Jacksonville, Florida
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RAPID, AUTOMATED, EPA-APPROVED MICROBIAL DETECTION SYSTEM FOR TESTING OF *E.COLI*, COLIFORMS, AND ENTEROCOCCI BACTERIA

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TECTA - PDS

- Our Mandate: To revolutionize the microbiological monitoring of water
- The Problem: Inadequate microbiological testing – ancient methods lead to water quality and human health problems
- We can and should do better.
- The Solution: Lab equivalent, Fully automated, Rapid, EPA approved, microbial detection system
  - The only ***"RAPID, AUTOMATED, & APPROVED"*** method available

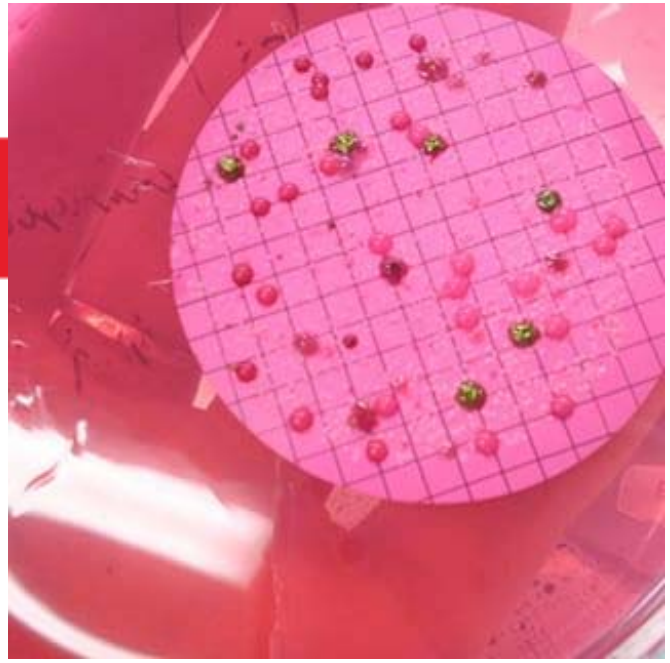
TECTA - PDS

- Formed in 2003 based on water monitoring technology developed at a major Canadian University - Queen's University
  - Direct response to Walkerton, Ontario *E. coli* contamination drinking water disaster
- Acquired by Veolia Water in 2009
  - Re-branded as ENDETEC – Global Monitoring Platform
- Management led buyout in 2016
  - Company repatriated to Canada
  - Entire supply chain now based within North America
- Sales in over 30 countries

The Problem: Inadequate microbiological monitoring

- **Automated bacterial test:**
  - **Testing done on-site, on-line.** ☑
  - **No storage or shipping.** ☑
  - **Overall test turn-around at most one day** ☑
  - **No visual estimation or judgment.** ☑
  - **Replace human sample manipulation/ intervention/decision making with Intelligent System using objective, pre-set criteria.** ☑

Conventional methods



Limitations of current methods

- Based on ancient technology
- Require a microbiology lab
- Take too long
- Visual interpretation required
- Prone to errors
- There are no better options
- Accepted as “state of the art”

The Solution

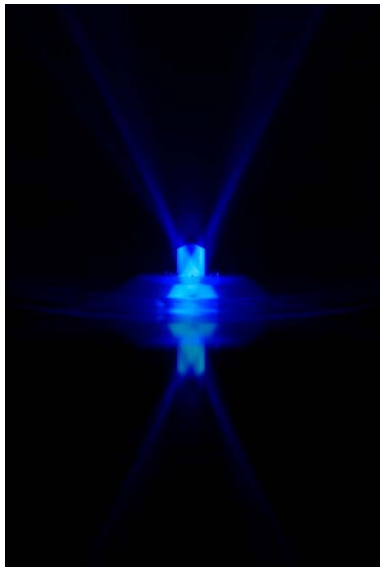
E. coli Detected!

- **Rapid, Fully automated, EPA approved, microbial detection system**
  - TECTA™ B16 Bench Top Testing System
  - TECTAlert™ Consumable Test Cartridges
- Lab-in-a-box
- Incredible ease-of-use
- All major micro parameters
- All water types

Allows microbiology to be done anywhere, by anyone at anytime

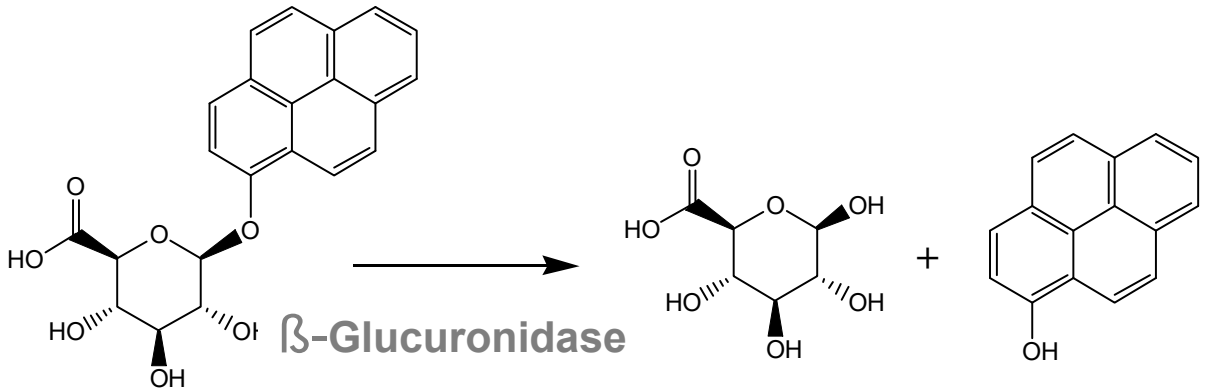
The Product Approach

- Identical enzymatic method of detection indicative of Coliforms and *E. coli* to other approved methods
- Introduce a novel opto-chemical sensor combination to eliminate visual interpretation.
- Package the complete test and sensor in a single-use cartridge with pre-measured reagents
- Simple instrument that can be operated in the field
- Continuous automated monitoring, interpretation and reporting of sample result



Theory of Operation - Enzyme Chemistry

- TECTA-PDS substrate:
  - Independent fluorescent markers for both *E. Coli* and Total Coliforms
  - Markers are hydrophobic and want to escape from the sample



(Hydrophilic) pyrene ß-D-glucuronide

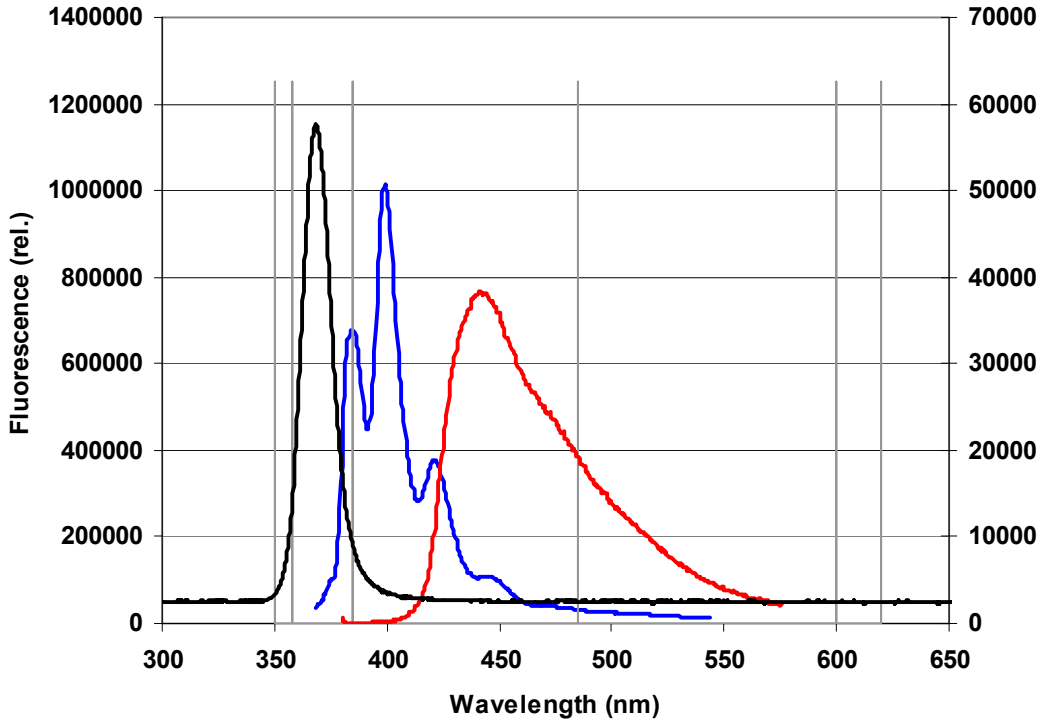
Glucuronic acid

1-hydroxypyrene **(Hydrophobic)**

- Same enzyme reaction as traditional, proven method
- Hydrophobic markers can be 'collected' out of sample for analysis
- Creates opportunity to automate the process and eliminate human interpretation

Theory of Operation - Optics

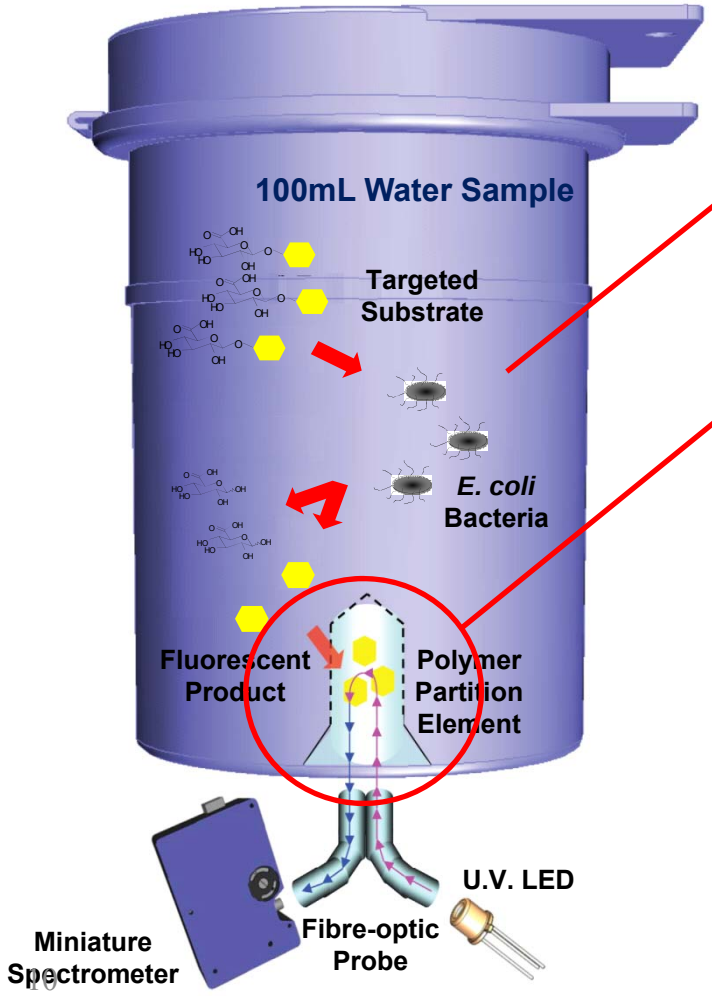
- Fluorescent markers can be monitored independently



Theory of Operation – All together

E. coli Detected!

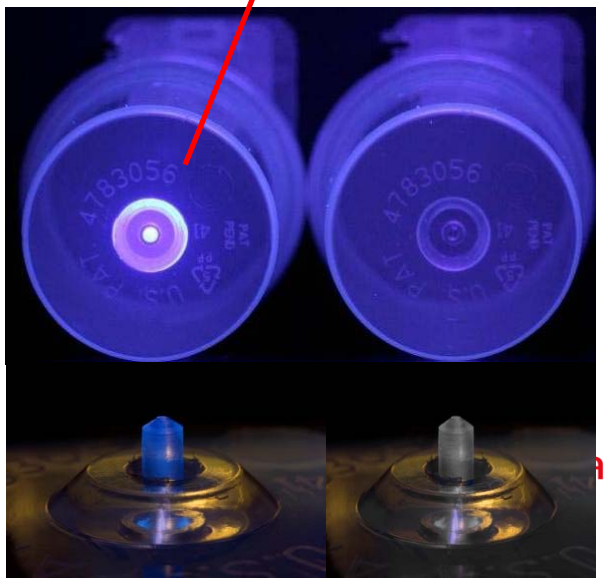
Enzyme-substrate / solution culture method



Detecting identical enzyme as conventional methods

Extracting fluorescent markers outside of sample into polymer

Automated detection of fluorescence in polymer triggers result



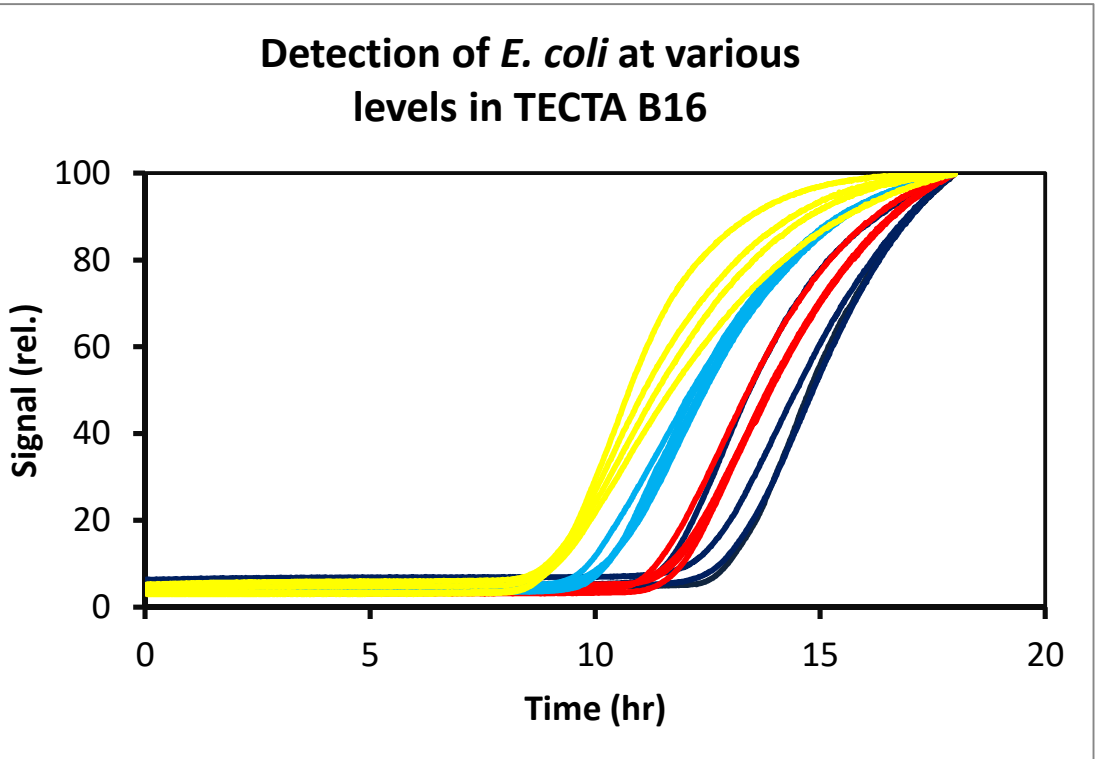
TECTA and Quantification

So Let's Talk about Quant

- Three methods utilized for quantification
  - Counting
  - Most Probable Number (MPN)
    - A statistical estimate based upon the number of positive versus negative wells
    - Range can be extended by using dilution factors
    - Standard tables sets upper & lower 95% confidence limits
  - Growth Kinetics
    - An estimate utilizing the inherent relationship between the number of bacteria and the speed at which they are detected
    - More bacteria present = faster detection

TECTA and Quantification

- Signal onset gives Time-to-Detection (TTD)
  - Indicates time for growth and enzyme expression
  - TTD linearly related to log CFU bacteria

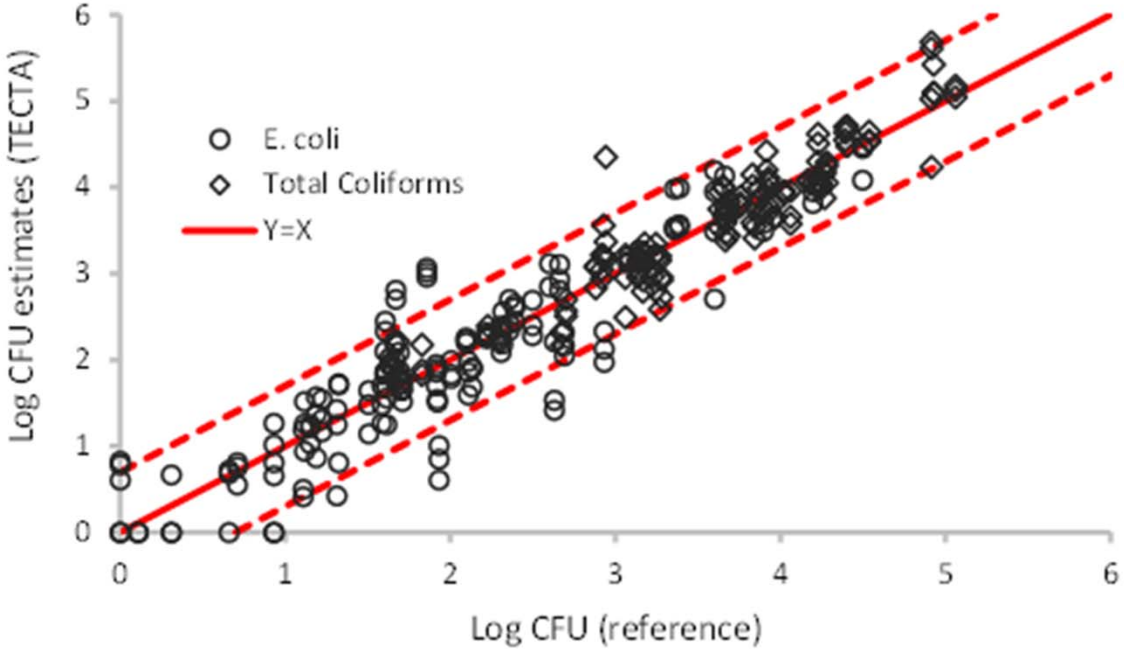


TECTA Raw Optical Data of 4 replicate samples spiked with:

- 10,000 cfu/100mL
- 1,000 cfu/100mL
- 100 cfu/100mL
- 10 cfu/100mL

TECTA and Quantification

- Comparison of TECTA and reference method
  - Split samples
  - *E. coli* and Total Coliforms tested simultaneously
  - 95% of results within 0.7 log of reference results
    - comparable to inter-lab studies using different methods



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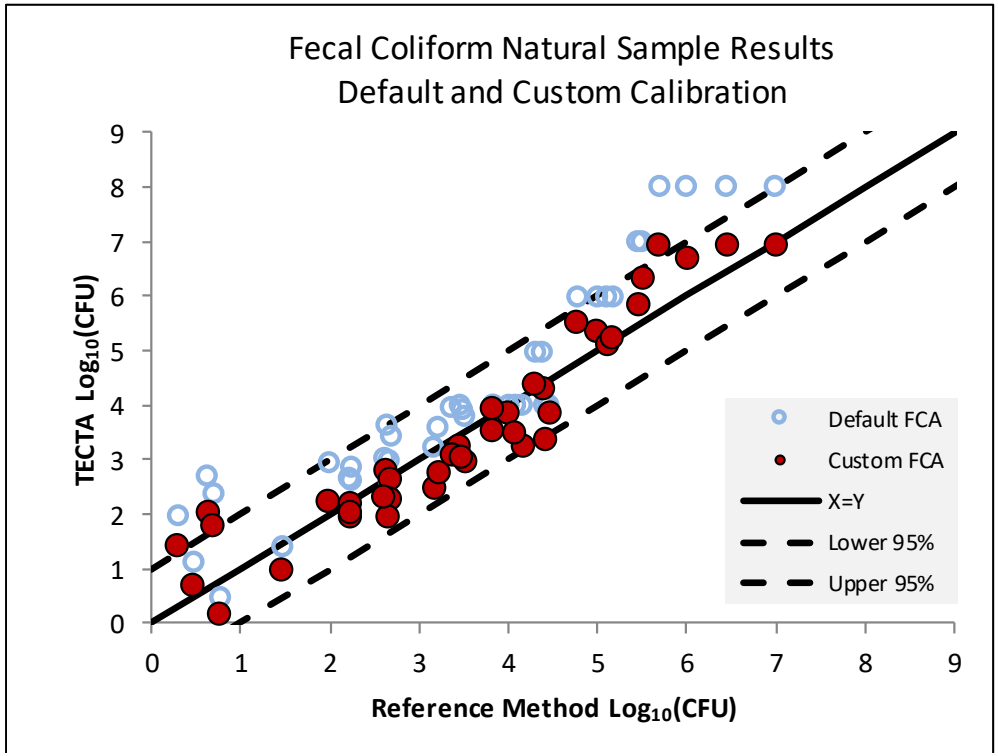
TECTA and Quantification

- But…different approved methods will give different quantitative results
- Growth kinetics can vary with bacteria source, sample matrix effects
  - TECTA is the only method capable of calibrating the quantitative result to match the method being compared

- TECTA results systematically above reference results
- Adjust calibration so both methods now match
- Validate adjusted calibration with additional data



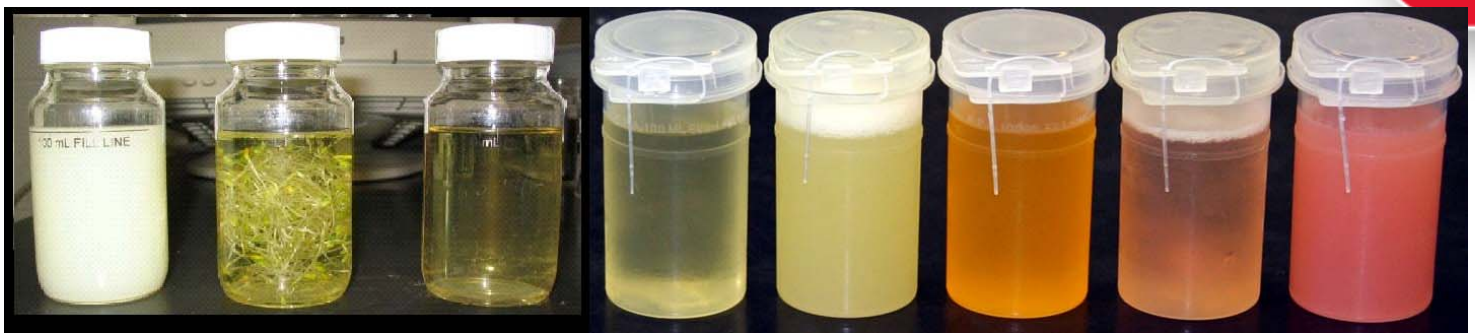
The TECTA Solution

TECTA™ B16

Rapid, Automated Microbial Detection System

- Fully automated bacterial test – *E. coli*, Total Coliform, Fecal Coliform, Enterococcus
- Lab-in-a-box with potential for on-site analysis; zero transport, zero storage; zero prep, sample on-test with no delay
- No visual estimation or judgment
- No human sample manipulation or intervention
- Fully automated test monitoring, interpretation and reporting via email; networkable

The TECTA Solution



Milk Sprouts Apple Juice Lake Water Lemonade Carrot Wash Iced Tea Pink Lemonade

- Not affected by turbidity or sample color
  - Applicable to a wide range of matrices
- High dynamic range: <1 CFU - 10^8 CFU / 100mL
  - No dilutions required
- Single-cell sensitivity
- Ready-to-use, pre-sterilized test cartridge
- Fastest test on market
  - only method available with early alerting
  - results in 2-18 hours depending on contamination level

Detection Times

CFU / 100mL v TTD value

< 1 (absent).....18 hours

1 CFU.....10h 40m

100 CFU.....8h 40m

1000 CFU.....7h 30m

10,000 CFU.....6h 30m

10^6 CFU.....4h 20m

****default calibration – E. coli-only test*

TECTA - PDS

The TECTA Solution

TECTA™ B16

Rapid, Automated Microbial Detection System

- Secure storage of test reports for QA/QC protection
- Networkable
- Automated reporting via email

TECTA-B16 (1.2.5) Report

Sample ID:
Collection Time: 2013-11-12 14:50:08
Stored: Unknown
Target Temperature (C): 35.63 | Actual Temperature (C): 35.46
Data File: XPDS00046.2013-11-12_14.50.08_Chamber1_TIME.pds

Test Result

E. coli Result: Present
EC Detect Time: 10h4m6s || Quantity: 140 CFU/100 ml
[EC-35.5 Default Calibration rev. 1.0]

Total Coliform Result: Present
Total Coliform Detect Time: 10h17m23s || Quantity: 3000 CFU/100 ml
[TC-35.5 Default Calibration rev. 2.0]

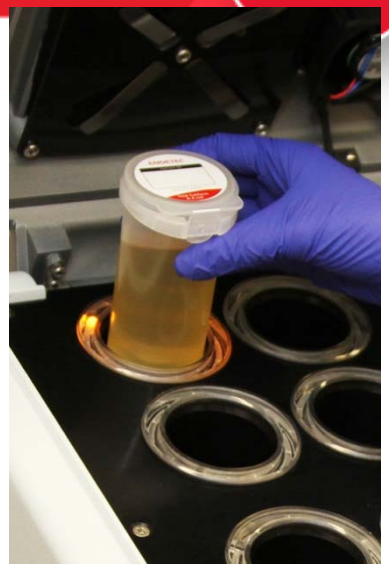
Advantages – Ease of Use - Running a TECTA Test

E. coli Detected!

1. 

2. 

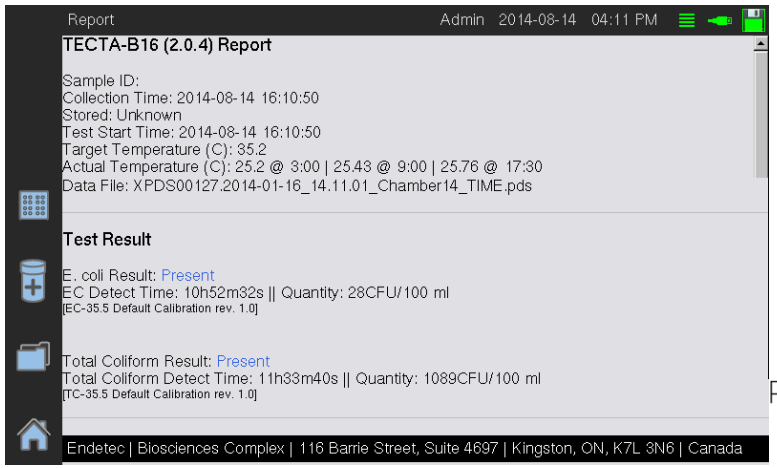
3. 

4. 

Just add water…

…and press "Play"

5. 

6. 

PDS

Approvals

- US EPA
  - *E.coli* & Total Coliform
  - First/only automated method to be approved by EPA
  - Fastest approved test on the market
  - 40 CFR 141
    - → Total Coliform Rule
    - → Revised Total Coliform Rule
    - → Groundwater Rule

"TECTA EC/TC Method" Approved by the US EPA and published in the Federal Register on June 19, 2014 & July 27, 2017

- Various other international approvals & validations
  - Ontario Ministry of Environment
  - Health Canada
  - EPA ETV

- AOAC International PTM
  - A variety of challenging matrices including vegetable wash water & Iced Tea

– PDS

Applications

E. coli Detected!

Conventional Methods / labs:

36 – 72 hours plus….

TECTA B-16:

2 – 18 hours

What opportunities exist for your operation if you had a rapid, on-site, easy to use micro system?

- Drinking water
  - Distribution compliance samples
  - Raw, pre/post filtration, pre/post chlorination, post clear well
  - Customer hand off
  - Broken/replacement pipe
- Waste / Reuse water
  - Raw, pre/post MBR, pre/post RO, pre/post UV
  - Sludge
- Remote/challenging locations
- Recreational water

The Customers: Las Vegas Valley

E. coli Detected!

- Application
  - Water main installations & repairs

Summary

- Automated TECTA system for *E. coli*, Total Coliform, Fecal Coliform, Enterococcus
  - Incredible ease-of-use
  - Simple and robust for use both within a laboratory or on-site
  - Rapid detection (most positive samples in 2h to 12h)
  - Approved under US EPA 40CFR141
- "Operationalizes" microbiology
  - Anywhere, anytime, by anyone
  - Improve efficiency & reduce costs
  - Improve water quality & health protection
  - Reduce risk / liability
  - Save time
  - Save lives
- Looking to work with the very best!

Questions?

For more information

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