



Shiga toxin-producing *Escherichia coli* (STEC) of serotype O187:H28 from food and food products

Michaela Projahn, André Göhler and Elisabeth Schuh

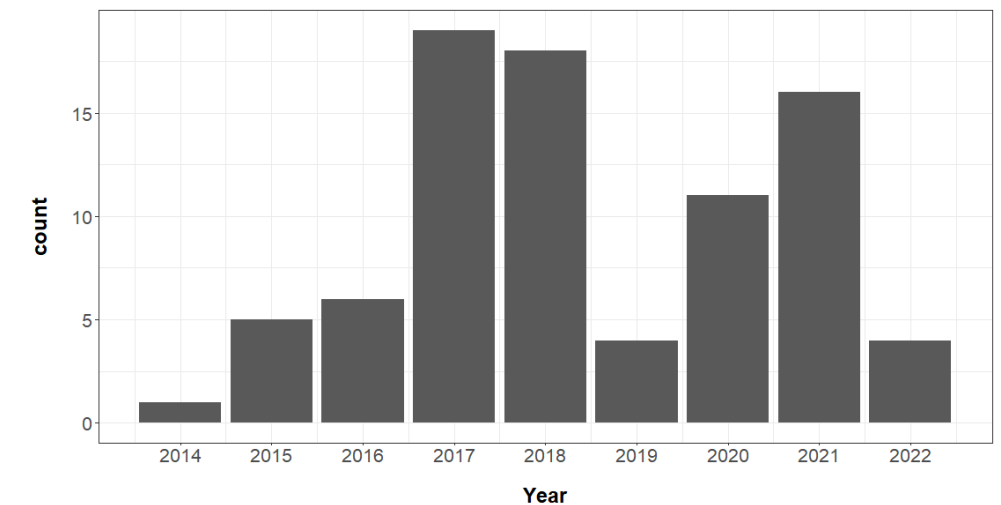
National Reference Laboratory for *Escherichia coli* including VTEC (NRL-*E. coli*)

STEC O187 lineage – Why?

- O187 among Top 5 Serogroups of 2021
- 84 isolates (without duplicates)
- Isolated between 2014 and 2022
- STEC isolated by 12 Federal State Laboratories
 - Diagnostics
 - Zoonosis Monitoring programs*
 - Federal Control Plan*
- Whole genome sequencing of all isolates

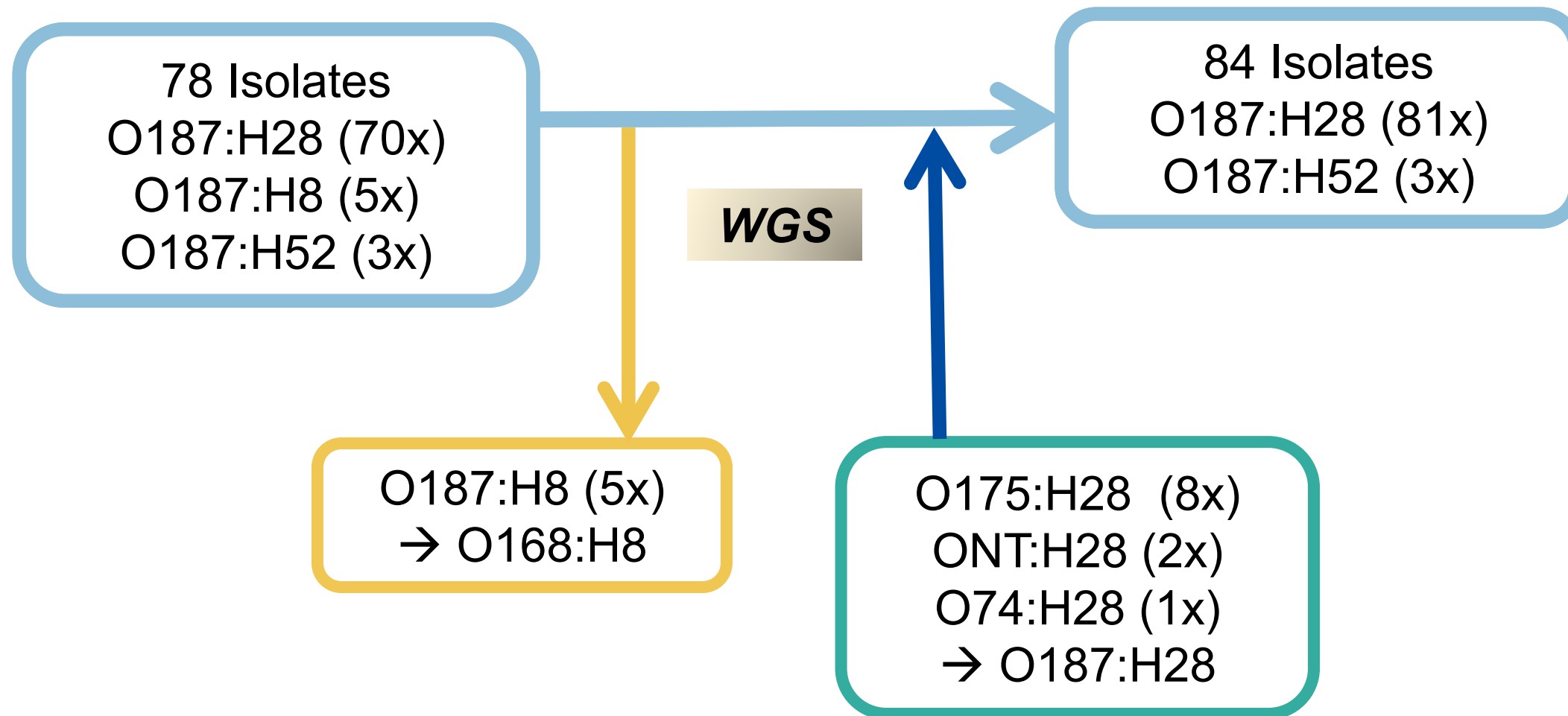
* organized by the Federal Office of Consumer Protection and Food Safety

Top 5 Serogroups	Isolates in 2021
O146	14.3 %
O8	5.4 %
O11	3.9 %
O113	3.9 %
O187	3.9 %



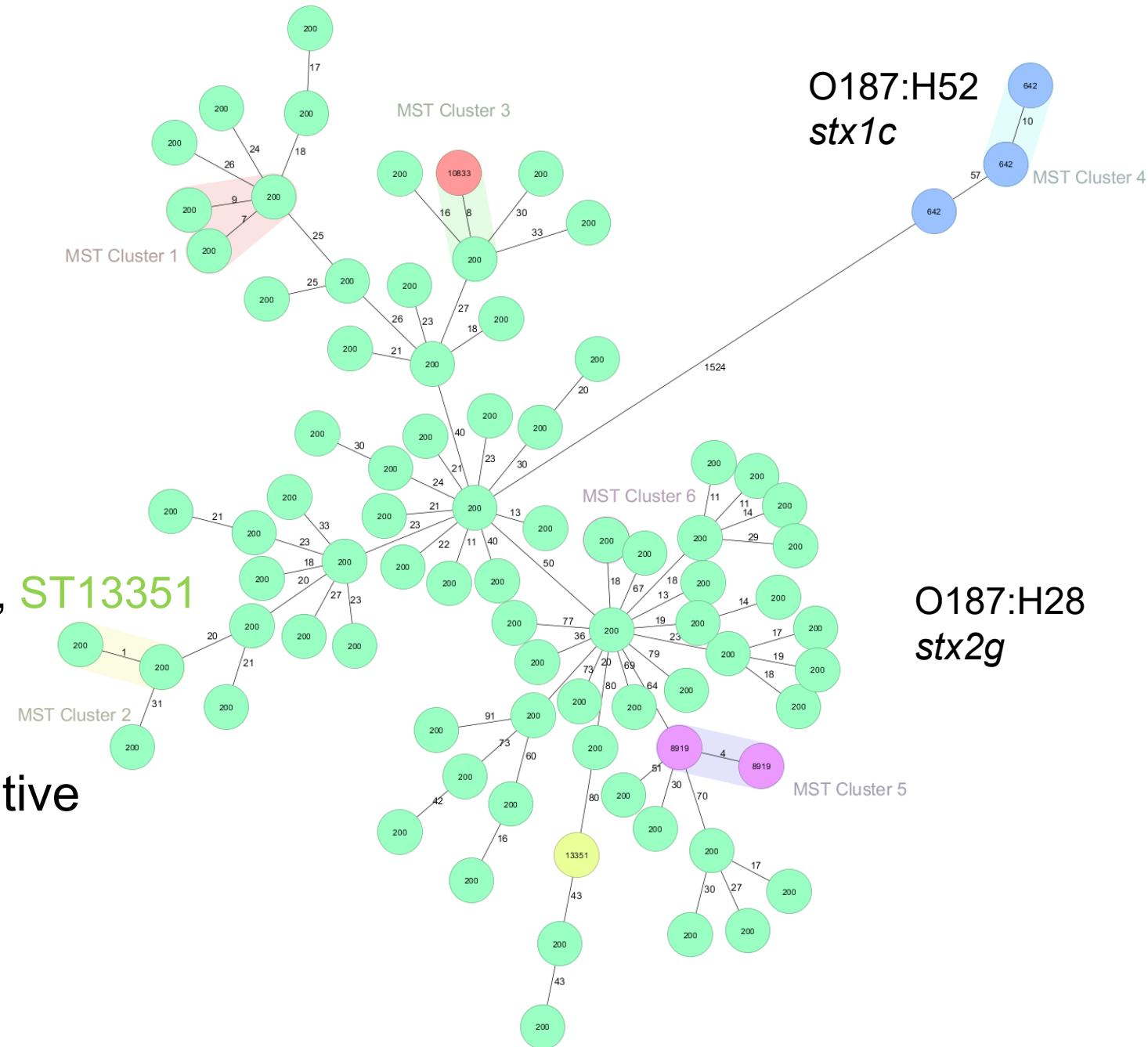
Classical Serotyping vs WGS

- Missclassifications in serological testings



STEC O187 lineage

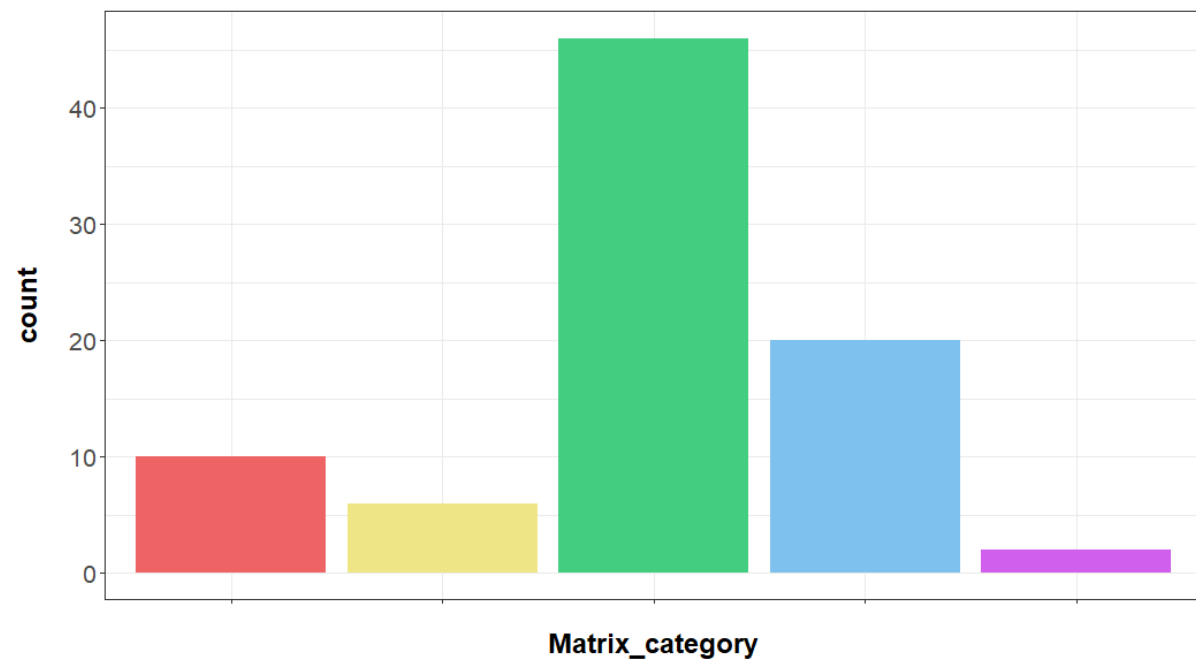
- Shigatoxin
 - O187:H28 – *stx2g*, *stx2g+stx2a*
 - O187:H52 – *stx1c*
- Serotype
 - O187:H28 - MLST **ST200**, **ST8919**, **ST10833**, **ST13351**
 - O187:H52 - MLST **ST642**
- 90,5 % of the O187 strains → *ehxA/hlyA* positive
- No *eae* or *nleB* detected



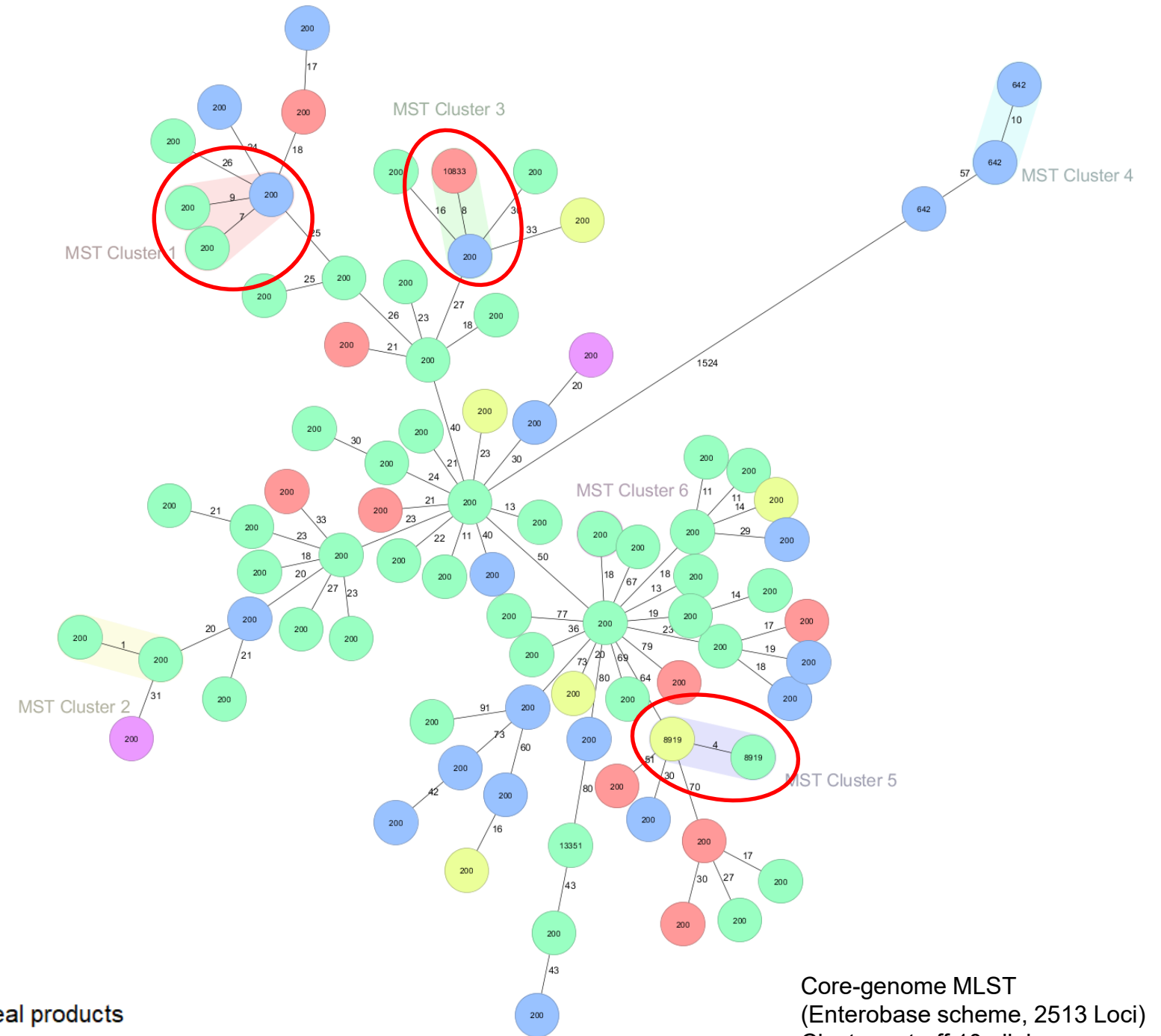
Core-genome MLST
(Enterobase scheme, 2513 Loci)
Cluster cut-off 10 alleles

STEC O187 lineage – food matrix

- Mainly from plant based foods like flour, baking mixes or dough



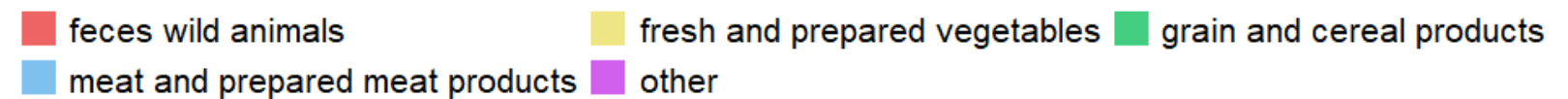
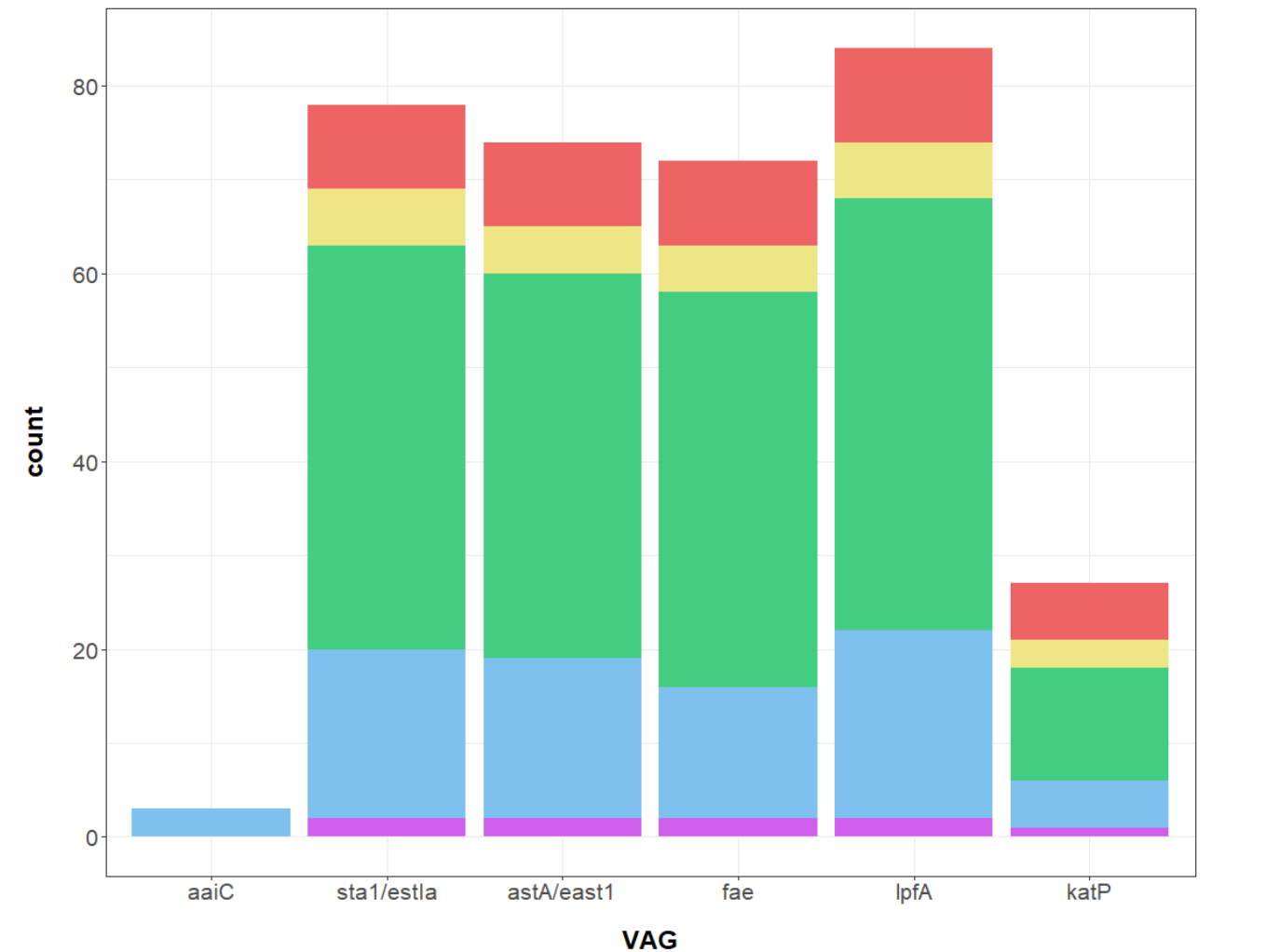
■ feces wild animals ■ fresh and prepared vegetables ■ grain and cereal products
■ meat and prepared meat products ■ other



Core-genome MLST
 (Enterbase scheme, 2513 Loci)
 Cluster cut-off 10 alleles

STEC O187 lineage – Virulence genes (WGS)

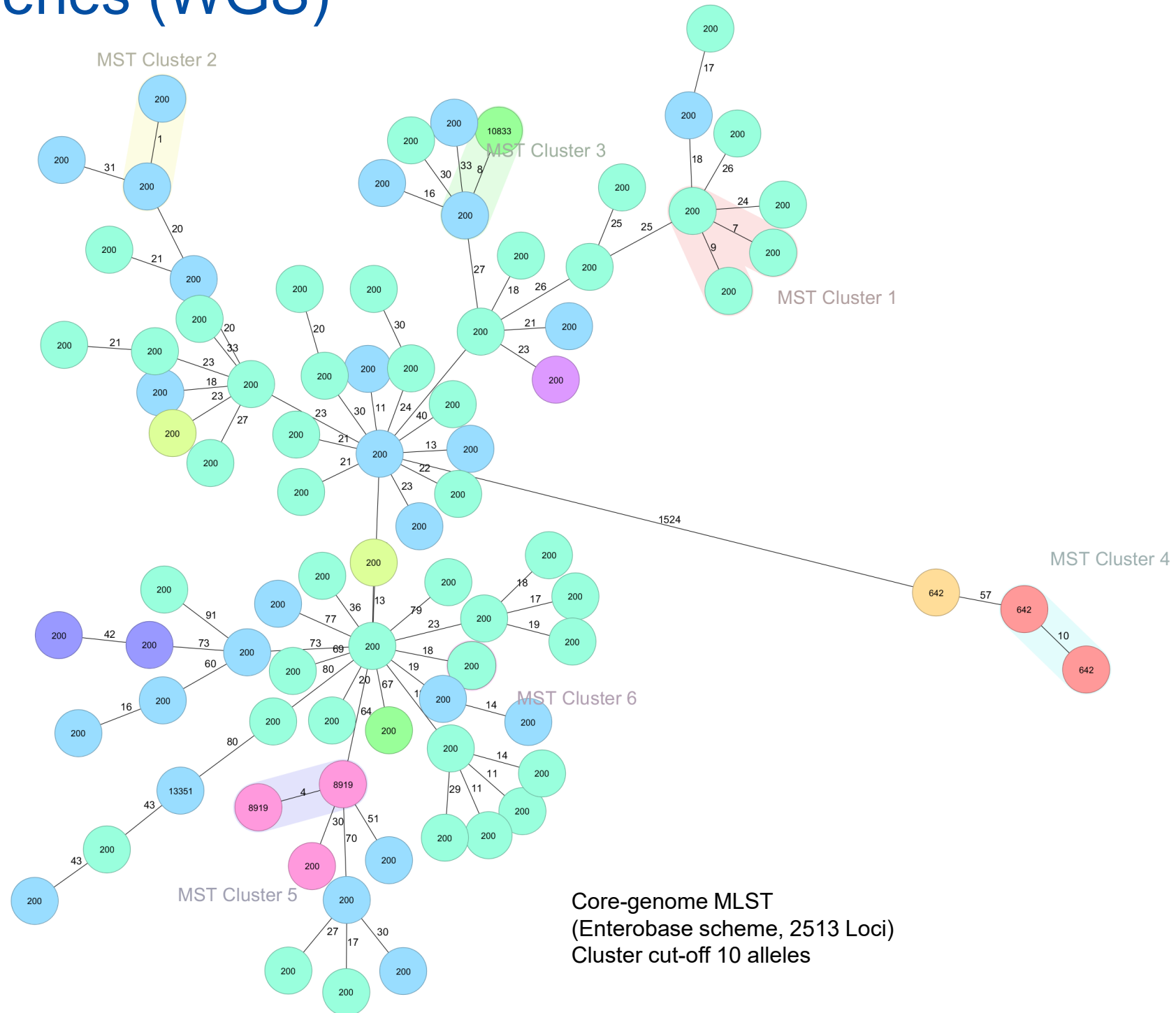
- *aaiC* – Typ VI secretion system (EAEC)
- *sta1/estla* – heat-stable enterotoxin ST (ETEC)
- *astA/east1* – heat-stable enterotoxin EAST1
- *fae* cluster – F4+ fimbriae
- *lpfA* – fimbrial protein
- *katP* – catalase-peroxidase



STEC O187 lineage – Virulence genes (WGS)







- Distribution of VAG combinations

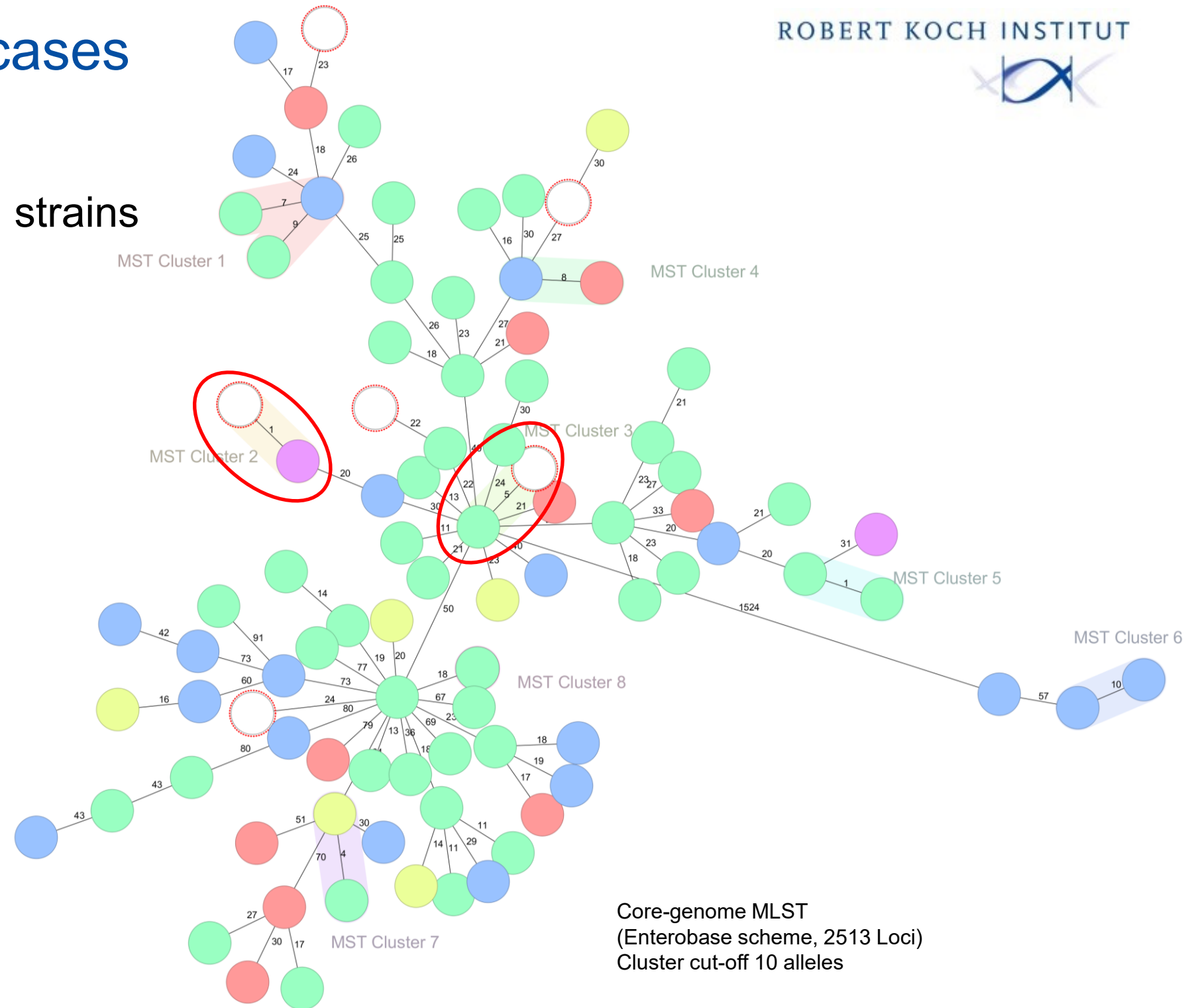
- aaiC+IpfA
- aaiC+sta1/estIa+astA/east1 +IpfA
- IpfA
- IpfA+katP
- sta1/estIa+astA/east1 +fae+IpfA
- sta1/estIa+astA/east1 +fae+IpfA+katP
- sta1/estIa+astA/east1 +IpfA
- sta1/estIa+fae+IpfA
- sta1/estIa+IpfA



STEC O187 lineage – human cases

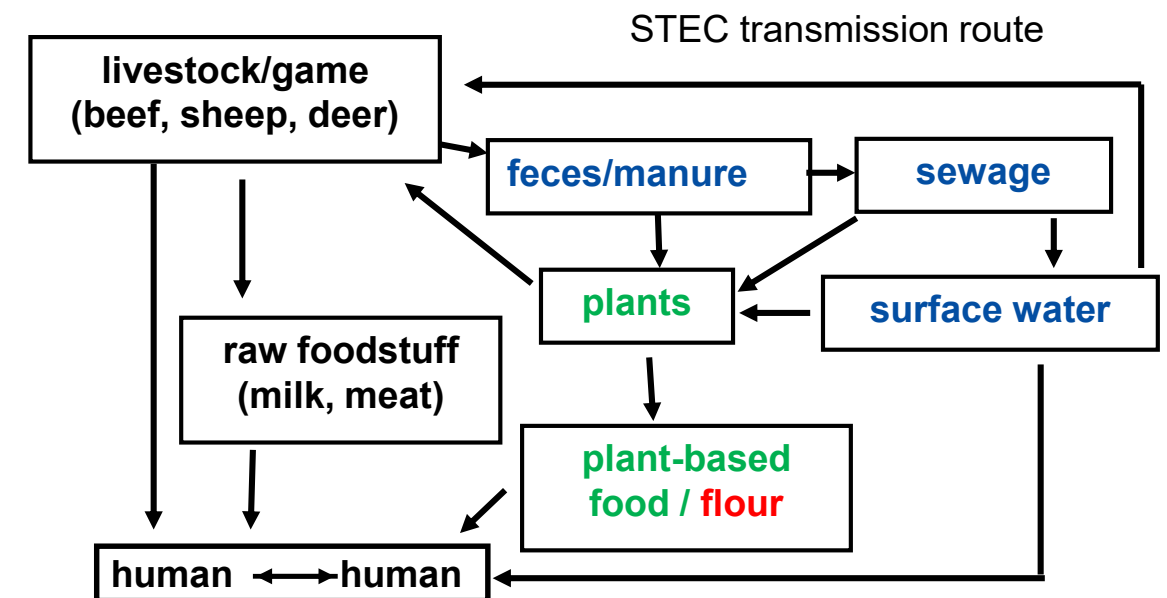
- Retrospective analyses of human strains
 - 1 x 2020
 - 2 x 2021
 - 3 x 2022

-  feces wild animals
-  fresh and prepared vegetables
-  grain and cereal products
-  meat and prepared meat products
-  other
-  human cases



Conclusion

- STEC O187:H28, MLST ST200, *stx2g* most common
- Main sources plant-based food especially flour and flour products + animal-based food from wild animals
- Additional VAGs for adhesion and enterotoxins → STEC/EPEC, STEC/EAEC hybrid strains
- Confirmed cases in humans
- Transmission routes?



Acknowledgment

Team NRL-*E. coli*

Katja Drache

Petra Ganas

André Göhler

Sabine Haby

Carolin Hobe

Marina Lamparter

Janina Malekzadah

Karin Pries

Carina Salzinger

Dana Schmidt

Elisabeth Schuh

Sebastian Steffan



German Federal Institute for Risk Assessment

Angelika Fruth

Christina Lang

ROBERT KOCH INSTITUT



Dietrich Mäde



SACHSEN-ANHALT



Bundesministerium
für Gesundheit

Integrierte Genomische
Surveillance von
Zoonoseerregern

ZMVI1-2518FSB706



Sonderforschungs-
bereich 1322-616
and 1322-712



German Federal Institute for Risk Assessment

Thank you for your attention

Michaela Projahn



Identify Risks –
Protect Health

**Any further O187
STEC out there?**

German Federal Institute for Risk Assessment

Max-Dohrn-Straße 8-10 • 10589 Berlin, GERMANY

Phone +49 30 - 184 12 - 0 • Fax +49 30 - 184 12 – 99 0 99

bfr@bfr.bund.de • www.bfr.bund.de/en