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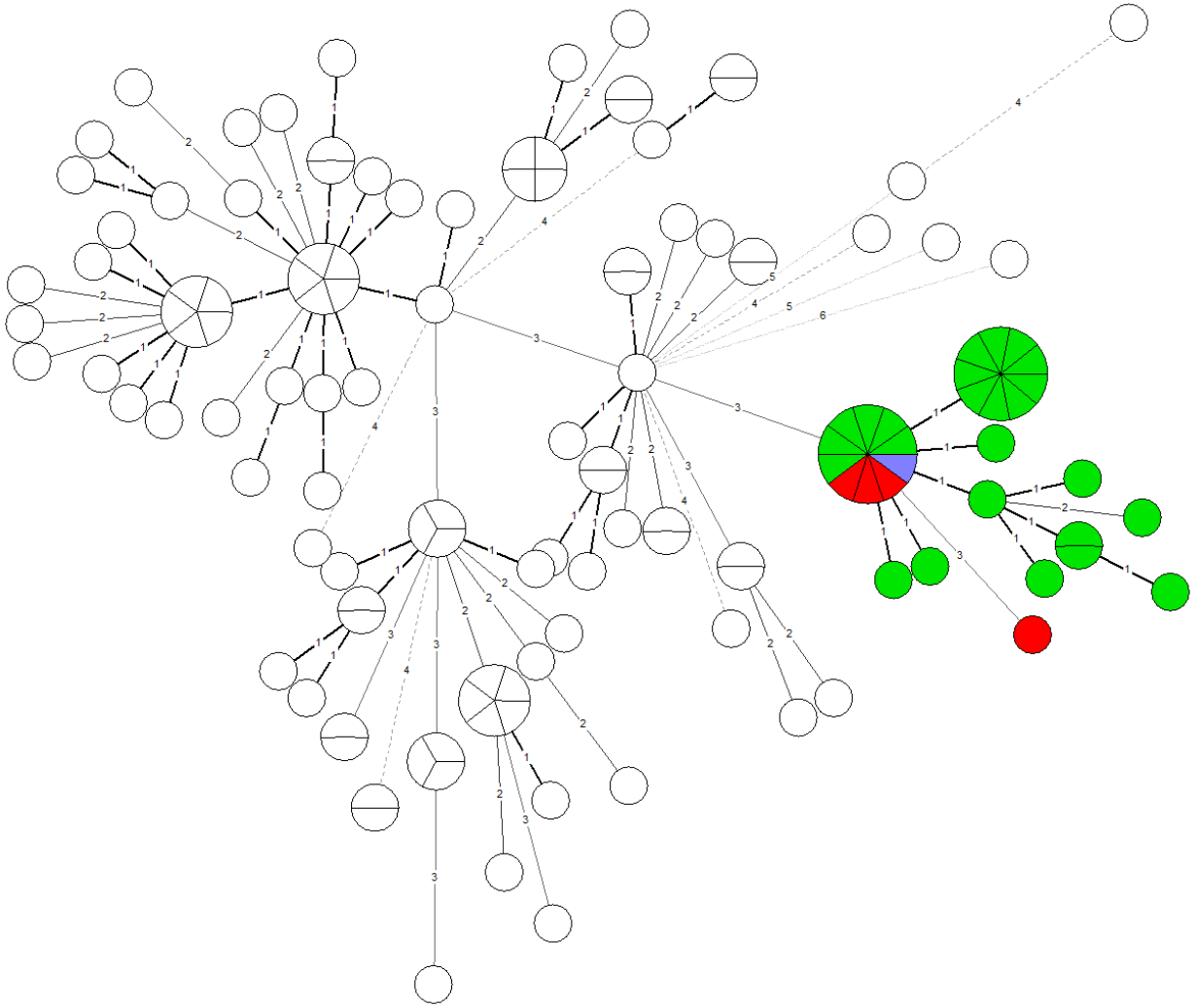

Clusterdetection and interpretation using cgMLST and SNP analysis

Pernille Gymoese, Foodborne Infections, Statens Serum Institut

Content

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- **Surveillance of *Salmonella* in Denmark**
  - Outbreak definition and communication
  - Cluster analysis and detection
  - Examples on cluster detection
- **Surveillance of *Campylobacter* in Denmark**

WGS-based surveillance of *Salmonella* in Denmark

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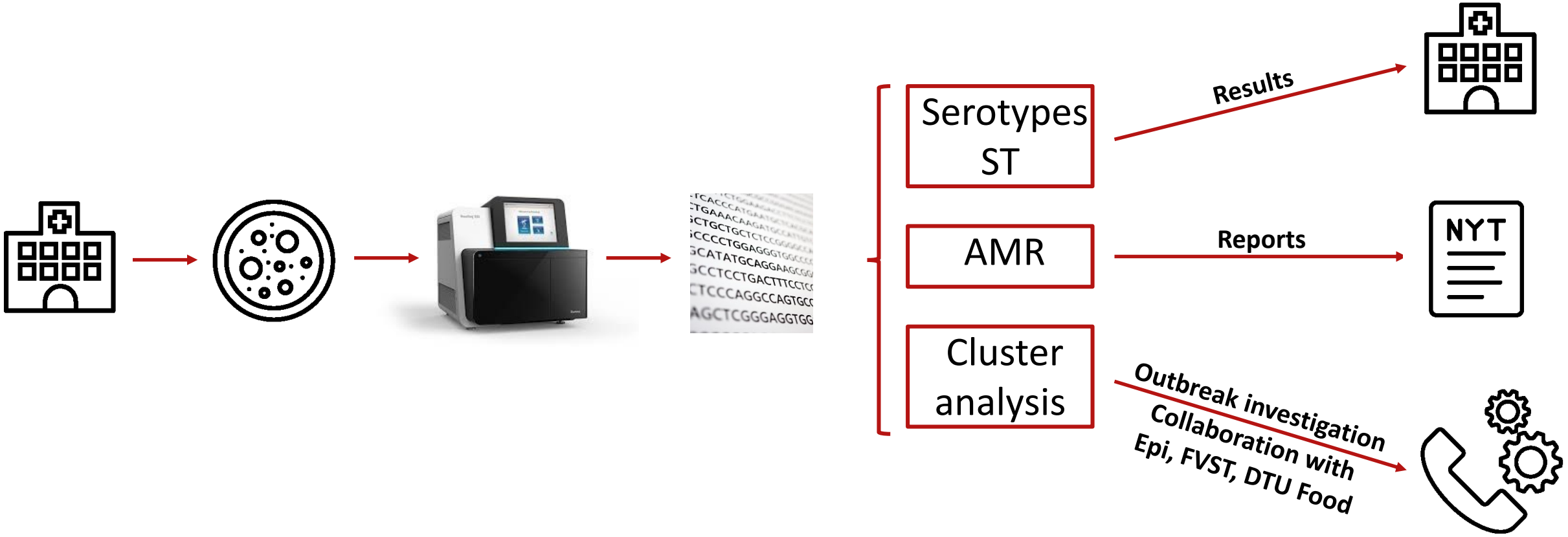
- Real time surveillance since 2018
- Flow from Hospital to SSI



Outbreak definitions and communication

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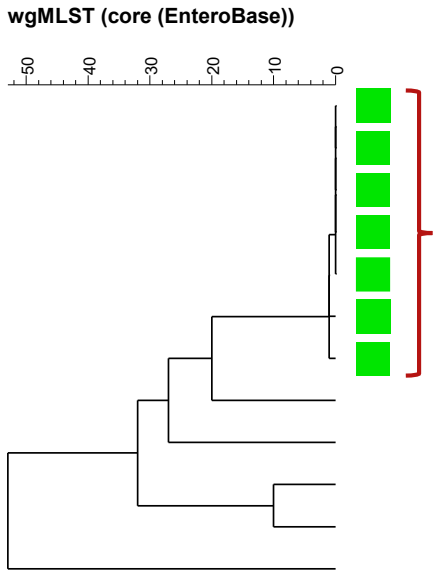
- **Outbreak definition**
  - Genetic cluster of ≥ 4 isolates within 3 months
- **Communication**
  - Genetic cluster ID
  - Outbreak ID
- **Retrospective analysis**
  - Cases to existing cluster – new event
  - Same cluster ID but different outbreak ID



ST19#65 →

FUD2102 ←

EPI

- Outbreak investigation
- Patient interview
- Contact with food authorities

Cluster analysis and detection

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- **Cluster detection**
  - cgMLST and single linkage clustering
    - Applied Maths/Enterobase scheme - Bionumerics
  - Cluster cut-off
    - ≤ 3 AD
    - ≤ 1 AD for clonal types (Enteritidis ST11 and monophasic Typhimurium ST34)
- **Inclusion criteria - not one fits all**
  - Type, time, place
  - Typing method (SNP, cg/wgMLST)
  - Clustering methods

Clonal types

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- **Enteritidis ST11 and monophasic Typhimurium ST34**
  - New clones
  - Little genetic diversity
  - Challenging cluster analysis
    - Supporting analysis – SNP or wgMLST
    - Additional analysis – AMR, plasmids, prophages
    - Other clustering methods
    - More strict cluster cut-off

Clonal types – *S.* Typhimurium ST34

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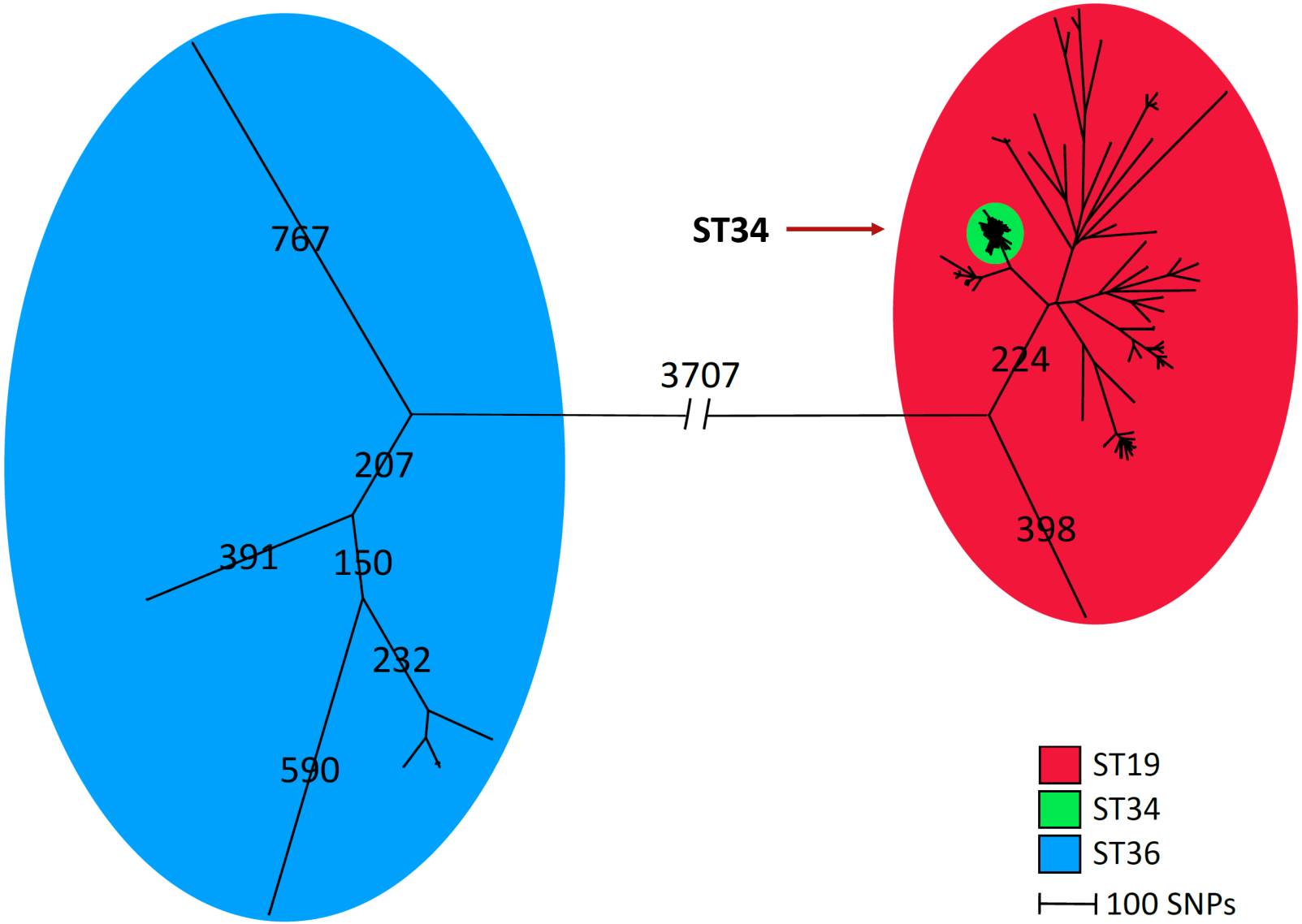

Clonal types – *S.* Typhimurium ST34

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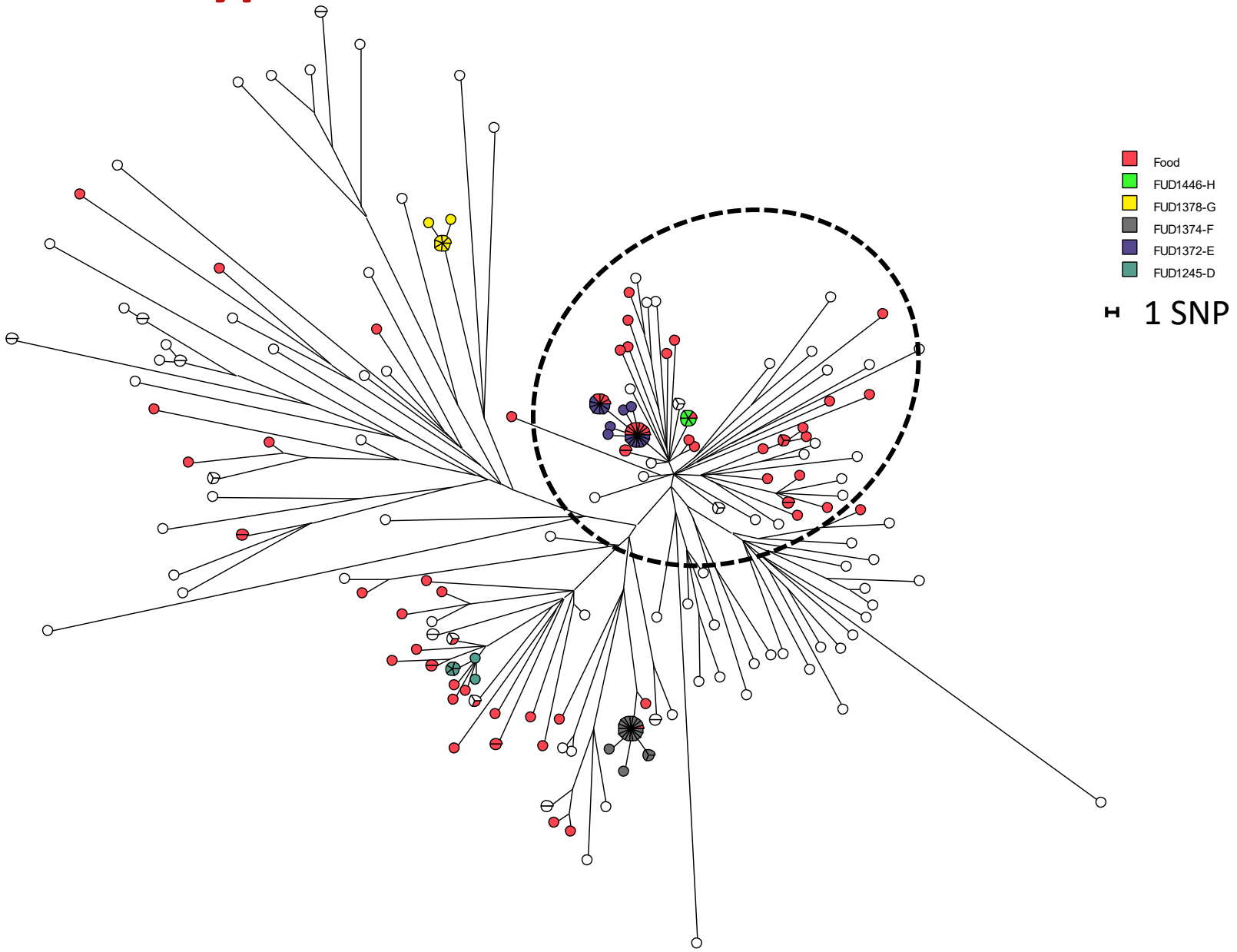

Clonal types – *S.* Typhimurium ST34

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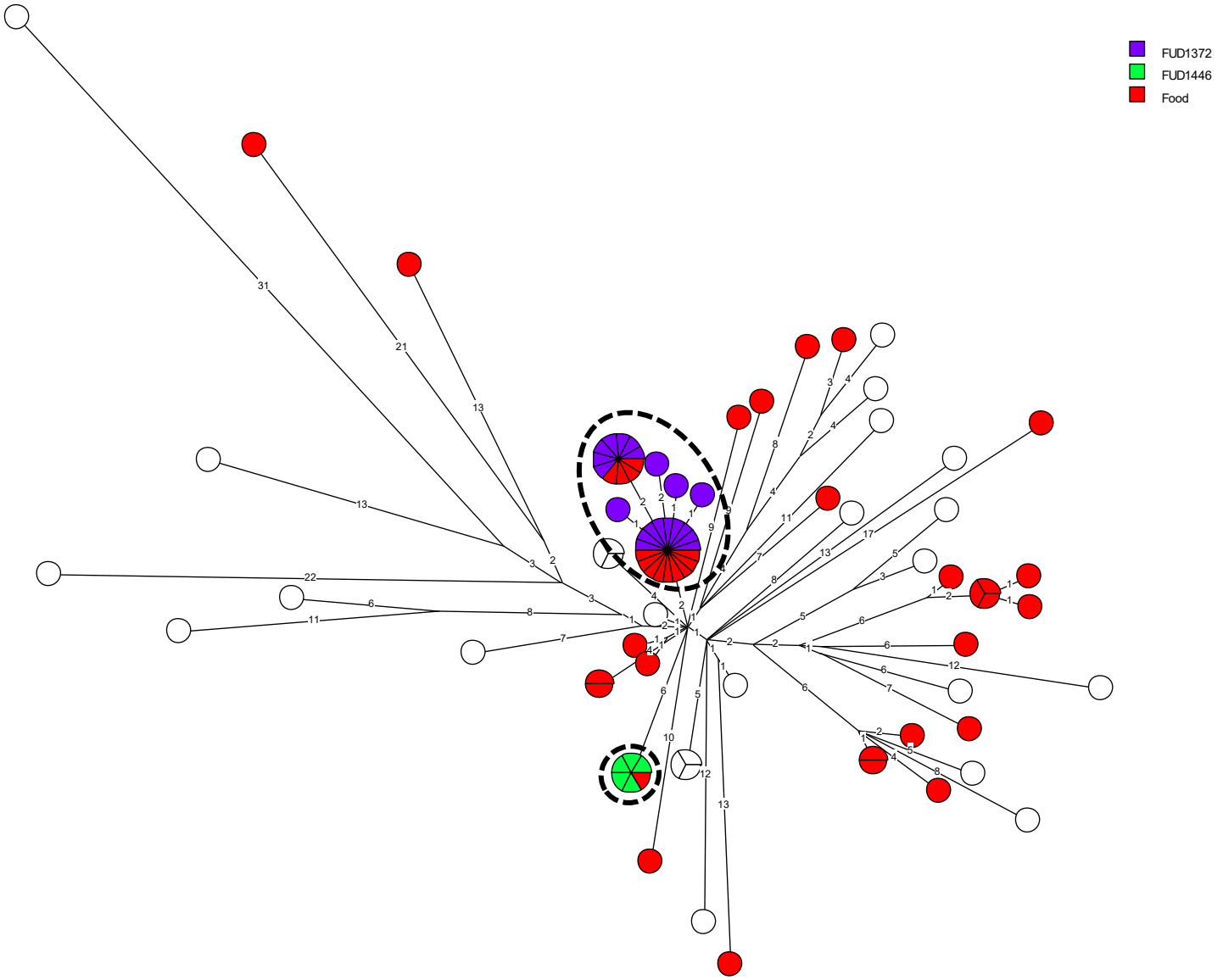

- **Outbreak FUD1372**
  - Defined by small plasmid
- **Outbreak FUD1446**
  - Defined by specific epi-data

Clonal types – *S.* Enteritidis ST11

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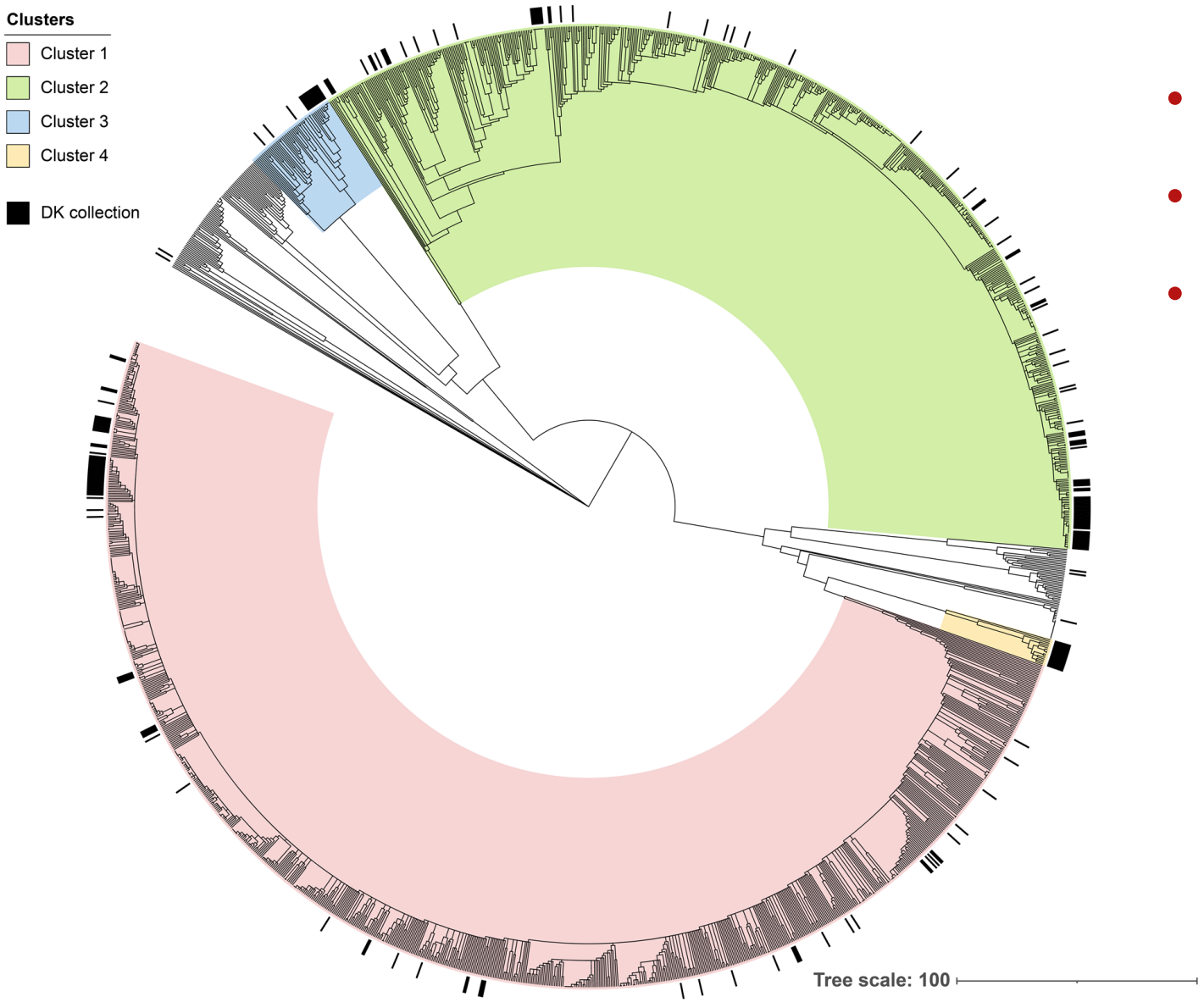

- 2 major clones in Europe
- Extremely little diversity
- **Cluster definition**
  - Strict cut-off
  - UPGMA instead of single linkage
  - Additional wgMLST analysis

WGS-based surveillance of Campylobacter jejuni/coli

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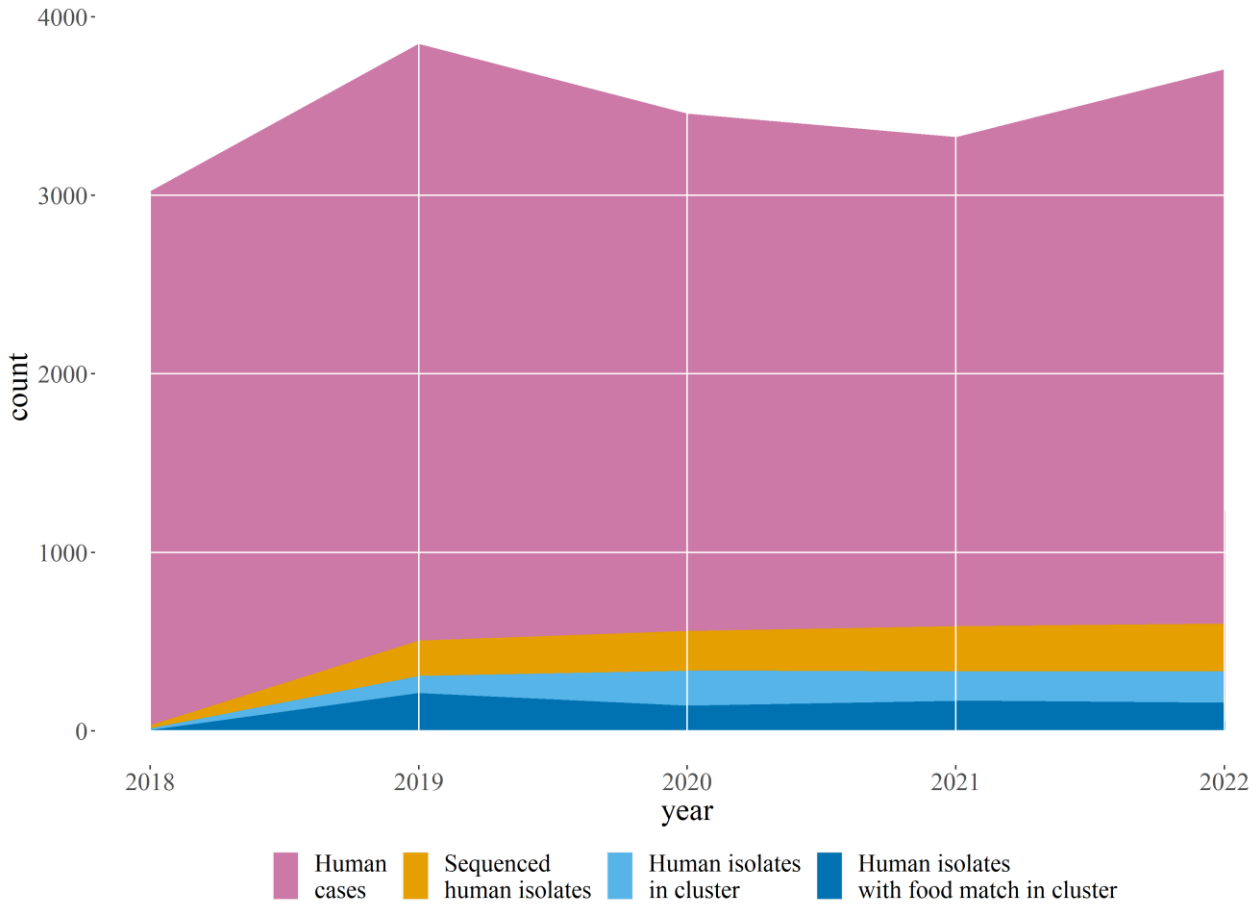
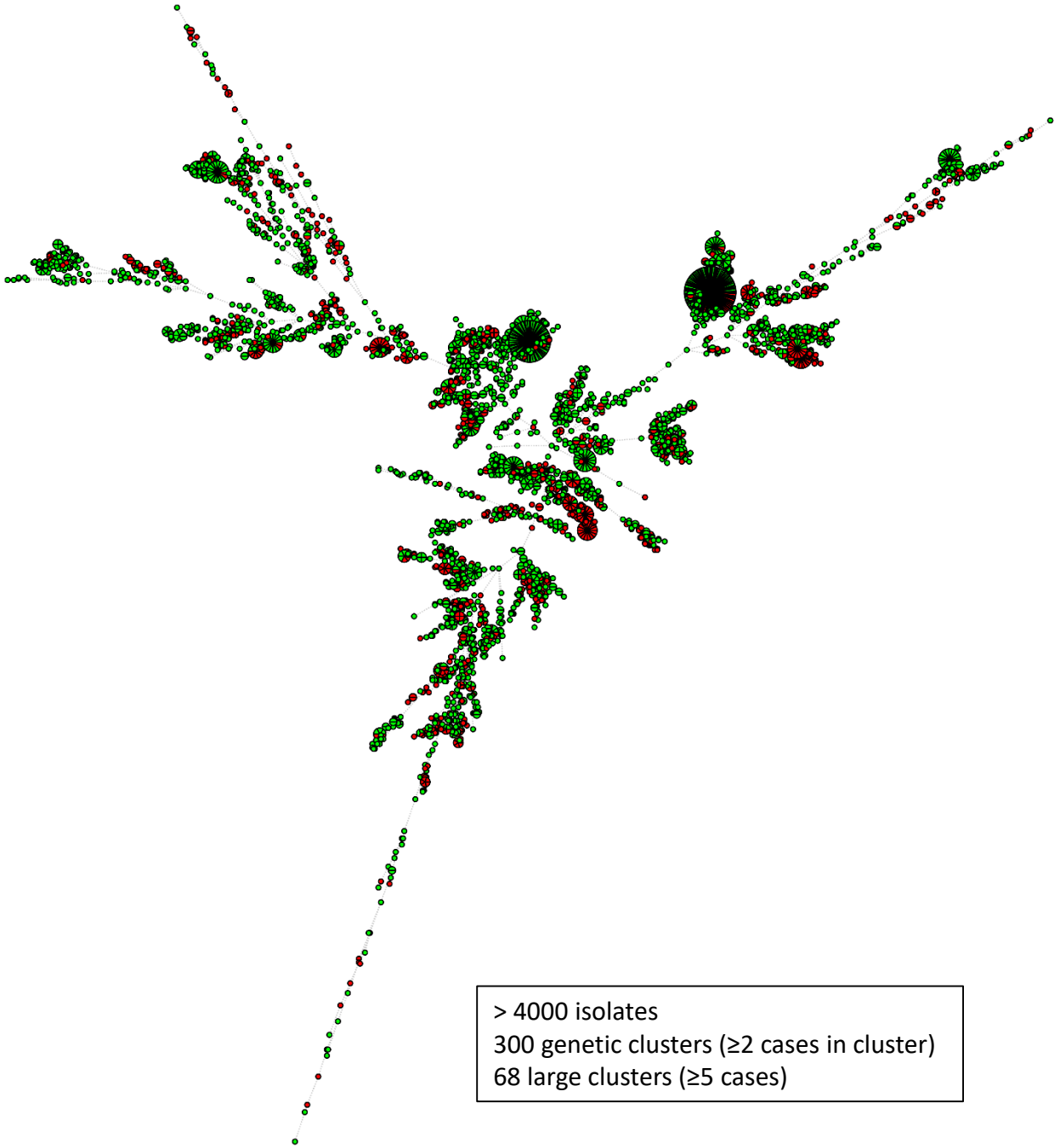
- Performed routinely since 2019
- Isolates from 10-15% of human cases
- 4/5 regions of Denmark represented
- Food data analyzed routinely at SSI
  - To find food matches





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- *Campylobacter* overall very diverse
- cgMLST and single linkage
  - ≤ 4 AD cut-off
- ~50% of human isolates form clusters

  - mostly small, some big
- 25-30% of human isolates match to food isolates (mostly chicken)

Concluding remarks

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- **Not one fits all**
  - Interpretation of results from cluster to cluster
  - Find the method that fits the data and types seen in your country
  - Do validation using well defined outbreaks
- **Clear definitions and communication is important**
  - Clear information on tools and methods
  - Clear information on cluster and outbreak definition (type, time, place)
  - Better understanding between lab and epi
  - Better understanding between countries
- **Epi data is extremely important**
- **It´s a working progress – ongoing evaluation of data is needed**

- **Questions?**
  - Is it better to include to many or to few?

Epipulse event – Outbreak of Enteritidis ST11

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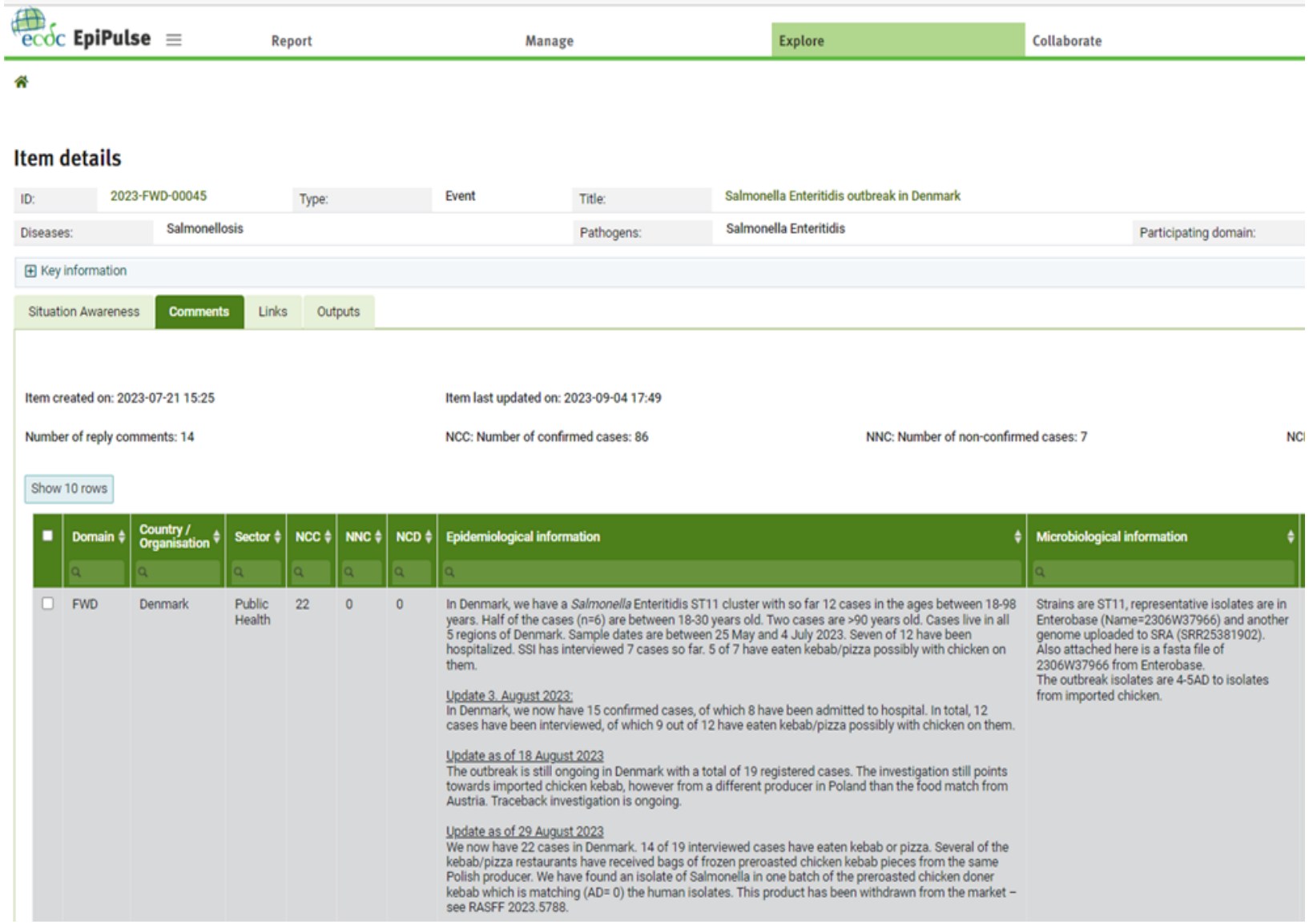

ecdc EpiPulse ≡ Report Manage Explore Collaborate

Item details

ID:	2023-FWD-00045	Type:	Event	Title:	Salmonella Enteritidis outbreak in Denmark
Diseases:	Salmonellosis			Pathogens:	Salmonella Enteritidis
Participating domain:					

⊞ Key information

Situation Awareness | Comments | Links | Outputs

Item created on: 2023-07-21 15:25

Item last updated on: 2023-09-04 17:49

Number of reply comments: 14

NCC: Number of confirmed cases: 86

NNC: Number of non-confirmed cases: 7

NCI

Show 10 rows

Domain	Country / Organisation	Sector	NCC	NNC	NCD	Epidemiological information	Microbiological information
FWD	Denmark	Public Health	22	0	0	In Denmark, we have a *Salmonella* Enteritidis ST11 cluster with so far 12 cases in the ages between 18-98 years. Half of the cases (n=6) are between 18-30 years old. Two cases are >90 years old. Cases live in all 5 regions of Denmark. Sample dates are between 25 May and 4 July 2023. Seven of 12 have been hospitalized. SSI has interviewed 7 cases so far. 5 of 7 have eaten kebab/pizza possibly with chicken on them. Update 3. August 2023: In Denmark, we now have 15 confirmed cases, of which 8 have been admitted to hospital. In total, 12 cases have been interviewed, of which 9 out of 12 have eaten kebab/pizza possibly with chicken on them. Update as of 18 August 2023 The outbreak is still ongoing in Denmark with a total of 19 registered cases. The investigation still points towards imported chicken kebab, however from a different producer in Poland than the food match from Austria. Traceback investigation is ongoing. Update as of 29 August 2023 We now have 22 cases in Denmark. 14 of 19 interviewed cases have eaten kebab or pizza. Several of the kebab/pizza restaurants have received bags of frozen preroasted chicken kebab pieces from the same Polish producer. We have found an isolate of Salmonella in one batch of the preroasted chicken doner kebab which is matching (AD= 0) the human isolates. This product has been withdrawn from the market – see RASFF 2023.5788.	Strains are ST11, representative isolates are in Enterobase (Name=2306W37966) and another genome uploaded to SRA (SRR25381902). Also attached here is a fasta file of 2306W37966 from Enterobase. The outbreak isolates are 4-5AD to isolates from imported chicken.

- **National outbreak of ST11 related to chicken kebab**
- **Epipulse - event**
  - Epidata
  - Mikrobiological data
  - Attached sequence
- **Turned into a international outbreak**

Outbreak of Enteritidis ST11

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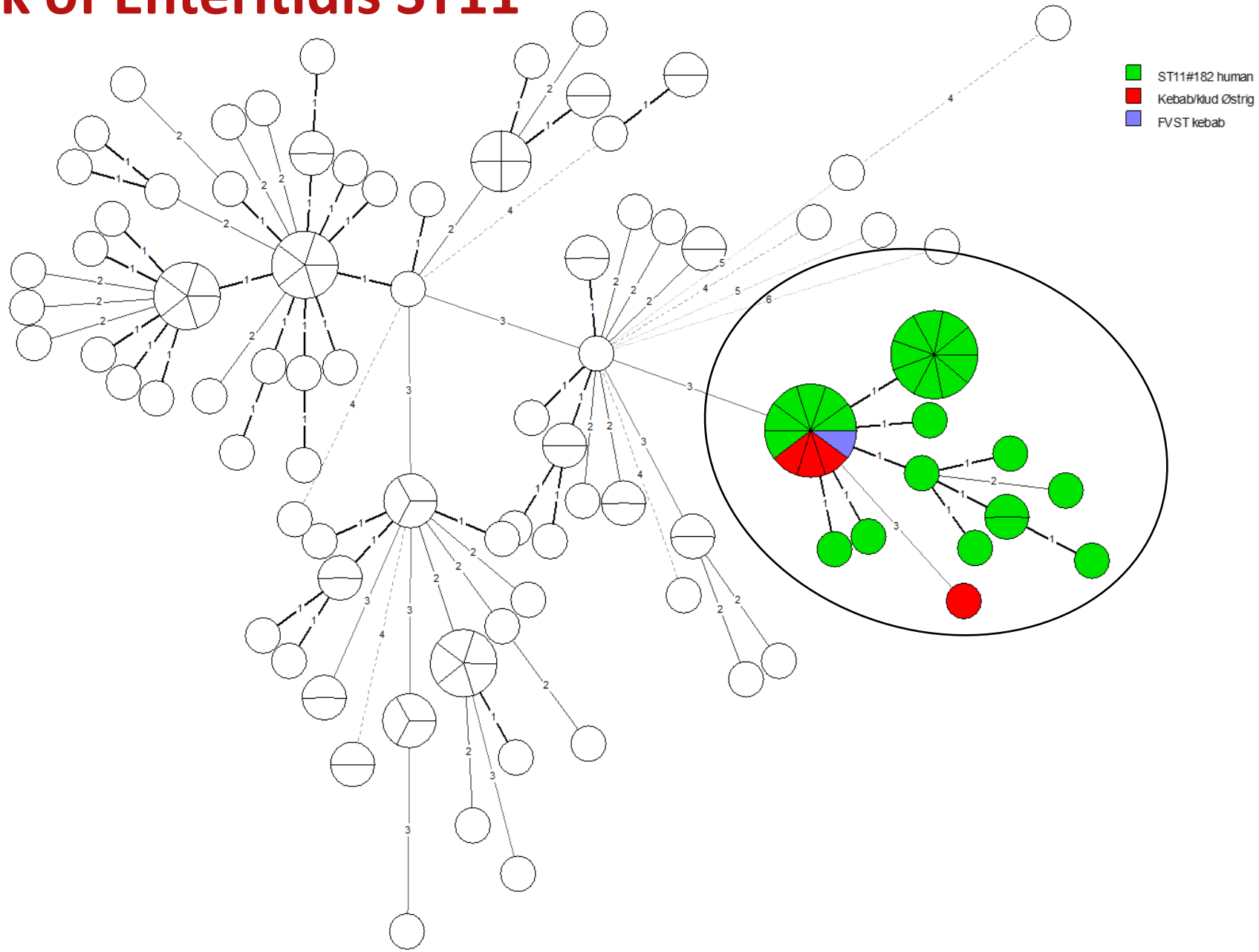

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Internationalt udbrud af *Salmonella* Enteritidis ST11 relateret til Polsk kyllingekebab

Pernille Gymoese, FBI – Fødevarebårne Infektioner