

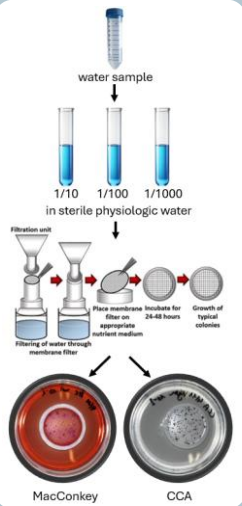
Analysis of microbiological water quality and antimicrobial resistance in water samples

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Program: Bachelor in Biochemistry

INTRODUCTION

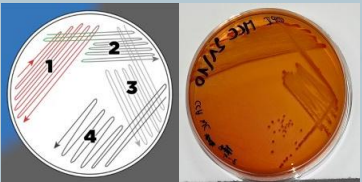
Surface water contains various microorganisms, including coliforms. The four types are *Escherichia*, *Enterobacter*, *Klebsiella*, and *Citrobacter*. The presence of coliforms is an indicator of fecal contamination. Due to the excessive use of antibiotics in human medicine, a significant increase in antibiotic resistance has been observed. The presence of antibiotic-resistant bacteria in the environment poses an increasing risk to public health and ecology. This study aims to determine the presence of coliforms in various water samples (including canal water, Kessel-Lo, the Dijle, and toilet water) and to investigate the antimicrobial resistance.

MATERIALS AND METHODS



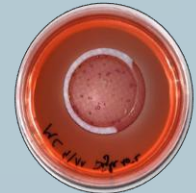
- Sample collection:** water collected in and around Leuven using falcon tubes.
- Dilution:** used dilutions are 10^{-1} , 10^{-2} and 10^{-3} .
- Filtration:** vacuum filtration through 0,45 µm filter
- Selective media:** plated on CCA and MacConkey because of best results.
- Antibiotic susceptibility test (Kirby–Bauer):** seven antibiotics used: amoxicillin, amoxicillin–clavulanic acid, meropenem, gentamicin, doxycycline, ceftazidime, ciprofloxacin.
- Identification:** API-20E strips for biochemical identification.

5. Streak plate



RESULTS

1. Coliform-count



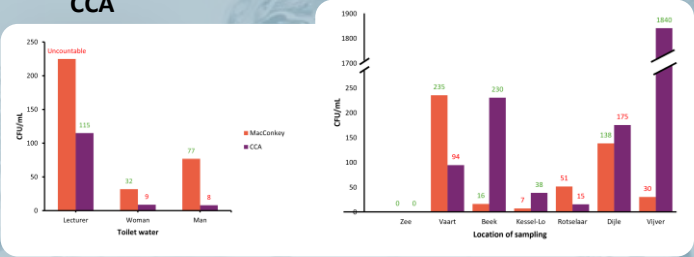
MacConkey agar

Colonies:
red = coliforms
transparent = non-coliforms /non-lactose fermenters

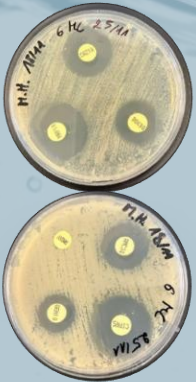


CCA

Colonies:
purple = coliforms
blue = presence of *E. coli*



2. Antibiotic resistance (Kirby–Bauer)



Diameter (cm) antibiotic	Dije				Vaart				Lecturer		Toilet Woman		Man	
	1	2	3	4	1	2	3	4	1	2	3	4	5	6
AMOX	2.83	0.00	0.00	0.00	1.68	1.14	0.00	0.00	0.0	0.0	0.0	1.7	0.0	1.4
AMC30	2.50	2.32	1.84	1.39	1.27	2.35	0.00	1.24	0.0	0.0	0.0	2.5	0.0	0.0
MRP10	3.02	3.09	3.11	3.17	3.08	3.16	2.75	3.48	2.8	3.1	2.8	3.2	3.1	2.8
GEN10	1.87	1.93	1.54	1.71	1.70	1.60	1.68	2.15	1.7	1.6	1.7	1.8	1.7	1.9
DOX30	1.60	2.18	2.20	0.00	1.71	1.90	1.61	1.72	1.6	1.8	1.7	2.3	2.1	1.6
CAZ10	2.75	2.57	0.00	0.00	2.29	2.35	2.18	2.39	2.1	2.2	0.0	2.8	2.4	2.2
CIPR5	3.49	2.97	2.80	2.60	2.49	2.51	2.87	3.23	2.5	2.7	2.8	3.0	2.5	3.3

Antibiotic (%)	Vaart	Dije	MacConkey	Toilet CCA
AMOX	29%	50%	83%	17%
AMC30	57%	67%	100%	17%
MRP10	100%	100%	100%	100%
GEN10	57%	83%	67%	83%
DOX30	86%	83%	83%	100%
CAZ10	86%	67%	100%	67%
CIPR5	86%	100%	67%	100%

3. Identification via API-20E



Sample	MacConkey	CCA
Lecturer	—	<i>Enterobacter cloacae</i>
Woman	<i>Enterobacter aerogenes</i>	<i>Klebsiella pneumoniae ssp pneumoniae 2</i>
Man	<i>Salmonella enterica ssp arizonae</i>	<i>Enterobacter cloacae</i>
Vaart	—	<i>Escherichia coli</i>
Dije	<i>Serratia plymuthica</i>	<i>Kluyvera spp</i>

CONCLUSION

This study assessed the microbiological water quality and antimicrobial resistance of coliforms in different water sources. Various types of coliforms were detected, with a notable resistance to amoxicillin but highly sensitive for meropenem and ciprofloxacin. The results indicate that natural waterways and sanitary systems act as important reservoirs for coliforms and antimicrobial resistance.