

# **PulseNet: Software Changes and Improvements to Online *E. coli* National Database**

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# What is PulseNet?

- CDC's network of public health and food regulatory agency laboratories
- Perform DNA “fingerprinting” of foodborne bacterial pathogens using CDC's standardized Pulse-field Gel Electrophoresis protocols
- Analyze DNA patterns using standard software and CDC's standard parameters
- Communicate results electronically via the Internet

# PulseNet 2001

- **U.S. sites participating**
  - 46 state and 4 local public health labs
    - USDA FSIS
    - FDA-CFSAN, FDA-CVM, and 6 FDA-ORA Field labs
- **7 area labs**
- **PulseNet North Canadian national lab coordinating 6 provincial laboratories**
- **28 labs online for *E. coli* National database**

# Database Evolution

- Beginning in 1996 Tiff image data analyzed using Molecular Analyst Fingerprinting Plus software
- Tiff images and associated text information were sent to CDC via email or FTP
- National Online Database Inaugurated in 1998
  - MA-F software is not client server
    - Add-on interface facilitated uploading of patterns and additional data maintained in Access database
    - Difficult to add states due to security issues
    - Dual databases were awkward to search

# BioNumerics, the Next Generation Software for PulseNet, 2001

- **Changed to PulseNet Customized BioNumerics software**
  - **Client software customized for PulseNet**
    - **Multiple “fingerprint” type experiments**
    - **Character type data (ex. Antimicrobial susceptibility)**
- **Customized Administrator software for managing the national database**

# Information fields

**Entry properties** [X]

**Source**

City: [ ]  
County: [ ]  
State: NY [ ]  
Country: USA [ ]

**Patient**

Age: [ ] yr [ ] mn  
Sex: [ ]

Outbreak: [ ]  
Source Type: Unknown [ ]  
Source Site: Unknown [ ]  
Toxin: [ ]  
Phage Type: [ ]  
SeroType: E. Coli O157:H7 [ ]  
Isolate status: [ ]

NARMS-EB  
 FoodNet isolate

**Patterns**

Xbal	Blnl	Spel
kk_ec02-08-01,5	kk_ec02-08-01,9	kk021001,11
kk021001,4	kk021001,7	

Isolat. Date: [ Tuesday, March 12, 2002 ]  
Receiv. Date: [ Tuesday, March 12, 2002 ]  
Upload date: 2001-03-15

Antibiotics... [ ] OK [ ]  
Submit... [ ] Cancel [ ]

# Additional Data

**BioNumerics**

File Edit Database Experiments Comparison Identification Scripts

Key	LabID	SourceCountry	SourceState	S	1	2	3	4
1	01P0151	USA	RI	Pi	●	-	-	-
2	2001-G0001116	USA	OR	U	●	-	-	-
3	2001G-0001096	USA	OR	U	●	-	-	-
4	2001G-0001130	USA	OR	U	●	-	-	-
5	2001G-0001131	USA	OR	U	●	-	-	-
6	2001G-0001140	USA	OR	U	●	-	-	-
7	5733	USA	GA		●	●	-	-
8	6039	USA	TX		●	●	-	-
9	6039/#1	USA	TX		-	●	-	-
10	6141	USA	GA		●	●	-	-
11	6142	USA	GA		●	●	-	-
12	6153	USA	TN		-	●	-	-
13	6154	USA	TX		-	●	-	-
14	6157	USA	TX		-	●	-	-
15	f5716	USA	KY		●	-	-	-
16	F5717	USA	FL		●	-	-	-
17	F5730	USA	GA		●	-	-	-
18	F5731	USA	GA		●	-	-	-
19	F5733	USA	GA		●	-	-	-
20	F5739	USA	GA		●	-	-	-
21	F5816	USA	IL		●	-	-	-
22	STANDARD-ecoli				●	●	●	-

**Experiments**

**Fingerprint types**

- 1 ↓ PFGE-Xbal
- 2 ↓ PFGE-BlnI
- 3 ↓ PFGE-Spel

**Character types**

- 4 antibio

**Files**

- ↓ STD-Ecoli-Xbal
- Kk100298
- RI01057
- OR00111
- mf010926,Scott

**Comparisons**

- 092701 comp

**Libraries**

# Connected to PulseNet Online National Database

**Server login**  
File Database

**PulseNet**  
The National Molecular Subtyping Network for Foodborne Disease Surveillance

Server com  
Server login

**Configuration** | Identification | Other

**9193 entries**

**Database fields**

- LabID
- SourceCountry
- SourceState
- SourceCountry
- SourceCity
- SourceSite
- SourceType
- PatientAge
- PatientSex
- IsolatDate
- ReceivedDate
- UploadDate
- Serotype
- Outbreak
- cdc\_id
- ListMember
- Phagetype
- Toxin
- TEMP
- Status
- NARMS-EB
- FoodNet
- PFGE-Xbal-file
- PFGE-Xbal-pattern

**Fingerprint types**

- PFGE-Xbal
- PFGE-BlnI
- PFGE-SpeI

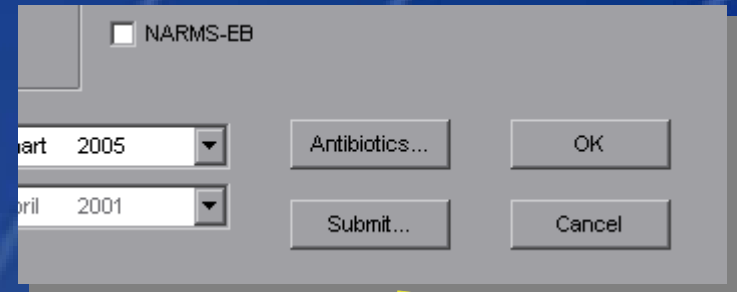
**Character types**

- antibio



# Submit an isolate

- Single button click to submit all information of an isolate to the server database



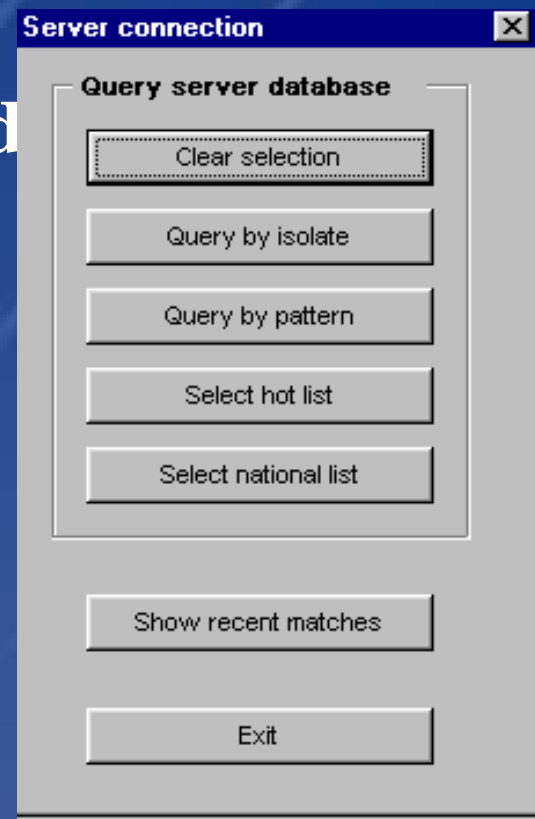
- “Official” database information fields
- All Normalized fingerprints + band information (for all enzymes)
- Corresponding TIFF files (if not yet present)
- Associated antibiotics resistance profiles



“Local” information (extra info fields, experiments) is **not** submitted to the server

# PulseNet “Client” BioNumerics software

- On-line system allows public health labs to actively submit and view PFGE patterns from the National database.
- Can compare local data to national database



# Client Isolate Query Functions

**Isolate query** [X]

**Source**

City:

County:

State:

Country:

Serotype:

Source type:

Source site:

Isolate status:

**Patient**

Age between  and

Sex:

**Isolate date**


from:  Monday , February 05, 200\*

to:  Monday , February 05, 200\*

X  Negative

**Server login**

File Database



Server computer:   
 Server login:

Configuration Identification Other

### Identification against a list

**PFGE-XbaI**  
**Dice (Opt:1.50%) (Tol 1.5%-1.5%) (H>0.0% S>0.0%) [0.0%-98.3%]**

Rank	Score	Key	LabID	SourceCountry	SourceState	SourceCounty
➔ 02BAC154						
➔ 1	100.0	DBS_WY___15574				
➔ 2	100.0	DBS__MA___01P1565				
➔ 3	97.4	DBS__NC___NC01-2376				
➔ 4	97.4	DBS_IL___103141				
➔ 5	97.4	DBS_CDC___G5286				
➔ 6	97.4	DBS__NC___NC01-3209				
➔ 7	97.4	DBS_IL___200954				
➔ 8	97.4	DBS_IN___0001-1412				
➔ 9	97.4	DBS_MI___01ST0841				
➔ 10	97.4	DBS_NY___BAC01-5623				
➔ 11	97.4	DBS_VA___OE14703				
➔ 12	97.4	DBS_FL___4639				
➔ 13	97.3	DBS__NC___NC01-2304				

**Pairwise comparison**

File Ctrl

Key: 02BAC154 & DBS\_WY\_\_\_15574

**Fingerprint types**

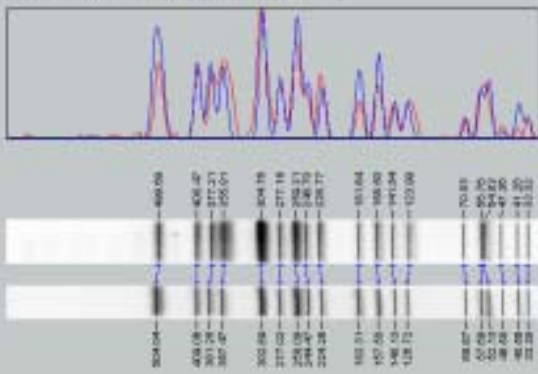
- PFGE-*XbaI* 100.0% (0/0)
- PFGE-*DnaI*
- PFGE-*SpeI*

**Character States**

width

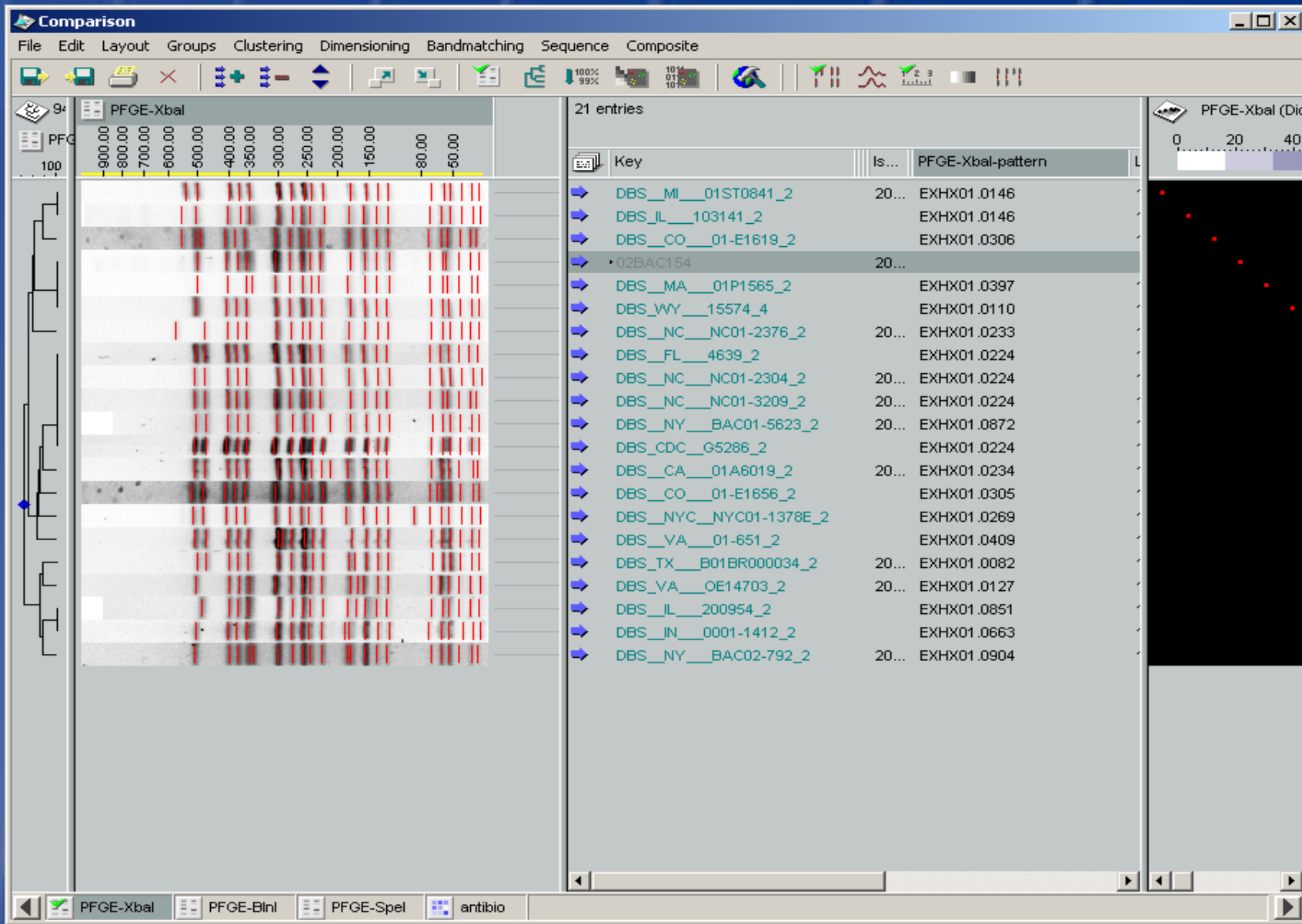
Similarity: 100.0% (weight 30)

Dice (Opt:1.50%) (Tol:1.5%-1.5%) (H:0.0% S:0.0%) [0.0%-98.3%]

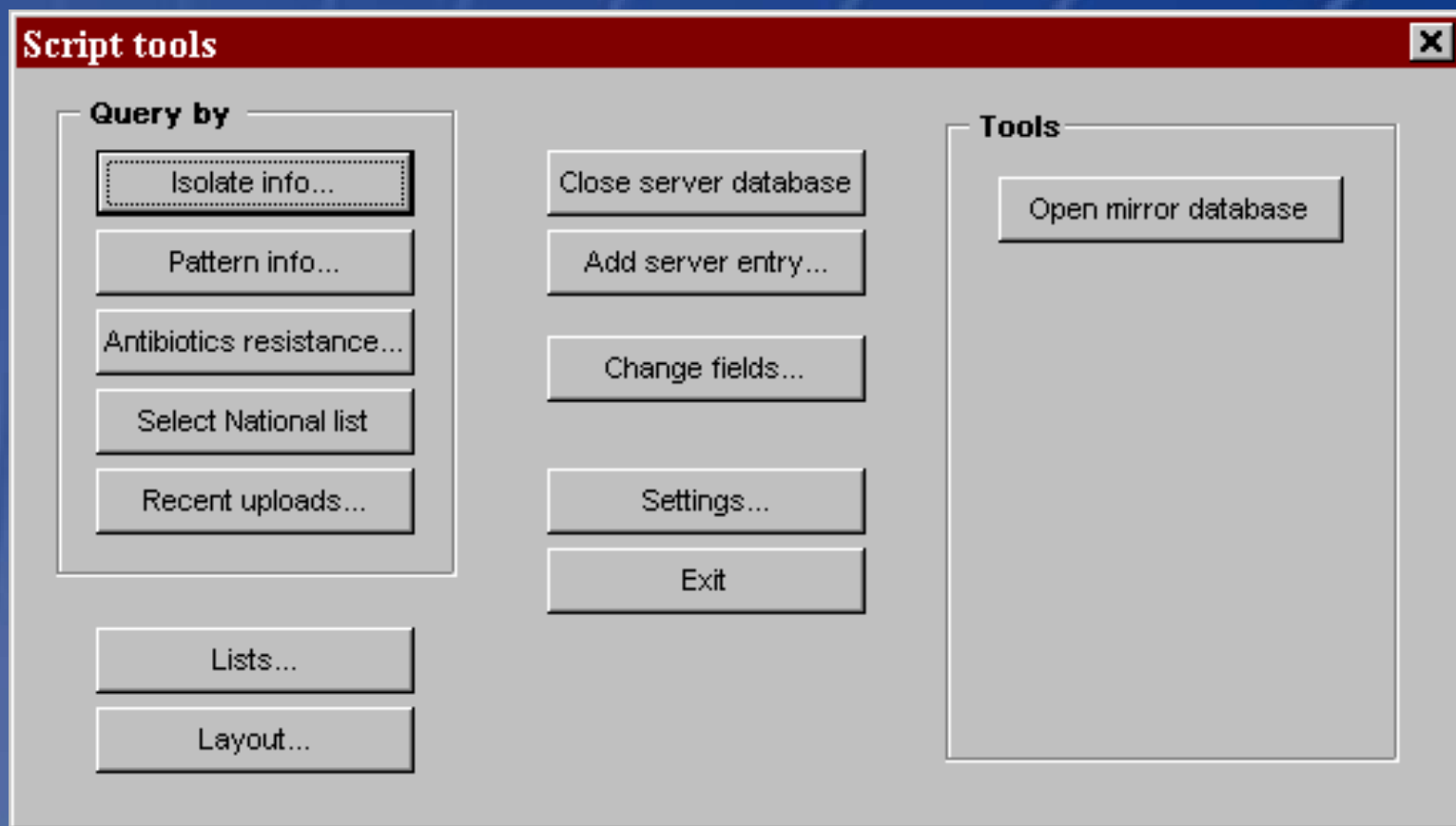


Authentication F... BioNumeric

SBH



# Administrator Functions



# Security for Online Database

- Upon satisfactory completion of a certification set of isolates and analysis a SecurID fob is issued to the participant.
- The participant must have their PIN number as well as the number from the SecurID fob to Authenticate to the CDC firewall and access the PulseNet server.
- An additional password is necessary to login to the *E. coli* database.

# Overview of the *E. coli* National Database

- In 2001, the PulseNet *E. coli* database was converted to a new client server on-line database system
  - Public health and food regulatory agency laboratories submit PFGE patterns via the internet
- Currently, there are over 9,100 PFGE entries in the database
  - *Xba*I (8412), *Bln*I (1610), *Spe*I (113) fingerprint patterns
- Participants are actively uploading and comparing patterns





The National Molecular Subtyping Network  
for Foodborne Disease Surveillance