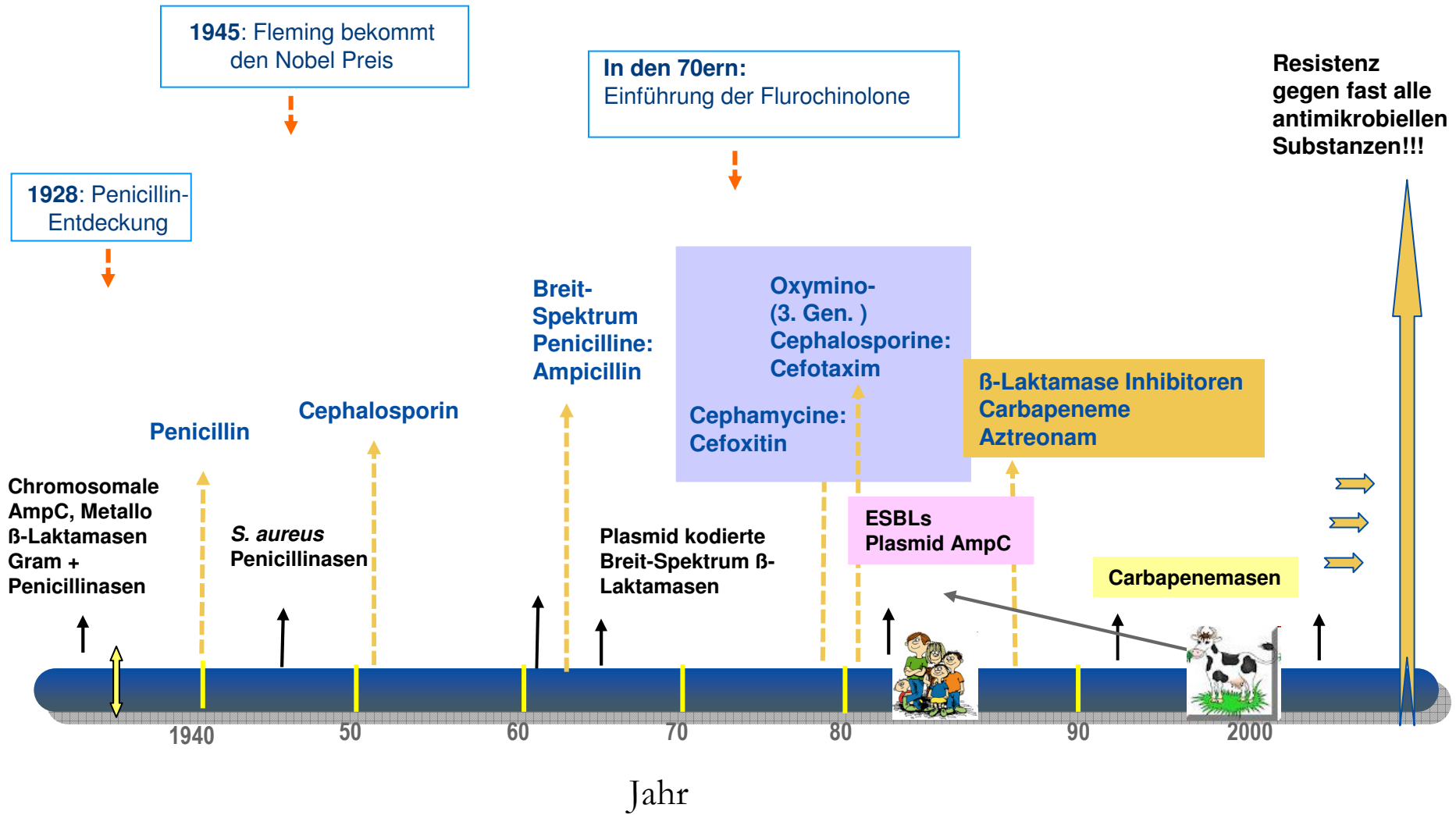


Resistente Keime aus der Tierproduktion: Der Fall ESBLs/AmpC

B. Guerra, I. Rodríguez, J. Fischer, A. Schroeter, R. Helmuth

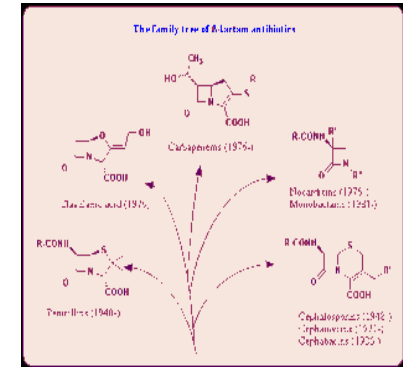
Historie



Beta-Laktame, Beta-Laktamasen, ESBL/AmpC

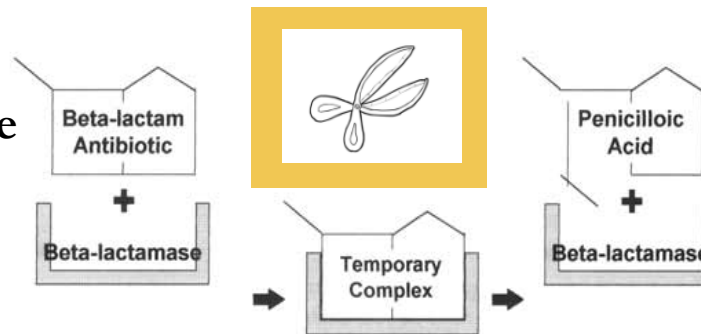
Beta-Laktame

- Inhibieren die Zellwand Synthese
- Gram + und –
- Behandlung von wichtigen Infektionen (Luftwege, Harntrakt, Haut).
- „Critically Important“ Antimikrobielle Substanzen (WHO)



Beta-Laktamasen: Enzyme

> 700 Gene

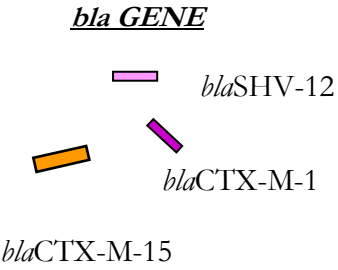


Extended Spectrum Beta-Laktamasen (ESBL) und Cephamycinasen (AmpC)

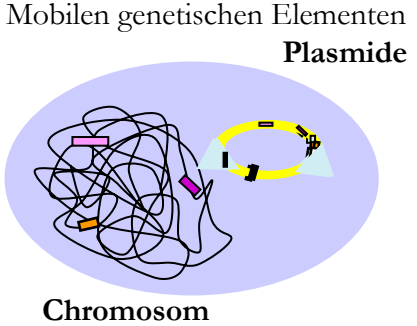
- Resistenz gegen 3. Generation Cephalosporine (einige 4th, Monobaktame, Cephamycin)
- Gram negative Bakterien wie *E. coli*, *Salmonella*, *Klebsiella*
- ESBLs: z.B CTX-M Familie, TEM-Varianten, SHV-Varianten
- Plasmid-Kodierte AmpC: z.B, CMY-2

Die Epidemiologie von ESBLs/AmpC

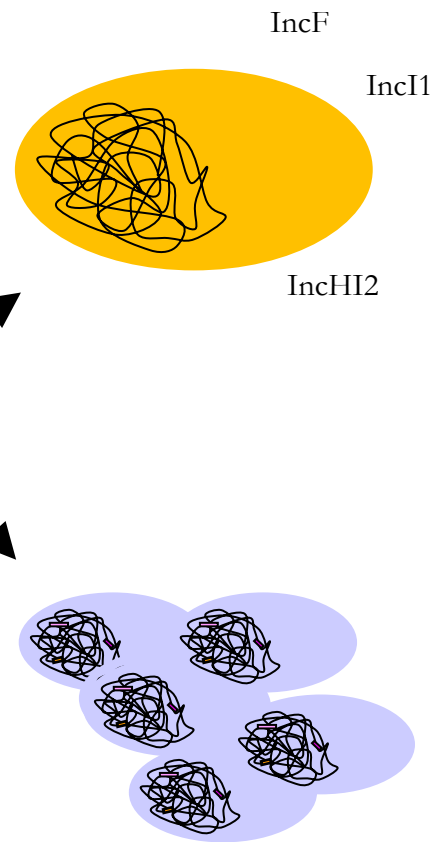
Welche?



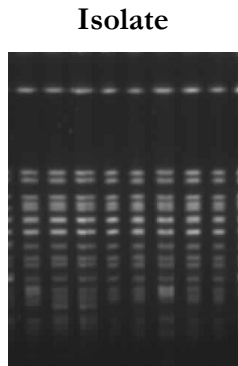
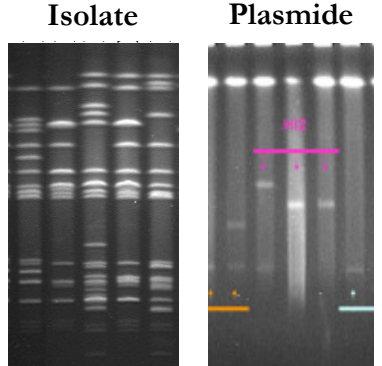
Wo?



Wie?



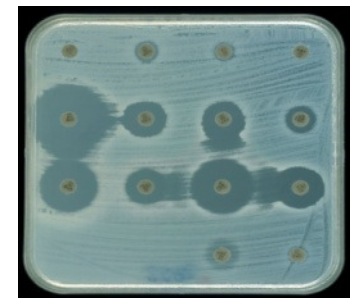
Was?



Daten des BfRs aus:

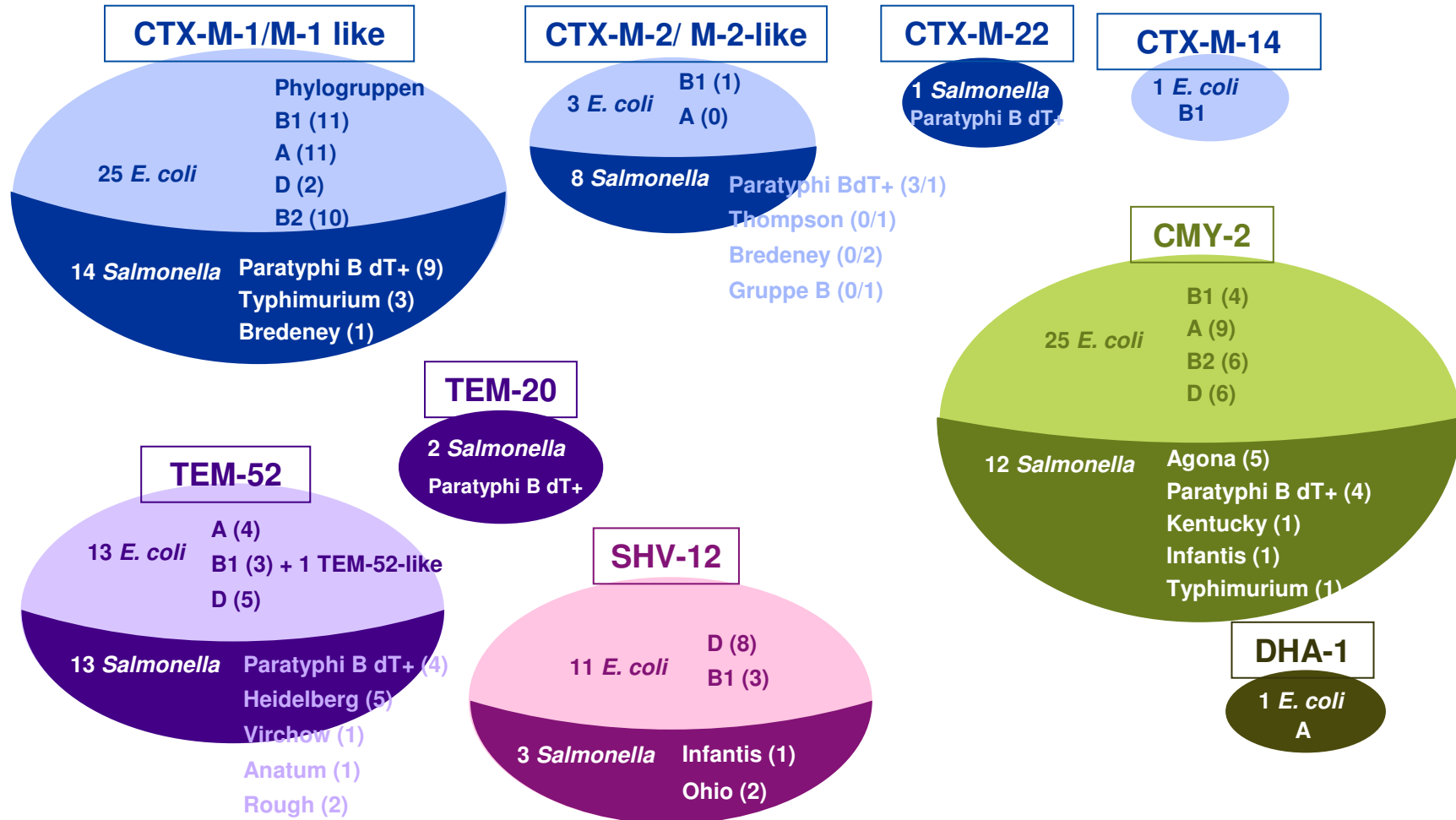
Isolaten des NRL-AR, NRL-Salm, NRL-E. coli

- Routine/Monitoring von Salmonellen, kommensalen *E. coli* und EHEC
- Forschungsprojekte:
 - a) EU SAFEFoodERA ESBLs: 2009-2011 (Europäischer Verbund)
 - b) RESET: 2010-2012 (Deutscher Verbund)
 - c) Beantragt EU EMIDA, 6 Länder (Europäischer Verbund)



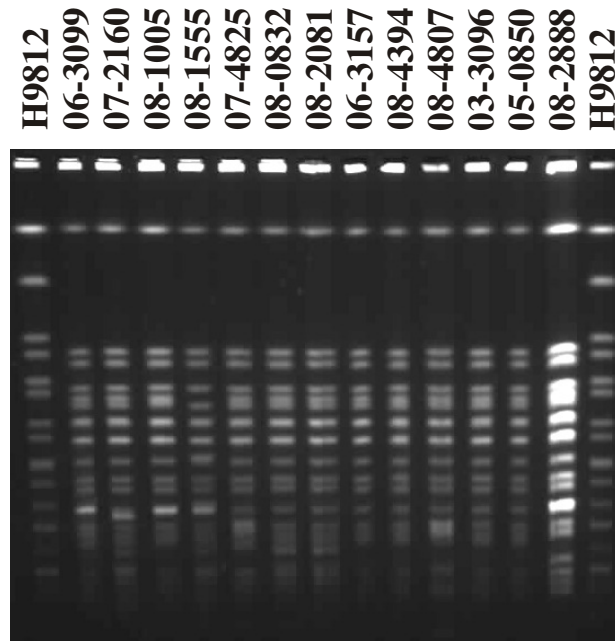
BfR Routine - Isolate vom Geflügel

56 *Salmonella* (22 Tier, 34 Lebensmittel); 86 *E. coli* (64 Tier, 22 Lebensmittel)

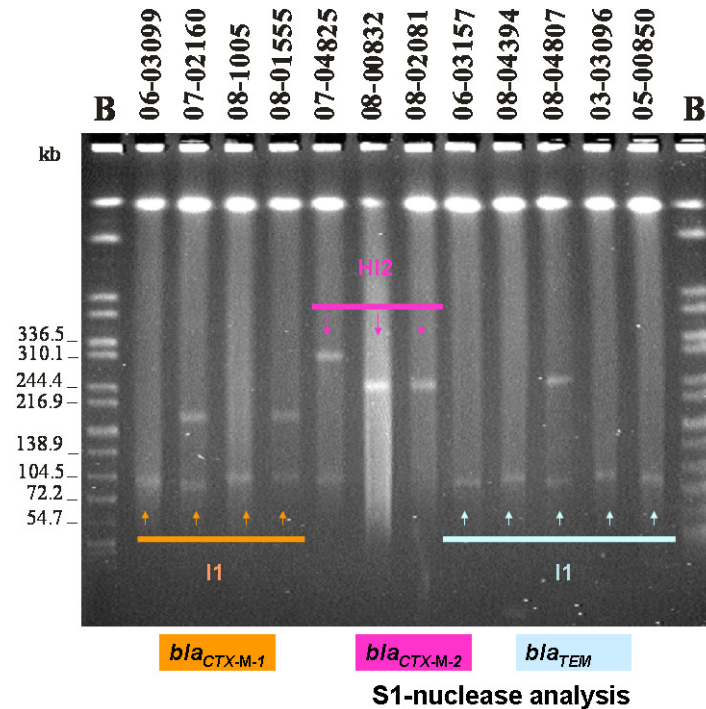


β-Laktamasen bei *S. Paratyphi* B dT+ aus Masthuhn und Hähnchenfleisch

- Klonale Verbreitung eines multiresistenten Stamms in Deutschland, Belgien und Niederlande sei Mitte der 90er
- Akkumulierung von Chinolon und Cephalosporin (3. Generation) Resistenzen



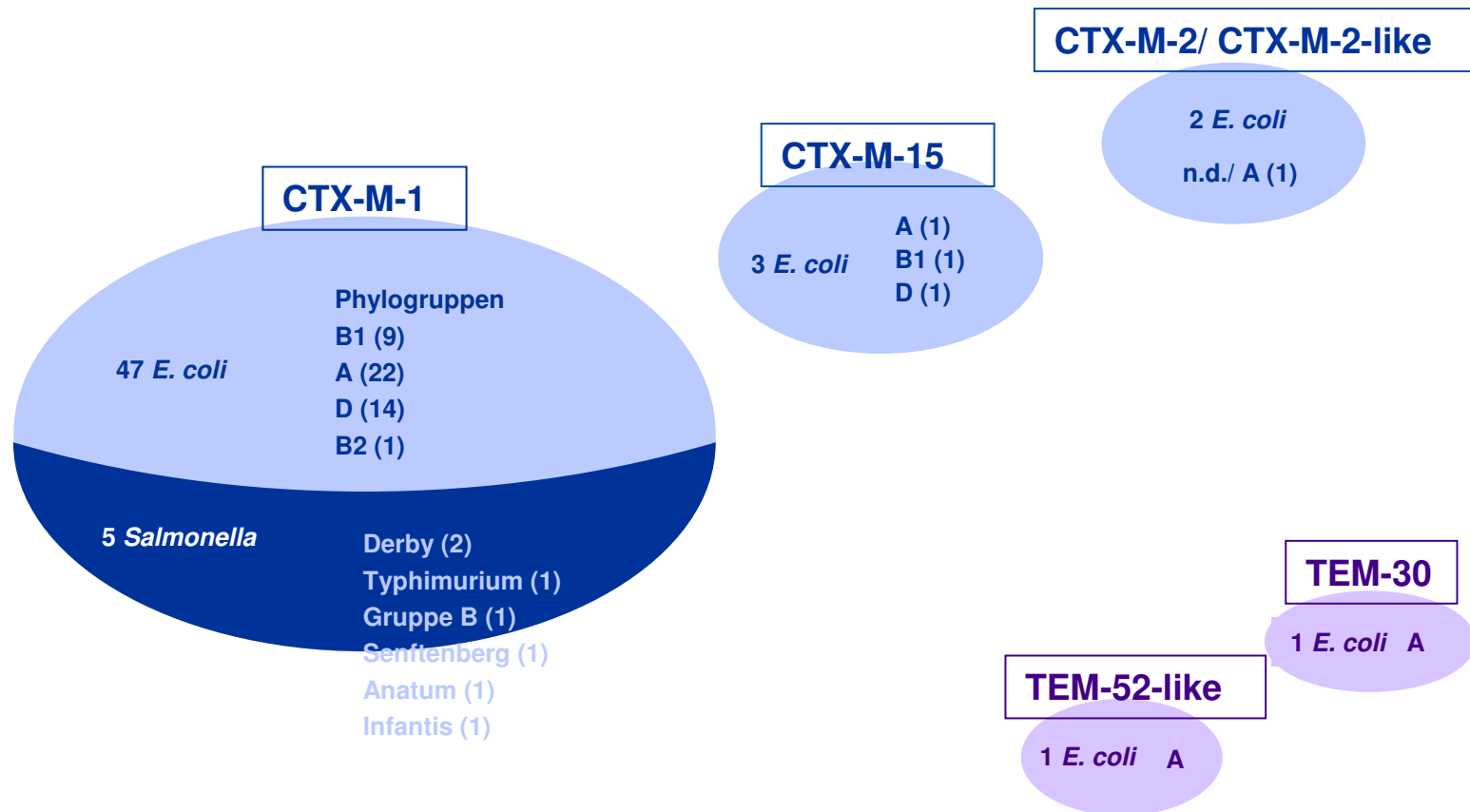
XbaI PFGE DNA-Analyse



S1-nuclease analysis

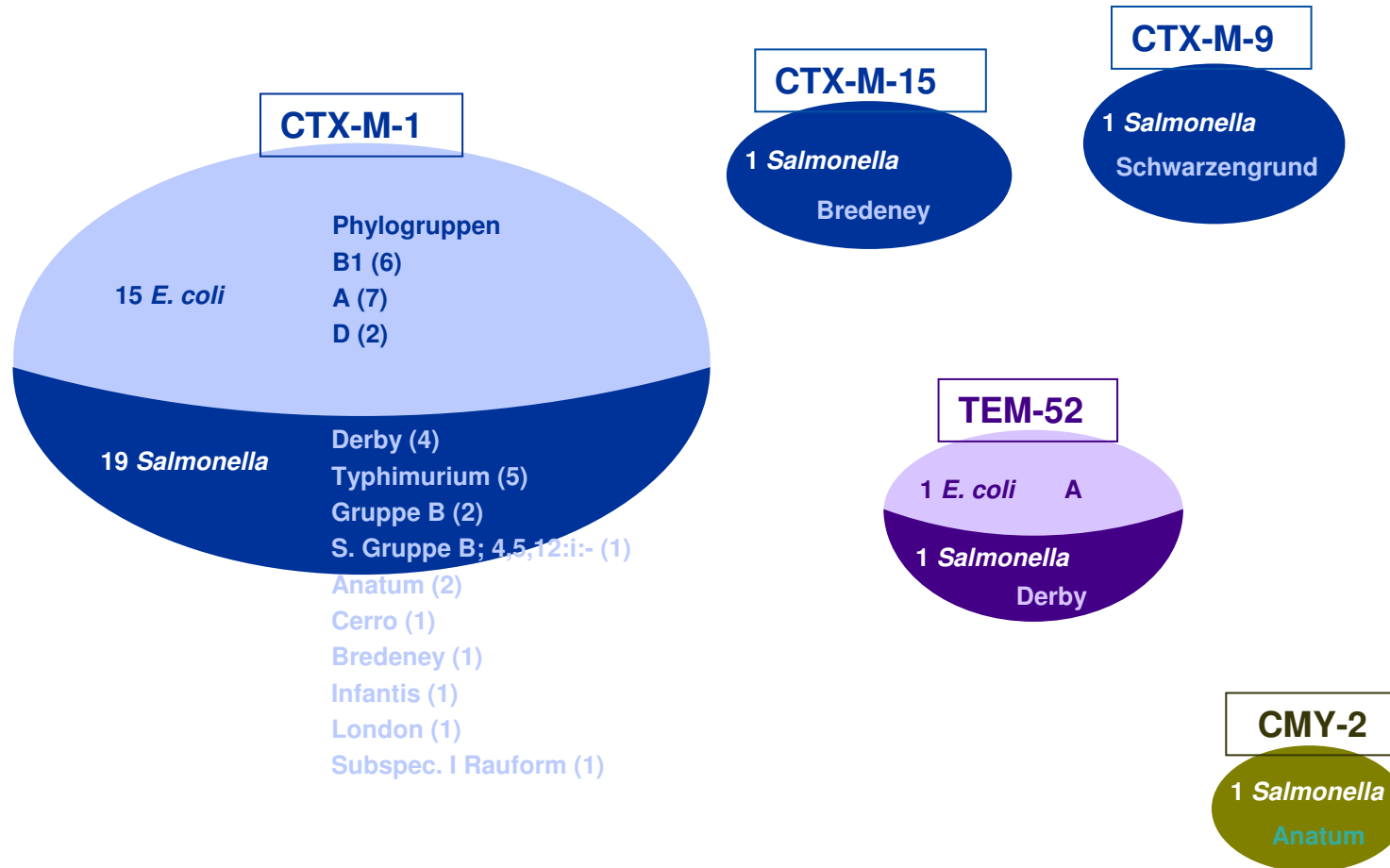
BfR Routine – Isolate vom Rind

62 *E. coli* (59 Tier, 3 Lebensmittel); 7 *Salmonella* (5 Tier, 2 Lebensmittel)



BfR Routine – Isolate vom Schwein

18 *E. coli* (Tier); 28 *Salmonella* (25 Tier, 3 Lebensmittel)



EU SafefoodERA ESBLs project

(2009-2011)



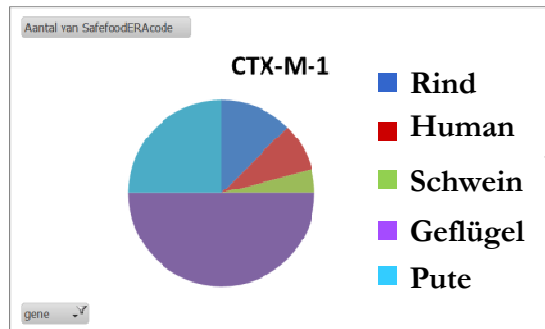
- **Title:** The Role of Commensal Microflora in the transmission of ESBLs
- **Aim:** to compare the characteristics of pathogenic and commensal *E. coli* and the food-borne pathogen *Salmonella* harbouring ESBLs in the community, foods for human consumption, health care and animal sources.
- **Partners:**
 - Germany: FLI, BfR
 - England: HPA, AHVLA
 - The Netherlands: CVI

359 Isolates 2005-2008

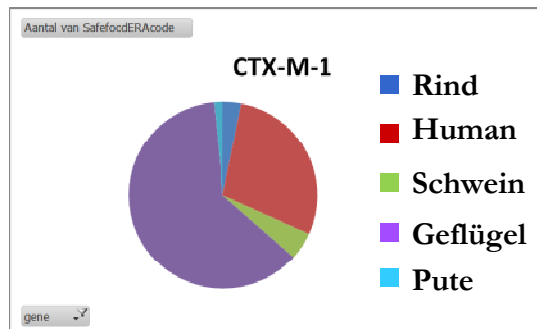
Do ESBL E. coli and Salmonella from food production animals pose a risk for public health?

EU SafefoodERA ESBLs projekt (Isolates till 2008)

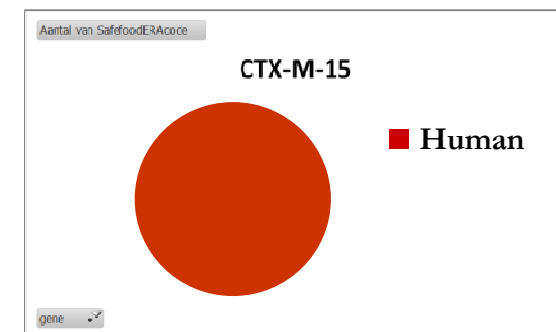
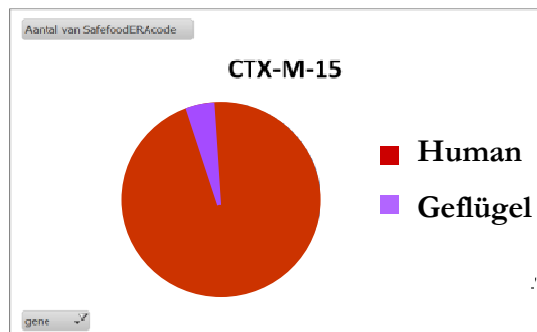
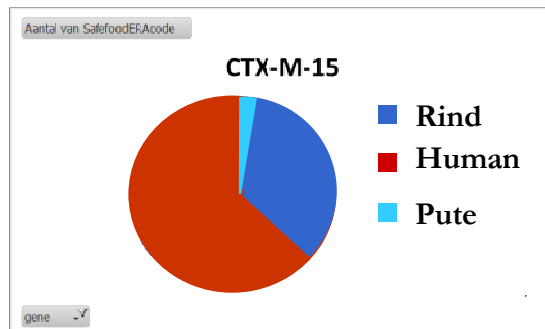
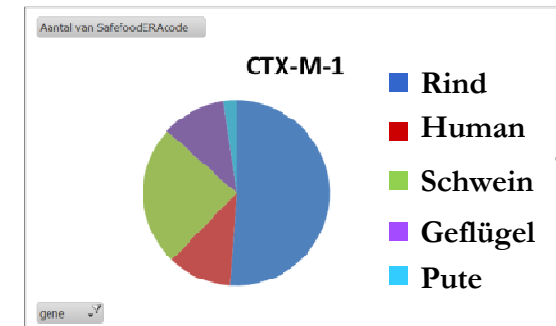
England



Niederlande



Deutschland



Schlussfolgerung:

Übereinstimmung auf der Gen- Plasmid- und Isolat- (MLST) Ebene in den 3 Ländern



Merle R, Hille K, Kreienbrock L

Das Ziel dieses Forschungsverbundes ist die Bewertung des Einflusses der verschiedenen Bakterien, deren Herkunft und der Übertragungswege, auf das Risiko für Menschen, den oben beschriebenen resistenten Bakterien ausgesetzt zu sein.

Partners 15 beteiligt Forschungseinrichtungen

- 

University of Veterinary Medicine Hannover, Foundation:

 - Department of Biometry, Epidemiology and Information Processing
 - Department of Pharmacology, Toxicology and Pharmacy
 - Institute of Food Toxicology and Analytical Chemistry
- 

Robert Koch Institute

 - Nosocomial Infections
- 

Free University Berlin:

 - Institute for Animal Hygiene and Environmental Health
 - Department of Veterinary Medicine
- 

Charité - Universitätsmedizin Berlin:

 - Institute of Hygiene and Environmental Medicine

- 

Federal Institute for Risk Assessment

 - Antimicrobial Resistance and Resistance Determinants
 - Unit Epidemiology and Zoonoses
- 

University of Paderborn

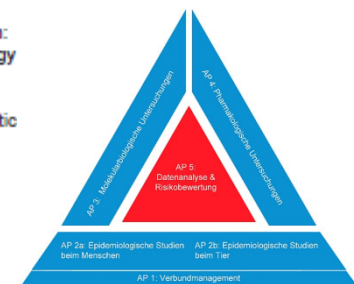
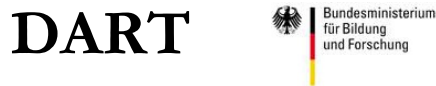
 - Department of Chemistry
- 

Justus-Liebig-University Gießen:

 - Institute of Medical Microbiology
- 

Friedrich-Loeffler-Institut (FLI)

 - Institute of Farm Animal Genetic
- And associated partners



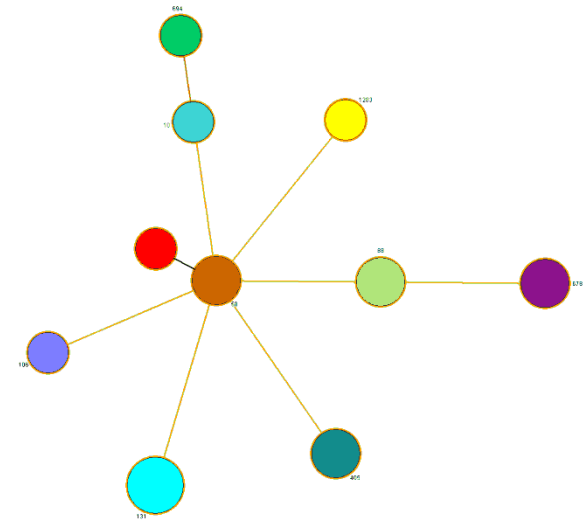
EHEC Ausbruch

E. coli O104:H4
Phylogroup B2; ST678;
Plasmid CTX-M-15; I1; pST31

Isolate fields										Incl1 MLST	
id	plasmid	isolate	species	country	year	source	beta lactamase	FAB formula	sender	ST	clonal complex
34	pEC_Bactec		Escherichia coli	Belgium		horse	CTX-M-15		Alessandra Carattoli	31	CC-31
36	AM20369		Shigella sonnei	USA	2004	human	CTX-M-15		Jason P. Folster	31	CC-31
305	ESBL-140	1190901453	Escherichia coli	The Netherlands	2009	human	CTX-M-15		Alieda van Essen	31	CC-31
319	ESBL-223	09E00520	Escherichia coli	Germany		human	CTX-M-15		Alieda van Essen	31	CC-31
357	ESBL-4		Escherichia coli	The Netherlands	2009	human	CTX-M-15		Alieda van Essen	31	CC-31
365	ESBL-43		Escherichia coli	The Netherlands	2009	human	CTX-M-15		Alieda van Essen	31	CC-31
371	ESBL-46		Escherichia coli	The Netherlands	2009	human	CTX-M-15		Alieda van Essen	31	CC-31
379	ESBL-499		Escherichia coli	UK		cattle	CTX-M-15		Alieda van Essen	31	CC-31
383	ESBL-517		Escherichia coli	UK		cattle	CTX-M-15		Alieda van Essen	31	CC-31
385	ESBL-545		Escherichia coli	UK		cattle	CTX-M-15		Alieda van Essen	31	CC-31
386	ESBL-557		Escherichia coli	UK		cattle	CTX-M-15		Alieda van Essen	31	CC-31
387	ESBL-558		Escherichia coli	UK		cattle	CTX-M-15		Alieda van Essen	31	CC-31
388	ESBL-582		Escherichia coli	UK		cattle	CTX-M-15		Alieda van Essen	31	CC-31
406	ESBL-696		Escherichia coli	UK	2009	human	CTX-M-15		Alieda van Essen	31	CC-31
409	ESBL-768		Escherichia coli	UK	2009	human	CTX-M-15		Alieda van Essen	31	CC-31
527	CTX-I1-O104:H4		Escherichia coli	Germany	2011	human	CTX-M-15		Alessandra Carattoli	31	CC-31

Taken from
<http://pubmlst.org/plasmid/>

plasmid	Phylogroup	MLST
ESBL-140	B2	131
ESBL-223	B2	1283
ESBL-4	B2	131
ESBL-43	B2	131
ESBL-46	A	694
ESBL-499	A	88
ESBL-517	B1	58
ESBL-545	D	New one
ESBL-557	D	106
ESBL-558	A	88
ESBL-582	D	58
ESBL-696	B2	405
ESBL-768	D	405



Kindly provided by M. Williams and J. Wain, on behalf of the Safefoodera ESBLs Consortium

Schlußfolgerung

- ESBLs und AmpC-kodierenden Gene sind in *Salmonella* und *E. coli* Isolate vom Tier/Lebensmittel nachweisbar.
- Die Inzidenz ist steigend.
- Mehrere β -Laktamase Varianten sind detektierbar.
- Mehrere (auch übertragbare) Resistenz Plasmide sind vorhanden (IncI1 am häufigsten).
- Klonale Verbreitung in einigen Serotypen.
- Müssen wir auch mit der Selektion von Carbapenemasen rechnen ?

Danke für Aufmerksamkeit

Beatriz Guerra

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beatriz.guerra@bfr.bund.de □ www.bfr.bund.de