



GenEpi-BioTrain Virtual training 23

Real-life experience with an E. coli outbreak

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Outline

This session consists of:

- Introduction to a real-life Enteroinvasive *Escherichia coli* (EIEC) outbreak, in Denmark, November-December 2021

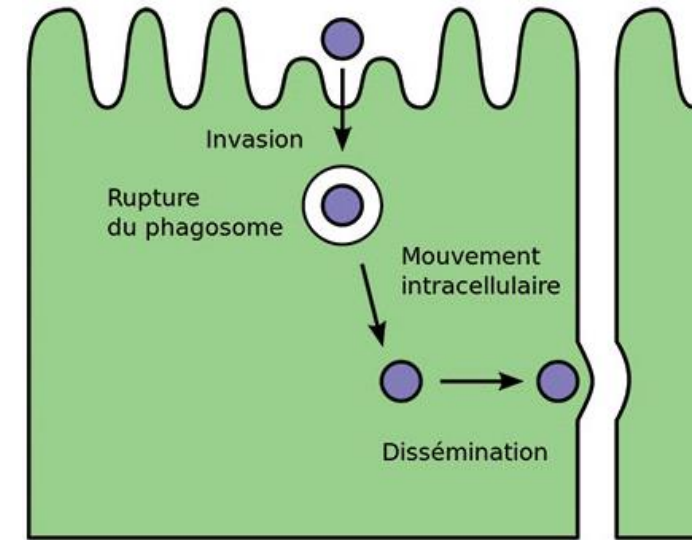




Have you heard about the **EIEC-** outbreak that occurred in Denmark, in 2021?

Enteroinvasive E. coli (EIEC)

- Genetically very close to Shigella
- Sharing the same principal virulence genes
- Causing similar clinical symptoms
- EIEC may be transmitted directly from person-to-person through fecal contaminated food or water
- EIEC outbreaks mostly reported in developing countries

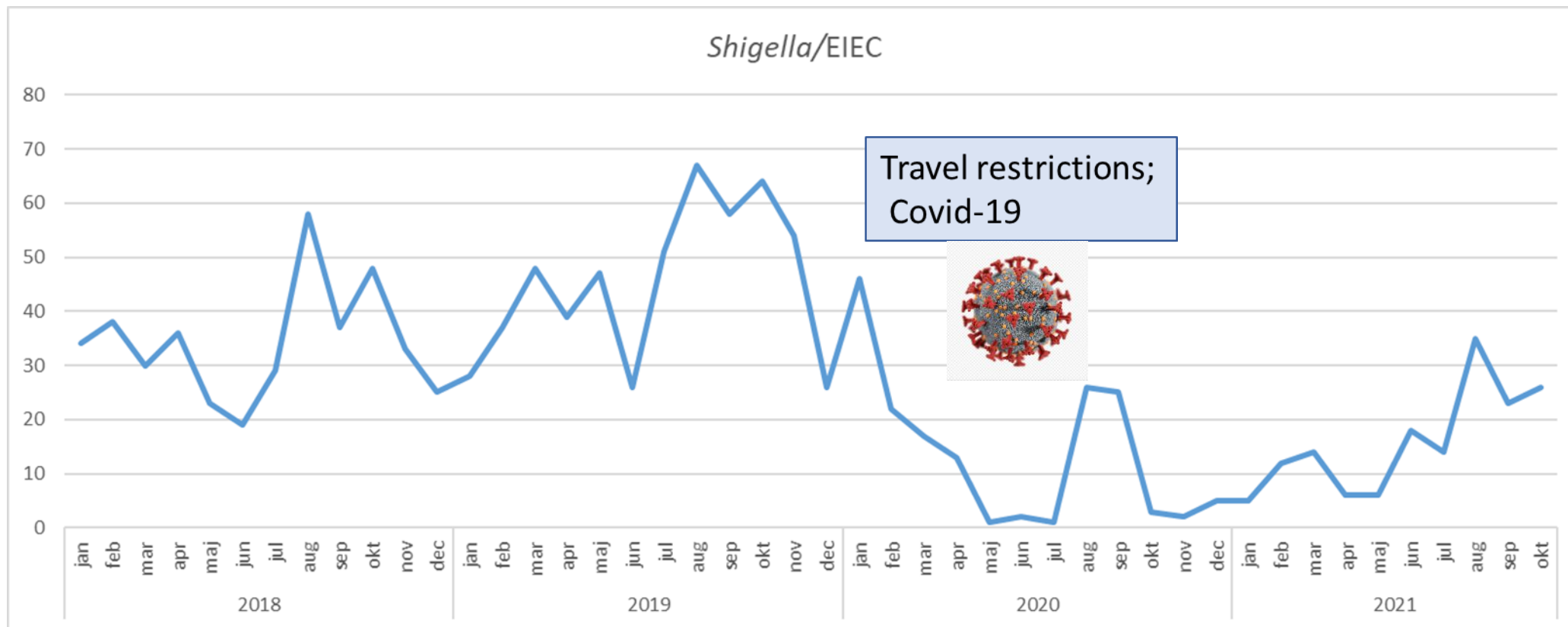


EIEC

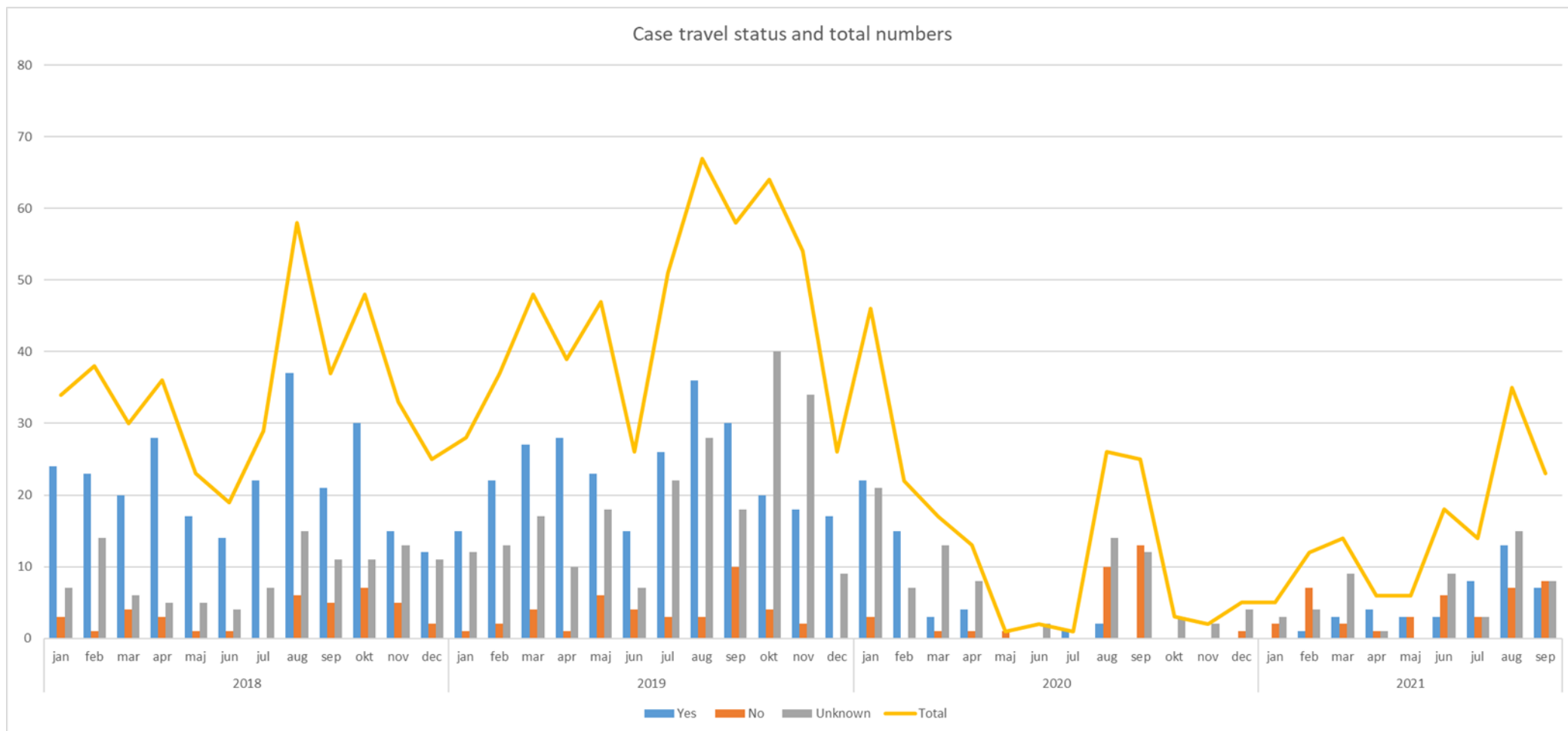
EIEC diagnostics and surveillance in DK

- PCR diagnostics target the invasive plasmid gene (IpaH) shared by both Shigella spp. and EIEC
- Positive samples are identified as a combination (Shigella/EIEC)
- Identification of EIEC requires culture positive samples
- EIEC is not notifiable
- Isolates from culture-positive samples are **voluntarily** sent to Statens Serum Institut (SSI) for characterization

Shigella/EIEC cases in DK, 2018-2021



Shigella/EIEC in DK by travel status, 2018-2021



The first signal...

December 13, 2021

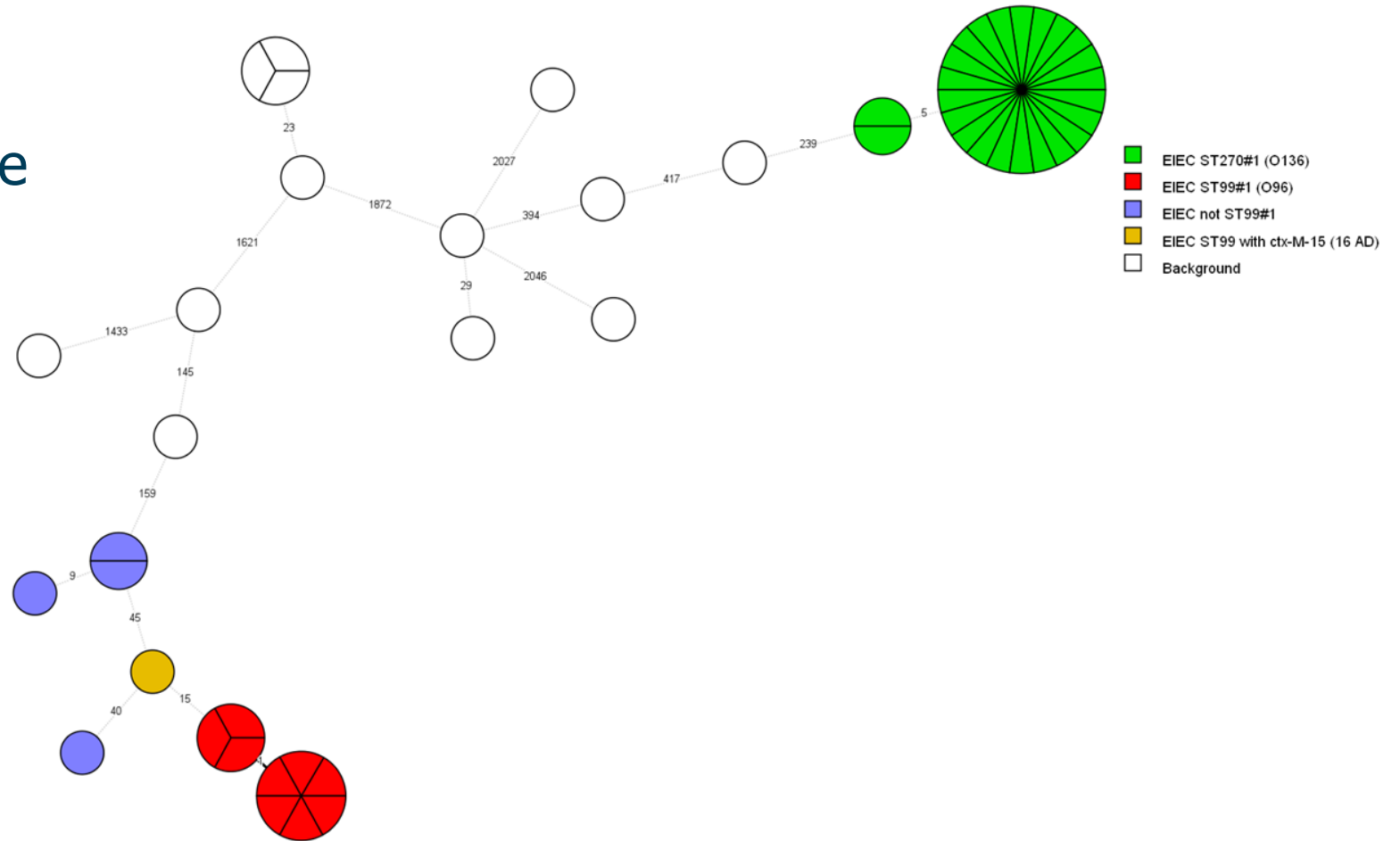
- A clinician from a the Clinical Microbiology Department reported a suspected Danish outbreak of EIEC
 - The suspicion was based on five EIEC-positive samples received between December 5–8
 - At the same time, SSI had received an additional six EIEC isolates
- The outbreak investigation was initiated

10 Steps of an outbreak investigation

1. Establish the existence of a “real” outbreak
2. Confirm the diagnosis
3. Define a case
4. Search for cases
5. Describe findings and generate hypotheses
6. Test hypotheses using analytical epidemiology
7. Draw conclusions
8. Conduct additional investigations
9. Communicate finding
10. Execute control and prevention measures

Whole Genome Sequences

Minimum spanning tree



Case definitions may differ at various stages

Sensitive

(broad or “loose,” in the hope of capturing most or all of the true cases)

- Advantage: it includes most or all of the true cases, no delay in typing
- Disadvantage: it sometimes includes other illnesses as well

Specific

(“strict”, in the hope of only capturing the true cases)

- Advantages: All cases are true cases
- Disadvantages: an underestimation of the total number of cases may occur, delay in typing

case-definitions

1. EIEC or IpaH positive from November 23, 2021 and onwards
2. Lab-confirmed Enteroinvasiv E. coli (EIEC) or PCR positive for EIEC/Shigella (IpaH positive) from November 23, 2021 and onwards, in Denmark
3. Lab-confirmed Enteroinvasiv E. coli (EIEC) or PCR positive EIEC/Shigella (IpaH positive) from November 23 – December 31, 2021.

Cases were excluded if 1) is different from O96:H19 ST99#1 or O136:H7 ST270#1 by WGS; 2) Has a serotype differed from O96 or O136; and 3) cases reported with travel prior to symptom onset with unknown WGS

Final case-definition

A case was defined as:

- A person with **laboratory-confirmed Enteroinvasive *E. coli* (EIEC)**
or
- PCR detection of **EIEC/Shigella (IpaH positive)**
- With symptom onset between 15 November and 31 December 2021

Exclusion criteria

Cases were excluded if:

- The isolate differed from **O96:H19 ST99#1** or **O136:H7 ST270#1**, or
- The case had reported travel prior to infection and no WGS result was available

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ECDC EpiPulse platform: EIEC

ecdc EpiPulse

Report Manage Explore Collaborate

Item created on: 2021-12-21 12:37
Item last updated on: 2022-03-09 17:25
Number of reply comments: 10
NCC: Number of confirmed cases: 68
NNC: Number of non-confirmed cases: 1
Number of confirmed deaths: 0

Domain	Country / Organisation	Sector	NCC	NNC	NCD	Epidemiological information	Additional information	Modified time
FWD	Denmark	Public Health	68		0	Update as of December 28, 2021: Now 68 cases reported to December 17, but the outbreak seen back of ready-to-eat salads pointing to spring onions. The Danish Health Authority notified this in a RASFF notification on December 12, 2021. The 63 cases were notified between December 12, 2021 and December 17, 2021. The first case was notified with cabbage. We have seen and increase/outbreak of EIEC in Denmark. The outbreak is caused by <i>Escherichia coli</i> O136:H19. The Danish Health Authority notified this in a RASFF notification on December 12, 2021. Serotyping of the EIEC isolates revealed two serotypes, O136:H- and O96:H19.		2022-01-27 08:45

No outbreaks reported in other countries

10 Steps of an outbreak investigation

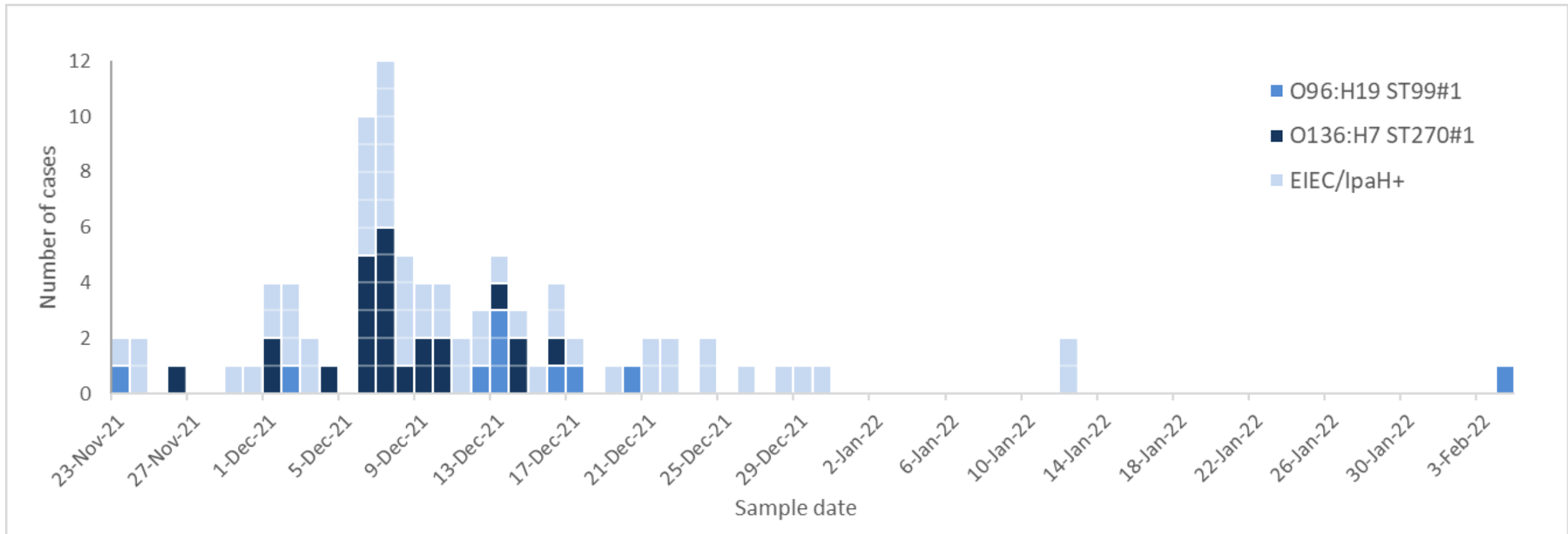
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Extent of the EIEC outbreak

- In total: 88 cases
- November 2021 to February 2022
- Female 58 (66%), male: 30 (34%)
- Age range: 0–91 years (median age 52 years)

- Clinical manifestation
 - Diarrhoea: 40/41
 - Bloody diarrhoea: 10/41
 - Hospitalised: 26 (30%)
 - Deaths: 3 (within 30 days from sample date)

EIEC cases by sample date and O-group





What do you think the source was?

Results of the first 12 interviews

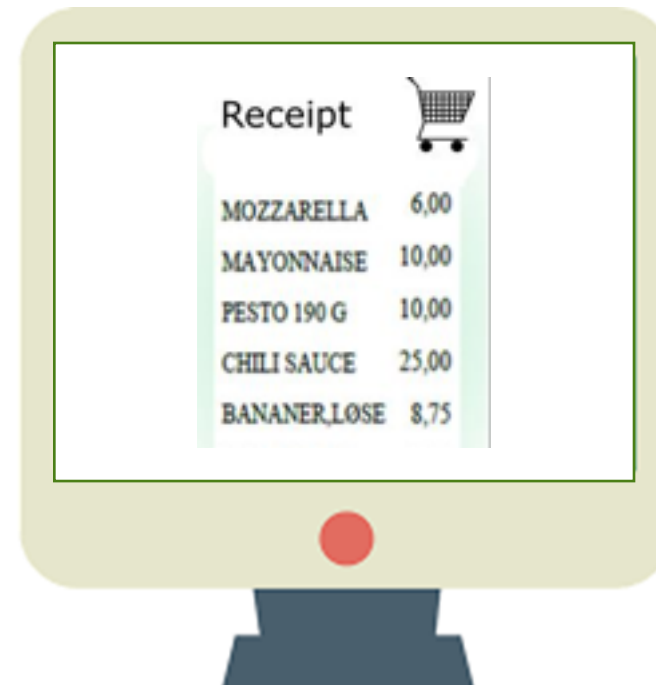
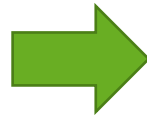
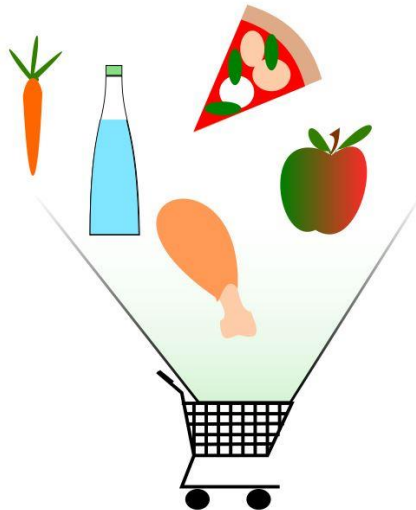
- No travel
- No common event
- No dining out
- 9/12 shopped in Supermarket chain A
- 6/12 mention ready-to-eat cabbage-salad
 - 5 Red cabbage
 - 4 bought salad in Supermarket Chain A

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What is consumer purchase data?

- Looking in the receipts of the food bought by patients prior to disease onset
- Data retrieved from supermarket databases
- Using membership/loyalty card or credit/debit card
- Search for specific transactions
- Compare purchase data from different patients



Trace back investigation

- Consumer card investigation
 - Receipts obtained from 8 cases
 - All ready-to-eat cabbage salad
 - Time from date of purchase and date of illness onset match the incubation period
- Trace back of product via Supermarket A
 - Common ingredient spring onions from Egypt
 - Imported from Dutch supplier to Supermarket A
- Samples from food products
 - Samples from food in DK and NL negative for E. coli



Root cause analyses?

- Contact to the Danish Embassy in Egypt
- Flooding of the Nile exceptionally heavy in 2021 (from Maj to Dec)



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Communication is not only at the end of investigation!



- Information to clinical microbiology departments (e-mails 13/12 + 15/12))
- Central Outbreak Management group and steering group
- International systems
 - community via Early warning and response system (EWRS) and ECDC Epipulse platform (21/12)
 - Rapid alert system for food and feed (RASFF) (23/12)
- Scientific community; published in Eurosurveillance
<https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2023.28.15.2200572?ref=foodsafetynews.com>

Communication SSI.dk, Dec 21



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Nyheder

Nyhedsbreve



Presserum



Sygdomsudbrud



Udbrud af Shiga-toksin-
producerende E. coli (STEC)
O157:H7

**Udbrud af enteroinvasiv
Escherichia coli i Danmark**

Udbrud med listeria i
Danmark 2018-2021

Udbrud med covid-19



Udbrudsarkiv

Arrangementer

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Udbrud af enteroinvasiv Escherichia coli i Danmark

Siden 23. november 2021 er der set en stigning i antallet af registrerede tilfælde med enteroinvasiv *Escherichia coli* (EIEC). Data er baseret på laboratorieanmeldelser og indsendelse af isolater fra de danske kliniske mikrobiologiske afdelinger. EIEC er en tarmbakterie vi normalt forbinder med rejsediarré – men patienterne har i dette tilfælde ikke været ude at rejse, og det tyder på, at en fælles fødevare kan have gjort folk syge.

Senest redigeret den 21. december 2021

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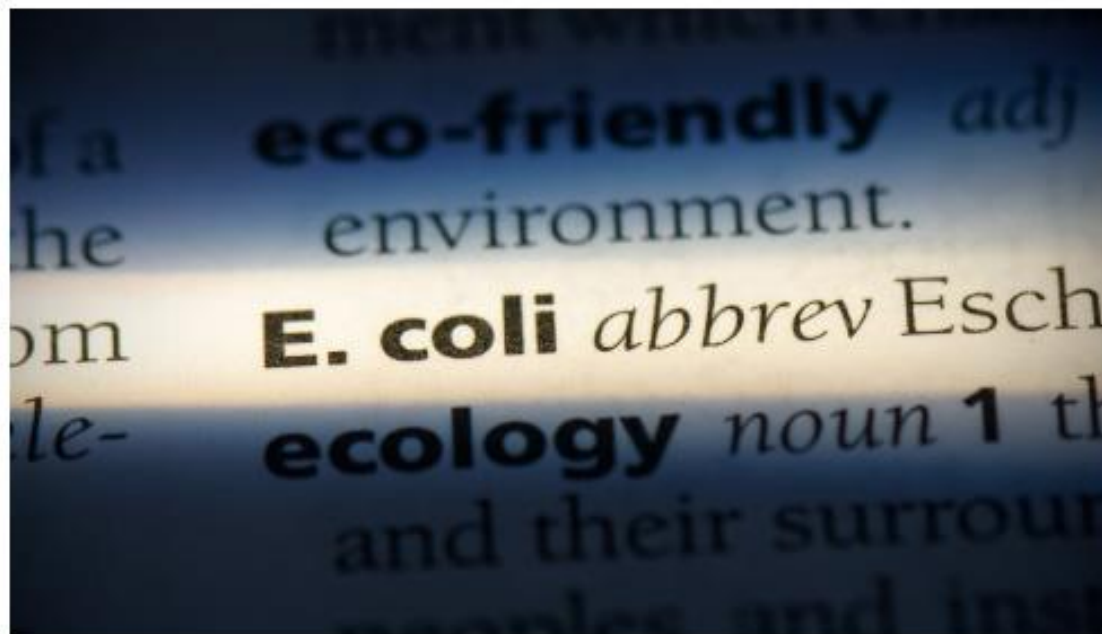
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Denmark searches for source of new E. coli outbreak

By Joe Whitworth on December 23, 2021

Communication SSI.dk, Dec 27



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Stort sygdomsudbrud med E. coli skyldes formentligt forårsløg i spiseklar kålsalat

Statens Serum Institut (SSI) har set en stigning i antal registrerede syge på grund af en særlig *Escherichia coli* (EIEC) i Danmark siden den 23. november 2021. Efterforskningen viser, at smitekilden sandsynligvis er forårsløg brugt i spiseklare kålsalater, som er solgt i tre forskellige detailkæder.

Senest redigeret den 27. december 2021

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Spring onions from Egypt suspected in Danish E. coli outbreak

By Joe Whitworth on December 29, 2021

Acknowledgements

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