Comparing E. coli Results Analyzed by Colilert® and Membrane Filtration

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Ohio River Valley Water Sanitation Commission

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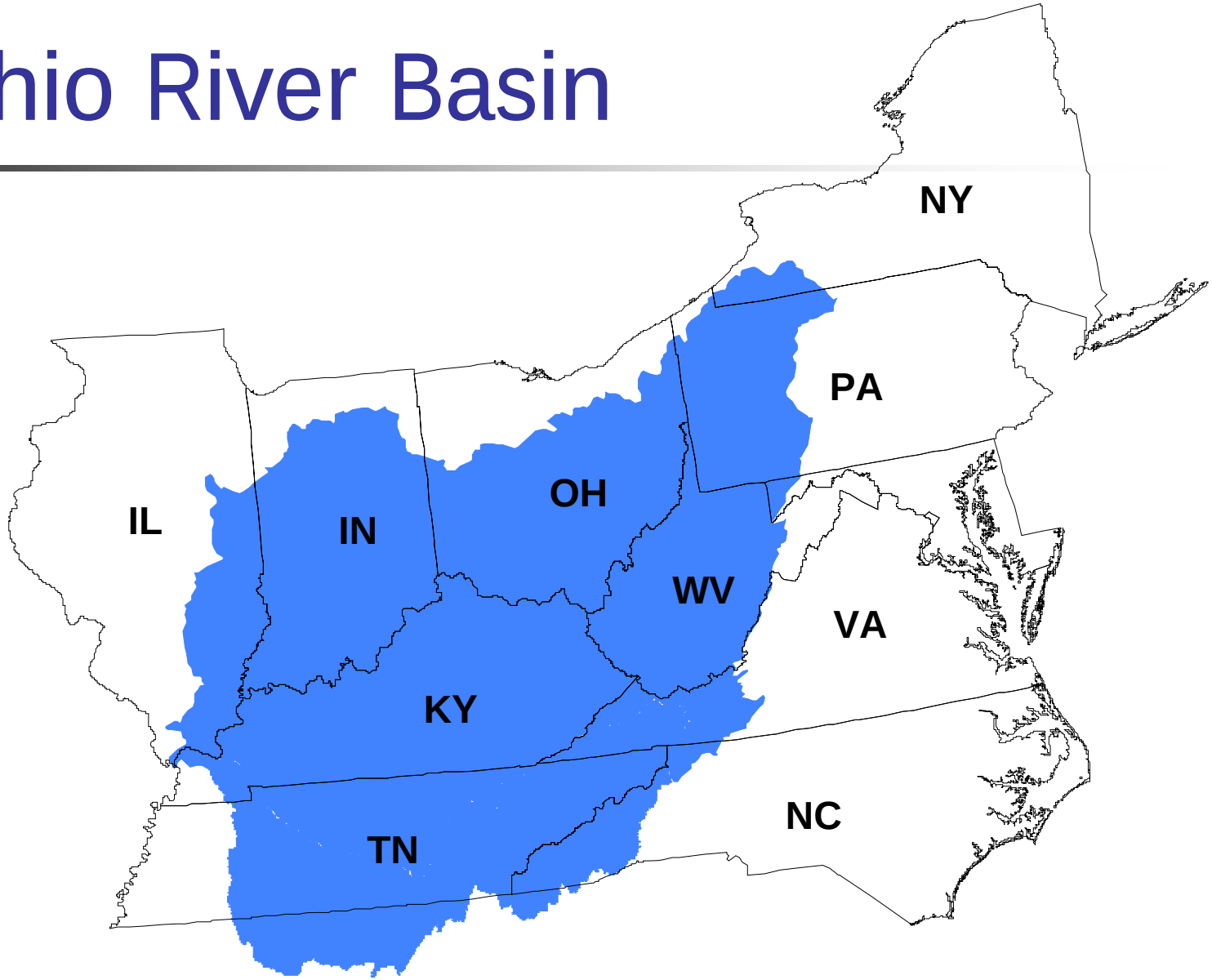
ORSANCO

- Ohio River Valley Water Sanitation Commission
- Compact signed in 1948 by state governors and approved by Congress

Ohio River Basin



Ohio River Facts

- Begins in Pittsburgh, PA at the confluence of the Allegheny & Monongahela
- 981 miles long
- Meets the Mississippi River at Cairo, IL
- Drainage basin covers 204,000 square miles

Bacteria Monitoring Issues

- Only 18% of river assessed for bacteria
- Limited funds
  - Focus on most significant problem areas
- Samples have very short hold time
  - Difficult to sample remote areas
- Sampling previously limited to urban areas only

Solution – Mobile Laboratory

- Moves lab to the field
- Fully equipped to process samples in the field

Mobile Water Quality Lab

- Colilert® method by IDEXX
- Analyze for *E. coli* and total coliforms
- 24-hour incubation

Program Objectives

- Assess entire river for E. coli
  - Especially areas previously not monitored
- Compare Colilert to membrane filtration
  - How does Colilert method stack up?

Intensive Bacteria Surveys

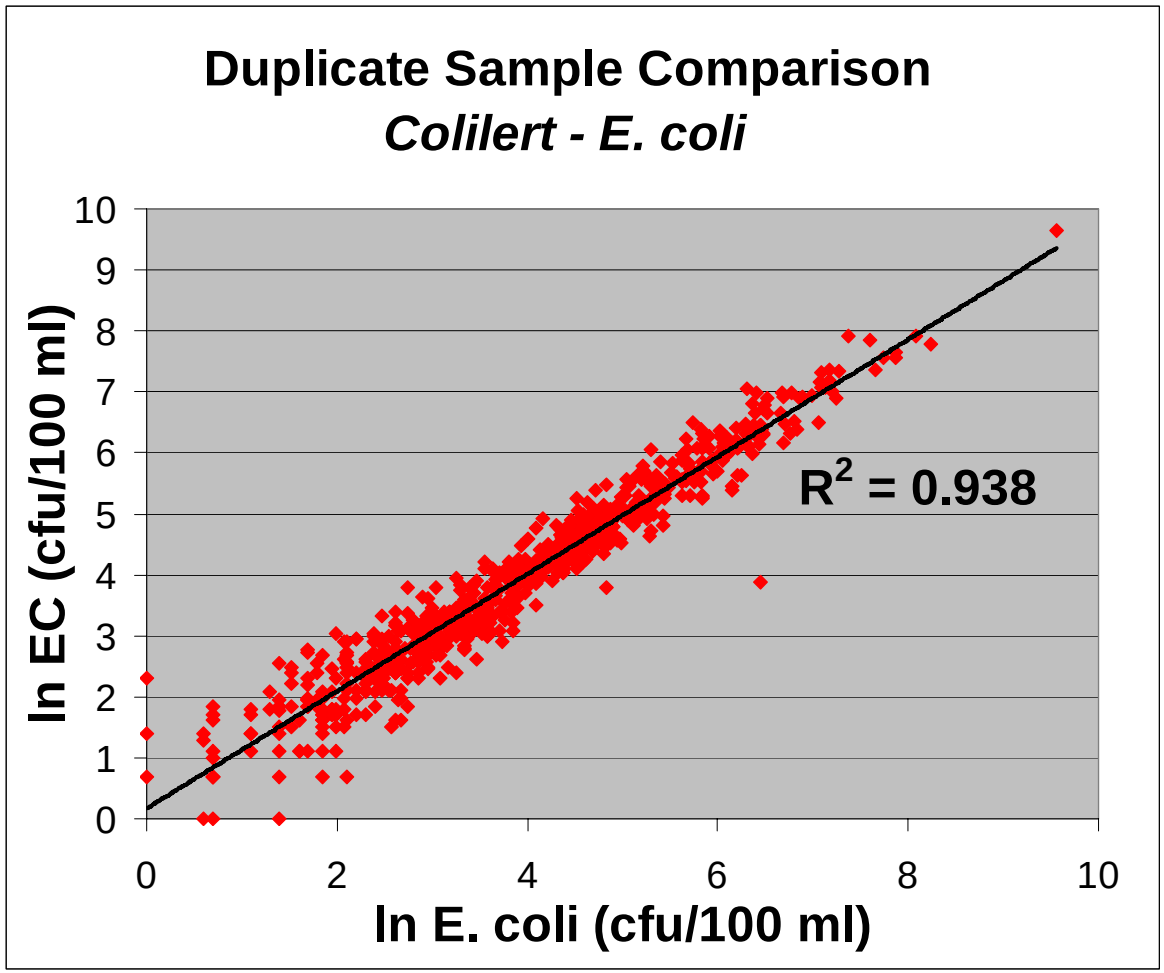
- Divided river into 3 reaches
  - Upper, middle, and lower
- Covered entire reach in one week
- Sampled each reach for 5 consecutive weeks
- 3 point cross sections
  - Every 5 miles
  - On all major tribs
  - Downstream of POTWs

Sample Analysis

- Ran over 9000 samples by Colilert
  - E. coli and total coliforms
  - 10 percent duplicate samples
  - 15 percent sent to contract labs for MF
- Seven contract labs used
  - E. coli – Standard Method 9213D
  - Fecal coliforms – Standard Method 9222D
    - Exception - One used 9222G

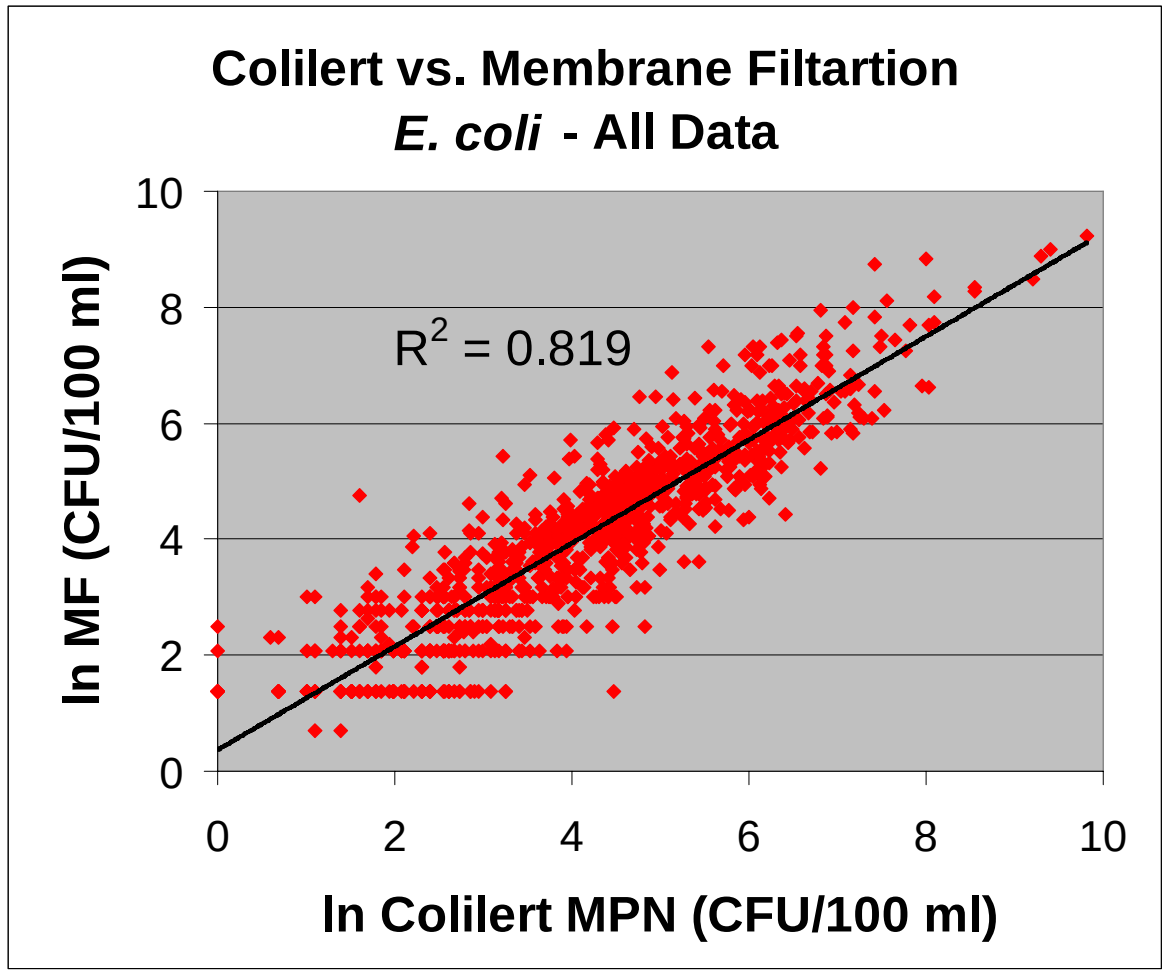
Duplicate Sample Data

- Colilert
  - 27% average relative percent difference
- Contract Labs
  - RPDs ranged from 21 to 62 percent
- Colilert performed better than 6 of 7 contract labs using membrane filtration



Colilert vs Membrane Filtration

- How does Colilert compare to MF?
- RPD = 50 percent overall average
- Mixed results across labs

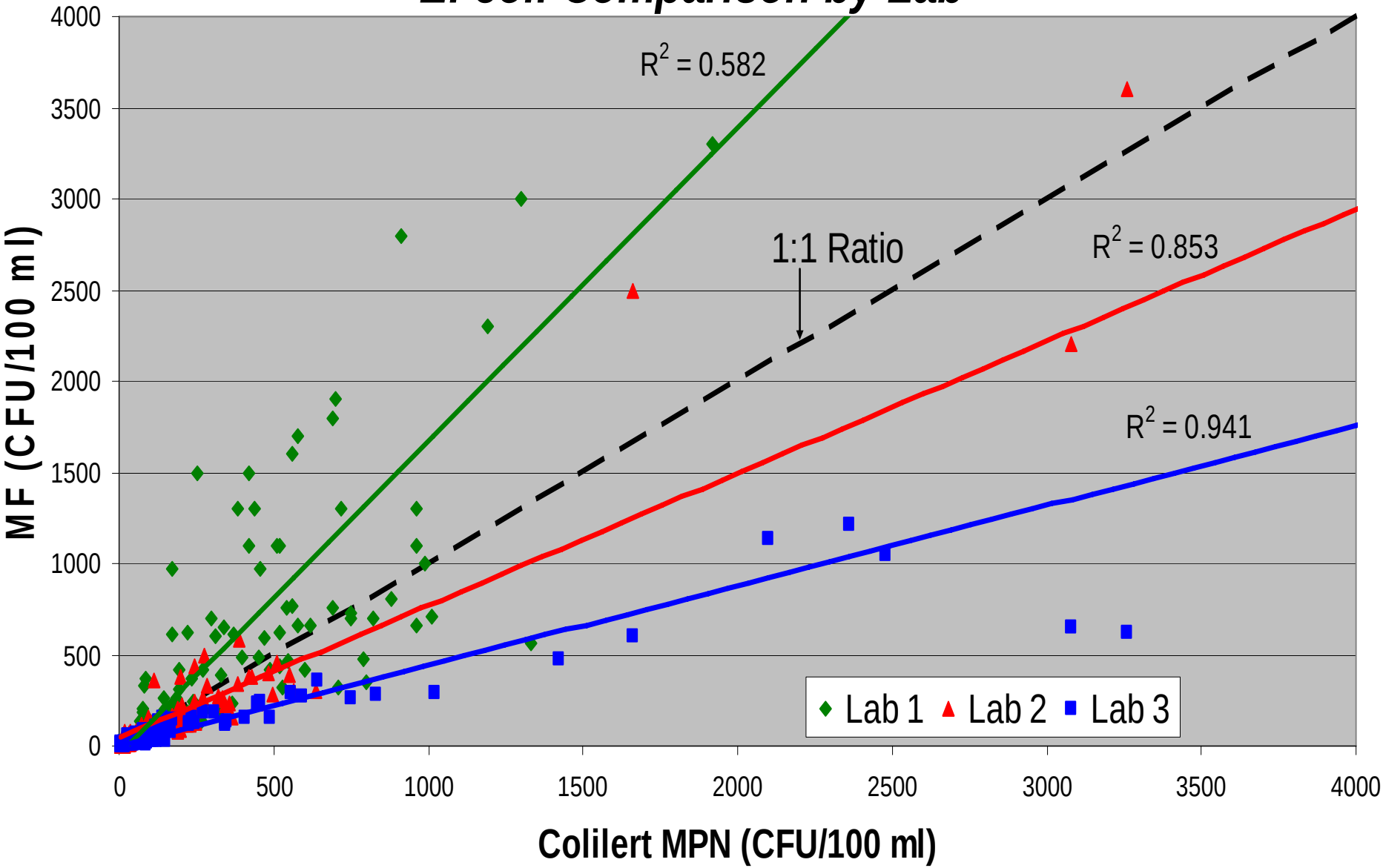


Individual Lab Comparison

- Compared Colilert to individual contract lab membrane filtration results
  - Average RPDs ranged from 39 to 65 percent
- Frequency Colilert greater than MF
  - Ranged from 25% to 84%
  - Overall Colilert > MF for 53% of samples
    - 49% when lab using SM9222G is excluded
- 7 different labs = 7 different relationships

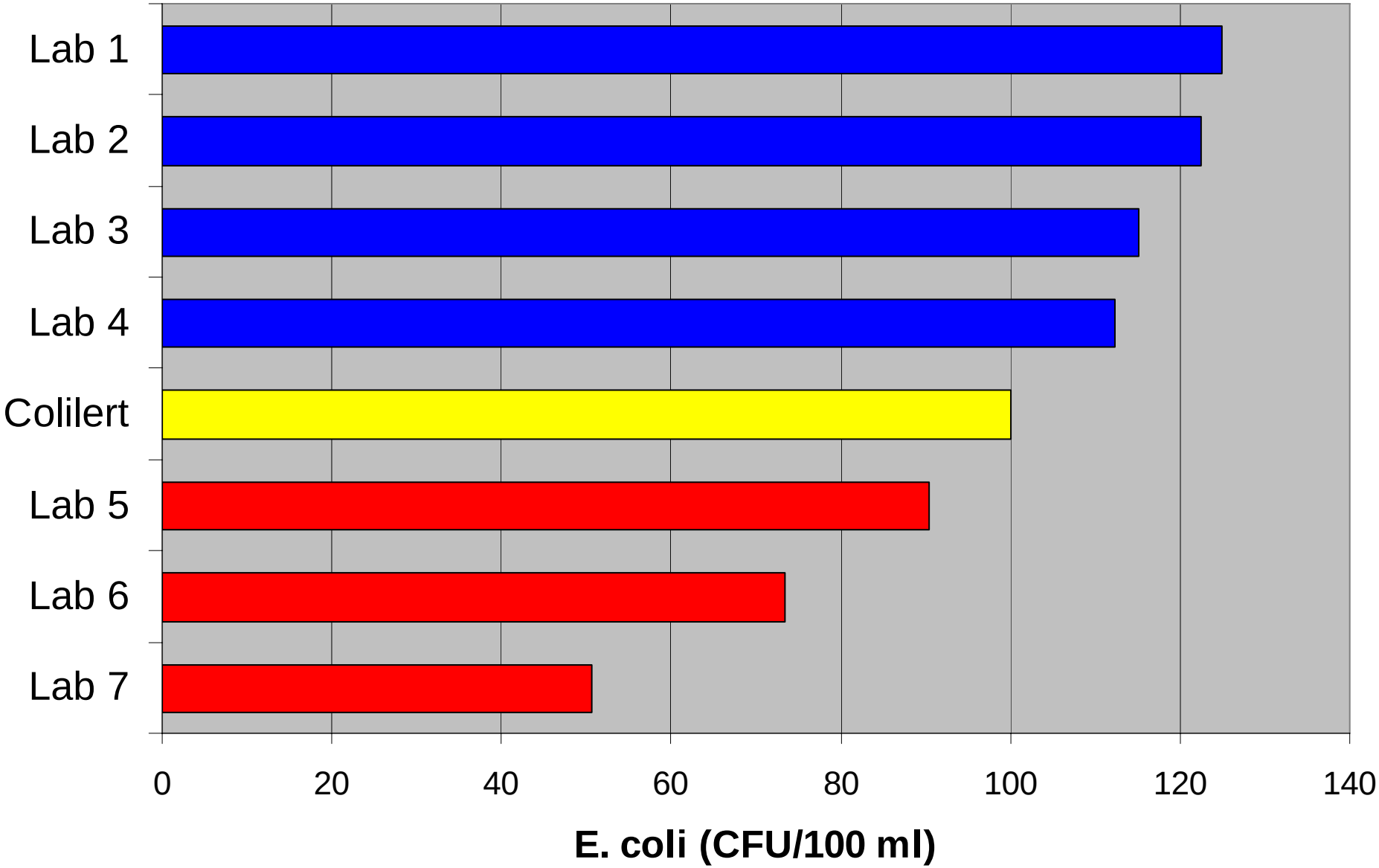
Colilert vs Membrane Filtration

E. coli Comparison by Lab



Predicted Membrane Filtration E. coli Results

Hypothetical Scenario: Colilert = 100 CFU/100 ml



Conclusions

- Duplicates - Colilert performed better than 6 of 7 contract labs using MF
- Colilert vs MF – Mixed results by lab
  - Consistent, yet biased, relationships observed for individual labs
  - Overall: Colilert > MF about half the time
  - Large differences common (RPD 50%)

Bottom Line

- Labs yield very different E. coli results even when standardized methods are followed
- Laboratory bias makes it difficult to develop consistent assessments over large areas that utilize data from multiple labs

Questions?

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