ANTIBIOTIC RESISTANCE IN *E. COLI* ISOLATED FROM SURFACE AND GROUND WATER IN AREAS WITH INTENSIVE LIVESTOCK FARMING.

L. Tuts[1,2], M. Heyndrickx[1,3], I. Becue[1], N. Boon[2], P. De Maesschalck[4], R. Eppinger[4], G. Rasschaert[1]

[1] Flanders Research Institute for Agriculture. Fisheries and Food. Technology and Food Science Unit, Melle, Belgium
[2] Ghent University. Faculty of Bioscience Engineering. Center for Microbial Ecology and Technology (CMET), Ghent, Belgium
[3] Ghent University. Faculty of Veterinary Medicine. Department of Pathobiology, Pharmacology and Zoological Medicine, Merelbeke, Belgium
[4] Flanders Environmental Agency (VMM)

Contact: laurens.tuts@ilvo.vlaanderen.be

INTRODUCTION

In the context of "One Health", it is crucial to acknowledge the affiliation between both human and veterinary medicine and the spread of antibiotic resistance in the environment. Entry of antibiotic resistance into the aquatic environment may occur via several ways and is, among others, associated with the use of raw manure on arable fields. This manure application is accompanied by a bacterial load, including antibiotic resistant bacteria, which can end up in surface water through run-off and draining, and in groundwater due to leaching through the soil. When antibiotic resistant bacteria from the environment are taken up by humans (directly through food or indirectly through other contact), antibiotic resistance genes may be transferred to bacteria belonging to human gut flora, including pathogens. By sampling environmental surface and groundwater, associated with intensive farming, the degree of resistance is investigated.

EXPERIMENTAL

SAMPLING

35 in West-Flanders (*Yser* basin)
15 in Antwerp (*Meuse* basin)

MANURE ACTION PLAN LOCATIONS

Surface water (2x) + groundwater (1x)
➔ Surface water is sampled at the **start** of the **fertilization period (February)** and at the **end (September)**

METHODOLOGY

1) Water (100 mL) **FILTRATION** on 0,45 µm CN membrane filters

2) ISOLATION on Rapid' *E. coli* 2 for water testing (BioRad)
and
Brilliance ESBL (Thermo Scientific)
(+ prior enrichment
in Lauryl Tryptose (1:1) for groundwater)

3) ANTIBIOTIC RESISTANCE PROFILING VIA SENSITITRE® (Thermo Scientific)

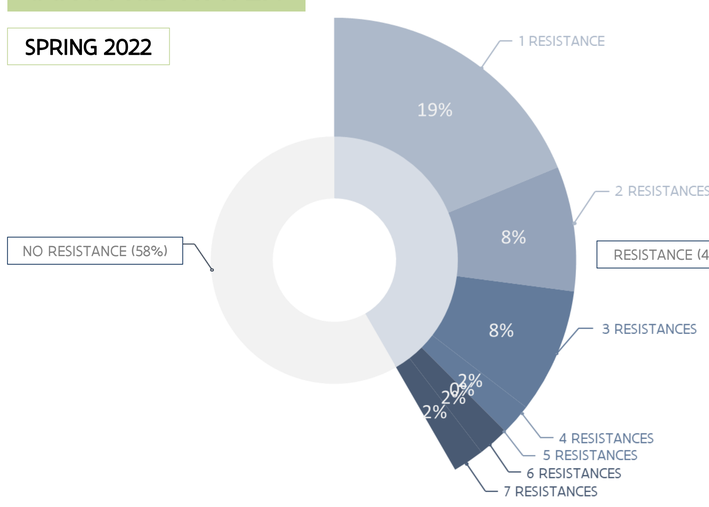
ANTIBIOTIC (EUVSEC 3)	CONCENTRATION (mg/L)	ECOFF (ng/µL)	ANTIBIOTIC (EUVSEC 2)	CONCENTRATION (mg/L)	ECOFF (ng/µL)
Ampicillin (AMP)	1 – 32	8	Cefepime (FEP)	0.06 – 8	0.25
Azithromycin (AZI)	2 – 64	16	Cefotaxime (FOT)	0.25 – 64	0.25
Cefotaxime (FOT)	0.25 - 4	0.25	Cefotaxime / clavulanic acid (F/C)	0.06/4 – 64/8	0.25
Ceftazidime (TAZ)	0.5 – 8	0.5	Cefoxitin (FOX)	0.5 – 64	8
Chloramphenicol (CHL)	8 – 64	16	Ceftazidime (TAZ)	0.25 – 32	0.5
Ciprofloxacin (CIP)	0.015 – 8	0.064	Ceftazidime / clavulanic acid (T/C)	0.12/4 – 128/4	0.05
Colistin (COL)	1 – 16	2	Ertapenem (ERP)	0.015 – 2	0.03
Gentamicin (GEN)	0.5 – 16	2	Imipenem (IMP)	0.12 – 16	0.5
Meropenem (MER)	0.03 – 16	0.125	Meropenem (MER)	0.03 – 4	0.06
Nalidixic acid (NAL)	4 – 64	8	Temocillin (TRM)	0.5 - 128	16
Sulfamethoxazole (SMX)	8 – 512	64			
Tetracycline (TET)	2 – 32	8			
Tigecycline (TIG)	0.25 – 8	0.5			
Trimethoprim (TMP)	0.25 - 16	2			

EUVSEC 2 is additionally used for presumable isolated Extended Spectrum Beta-Lactamase producing *E. coli*

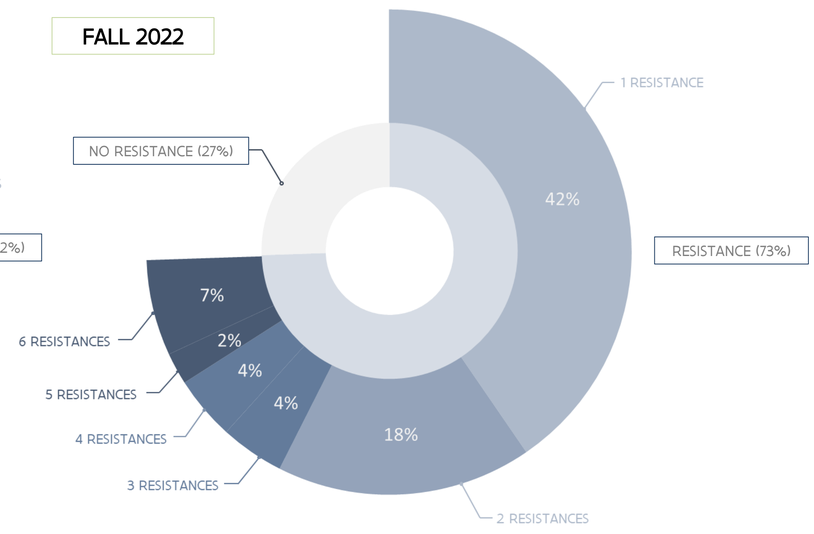
RESULTS

SURFACE WATER

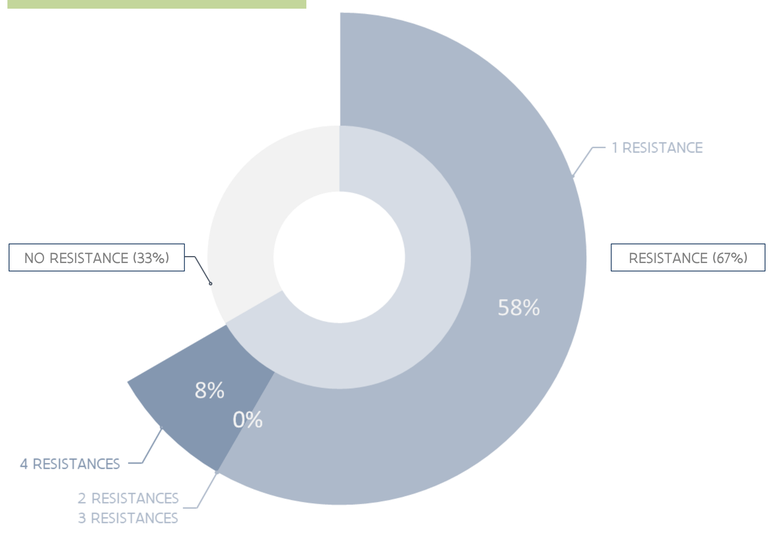
SPRING 2022



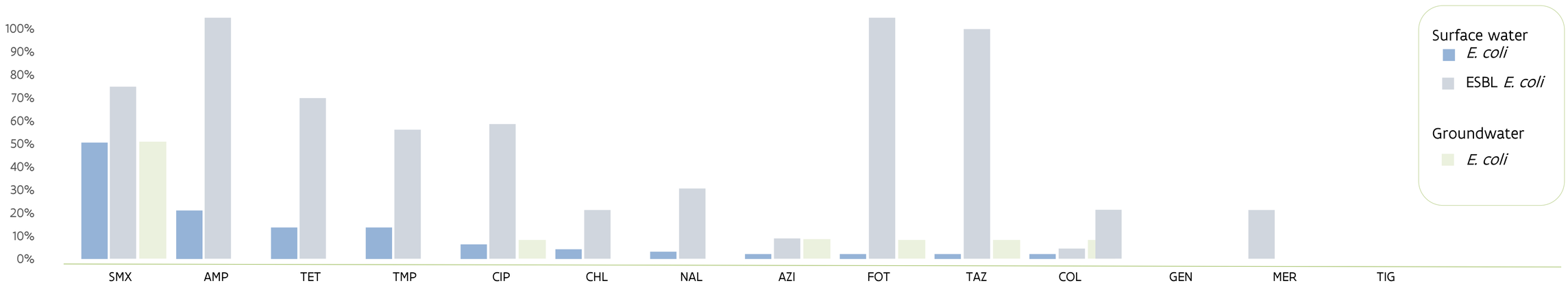
FALL 2022



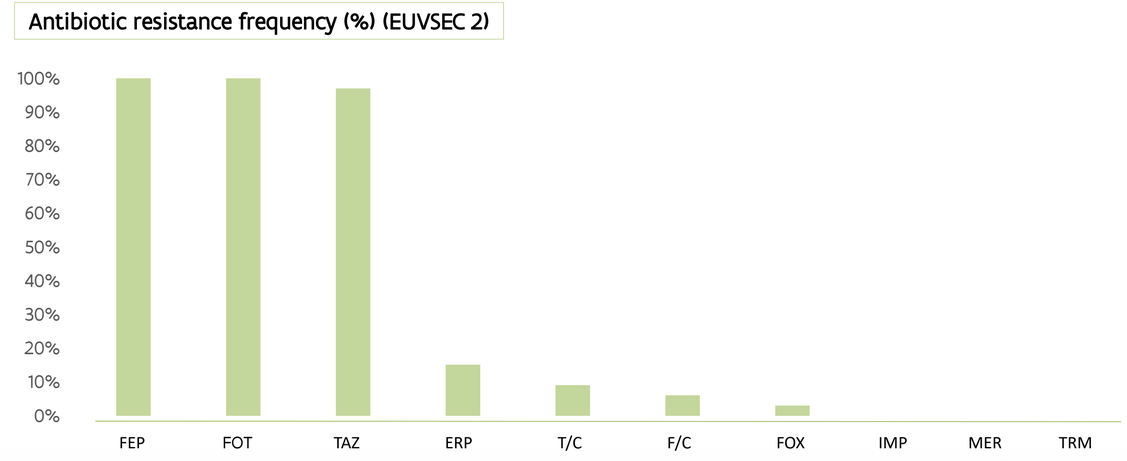
GROUND WATER



Antibiotic resistance frequency (%) (EUVSEC 3)



Antibiotic resistance frequency (%) (EUVSEC 2)



CONCLUSIONS

- Frequency of resistance ranges between 42%-73% in surface water
  - Resistance against sulfamethoxazole most common
  - Resistance levels for isolated *E. coli* are higher after the fertilization period
  - ESBL *E. coli* display higher overall resistance
- Observed resistance frequency of 67% in groundwater
  - Resistance against one antibiotic (sulfamethoxazole) is the most common
- Remarkable resistance against clinically important antibiotics: colistin, ertapenem and 3rd & 4th generation cephalosporines

ILVO Flanders Research Institute for Agriculture, Fisheries and Food
UNIVERSITEIT GENT
Flanders is agriculture and fisheries
belspo
Aquatic Pollutants