

ENDETEC

TECTA: Solutions for Automated Microbiology



Solutions & Technologies

The Impact: Advantages of Automated Microbiology

▶ Faster results

Unlike traditional methods where results can only be read at the end of a fixed incubation period (typically 24 hours), the sample is monitored continuously throughout the test – yielding results 20-80% faster than traditional methods.

▶ On-site testing

Full test automation in a compact instrument package enables the testing system to be located in close proximity to the point of sampling, eliminating the cost and delay of transporting samples to centralized laboratory facilities.

▶ Extreme ease-of-use

TECTA single-use tests do not require microbiological expertise or visual estimation of results – providing unprecedented ease-of-use.

▶ High reliability

Test samples destined for analysis by the TECTA system do not require any handling, dilution or mixing of reagents. These tests are based on proven detection methods, resulting in industry-leading reliability and performance.

▶ Lower cost

Low cost instrumentation – and elimination of sample transportation and handling costs – result in lower per-test cost.



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▶ Safe Water - A Critical Need

Water plays a central role in our lives, and access to safe water is essential for everyone – from those living in the world's largest cities to the smallest towns and as a key element of industrial processes producing everything from the most basic foods to today's most advanced microelectronics.

Water destined for human and industrial consumption is required to be quality tested for a wide variety of contaminants, including potentially harmful microorganisms. While many water quality parameters such as pH, chlorine and turbidity can be measured in near real-time by on-line measurement instrumentation, microbiological testing presents a unique challenge. The requirement to detect a single *E.coli* cell in a 100mL water sample has been compared to the challenge of finding a single coffee bean in 40,000 Olympic-sized swimming pools.

The majority of microbiological water quality tests rely on traditional microbiological methods that were developed decades ago. Water samples are sent to a laboratory where they are filtered and subsequently placed into a growth culture media that is typically incubated for 24 hours. After the incubation period, each sample is inspected by a trained technician for signs of bacterial growth. Chemical additives in the growth media cause colonies of specific target bacteria to change colour or to appear fluorescent under ultraviolet light.

While these methods are the current gold standard, they require 24-48 hours for samples to be transported, analyzed and the laboratory results to become available. In the event of contamination, these delays in receiving test results increase the risk of public exposure, requiring costly remedial action or product recalls.

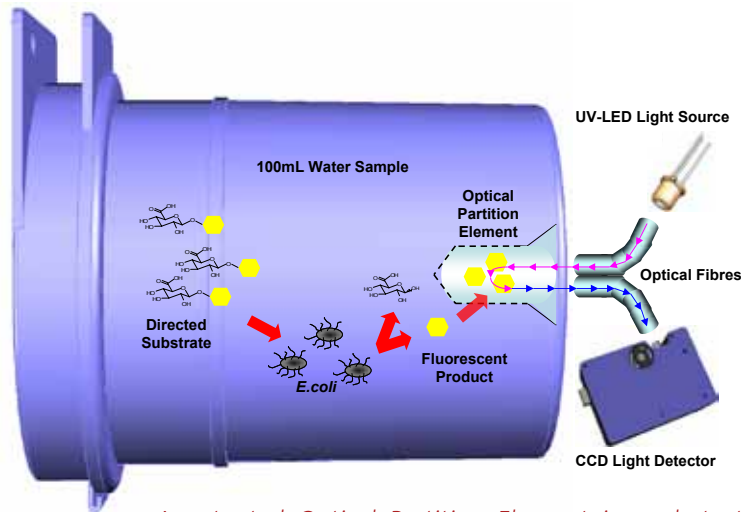
▶ The Innovation: Introducing the TECTA Automated Microbiology Solution

The impact of highly-publicized events involving contamination of municipal water supplies has driven the need to develop new microbiological test methods that are faster and easier to use than traditional methods, while maintaining the sensitivity and reliability that have been trusted for decades.

In 2001, a consortium of university researchers and water quality experts proposed an innovative approach – a novel way of automating the test by using a polymer-based optical sensor to detect the same types of fluorescent indicators of bacteria used in the trusted current methods. Pathogen Detection Systems, Inc. was subsequently formed to provide municipalities and industries worldwide with the automated microbiology solutions that were developed as a result of this research, and the company has become part of the ENDETEC global water quality sensor platform. The company's manually-sampled automated microbiology systems are core products within the TECTA family of water quality monitoring solutions.



TECTA Technology Overview



A patented Optical Partition Element in each test cartridge facilitates rapid detection of fluorescence, indicating the presence of bacteria in the sample.

The innovative capabilities of the TECTA system are made possible by a patented polymer based optical sensor, the “Optical Partition Element”, that is built into every test cartridge.

Each cartridge contains pre-measured amounts of growth media that support the enrichment of any target bacteria that are present in the sample. As target bacteria such as *E.coli* or Coliforms begin to multiply, they emit a specific enzyme that interacts with a proprietary chemical substrate in the cartridge, releasing fluorescent molecules from the substrate.

These fluorescent indicators rapidly move from the water sample into the polymer optical sensor located within the cartridge, enabling automated detection by a low-cost ultraviolet optical detection system that is built into the TECTA instrument.

▶ The novel combination

of the polymer-based optical sensor and ultraviolet optical detection system provides several key advantages.

The fluorescent indicators are extracted and concentrated within the polymer of the optical sensor, facilitating both rapid detection at the earliest possible time and eliminating the risk of off-colour samples or turbidity within the water sample obscuring the fluorescent indicator.

▶ When placed in the TECTA instrument

the test is monitored continuously throughout the incubation process – providing alerts of contaminated samples as soon as possible and eliminating the requirement to wait until the end of a fixed incubation process (typically 18-24 hours). This unique early alerting capability allows the system to provide results within 2-18 hours, depending on the level of sample contamination.

▶ In addition to a “presence/absence” result

the system is capable of providing an estimate of the number of bacteria that were present in the original sample – an important indicator of the level of severity of an adverse microbiological test result.



The TECTA Automated Microbiology Platform

Imagine the Possibilities!

The core TECTA automated microbiology technology can be packaged in a variety of instrument configurations to meet the needs of a wide range of applications – from the smallest remote municipality to the largest industrial processor.



▶ Desktop Systems for Municipal and Industrial Quality Assurance

Water samples can be manually obtained and introduced directly into the TECTA test cartridge that is pre-filled with all required test reagents, eliminating sample preparation and the requirement for sample dilution. Samples from municipal water distribution systems, or from points of use in industrial process water systems, are then processed by a compact desktop instrument located in close proximity to the point of sampling by personnel who do not require extensive microbiological training, saving sample transport costs and providing the fastest possible results by ensuring that samples are tested as soon as they are obtained.

▶ Laboratory Automation Systems

The TECTA system can be used to automate the process of testing large volumes of samples that have been collected in a variety of locations and returned to a central testing laboratory for analysis. Sample processing can be completely automated, eliminating all sample preparation steps that traditional methods require, which are costly in terms of labour and increase the risk of sample contamination. Labour-intensive sample interpretation and result recording are also eliminated, further reducing test processing costs and enabling direct transfer of analysis results to laboratory information systems and immediate communication of adverse results to the appropriate recipients.



▶ Auto-Sampling Systems for Process Control

Full test automation also allows for development of autonomous, auto-sampling systems that can automatically obtain and analyze microbiological samples via a direct connection to a sampling point. In addition to periodic sampling, samples can be obtained automatically in response to pre-defined triggering events such as high turbidity or low residual chlorine, providing timely confirmation of microbiological activity during these potentially adverse water quality events and providing critical microbiological process data for water treatment, distribution system monitoring and industrial process control applications.

Extensive Performance Validation

Using the same, well-accepted approach of detecting characteristic microbiological enzyme indicators, the TECTA method for *E.coli* and Total Coliform detection has been extensively validated by field tests and side-by-side comparison studies with standard microbiological analysis methods. The TECTA method has been validated as a Performance Tested Method™ by AOAC International and is an approved alternative method for testing drinking water for regulatory compliance purposes in the Province of Ontario, Canada. Additional regulatory approvals are pending worldwide.

Future Development

Through an active R&D program, ENDETEC is developing a wide variety of additional microbiological tests to meet the needs of municipal and industrial customers worldwide. All tests are based on the TECTA automated microbiology platform that provides laboratory-grade microbiological test results on-site, as close as possible to the point of sampling, offering industry-leading ease of use, speed, and reliability.

ENDETEC

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ENDETEC is a Veolia Water Solutions & Technologies company – a global leader in water treatment technologies.

Global leader in water treatment

Veolia Water Solutions & Technologies, a fully owned subsidiary of Veolia Water, is a design & build company and a specialized provider of technological solutions in water treatment to meet the needs of municipal and industrial customers.

VWS 2009 Key Figures

- €2.5 billion revenue
- 130 business units in 57 countries
- 9,500 employees
- 60% researchers, engineers, project managers
- Over 250 proprietary technologies



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