

Where do antibiotic resistant bacteria emerge?

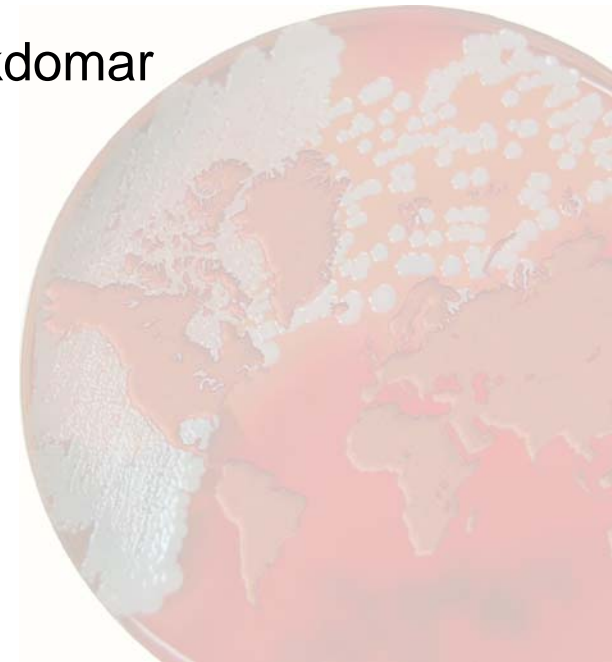
Humans, animals, environment, outer space....

Björn Olsen

Professor, Överläkare, Infektionssjukdomar

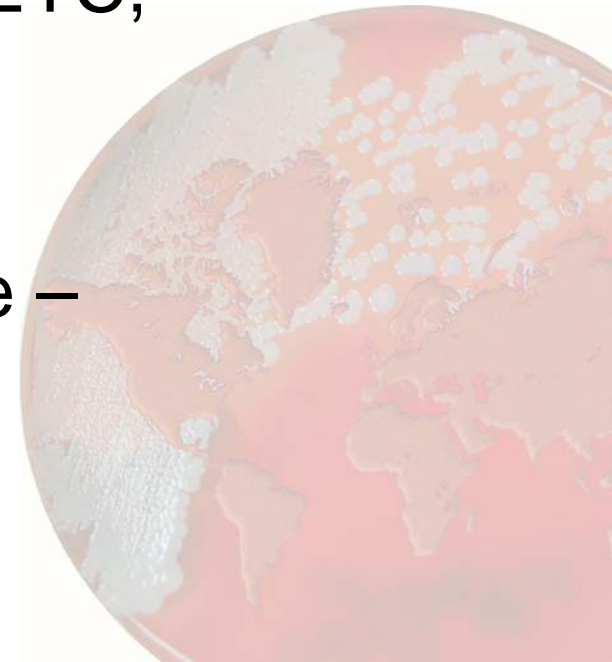
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Antibiotic resistance

- Antibiotics available for 70 years
- MRSA, VRE, ESBL, CTXM, AMP, TEM, SHV, TET, NDM, ETC, ETC, ETC.....
- Collective debt
- No new antibiotics in pipe-line – antibiotic paradox



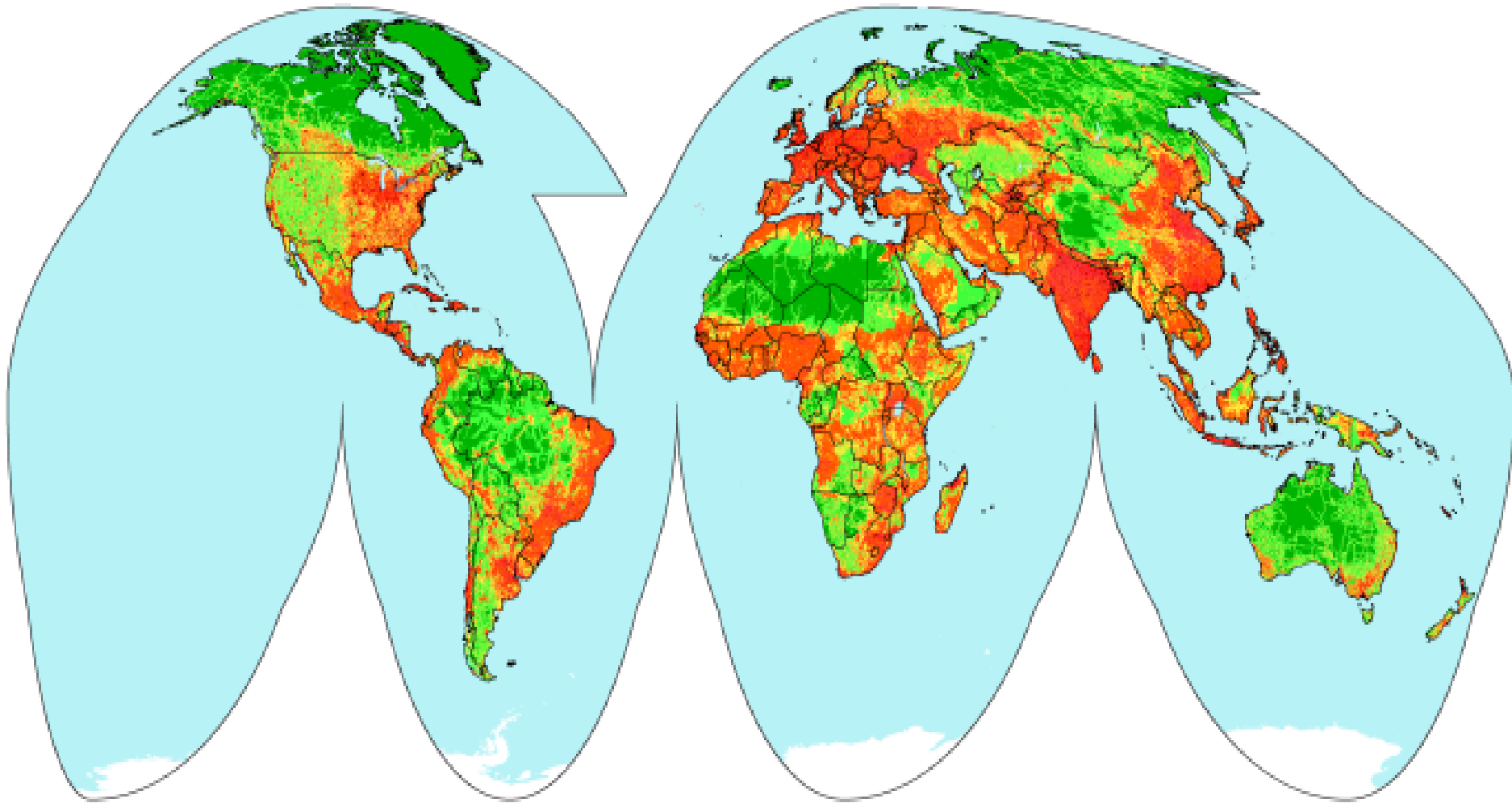
To the Congress in 1969:

*The time has
come to close
the book on
infectious
diseases*



William H. Stewart
Surgeon General 1965-69

The human "foot print"



The world goes to town

The
Economist

MAY 5TH–MAY 11TH 2007

www.economist.com



Urban pop:
2011~ 3 bill.
2030 ~ 5 bill.

*“Human
History will
ever more
become
Urban
History”*

Where are antibiotic resistant bacteria selected?

ANTIBIOTIC ECOSYSTEMS

≈1/3

Treatment & prophylaxis

Human medicine

Community

90%

10%

Hospital

**Veterinary
medicine**

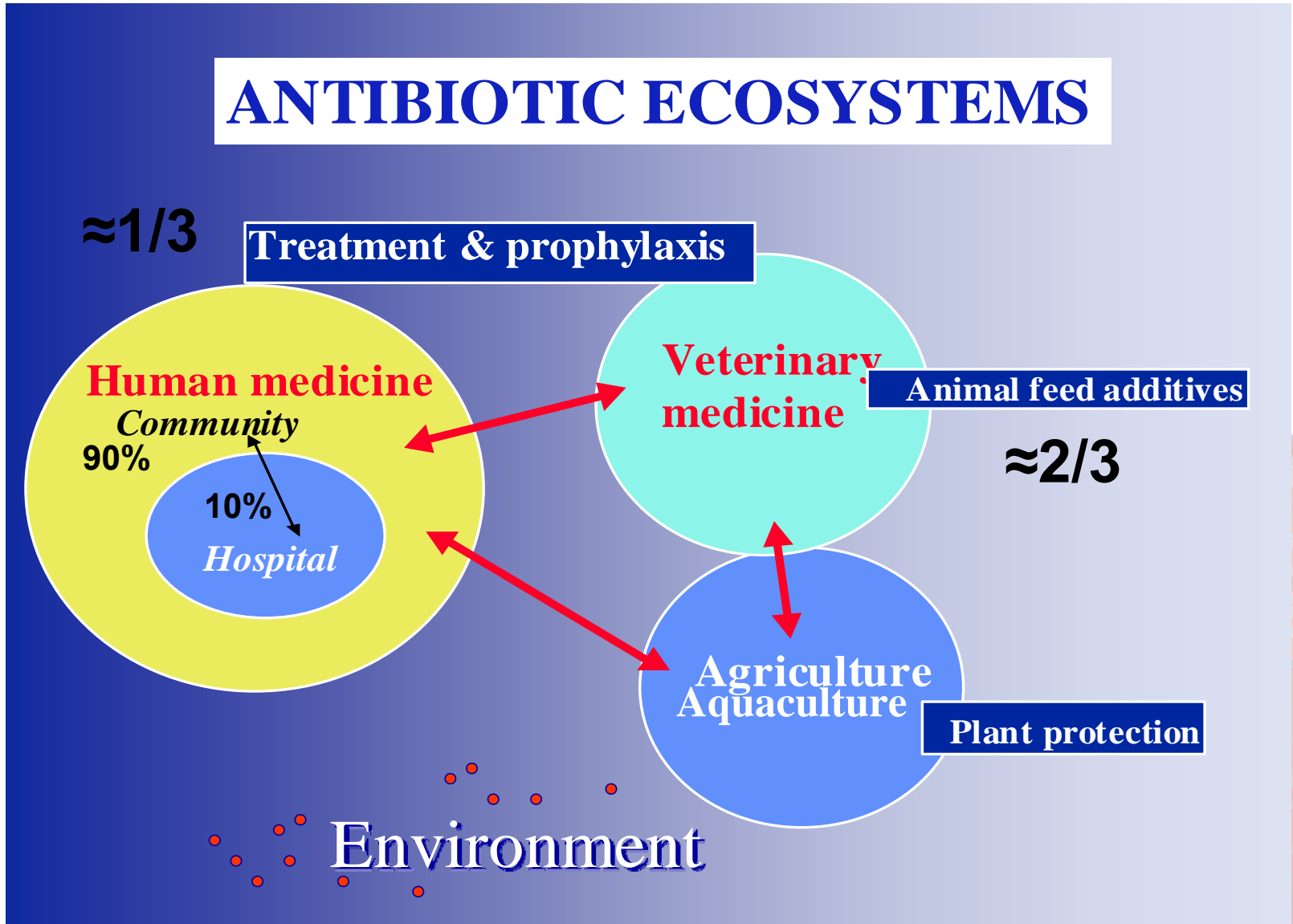
Animal feed additives

≈2/3

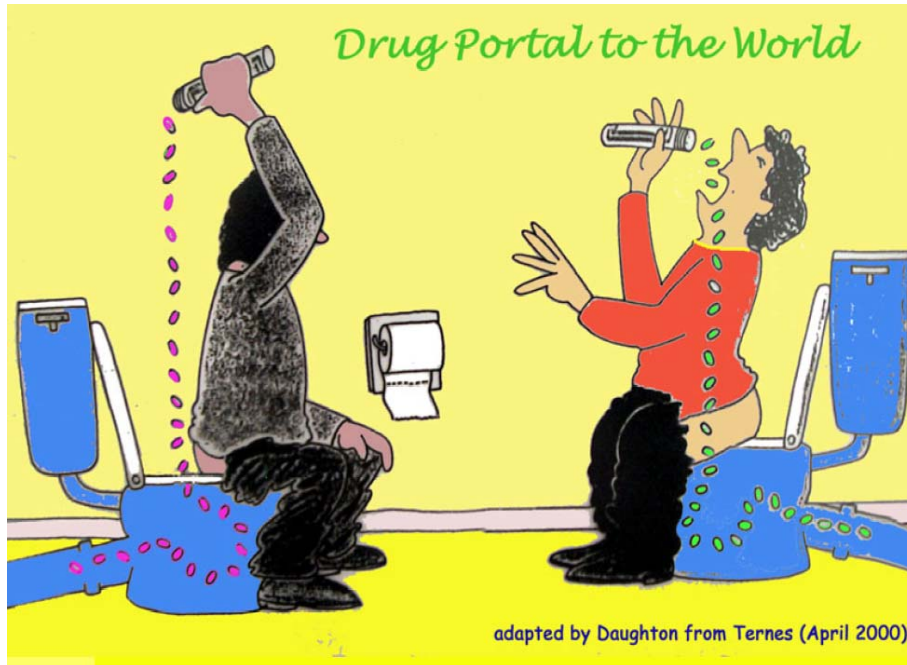
**Agriculture
Aquaculture**

Plant protection

Environment



Drugs for human treatment and veterinary use are released into the environment



Antibiotics are excreted in urine

- Fluoroquinolones
- Aminoglycosides
- Tetracycline
- Macrolides
- Penicillins
- Cephalosporins
- Trimetoprim

Globally 300,000 -- 500,000 tons of antibiotics used per year → ≈50% is released into the environment (water and soil) via human and animal urine

In Sweden about 40 tons released into environment per year

An extreme case

Effluent from a wastewater treatment plant serving about 90 bulk drug manufacturers in Patancheru, near Hyderabad, India

The concentration of the most abundant drug, ciprofloxacin, was up to 31 ug/ml

10^3 x MIC for susceptible E. coli

10-20x higher than plasma levels in ciprofloxacin treated patients

310 000 above selective concentration

J Hazard Materials 2007



More typical situations

Concentrations of quinolones in water and sludge

**Sewage water from Uppsala
University Hospital**

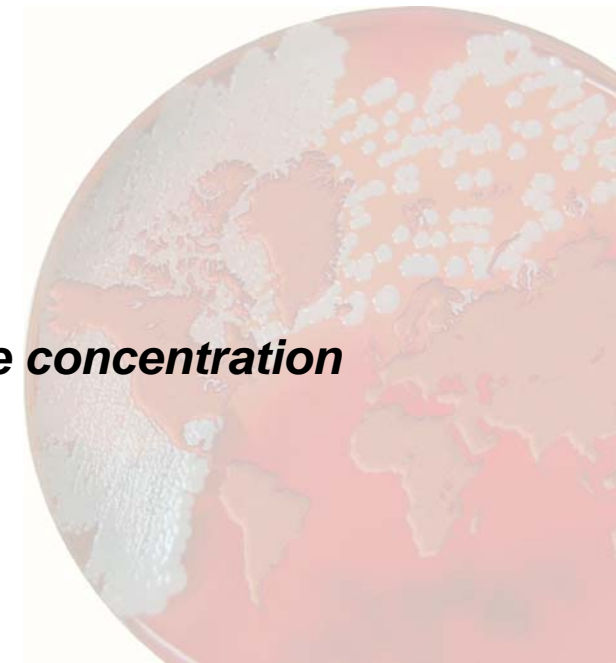
2-14 ng per ml

20- to 140-fold above selective concentration

Sludge (Sweden/US)

0.1-48 ng per gram

1- to 480-fold above selective concentration

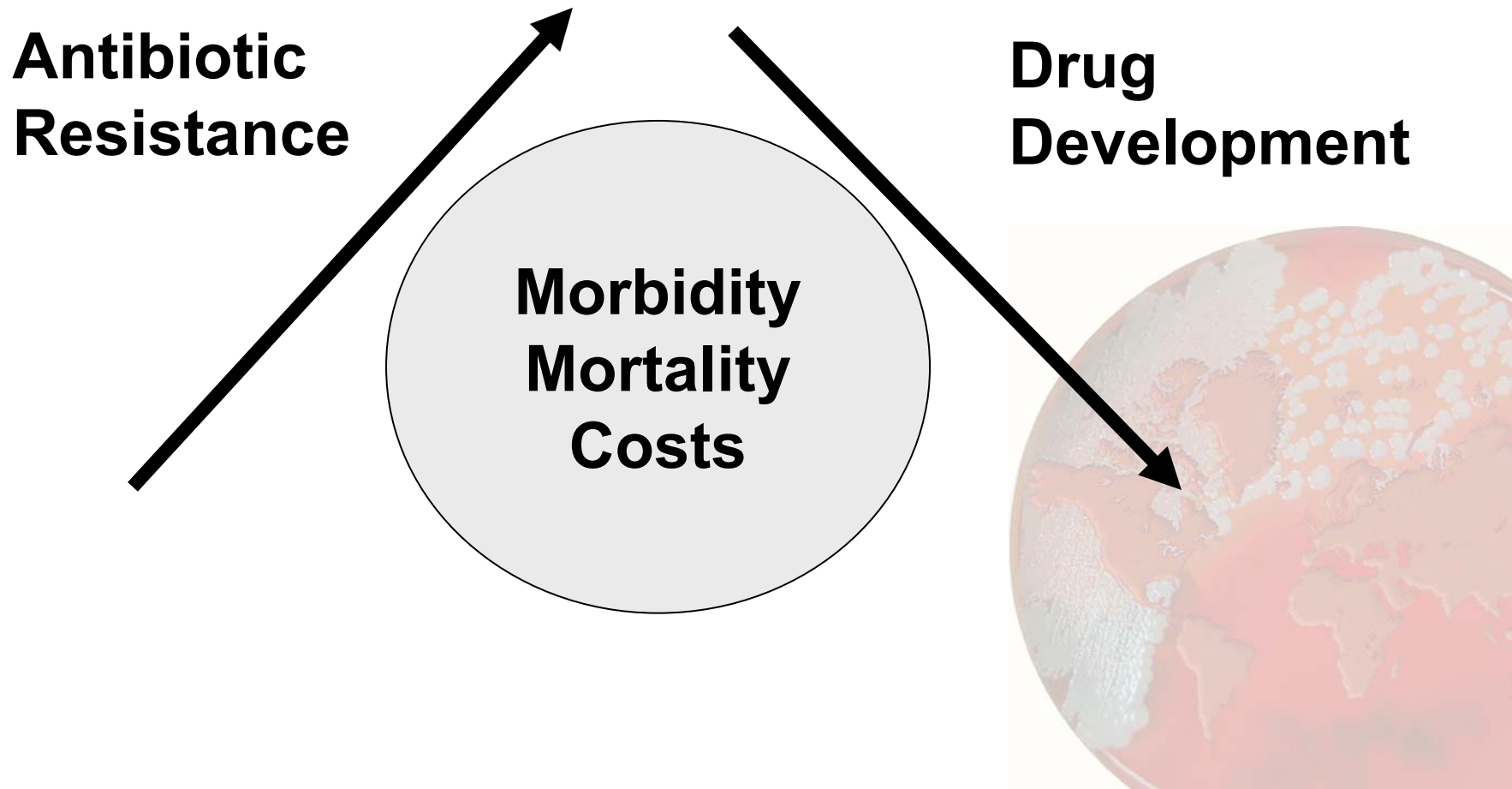


Antibiotic resistance

- Found in all biota over the world
- Found in several indicator species
- Same resistance markers in humans, domestic animals and wildlife



We are facing a public health threat



What can we do?

Reduce the resistome

Reduce release of antibiotics

Ban growth promoters in animal feed (implemented within EU)

Reduced doses/treatment times

Reduce the resistome for example by:

Safe production

Implement procedures at sewage plants that destroy antibiotics

Efficient technology already exists (e.g. ozone treatment of water)

Cross disciplinary collaboration

