

# TECTA - PDS

- Our Mandate: To revolutionize the microbial 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, automated microbial detection system for on-site testing
  - The only **“RAPID, AUTOMATED, & APPROVED”** method available

## Company Introduction

### • TECTA-PDS – Quick history

- Queen's University (Canada)
- Response to *E. coli* contamination in Walkerton, Canada
- Acquired by Veolia Water in 2008
- Management buyout in 2016
- TECTA Solutions
  - Rapid, automated microbial detection of *E. coli* and Coliforms bacteria



The Problem: E.Coli is a reality

# Boil water advisory issued for Picture Butte

Alberta Health Services says water should be boiled for at least a minute before consumed

CBC News Posted: Feb 20, 2014 12:50 PM MT | Last Updated: Feb 20, 2014 12:50 PM MT

Facebook 0

People in Picture Butte are being told to boil their water.

Sta

Twitter

## 1.3 million Montrealers face boil water advisory

Residents should expect advisory to last a minimum of 24 hours

CBC News Posted: May 22, 2013 10:46 AM ET | Last Updated: May 23, 2013 9:06 AM ET

98 cases of E. coli outbreak

0 0

Monday 22 October 2012 20:21

Doylestown - Water restrictions remained in place at Linden Elementary School in Doylestown Wednesday, a day after it was revealed that fecal coliform showed up in a water test at the school.

News World news E coli

## Coroner calls for stricter controls after E coli death

## to Opelika, Alabama Water Park

ark are investigating an E. coli O157:H7 outbreak linked to a water park in

There are a further 175 probable cases

# Tap water warning in Copenhagen after E.coli found

Aug 21, 2011

*The Problem: E.Coli is a reality*

PART TWO  
**REPORT OF THE  
 WALKERTON  
 INQUIRY**  
 A Strategy for Safe

**'Preventable'  
 tragedy  
 claims fifth  
 victim**

**The E. coli crisis**



## Walkerton Report – Causes:

- Lack of technology
- Centralized testing
- Storage and transport of samples
- Long overall test time
- Manual test method
- opportunity for human error / human negligence
- Regulatory shortcomings
- **INADEQUATE TESTING**

Police  
 deal a controversial arrest.

Pages A10-A11



Pages B3

Providing Service to the Community Since 1987

\$3.00 (plus GST)

# Deadly waters

Five people dead due to E. coli contamination of Walkerton water supply

By Brent Crosser

Five people have died and about 1,000 have sick with E. coli, thanks to Walkerton's water supply, officials are saying the worst is still feared in Walkerton, Ontario.

What has happened is a public health emergency, it should be treated as such, says Dr. Murray Wilkerson of the



in 1996, the town was able to eliminate major contamination with its \$200-million plant, a year before the Walkerton water crisis.

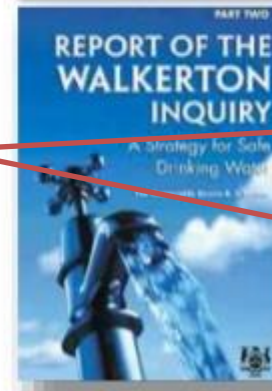
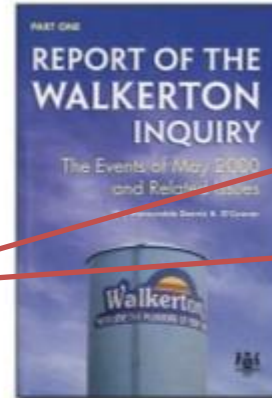
Five children are currently being treated at the Children's Hospital of Western Ontario in London, Ont., but by Wednesday, they were all recovering.

London, Ont., Mayor Gordon Campbell said that patients, including one who is expected to die, are recovering well.

# The COST

## Response to the Walkerton Tragedy

- Part One of the Walkerton Commission of Inquiry:
  - Improper operating practices by the Walkerton Public Utilities Commission and lack of regulatory and compliance obligations by the Ontario Government
  - Total estimated damage: \$64.5-155 million
- Part Two of the Walkerton Commission of Inquiry:
  - The Commission recommended that Ontario residents be guaranteed by law that their tap water is safe
  - The Ontario Government to spend \$329 million to make the water safe
  - The Ontario Ministry of the Environment to establish an agency to oversee water safety



Hospital Stays & Air Trans.& Opp. Cost	\$	597,418
Coroner Costs	\$	559,824
Physician Visits	\$	99,239
	\$	64,527,194

## The Solution...

### • Walkerton Report – Solution / Government checklist:

- ☑ • Automated 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

**TECTA™ Solutions**  
**Rapid, Automated**  
**Microbial Detection**  
**System**

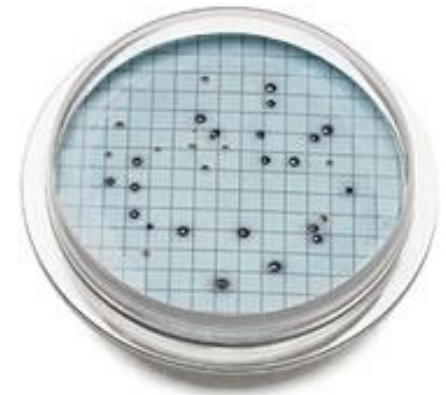




- The current testing methods are not sufficient for labs and utilities that are facing pandemic related challenges

# Solution-Culture Test Methods

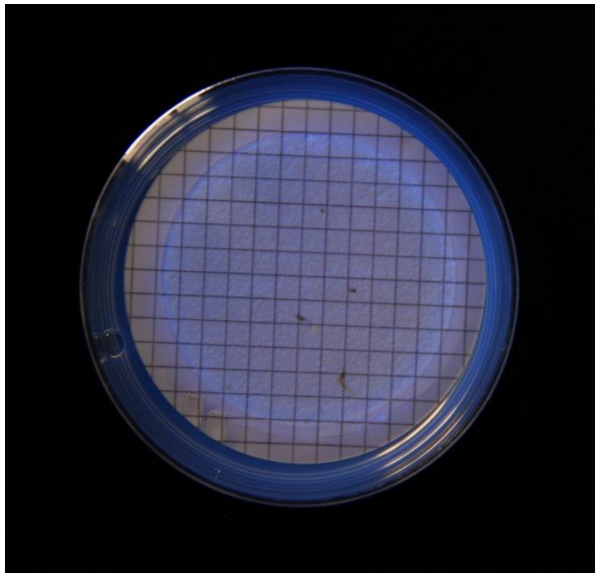
- Current methods for *E.coli* and TC involve enzyme detection through:
  - Shipping water sample to an accredited laboratory
  - Various aseptic manipulations of the water sample
  - Fixed time incubation of 18, 24 or 48 hours
  - Visual interpretation of colour or fluorescence change
  - Manually keeping records of all samples





## Membrane Filtration - Results

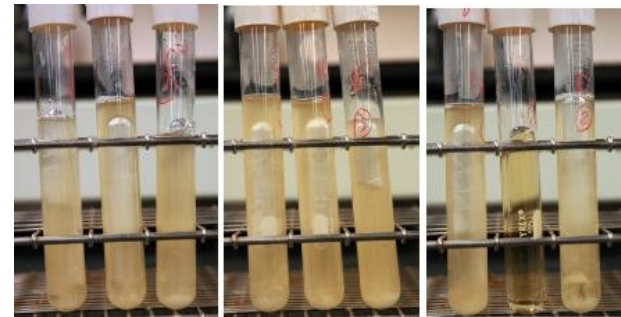
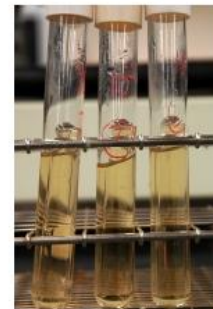
- **How hard is it to count - What's the big deal??**



- dynamic range 0~80 CFU or sample dilutions required
- excess “general bacteria” can result in “over-grown” plate

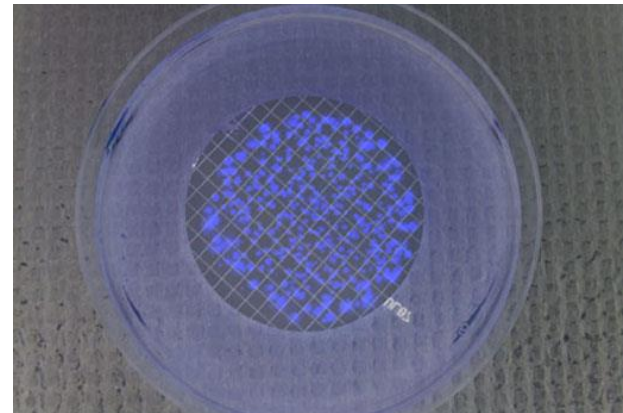
## Other Methods

- Test Tube Methods
  - Lactose fermenting bacteria
  - Presence of gas bubbles in each tube
  - P/A or quant using multi-tubes & MPN
  - When was it invented??
  - 1914
  - Still being used today

 $10^{-2}$  $10^{-3}$  $10^{-4}$  $10^{-5}$  $10^{-6}$

## Other Methods

- Defined substrate methods (or Enzyme methods)
  - Colour change and fluorescence
  - Two method styles
    - Solution Culture - media powder mixed into sample
    - MF Plates
  - IDEXX Colilert, Colitag; Colisure; ReadyCult; E\*Colite
  - P/A or quant by MPN (Quantitray or tubes); plate counting
  - When was it invented??
  - 1988



## Visual detection

- Visual detection is subjective, might depend on lab

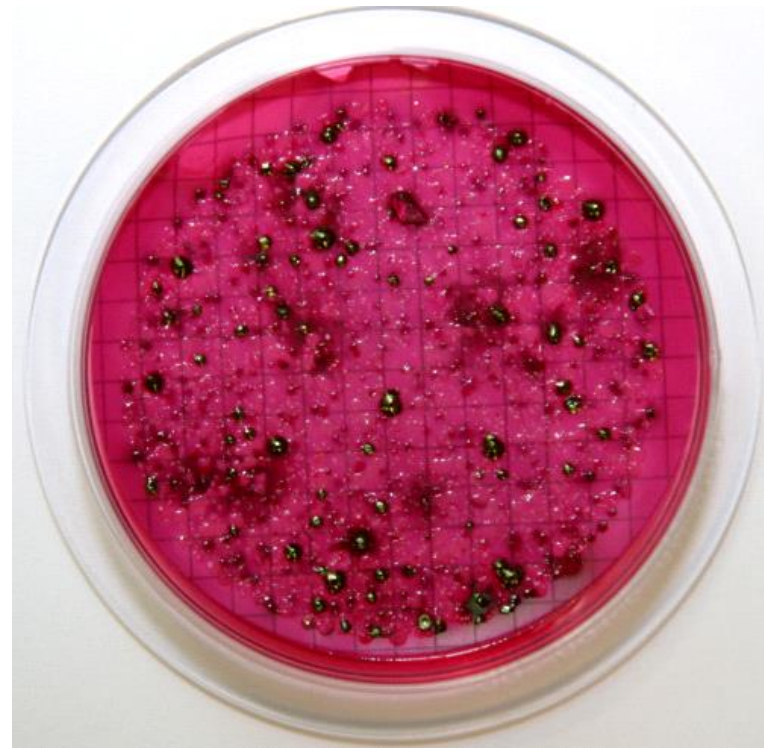
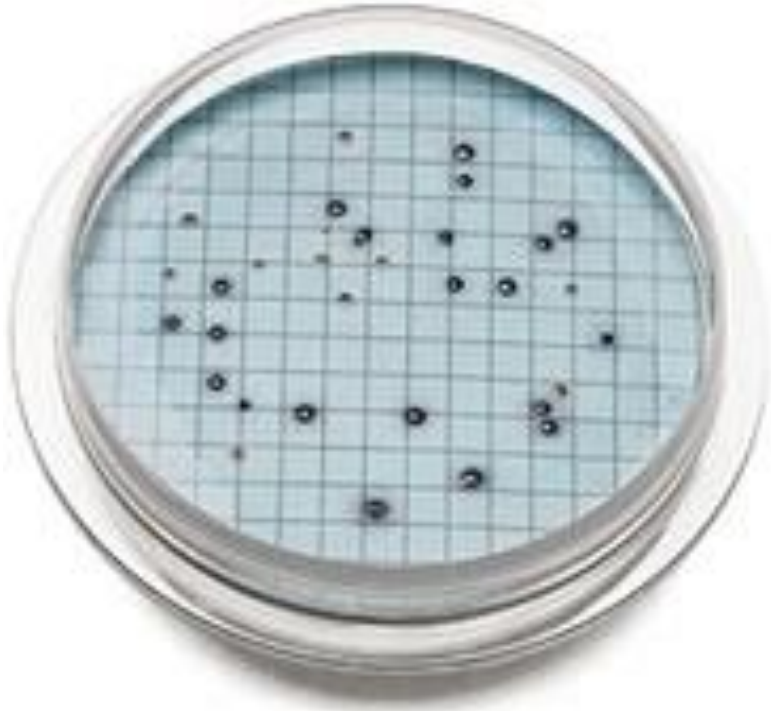


**Negative sample**

**All these samples are positive  
(Spiked E.coli Samples)**

## Visual detection

- Visual detection is subjective, might depend on lab

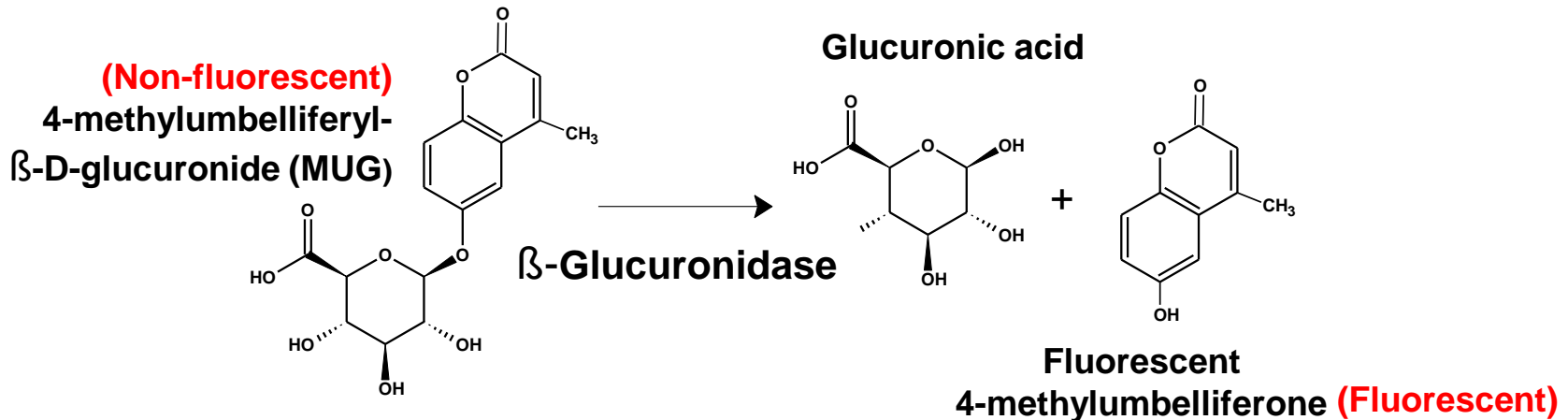


# Enzyme Chemistry – Traditional Methods

## Current chromogenic substrate method:

- Fluorescent marker for E.Coli, Colour change for Total Coliforms
- Markers are **hydrophilic** and stay dissolved in the sample

### Competitor E.Coli Substrate



- Human interprets the results – sometimes difficult to tell!
- Fixed incubation time
- Requires a laboratory infrastructure

# Conventional methods

- Much longer turn-around time



Between 36 – 72 hours plus

## Automated method

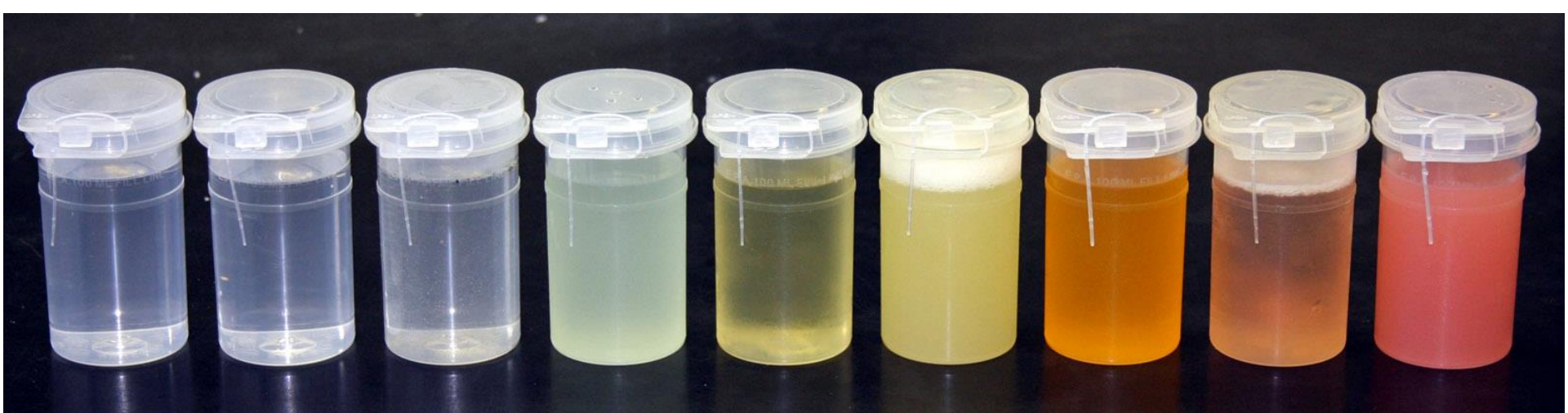
- Selective broth culture with detection of enzymes identical to conventional tests:
  - glucuronidase for *E. coli*
  - galactosidase for coliforms
- Opto-chemical sensor extracts and automatically detects enzyme product
- Complete test and sensor in a single-use cartridge with pre-measured reagents
- Simple instrument that can be operated in the field
- Continuous automated interpretation and reporting of sample result



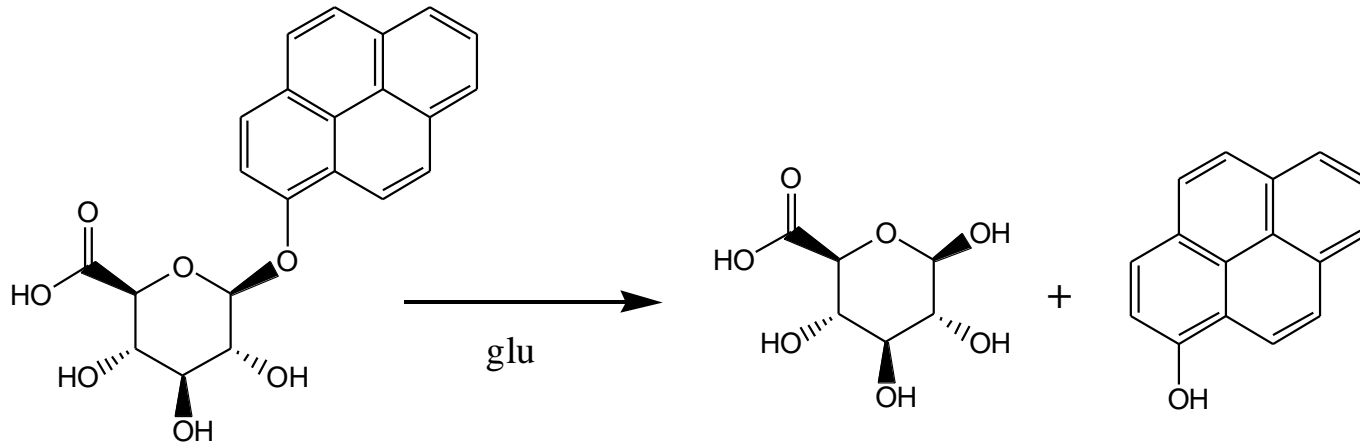


# The Innovation

- Isolating the optical detection outside of the water sample matrix allows TECTA method to test coloured and turbid samples



# The Innovation



pyrene-β-D-glucuronide  
**(Hydrophilic)**

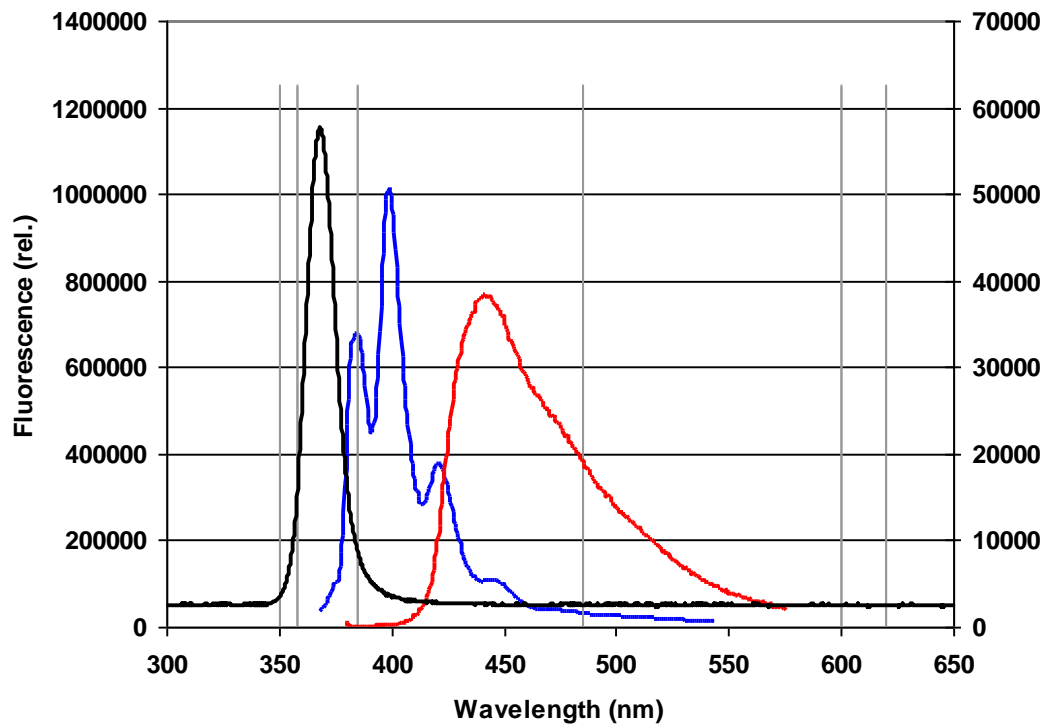
β-D-glucuronide  
**Glucuronic acid**

1-hydroxypyrene  
**(Hydrophobic)**

- Same indicator enzymes as other approved methods
  - for E. coli use glucuronidase enzyme.
  - for Total Coliforms use galactosidase enzyme.
- Hydrophobic fluorescent markers can be 'extracted' out of sample for analysis.
- Automate detection and eliminate human interpretation.

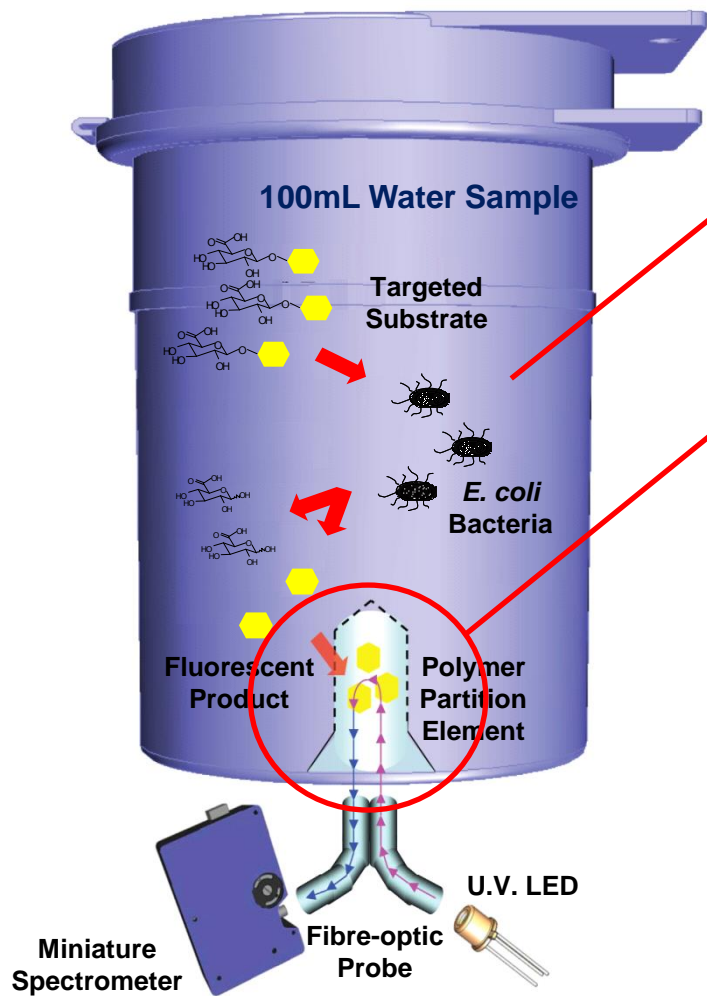
# The Innovation

- Separate fluorescent colours used for monitoring E.coli and Total Coliforms independently within the same sample



# The Innovation

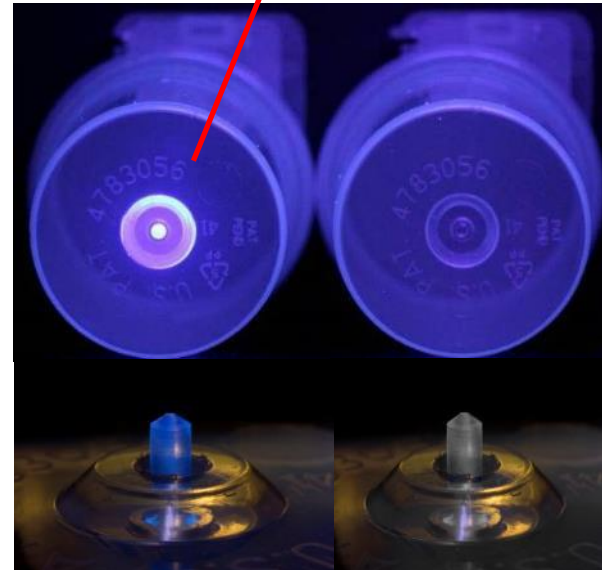
## Enzyme-substrate / solution culture method



Detecting identical enzyme as conventional methods

Extracting fluorescent markers outside of sample into polymer

Automated detection of fluorescence in polymer triggers result

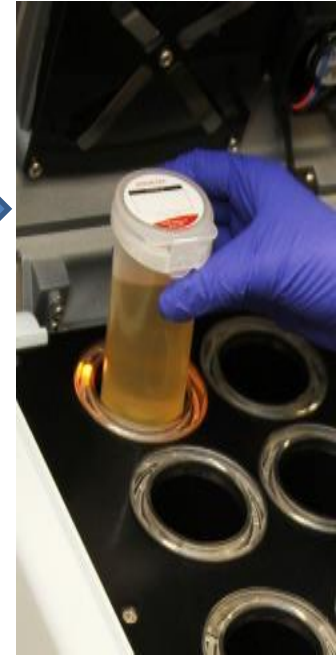
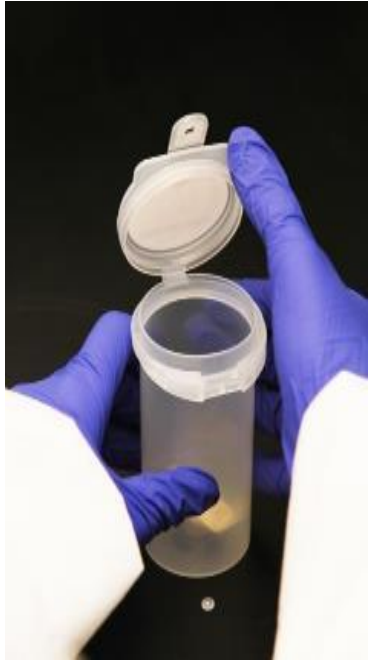


# The TECTA Solution

- **The Problem:** Traditional methods are manual, require a lab, slow to get samples to a lab, require visual interpretation and manual record keeping
- **The TECTA Solution:** Fully automated analysis, Rapid, EPA approved, microbial detection system
  - It remains the only **“RAPID, AUTOMATED, & APPROVED”** method available



## The TECTA Solution



*Just add water...*

*...and press "Play"*

## B16 and B4 Systems



- Fully automated bacterial test – E.coli, Total Coliform, Fecal, Enterococcus
- Lab-in-a-box - Place water sample cartridge in unit, press start, walk away
- Fully automated test monitoring, interpretation and reporting via email
- US EPA Approval with single cell sensitivity
- Test any water, waste water matrix - not affected by turbidity or sample colour
- High dynamic range with no dilutions required



### TECTAlert-CCA

- E.coli & Total Coliform
- Incubation at 35.5°C
- Popular for Drinking Water

### TECTAlert-ECA

- E.coli
- Incubation at 41.5°C
- Rapid Test (16 hours)
- Popular for Bathing Water
- Marine water must be diluted 1:10

### TECTAlert-FCA

- Fecal Coliform
- Incubation at 44.5°C
- Popular for Wastewater

### TECTAlert-ENA

- Enterococcus
- Incubation at 41.5°C
- Popular for Bathing Water
- Marine water must be diluted 1:10