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The prevalence of antibiotic resistant coliform bacteria in wastewater in the Czech and Slovak Republic

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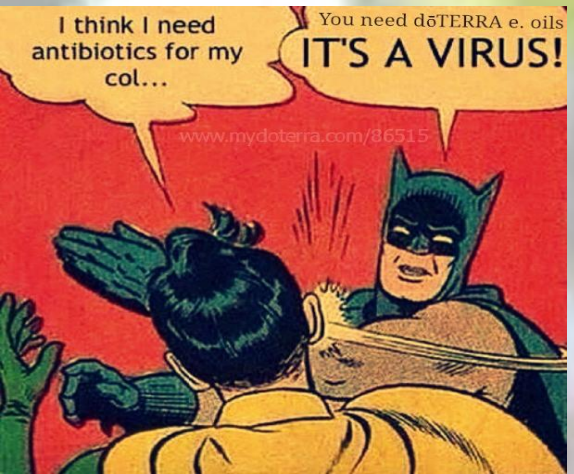
ANTIBIOTIC RESISTANCE

Socio – economic problem

Excessive and inappropriate use of antibiotics



Non-metabolized form

1. Medical purposes

WASTEWATER

Drugs

2. Disinfection

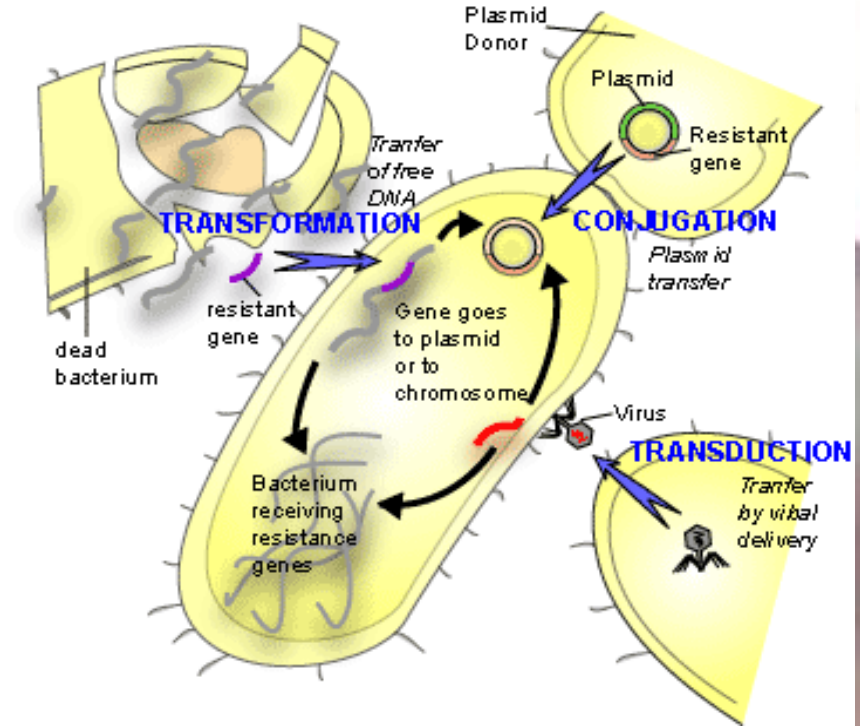
Resistance genes and resistance bacteria

Residual concentrations

WWTP

Concentrations of antibiotics in wastewater → ng/L or mg/L → Selective pressure for resistance development

1. Horizontal gene transfer



2. Spontaneous mutations in chromosomal genes

Aim of study

Monitoring of total and antibiotic resistant coliform bacteria (especially *Escherichia coli)* prevalence in:

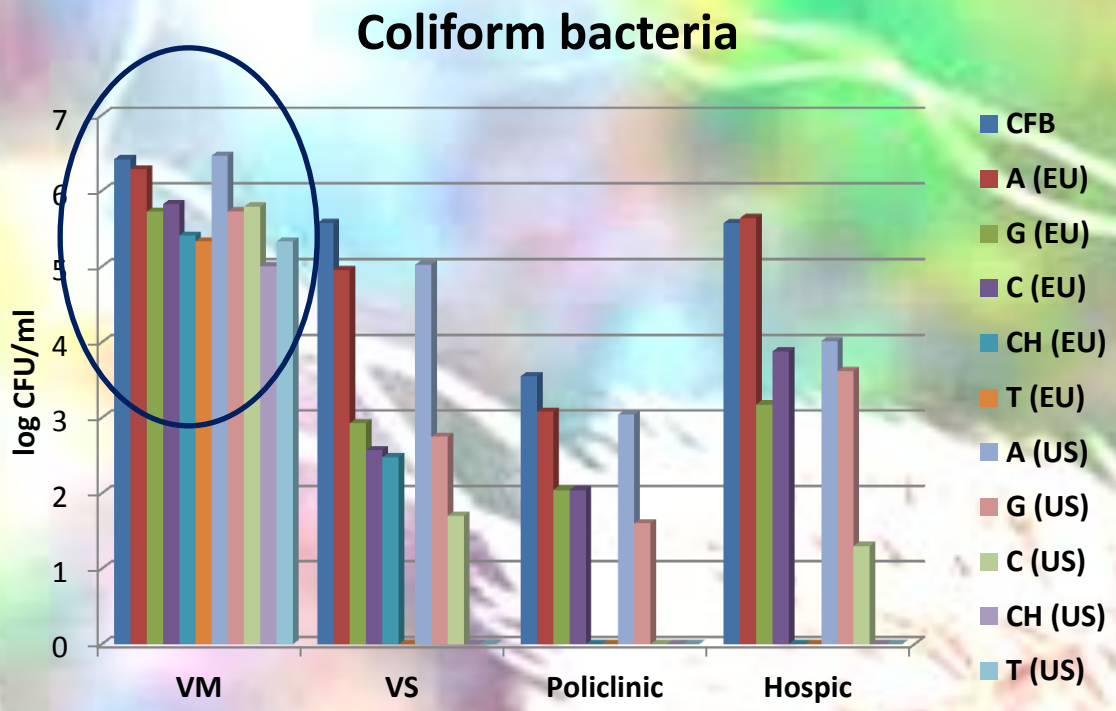
a. wastewater from hospitals and health care facilities,
b. WWTP influent and effluent wastewater,
c. WWTP sewage sludge

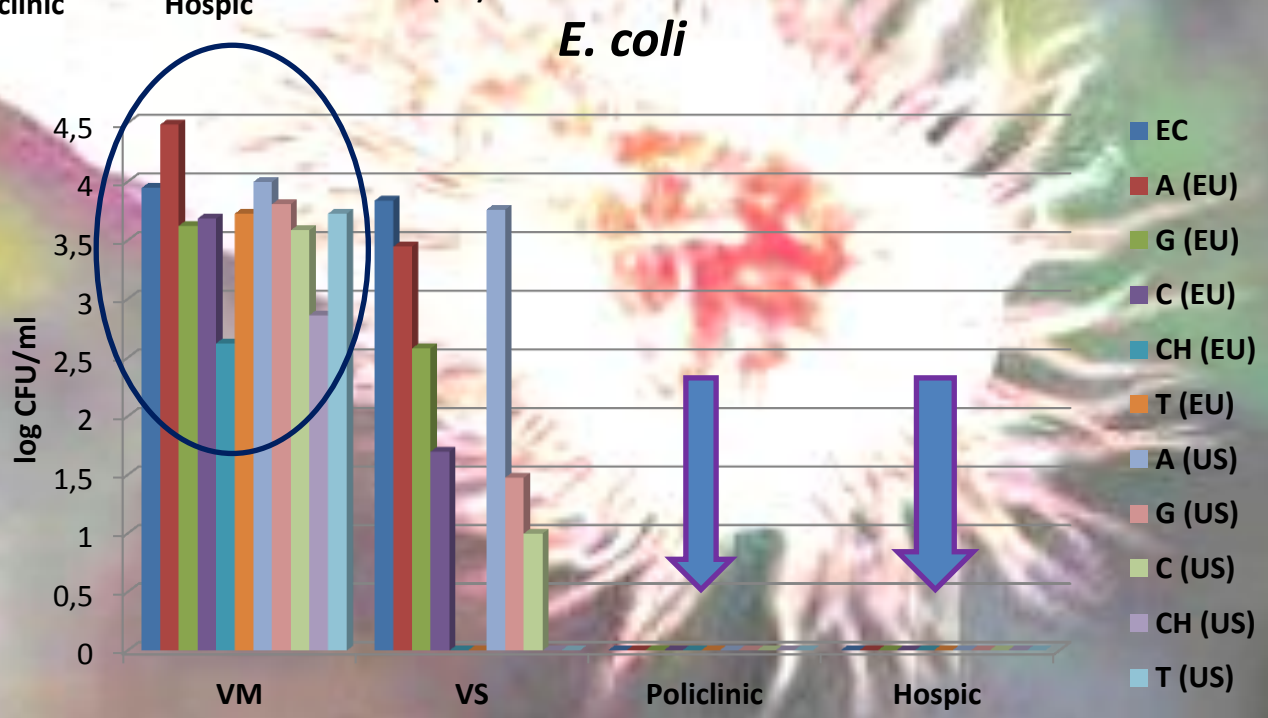
in selected cities of Slovak and Czech Republic.

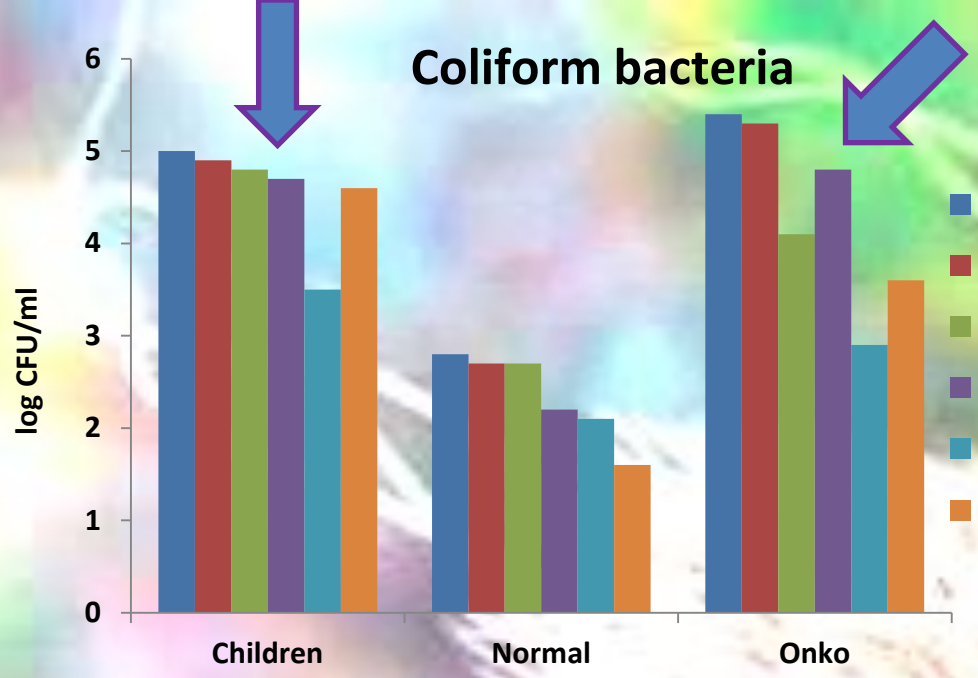
Hospitals

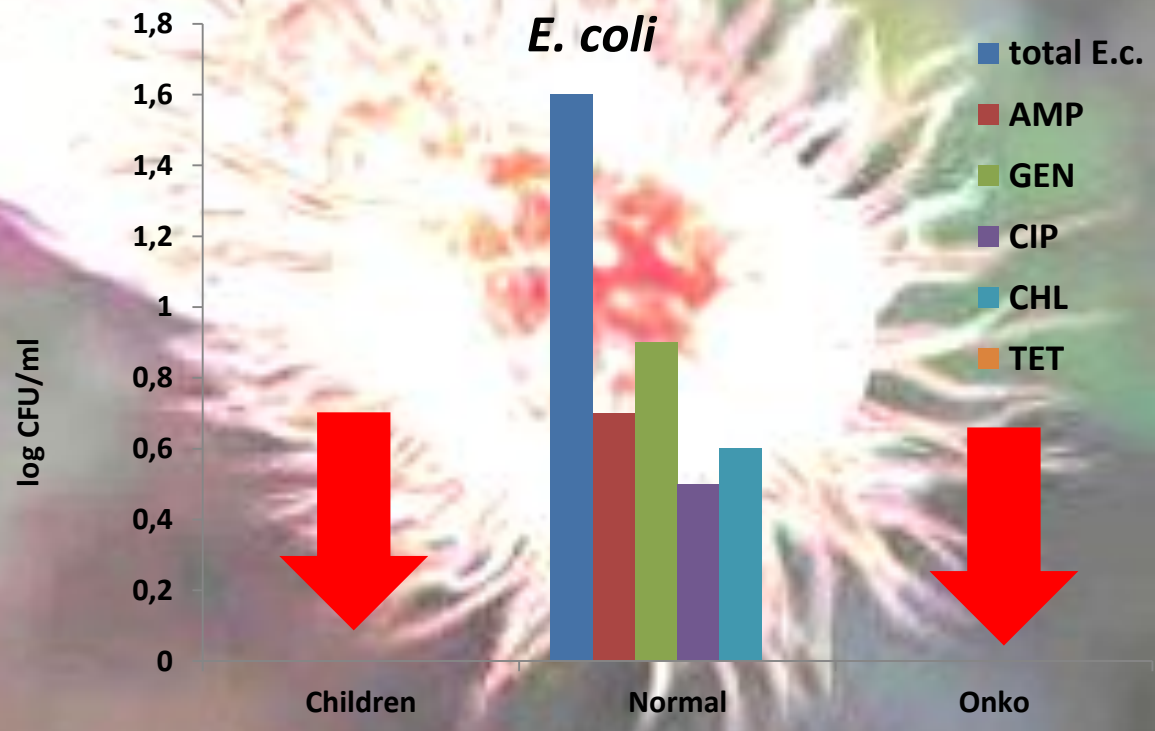
Hospital	Valašské Meziříčí log CFU/ml	Vsetín log CFU/ml	Policlinic log CFU/ml	Hospic log CFU/ml
Total coliform bacteria	6,4	5,8	3,5	5,6
E. coli	4,5	3,8	0	0

Hospital	Children log CFU/ml	Normal log CFU/ml	Onko log CFU/ml
Total coliform bacteria	5	2,8	5,3
E. coli	1,6	1,65	0


Coliform bacteria
log CFU/ml
0
1
2
3
4
5
6
7
VM
VS
Policlinic
Hospic
CFB
A (EU)
G (EU)
C (EU)
CH (EU)
T (EU)
A (US)
G (US)
C (US)
CH (US)
T (US)


E. coli
log CFU/ml
0
0,5
1
1,5
2
2,5
3
3,5
4
4,5
VM
VS
Policlinic
Hospic
EC
A (EU)
G (EU)
C (EU)
CH (EU)
T (EU)
A (US)
G (US)
C (US)
CH (US)
T (US)

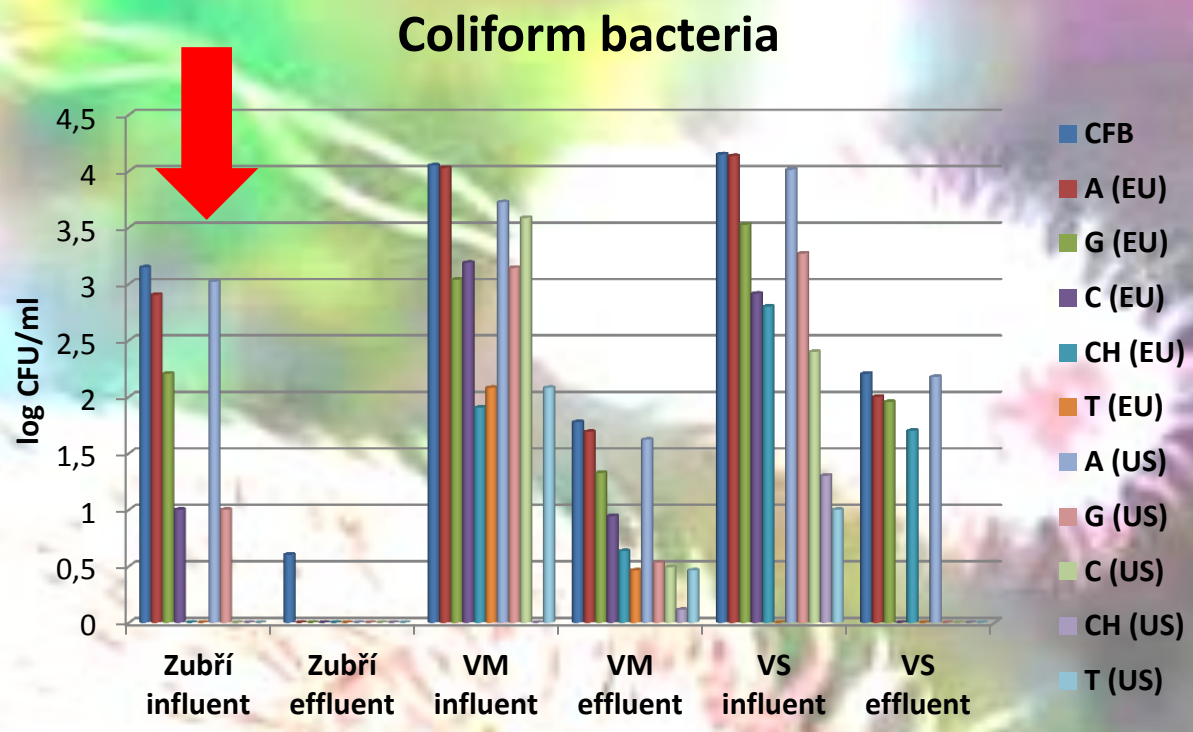

Coliform bacteria
log CFU/ml
0
1
2
3
4
5
6
Children
Normal
Onko
total CFB
AMP
GEN
CIP
CHL
TET

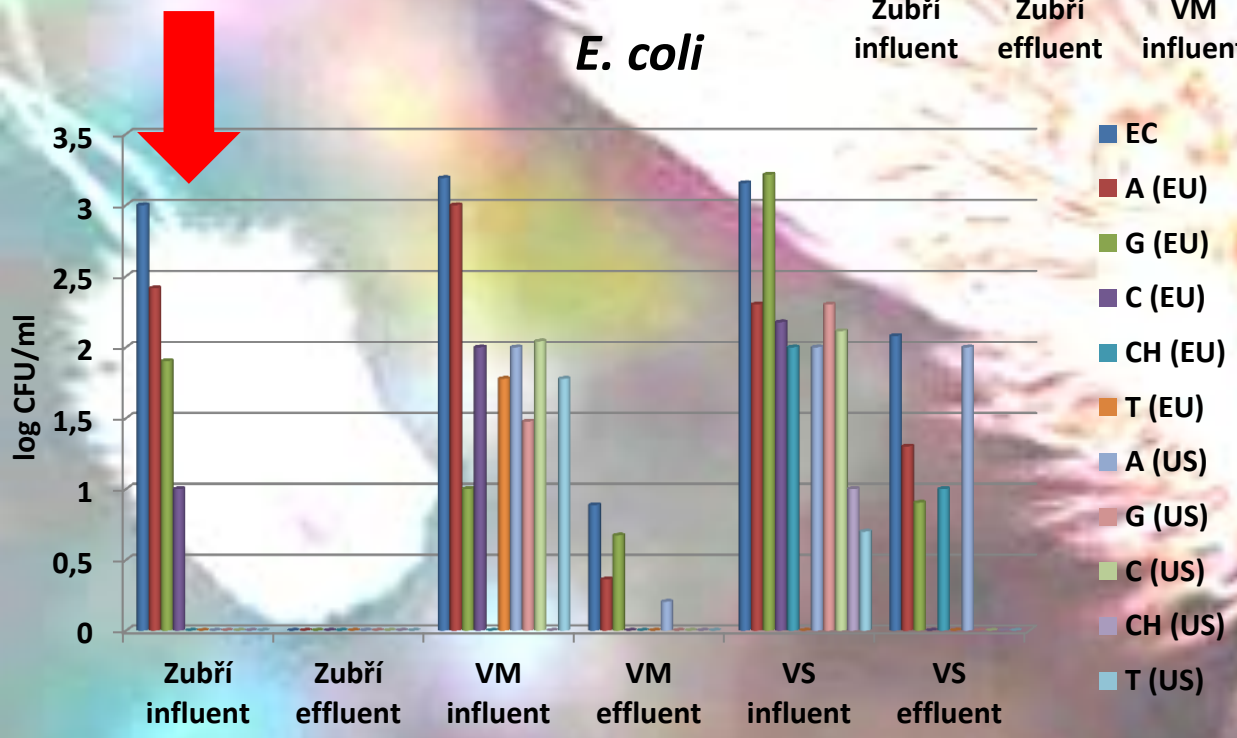

E. coli
log CFU/ml
0
0,2
0,4
0,6
0,8
1
1,2
1,4
1,6
1,8
Children
Normal
Onko
total E.c.
AMP
GEN
CIP
CHL
TET

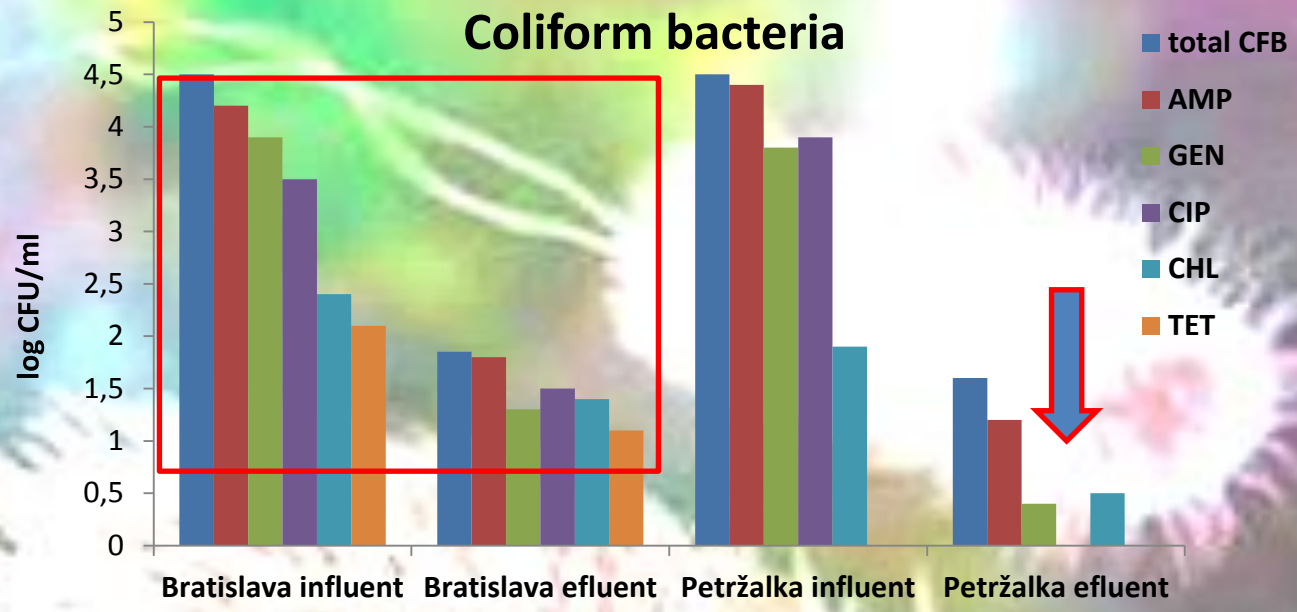
WWTP influent and effluent wastewater

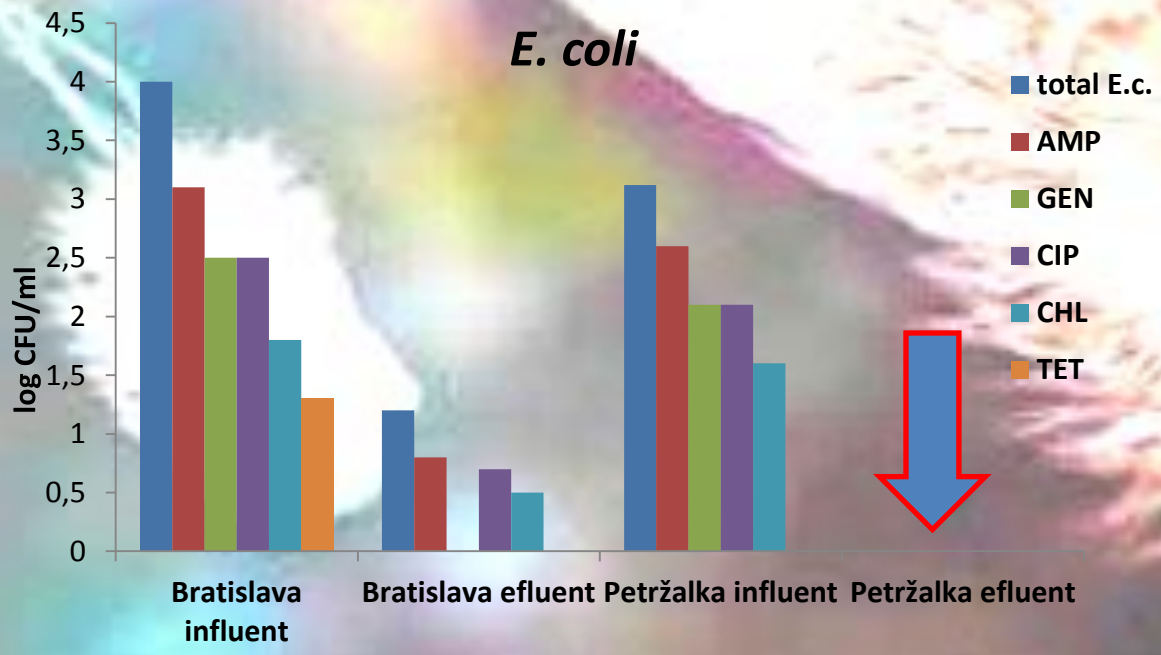
WWTP	Zubří		Valašské Meziříčí		Vsetín	
log CFU/ml	influent	effluent	influent	effluent	influent	effluent
Total coliform bacteria	3	0,6	4	1,8	4,1	2,2
E. coli	2,4	0	3,2	0,9	3,2	2,1

WWTP	Vrakuňa		Petržalka	
log CFU/ml	influent	effluent	influent	effluent
Total coliform bacteria	4,7	1,9	4,6	1,6
E. coli	4,1	1,2	3,1	0


Coliform bacteria
log CFU/ml
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
Zubří influent
Zubří effluent
VM influent
VM effluent
VS influent
VS effluent
CFB
A (EU)
G (EU)
C (EU)
CH (EU)
T (EU)
A (US)
G (US)
C (US)
CH (US)
T (US)


E. coli
log CFU/ml
3,5
3
2,5
2
1,5
1
0,5
0
Zubří influent
Zubří effluent
VM influent
VM effluent
VS influent
VS effluent
EC
A (EU)
G (EU)
C (EU)
CH (EU)
T (EU)
A (US)
G (US)
C (US)
CH (US)
T (US)

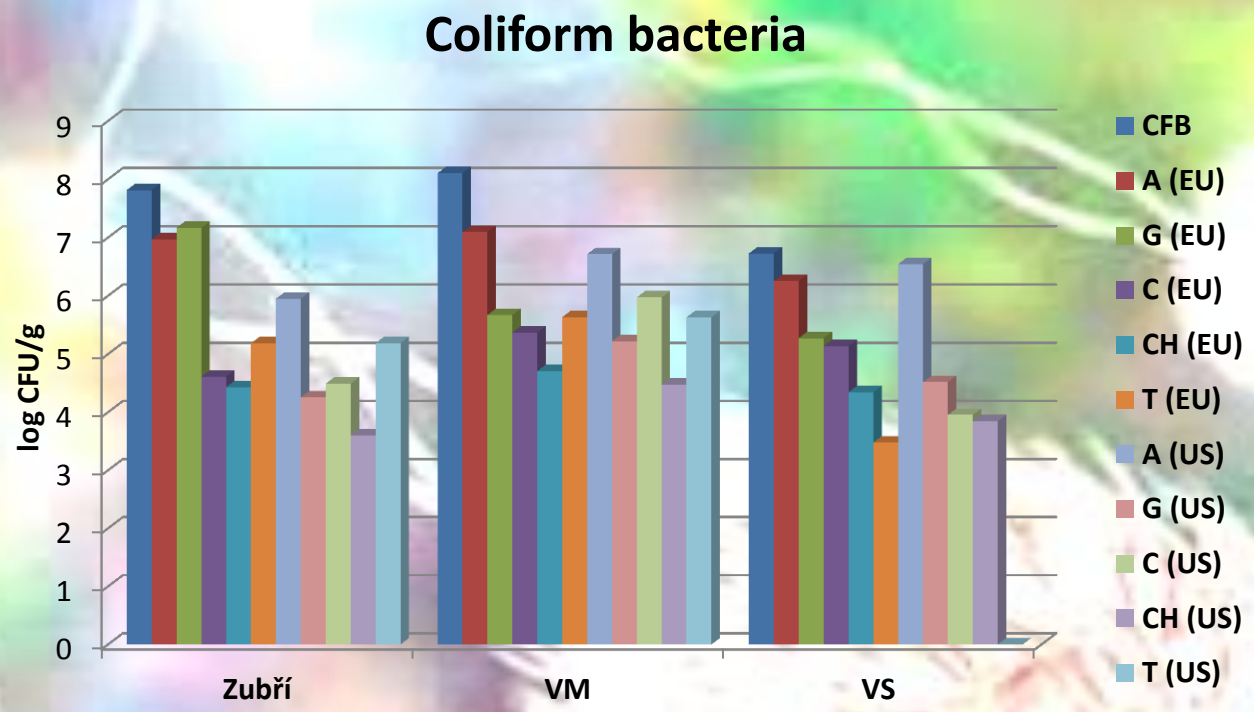

Coliform bacteria
log CFU/ml
5
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
Bratislava influent
Bratislava efluent
Petržalka influent
Petržalka efluent
total CFB
AMP
GEN
CIP
CHL
TET

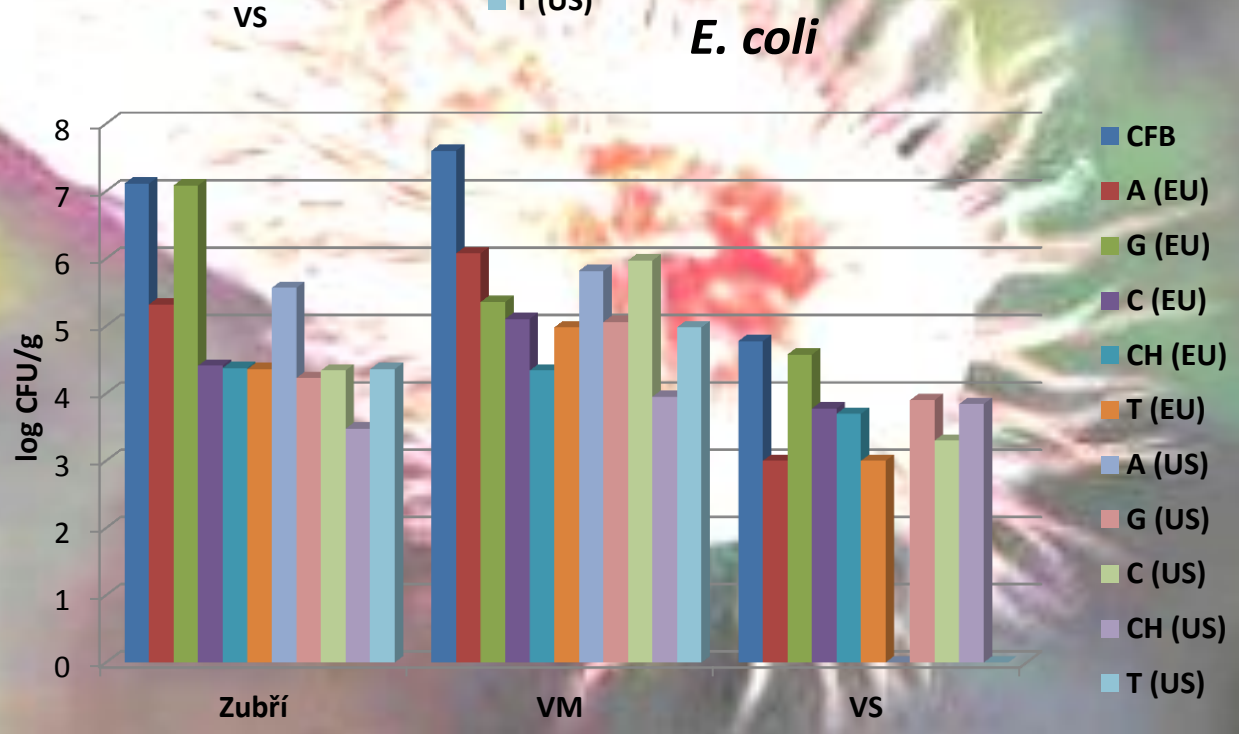

E. coli
log CFU/ml
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
Bratislava influent
Bratislava efluent
Petržalka influent
Petržalka efluent
total E.c.
AMP
GEN
CIP
CHL
TET

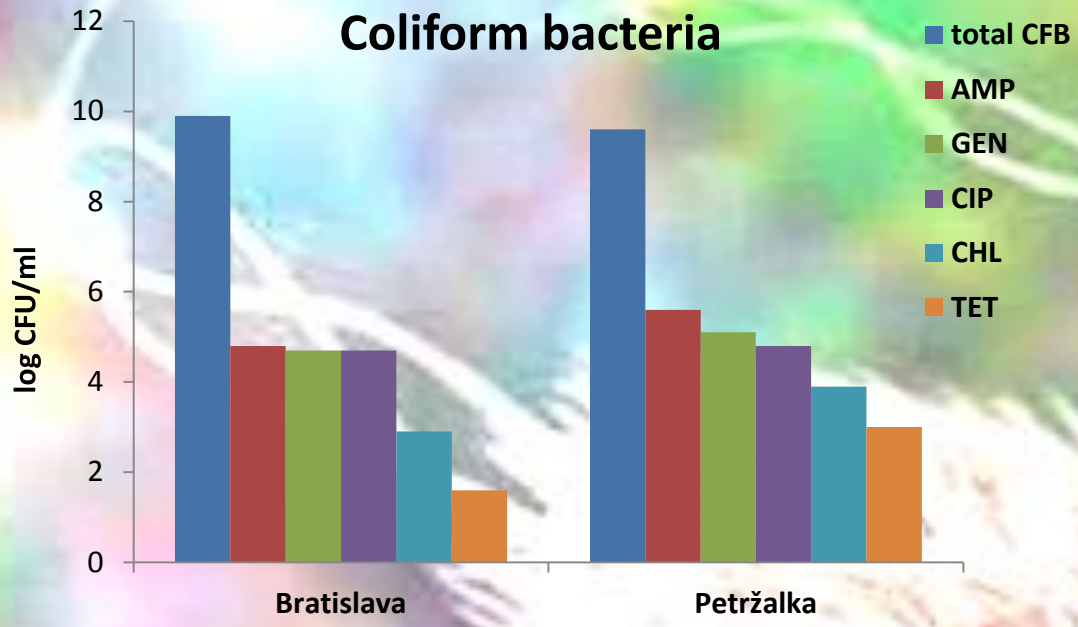
WWTP sewage sludge

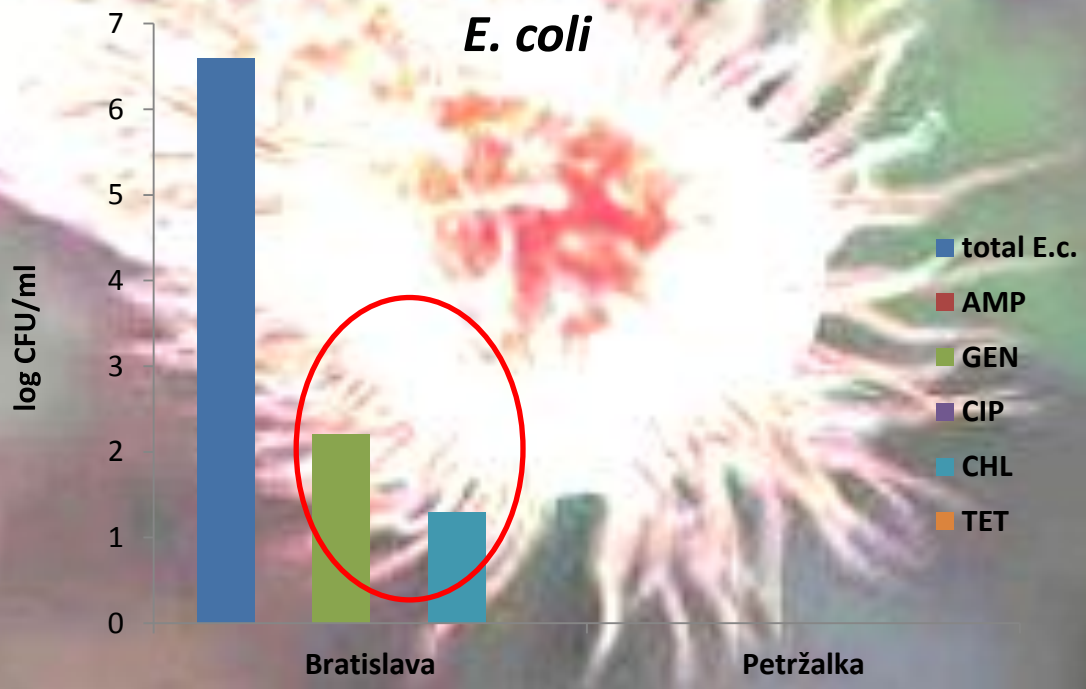
WWTP	Zubří log CFU/ml	Valašské Meziříčí log CFU/ml	Vsetín log CFU/ml
Total coliform bacteria	6,8	7,1	6,2
E. coli	6,1	6,6	4,8

WWTP	Vrakuňa log CFU/ml	Petržalka log CFU/ml
Total coliform bacteria	9,9	9,6
E. coli	6,6	0


Coliform bacteria
log CFU/g
0
1
2
3
4
5
6
7
8
9
Zubří
VM
VS
CFB
A (EU)
G (EU)
C (EU)
CH (EU)
T (EU)
A (US)
G (US)
C (US)
CH (US)
T (US)


E. coli
log CFU/g
0
1
2
3
4
5
6
7
8
Zubří
VM
VS
CFB
A (EU)
G (EU)
C (EU)
CH (EU)
T (EU)
A (US)
G (US)
C (US)
CH (US)
T (US)


Coliform bacteria
log CFU/ml
12
10
8
6
4
2
0
Bratislava
Petržalka
total CFB
AMP
GEN
CIP
CHL
TET


E. coli
log CFU/ml
7
6
5
4
3
2
1
0
Bratislava
Petržalka
total E.c.
AMP
GEN
CIP
CHL
TET

Conclusion

Anthropogenic activities create environmental sources of resistance. According to obtained data we should have better management with ATB as well as with sewage sludge. New technologies for tertiary cleansing of wastewater should be developed.

Problem of Antibiotic Resistance
& Rational use of antibiotics

Dr. Naser Tadvi
Associate Prof., Pharmacology

Thank you for your attention!

Acknowledgement

This study was financially supported by Research and Development Agency of Slovak Republic, contract No. APVV-0122-12.