

Bacterial Source Tracking

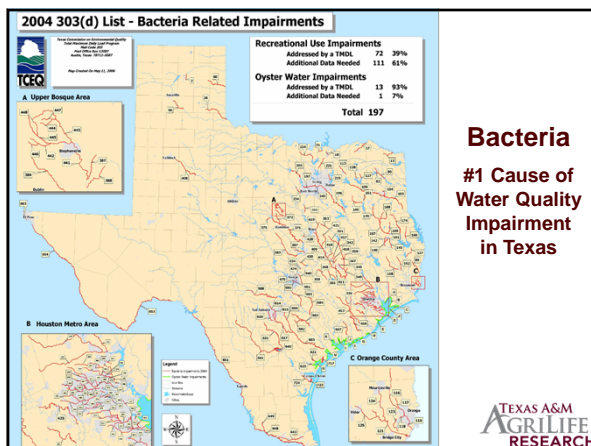
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Outline

- Introduction
- Bacterial source tracking (BST) methods
- Use of BST for watershed characterization





Fecal Indicator Bacteria (FIB)

- FIB (e.g., *E. coli*) used as an indicator of fecal pollution and health risk
- High levels of FIB = higher probability of health risks
- Does not necessarily reveal the source(s) of fecal contamination



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What is Bacterial Source Tracking (BST)?

- Used to determine the sources of fecal contamination
- Based on uniqueness of bacteria from individual sources
- A variety of different methods are used



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BST Target Organisms


- Bacterial v. Microbial Source Tracking
- Different targets:
 - *E. coli*
 - *Bacteroidales*
 - Bacteriophage
 - Human viruses
 - Chemicals



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BST Methods


- Can be classified according to approach:
 - Phenotypic v. Genotypic
 - Library-dependent v. Library-independent




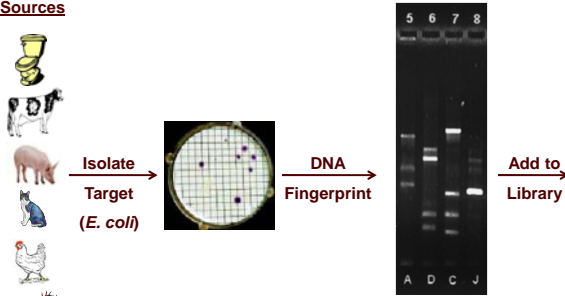
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Development of BST Known-Source Library

Sources




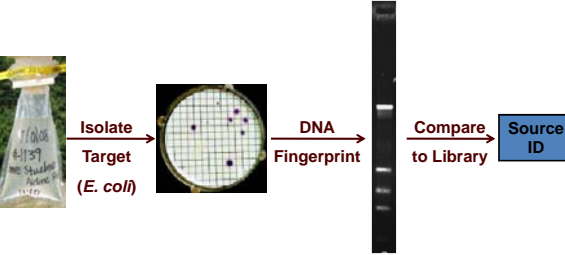
Isolate Target (*E. coli*) → DNA Fingerprint → Add to Library



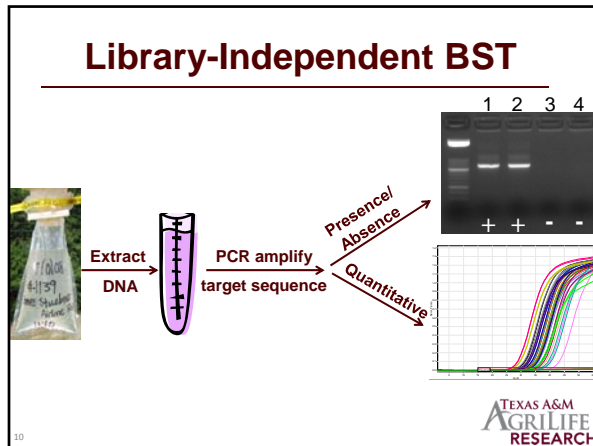
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Library-Dependent BST

Isolate Target (*E. coli*) → DNA Fingerprint → Compare to Library → Source ID



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- ### Library-Independent BST
- **Most common approach targets *Bacteroidales***
 - **More abundant than *E. coli* in human and animal feces**
 - **Not pathogens**
 - **Subgroups host-specific**
 - **Markers available for humans, ruminants, horses, birds, and hogs**
 - Highly (but not 100%) specific
 - Limited markers for wildlife
 - Correlation with FIB and pathogen levels uncertain

- ### BST Method Overview
- Library-Dependent BST:**
- **Used in many studies**
 - **Library construction expensive**
- Library-Independent BST:**
- **Rapid and less expensive**
 - **Limited markers, but new markers being developed**
 - **Geographic stability of markers?**
 - **Quantification?**




BST for Little Brazos River Tributaries

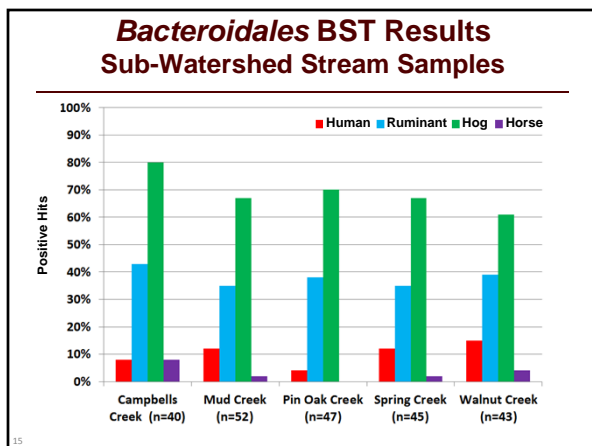
Limited library-dependent

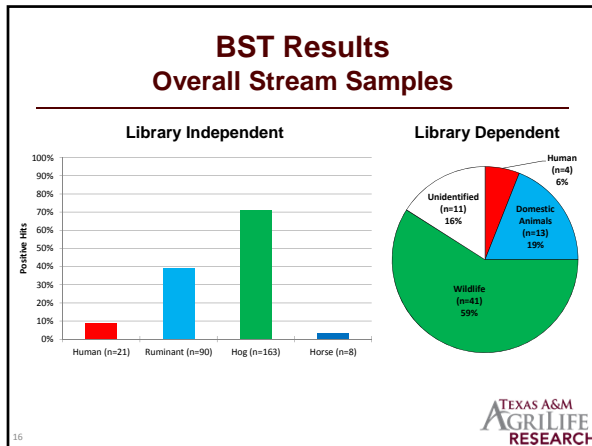
- Analyzed *E. coli* from 81 water samples from across the study area using DNA fingerprinting
- Best match ID against Texas *E. coli* BST Library (1459 isolates from 1285 fecal samples)
- Categorized to three major sources: human, domesticated animal, or wildlife

Library-independent

- Analyzed 259 water samples from across the study area using *Bacteroidales* PCR (presence/absence)
- Human, ruminant, hog, and horse markers



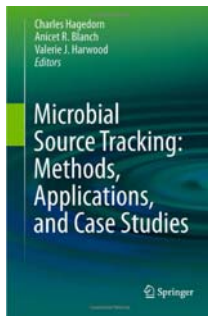
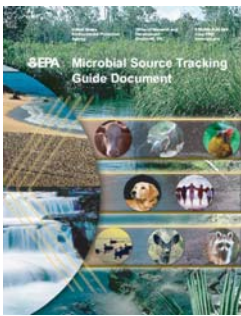




- ### Use of BST Results
- **Reconciled with:**
 - Land use
 - Watershed source survey
 - Modeling
 - **Information provided to stakeholders for watershed protection planning process**
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- ### What is the Goal of BST?
- **How many potential sources?**
 - All, most numerous...
 - One or a few (e.g., human)
 - **What level of resolution is needed?**
 - Individual species or groups (e.g., humans, domesticated animals, and wildlife)
 - Presence/absence, relative ranking, or absolute number of various sources
 - **Complementary methods & information**
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Additional Information



<http://texasbst.tamu.edu/2012-conference/>



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Questions?

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