

# Antibiotic Resistance Profile among Shiga Toxin-Producing *Escherichia coli* Isolated from dairy cattle

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## Introduction

- Shiga toxin-producing *Escherichia coli* (STEC) are foodborne pathogens that can cause serious diseases in humans, including bloody diarrhoea and kidney failure;
- Ruminants, such as cattle, are considered the main reservoirs and source of STEC;
- STEC strains are characterized by the production of Shiga toxin (Stx);
- STEC are transmitted to humans through many different routes;

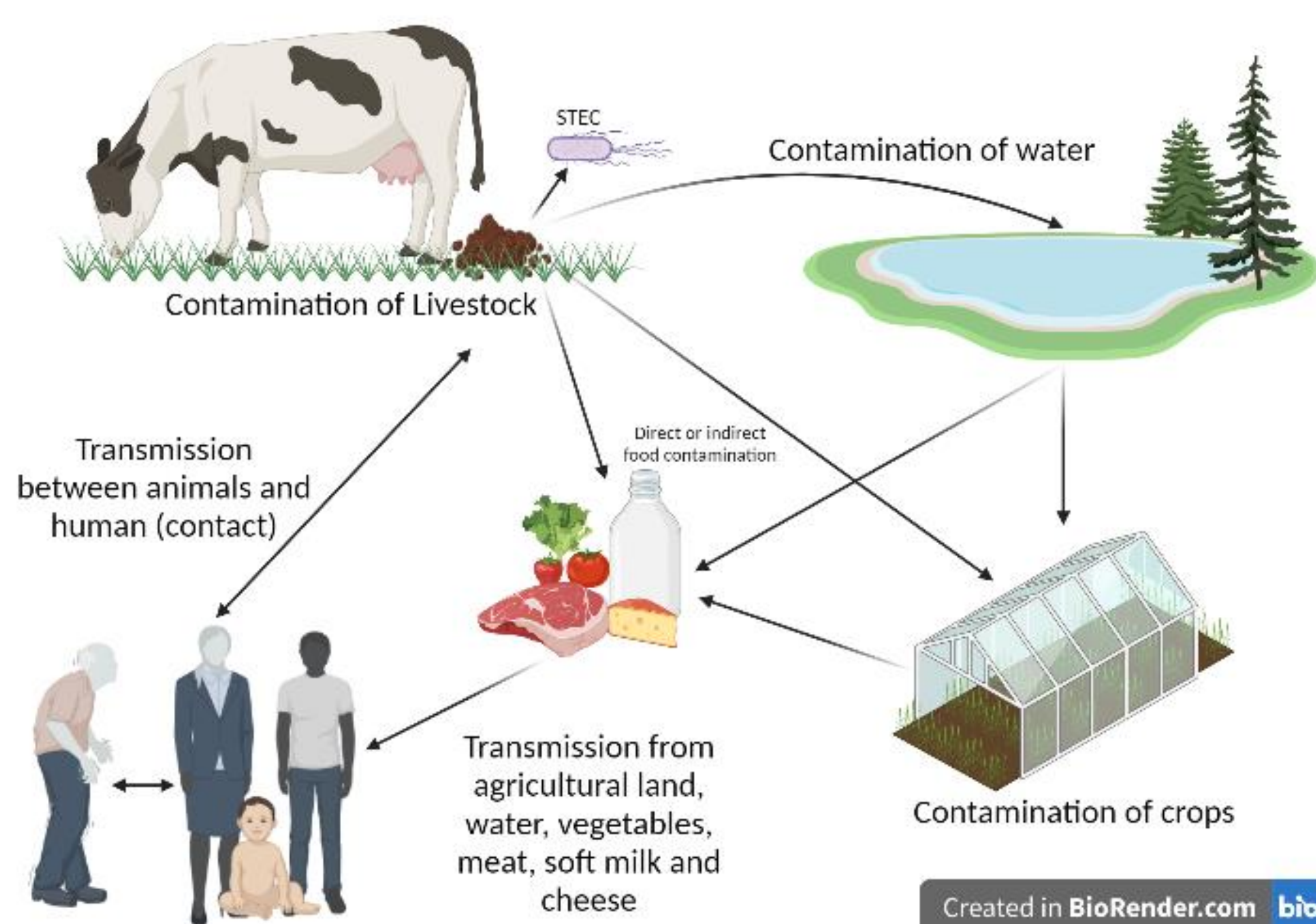


Figure 1 – Routes of transmission of and infection with Shiga toxin-producing *Escherichia coli* (STEC).

- The presence of STEC with antimicrobial-resistance (AMR) is increasingly frequent in patients with serious disease;
- AMR STEC can enter the food chain and pose a significant risk to consumers.

## Aim of the study

Evaluate the antibiotic resistance profile in different STEC serogroups isolated from dairy cattle (cows and heifers) in Northern Portugal to better understand the epidemiology, emergence and prevalence of AMR in STEC.

## Methods

- Susceptibility tests were performed on 55 STEC strains belonging to 29 serogroups;
- STEC strains were isolated from lactating cows and heifers in 17 farms at North of Portugal sampled in 2019;
- Antibiotic susceptibility testing (AST) was performed by disc diffusion method following EUCAST, 2020 and CLSI, 2020 (Figure 2);

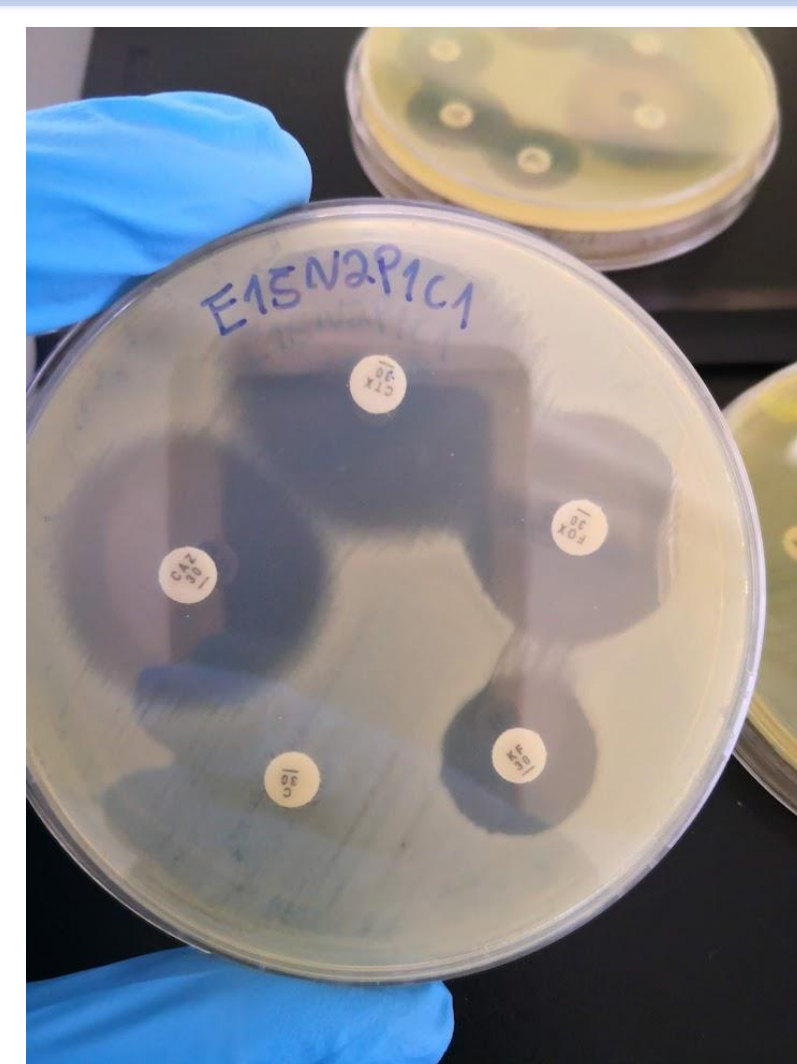


Figure 2 – Plate with antibiotic susceptibility testing (AST) performed by disc diffusion method on E15N2P1C1 (STEC isolate) showing resistance to chloramphenicol

Table 1. Antibiotics used in the tests:

Class of Antibiotic	Antibiotic (Disk concentration)
Penicillins	AMP-Ampicillin (10 µg); AMC-Amoxicillin-clavulanic acid (30 µg)
Cephalosporins	CAZ- Cefazidime (30 µg); CTX- Cefotaxime (30 µg); FOX- Cefoxitin (30 µg); KF- Cephalothin (30 µg)
Carbapenems	IMP- Imipenem (10 µg); MEM – Meropenem (10 µg)
Aminoglycoside	K- Kanamycin (30 µg)
Phenicol	C- Chloramphenicol (30 µg)
Sulphonamides/trimethoprim	SXT- Trimethoprim-sulfamethoxazole (25 µg)
Fluoroquinolones	MXF-Moxifloxacin (5 µg); LEV- Levofloxacin (5 µg)
Tetracyclines	TE- Tetracycline (30 µg); TGC- Tigecycline (15 µg)

Organized by:

## Results

- Results reveal low level of resistance among the isolates tested.
  - Five (9%) STEC isolates were resistant to one antibiotic, and three (5,5%) to three or more antibiotic classes (multidrug resistance-MDR) (table 2);
- Table 2.** Antibiotic resistance profile of Shiga toxin-producing *Escherichia coli* isolated from dairy cattle (lactating cows and heifers).

	Number of isolates	Number of STEC with resistance profile		
		1 class	3 classes	5 classes
Lactating cows	25	2 (8%)	1 (4%)	0
Heifers	30	3 (10%)	1 (3.33%)	1 (3.33%)
<b>Total</b>	<b>55</b>	<b>5 (9.09%)</b>	<b>2 (3.63%)</b>	<b>1 (1.81%)</b>

- STEC (E4V6P5C1) and STEC (E15N4P2C5) isolates presented resistance to three classes of antibiotics: penicillin (AMP), tetracyclines (TE) and Sulphonamides/trimethoprim (SXT);
- STEC (E15N2P1C1) isolate presented resistance to five classes of antibiotics: phenicol (C), tetracyclines (TE), fluoroquinolones (MXF), aminoglycoside (K) and sulphonamides/trimethoprim (SXT);
- STEC isolates are more resistant to the antibiotic Tetracycline (table 3);

Table 3. Antibiotic and percentage of isolates with resistance.\*

Antibiotic	% of isolates with resistance
Ampicillin	3,6
Amoxicillin-clavulanic acid	3,6
Cefoxitin	1,8
Moxifloxacin	1,8
Tetracycline;	9,1
Trimethoprim-sulfamethoxazole	5,5
Kanamycin	1,8
Chloramphenicol	1,8

\*Only antibiotics that had resistant isolates are listed above.

- MDR strains were resistant to antibiotics commonly used to treat gastroenteritis;
- Serogroups found with resistance profile: O22, O91, O116, O119, O172, O177;
- O22 and O91 are important serogroups to public health surveillance.

## Conclusions

- AMR did not seem to be widely spread in STEC isolates from dairy cattle in Northern Portugal;
- Serogroups O22 and O91 might be of special concern as multidrug resistance profiles have been identified.

## References:

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