment plants and the distribution net.



Clinical and Molecular Diagnostics Laboratories

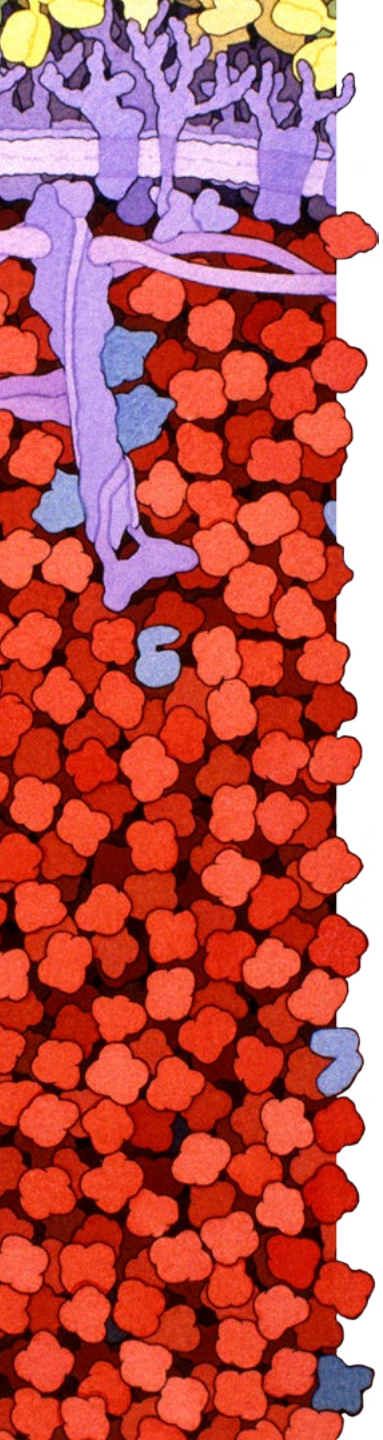
Molecular diagnostic laboratories rely on access to high-quality, consistently performing products in their assays. Promega manufactures **reagents** under a rigorous quality program that contributes to robust and reliably performing molecular assays. Products are manufactured to the highest quality standards through maintenance of ISO 9001 & ISO 13485 certification as well as enhanced capabilities for cGMP manufacturing. The **Promega PCR Optimization Kit**, launched in 2016, allows customers to rapidly define their own unique PCR master mix for a variety of applications in research or clinical use. This is just one example of how we can provide flexible solutions with product customization options to meet clinical laboratory or IVD manufacturers' needs.

Equipping Zika Researchers

In the beginning of 2014, Brazil was affected by several cases of fetal and newborn microcephaly, a congenital condition associated with incomplete brain development. In addition, the number of dengue and chikungunya cases continued to increase at alarming levels. Because the vectors of all three diseases are the same, researchers asked if those microcephaly cases were related to the vector.

Gubio Soares is a well-known Brazilian virologist who had discovered the presence of Zika Virus in Brazil, leading other researchers to report microcephaly linked to Zika Virus. Many of these laboratories never had any experience with qPCR assays before the emergence of these diseases. Because of the support of Promega scientists and reagents, today they are performing these critical assays independently.

Brazilian virologist Gubio Soares Campos. (Photo by Christophe Simon/AFP/Getty Images)



Quality Process and Product

The Promega campus in Madison, WI, USA, was first certified to international standards for quality management systems in 1998 and, along with Promega Biological Products, Shanghai, China, is currently certified to both the ISO 13485 and ISO 9001 standards. Certification to these standards ensures our customers that research products and medical devices are developed, manufactured, tested and delivered to the highest quality standards. Currently, 16 locations are certified to meet the requirements of ISO 9001, ISO 13485 or both.

Promega plays an essential part in ensuring compliance with applicable laws and regulations in the development and distribution of safe and effective products worldwide. We are committed to compliance with or exceeding the requirements of all applicable environmental, health, and safety laws and regulations.

Investments for the Future

To sustain contributions to scientific exploration and application, we will continue to invest in the development and discovery of new technologies. In 2016, over $38 million (US) was invested in research and development, and 64 new patent applications were filed. Promega has an extensive intellectual property portfolio because of sustained global investment in research and development.

We also work with academic institutions and other entities to license and develop promising technologies.

64 new patent **applications**

products launched **15**

542 **issued** patents & **pending** applications

Employees work in a Feynman Center quality control lab at our Madison headquarters.

Promega continues to develop improved technologies for routine DNA and RNA isolation.