PulseNet in Change: Challenges and Opportunities

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Objectives of PulseNet USA remains unchanged

- Detect foodborne disease case **clusters** by PFGE
- Facilitate early identification of common source **outbreaks**
- Assist epidemiologists in investigating **outbreaks**
  - Separate outbreak-associated cases from other sporadic cases
  - Assist in rapidly identifying the source of outbreaks
  - Act as a rapid and effective means of communication between public health laboratories

What could PulseNet do in 2007?

1) Enhance cluster detection
   - Next-generation subtyping methods
2) Enhance support for outbreak investigations
   - Comparison with non-human isolates
   - PulseNet International
3) Support for investigations into sporadic foodborne infections
   - Microbiological attribution analysis

1) Enhance cluster detection

- PFGE slow, costly and laborious
- PulseNet next generation methods
  - MLVA for *E. coli* O157
    - Implemented at CDC and in 4 states
    - Scripts being written for the PulseNet *E. coli* database
  - MLVA for *S.* Typhimurium
    - External validation in PulseNet laboratories
    - To be implemented in PulseNet laboratories
  - MLVA for *S.* Enteritidis
    - Prototype developed by the MN lab*
    - Internal validation at CDC
  - MLVA for *Listeria monocytogenes*
    - Prototype developed by the NC lab
    - Internal validation at CDC
  - <u>SNP analysis for subtyping of *E. coli* O157</u>
    - <u>Developed by CDC</u>

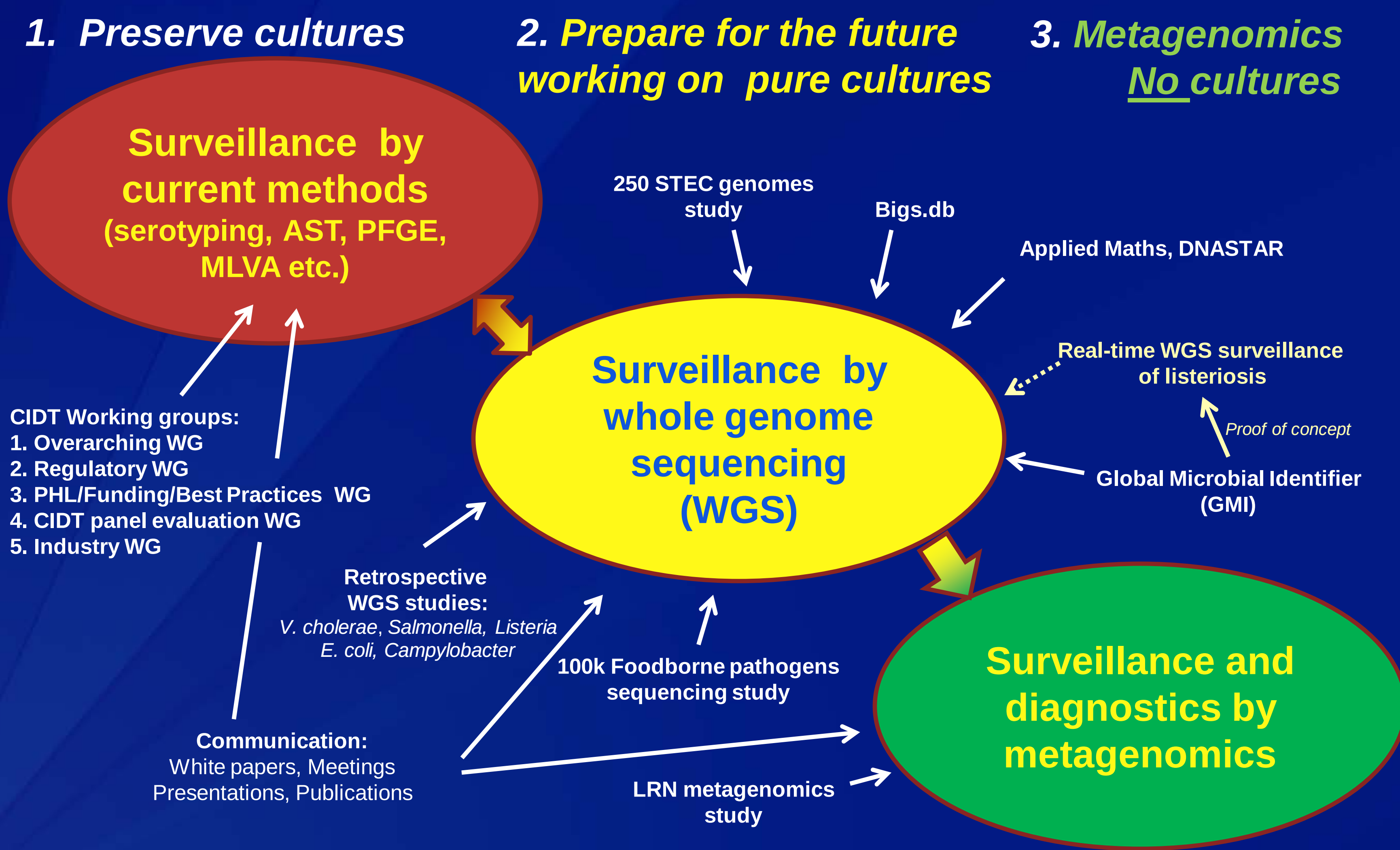
* **Boxrud D *et al.*. J Clin Microbiol. 2007;45(2):536-43.**

Cluster detection in 10 years (after 2007)

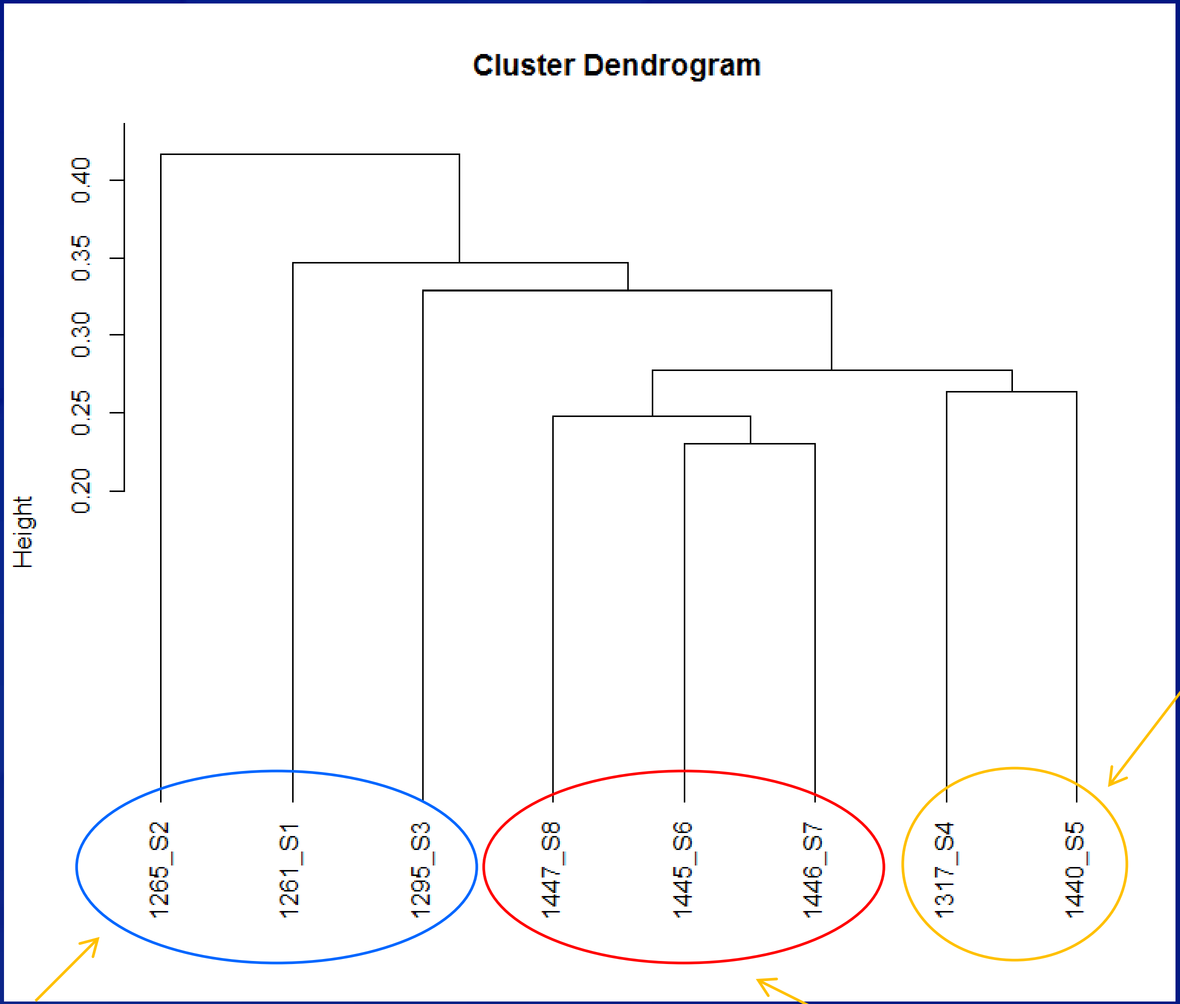
- Combined non-culture diagnosis and subtyping in the clinical, veterinary and food microbiology labs automatically reported to linked public health, FDA and USDA databases
- Automatic cluster detection algorithms
- Automatic comparisons of human and non-human data

Diagnostic Molecular Diagnostic Panels Are Threatening Surveillance

Laboratory Strategy to Meet The Challenge of Culture Independent Diagnostic Methods (CIDT)



K-mer Based Dendrogram of Illumina Sequenced *Salmonella enterica* ser. Thompson

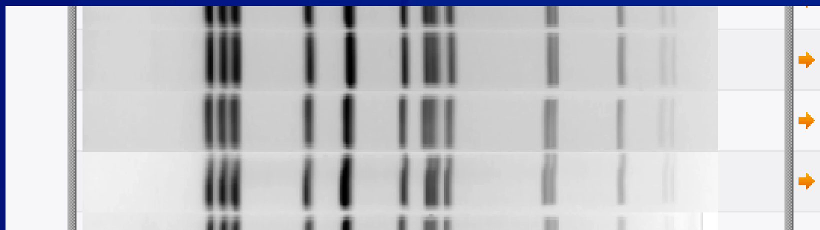


Spurious Samples

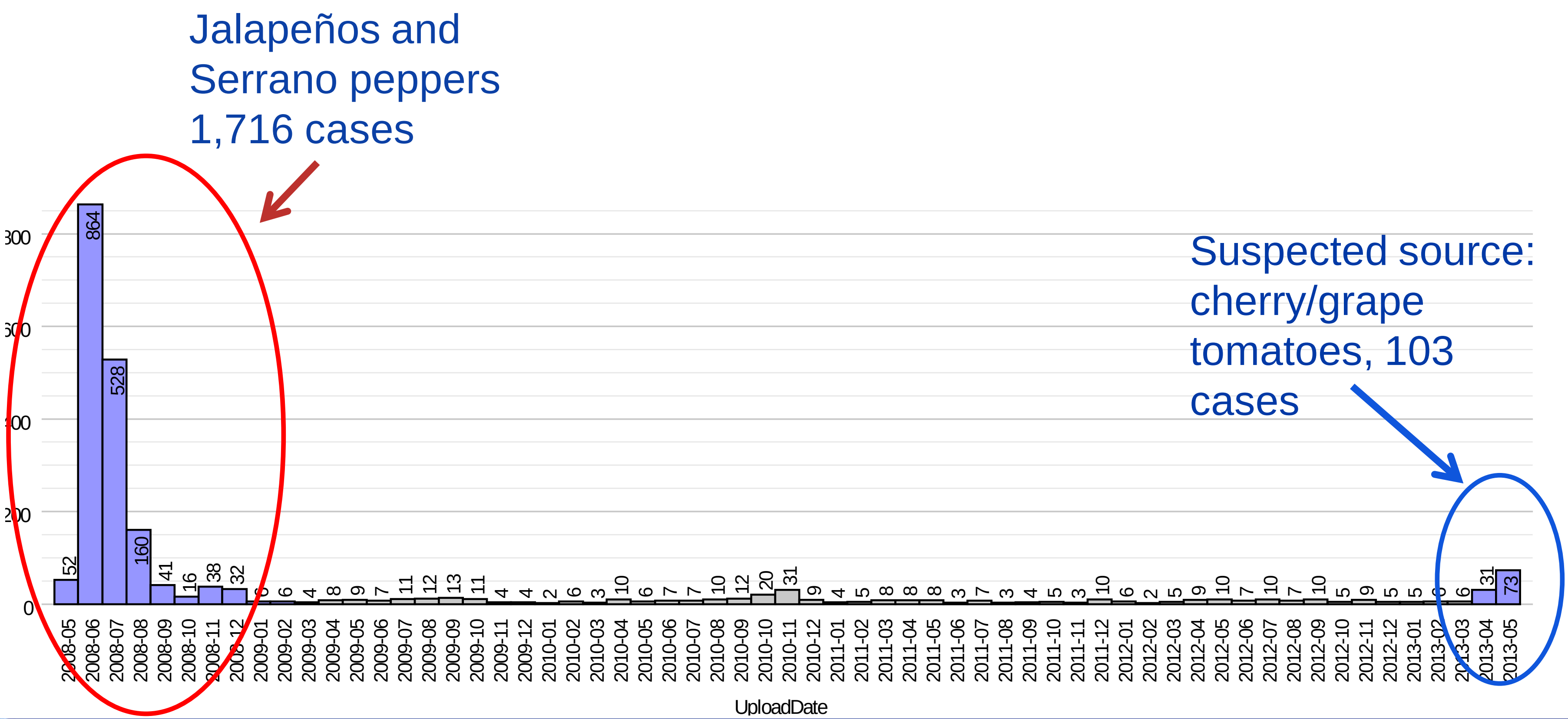
US Outbreak Cluster

Dutch Outbreak

Salmonella Saintpaul Pattern JN6X01.0048, Historical and Real Time Outbreak



→ **WGS**



Proof-of-Concept on the Use of Real-Time Whole Genome Sequencing in Conjunction with Enhanced Surveillance for Listeriosis

Public Health Agency of Canada

The PulseNet Web-Portal

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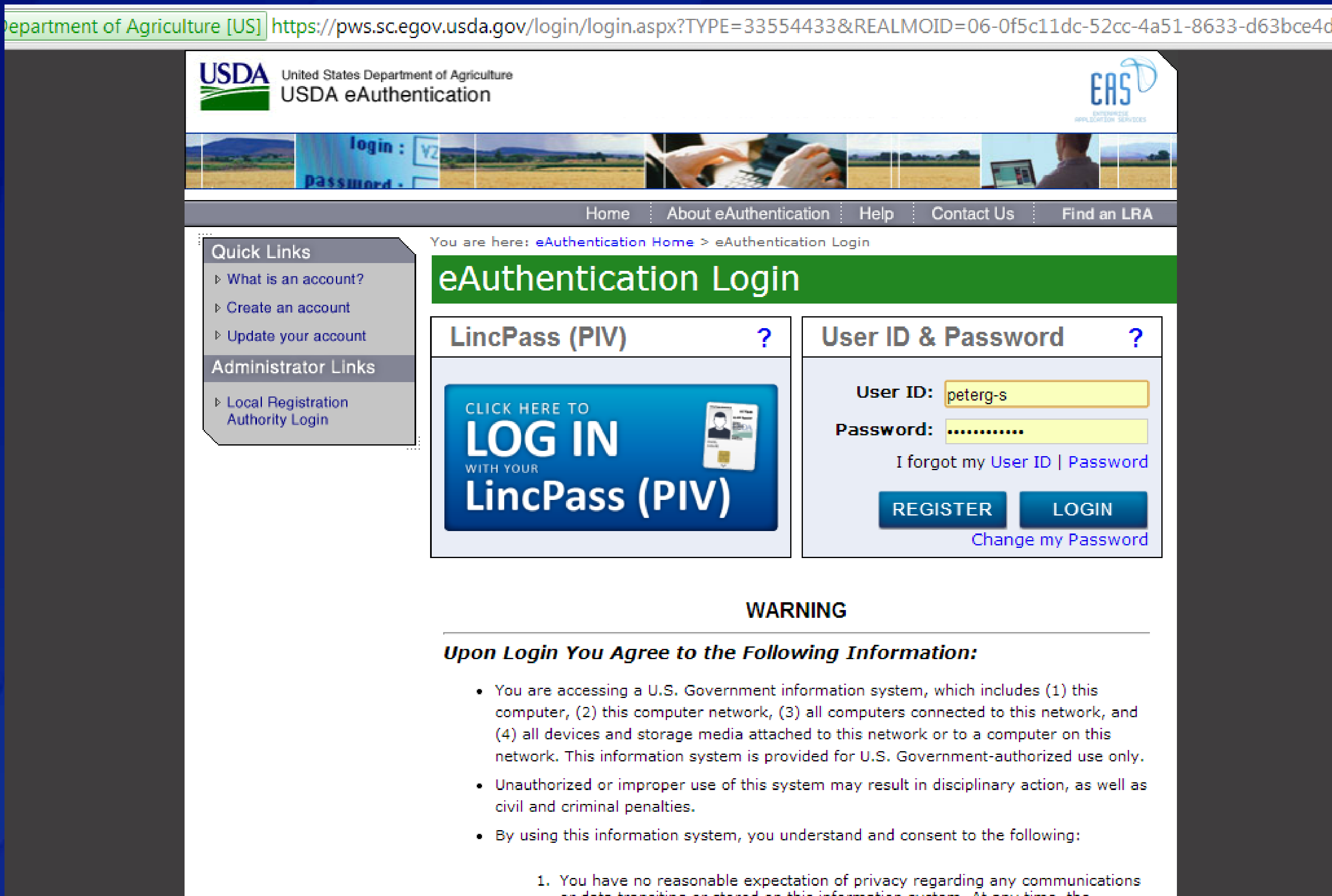

Why will PulseNet be successful in its next decade?

- Clear vision
- Articulated vision in simple terms
  - “PulseNet saves lives”
- Dedicated and loyal co-workers and colleagues
- Partners with a “Can Do” attitude
- Continually reevaluating processes and implemented changes as necessary
  - Software automation
  - New subtyping methods
  - Collaboration from “Farm to Fork”

Acknowledgements

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Public Health Agency of Canada

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