Stockholm Water Week 2018

Antimicrobial resistance threatens us all: Role of WASH in AMR

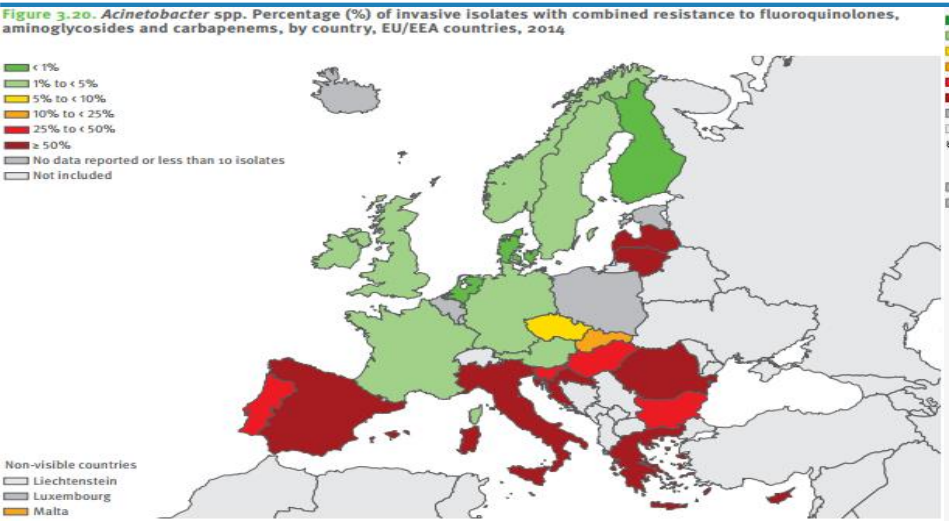
Marc Sprenger, MD PhD , Director AMR

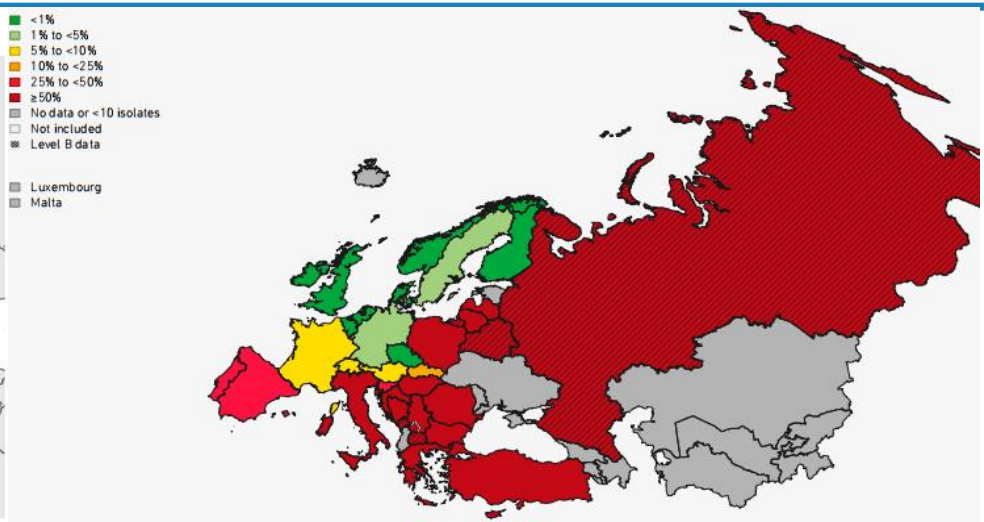
26 August 2018

World Health Organization

What is the scene?

Multidrug-resistant *Acinetobacter spp.*





2014 EARS-net

2016 CAESAR

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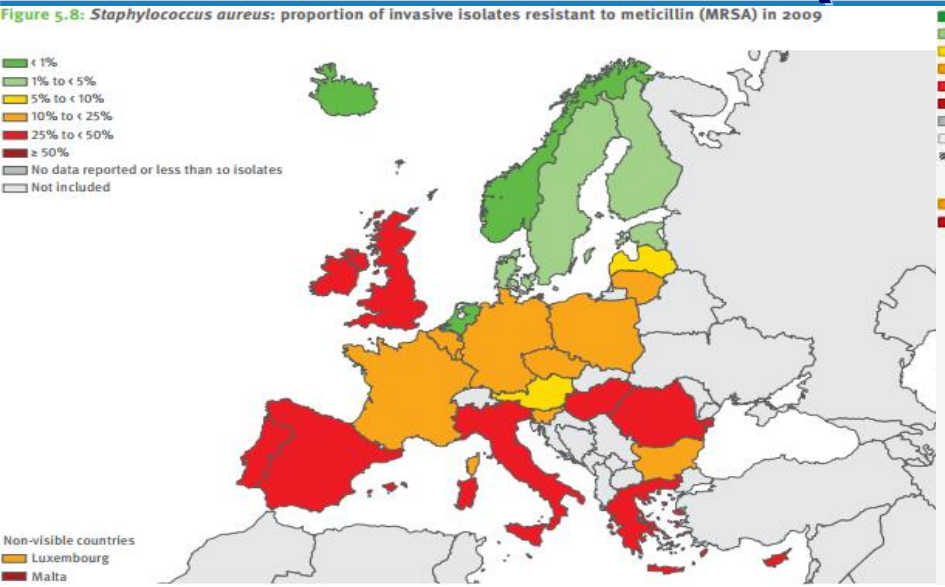
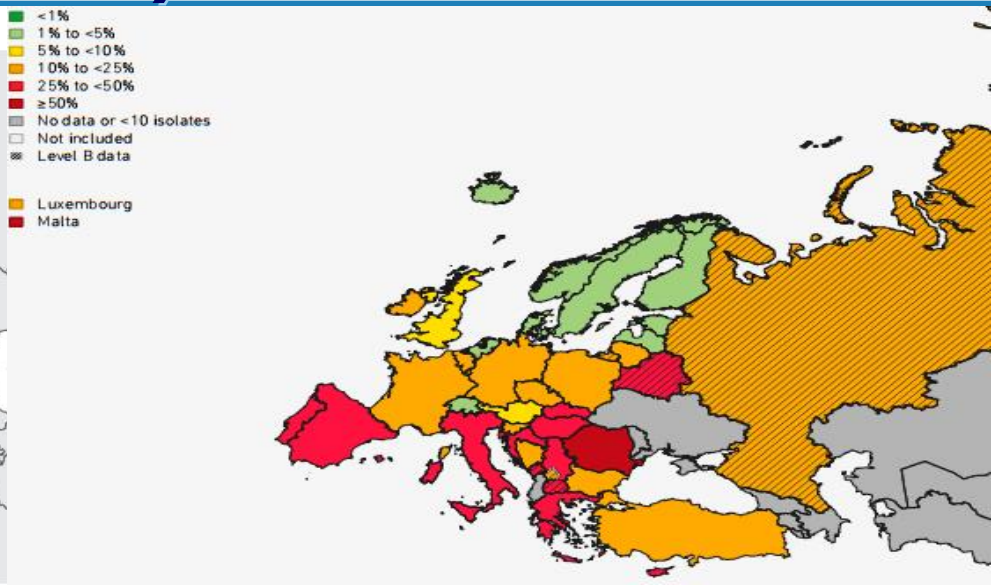
Methicillin-resistant *Staphylococcus aureus* (MRSA)





2009 EARS-net **2016 CAESAR**

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AMR is the Greatest Threat to Modern Medicine

Profound health consequences

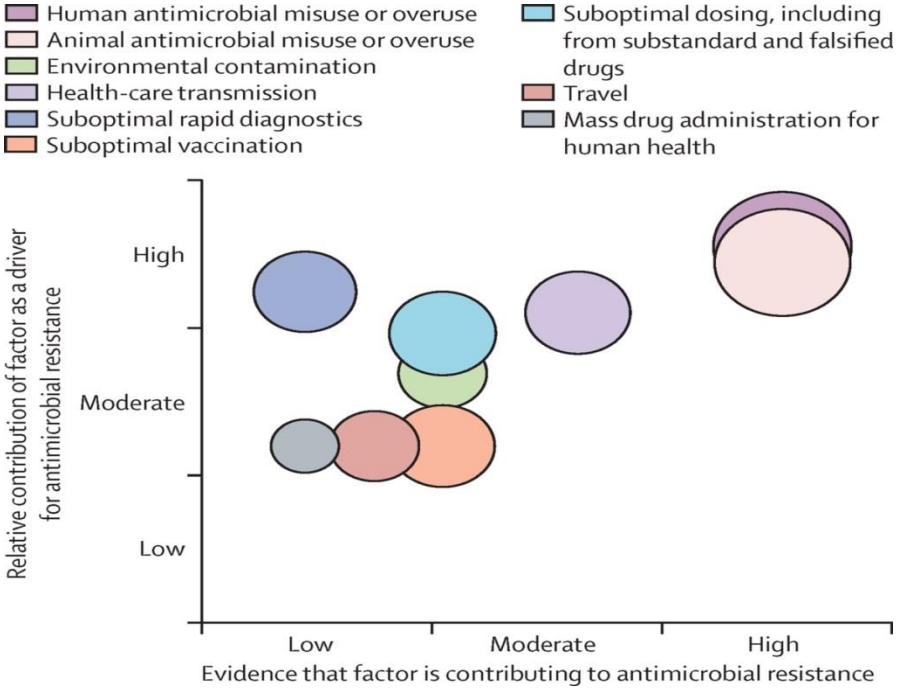
- Individuals, health systems, food systems, and practice of medicine

Economic and other intersectoral implications

- Development, agriculture, food, business, etc.

Long-term threat with no end in sight unless fundamental changes are made

Factors Contributing to AMR



Holmes at al., 2016

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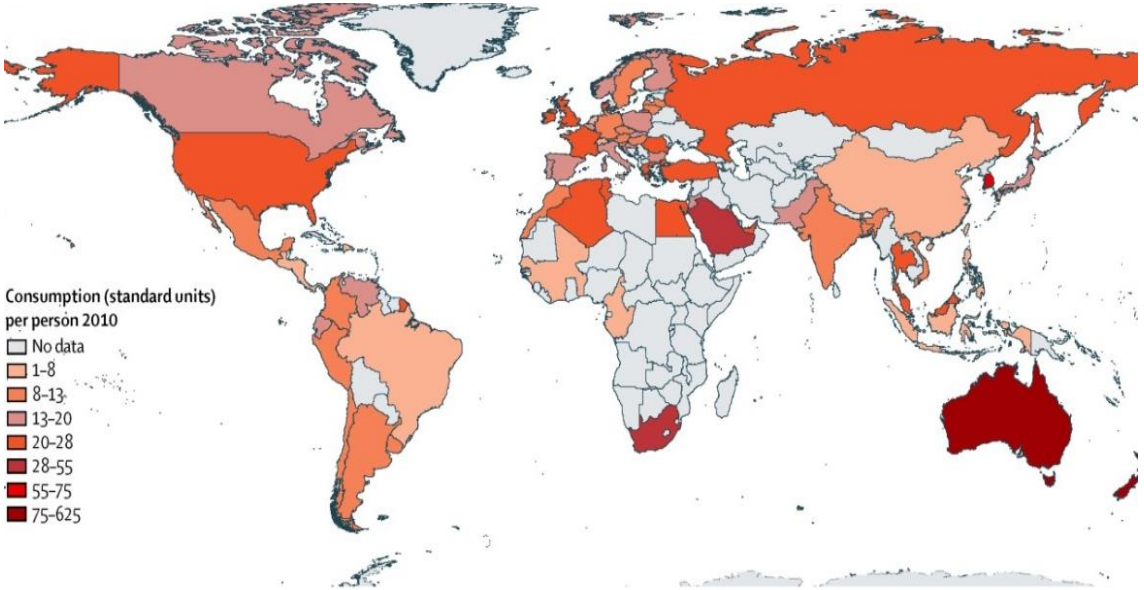
Use of Antibiotics Is On The Rise

Total global antibiotics consumption increased 30%



Van Boeckel et al. The Lancet Infectious Diseases 2014 14, 742-750DOI: (10.1016/S1473-3099(14)70780-7)

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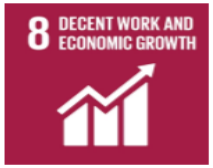
AMR and the SDGs

AMR hardest on the poor

Antibiotic residues (hosp, pharma & agri contaminate water

Untreatable infections in animals threaten food prod



*Cumulative costs AMR $120 trillion by 2050

AM core components health systems

Balance access, innovation and conservation of AM

Require multi-stakeholder partnerships

*World Bank Group Report on Drug-Resistant Infections (March 2017)

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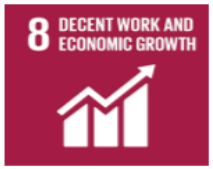

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Global Action Plan Antimicrobial Resistance

Adopted by World Health Assembly in 2015

Recognized & supported by FAO (Resolution 4/2015) and OIE (Resolution 26) governing bodies in 2015

Bring AMR to UNGA!

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Global Action Plan's 5 Strategic Objectives

1. Improve awareness and understanding
2. Strengthen knowledge through surveillance & research
3. Reduce the incidence of infection
4. Optimize the use of antimicrobial medicines
5. Ensure sustainable investment

Develop National Action Plan

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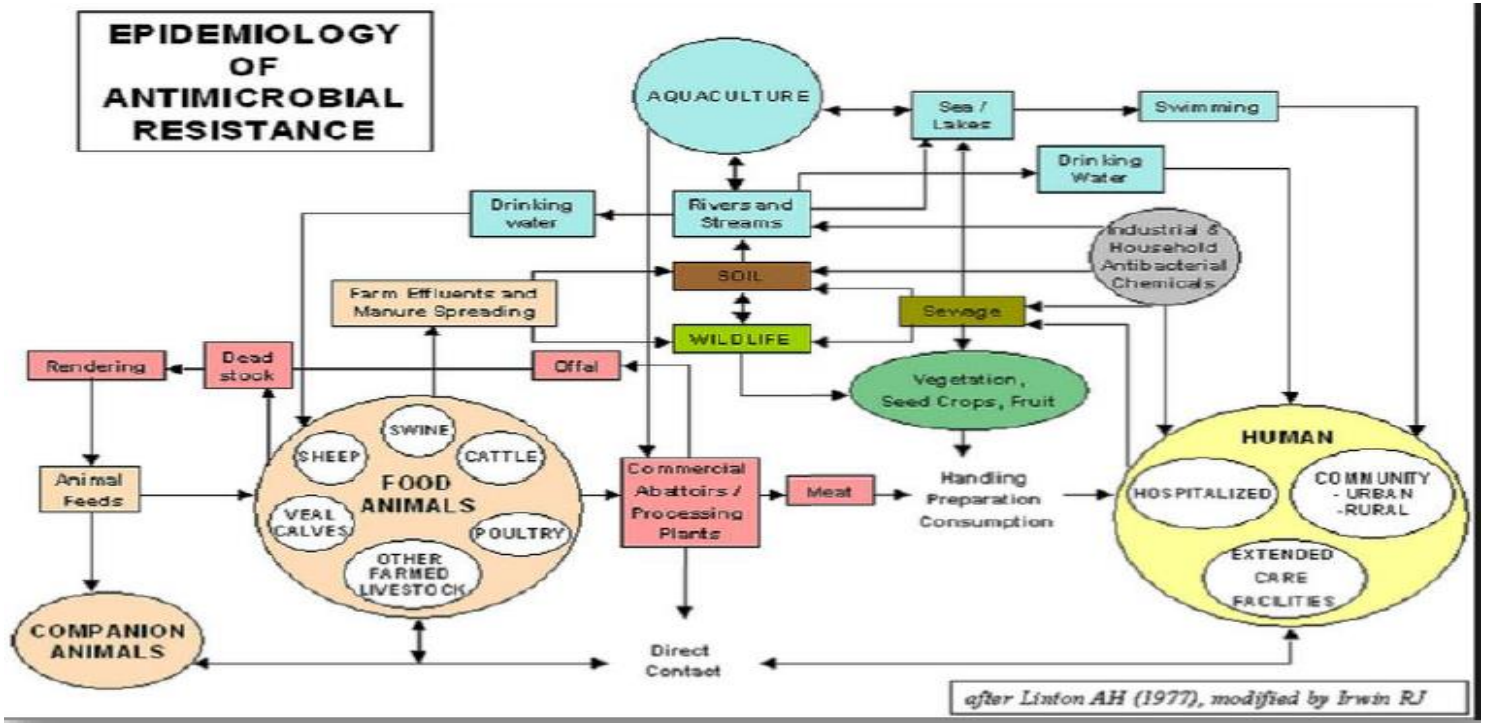
"One Health" Approach



http://www.phac-aspc.gc.ca/cipars-picra/gfx/2b_e.gif

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AMR & Environment

Bacteria in Environment can develop resistance through contact AM / resistant genes

1. **Release of AM via humans (urine -> effluent -> sewage)**
2. **Release of AM via agri/aqua-culture**
3. **Release of AM via manufacturers**

AMR & Environment: the unknowns

1. Contribution of different sources to AMR
2. Impact of Environment on human/animal AMR
3. Efficacy of interventions to mitigate environmental AMR

No regret options:

1. Prevent spread of infection (IPC)
2. Reduce use & release of AM

Prevention of infections: Water & Sanitation

40% of health facilities in LMICs have no source of water

- Impossible to prevent infection

Hospital water sources

Use of stored water due to intermittent access

Source: *Emory University*

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Result: Antibiotics as a substitute for hygiene

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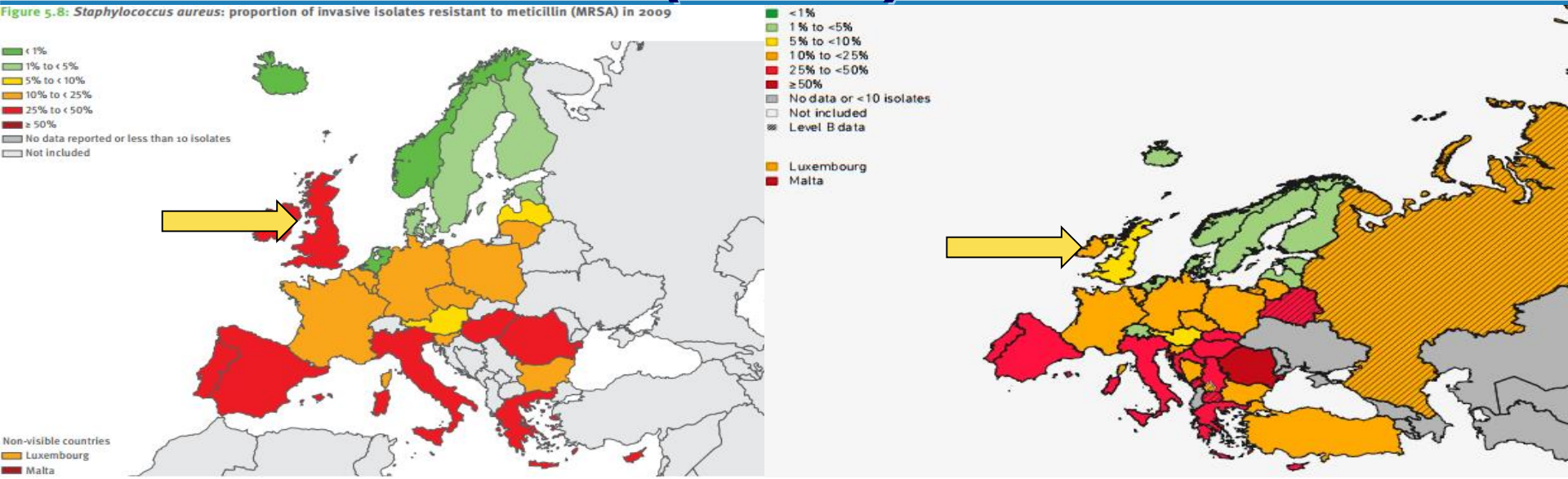
Methicillin-resistant *Staphylococcus aureus* (MRSA)



2009 EARS-net

2016 CAESAR

World Health Organization


Drazole
IBUCAP
40 x 40
UOPAZ
IBUCAP

Prevent AM from entering environment

Reduce use of AM in humans & agriculture (guidelines /regulation)

Reduce pharmaceutical effluence; better waste management in pharma

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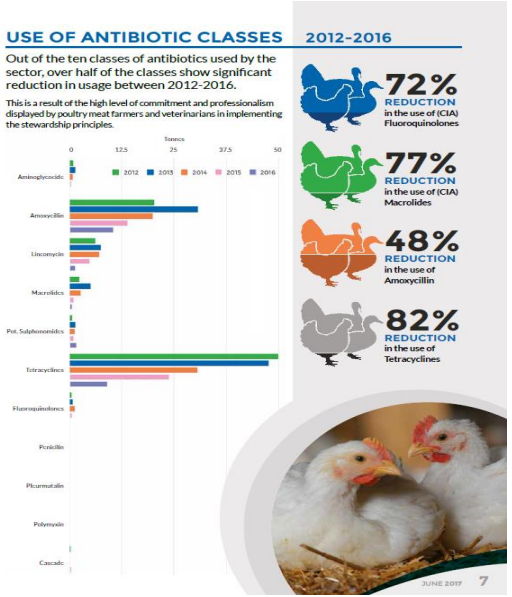
British Poultry Council

BPC reduced antibiotic use by weight by 71%

Poultry meat production increased by 11%



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Going forward – source control (1)

Implementation of WASH & IPC in healthcare to reduce infections

Implementation of WASH in communities - wastewater treatment, drinking water treatment

LIC – prioritize strengthening basic sanitation

HIC – Examine efficacy of wastewater treatment

Going forward – source control (2)

Reduce use in humans and agriculture

Stewardship, behaviour change – self prescription, illegal sales

Countries: environmental regulations and enforcement systems, or promote “low as practically achievable” approach to limit discharge in hotspots

GMP can play supporting role monitoring compliance with regulations

Conclusion

1. No time to lose: implement WASH, IPC, Stewardship
2. Reduce unknowns: data & evidence AMR & Environment (gaps in knowledge and future research areas)
3. Environment must be an integral part of AMR response

For More Information

Please visit: http://www.who.int/antimicrobial-resistance/en/

On Twitter: @Marcsprenger4PH

World Health Organization

PHARMACEUTICALS IN DRINKING-WATER

Table 4. Probabilistic modelling data for the top 24 drugs from worst-case deterministic modelling

Drug name	Mean PEC_{dw} (µg/l)	MTD (mg)	MOE	Comments
Total NSAIDs	2.74	7.5	2 737	Combination of 1
Cannabis (tetrahydrocannabinol)	1.377	1	726	Illegal drug
Oseltamivir carboxylate (Tamiflu active metabolite)	107	52	486	Used under pand
LSD	0.097	1	10 309	Illegal drug
Cocaine (methylbenzoylecgonine)	0.029	1	34 483	Illegal drug
Aminophylline	0.15	1	6 667	Smooth muscle re
Beclometasone	0.005	0.05	10 000	Anti-asthmatic
Zidovudine	0.057	0.5	8 772	Antiviral
Ecstasy	0.487	1	2 053	Illegal drug
Acamprosate	0.435	1	2 299	Alcoholism treatm
Total statins	1.27	5	3 937	Cholesterol reduc
Nitroglycerine	0.035 4	0.15	4 234	Vasodilator
Heroin (diamorphine)	0.004 49	1	222 717	Illegal drug
Simvastatin	1.18	5	4 227	Cholesterol reduc
Codeine	0.015 7	20	1 277 139	Narcotic analges
Ramipril	0.153	1.25	8 177	Diuretic
Lisinopril	0.396	2.5	6 316	Angiotensin conv
Methadone	0.082 2	1	12 173	Opioid agonist
Furosemide	1.74	20	11 507	Diuretic
Amphetamine	0.017 4	1	57 405	Illegal drug
Norethisterone	0.023 6	0.35	14 824	Progesterone deri
Doxazosin	0.006 81	1	146 843	Alpha blocker
Bendroflumethiazide	0.275	2.5	9 094	Diuretic
Cyclosporin	0.000 8	2	2 500 000	Immunosuppressio

LSD, lysergic acid diethylamide; PEC_{dw}, predicted concentration in drinking-water
Source: DWI (2007)

2012 Review of Pharmaceuticals in Drinking-water

- Detection of trace pharmaceuticals in surface + ground water impacted by human, industrial and animal wastewater discharges (typically less than 100 ng/l).
- Concentrations in treated drinking water are generally 1000-fold below the lowest therapeutic dose, creating a substantial margin of safety.
- Conventional treatment removes 50%; advanced may remove up to 99%
- Development of water quality standards and the installation of specialized treatment processes to reduce trace concentrations of pharmaceuticals are not currently warranted
- Investigative monitoring may be appropriate in “hotspot” areas