Bio-Strike

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synenergene
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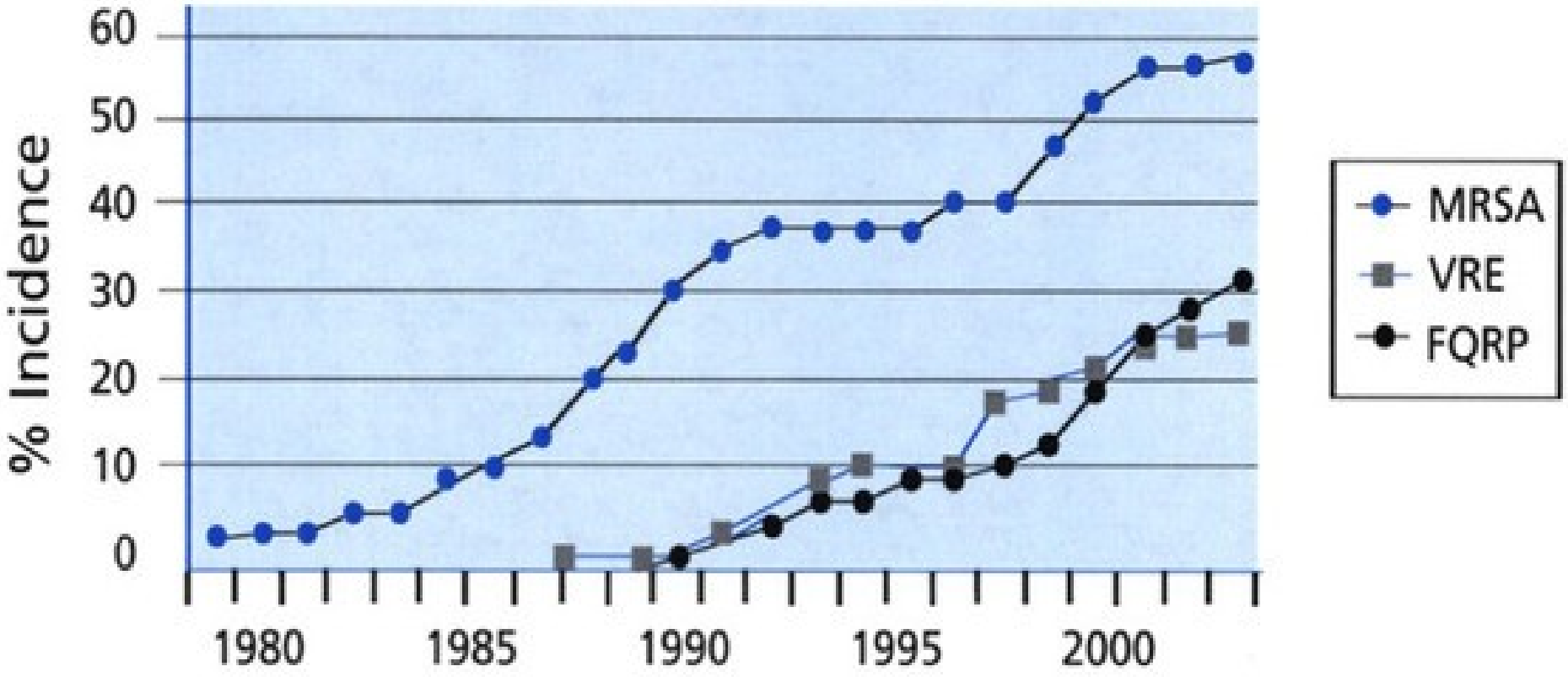
Bio-Strike
A strategy to overcome the
Antibiotics Crisis

Antibiotics Crisis

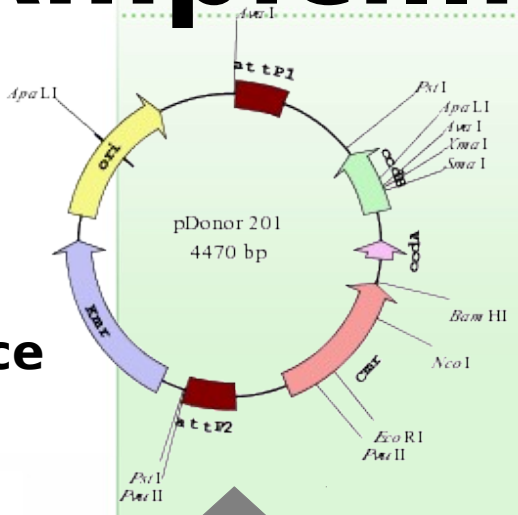


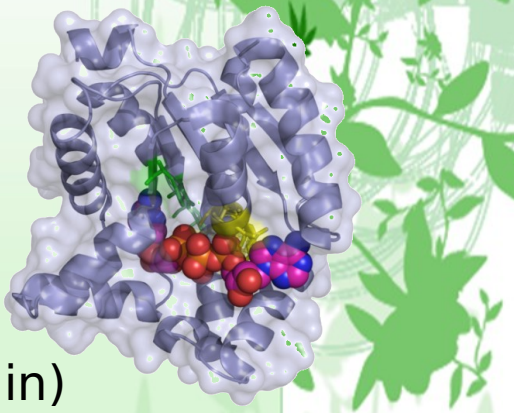
MRSA = methicillin-resistant *Staphylococcus aureus*; VRE = Vancomycin-resistant *enteroccoci*
FQRP = Fluoroquinolone-resistant *Pseudomonas aeruginosa*

Souce: center for disease control

Ampicillin Resistenz

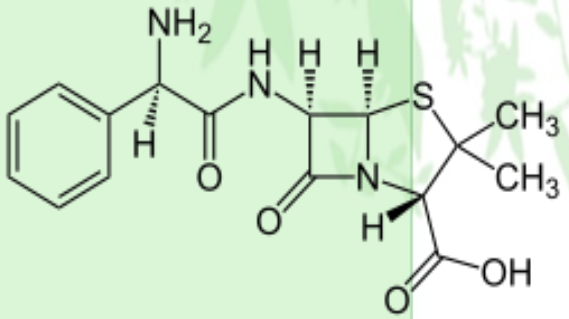
Plasmid With Ampicillin Resistannce gene





beta-lactamase
(destorys Ampicillin)

Bakteria With cell wall
(grampositiv)



Ampicillin
(blocks D-Alanin-Transpeptidase)

Antibiotics Crisis

Market failure

1990

- 18 companies,
- 10 new antibiotics

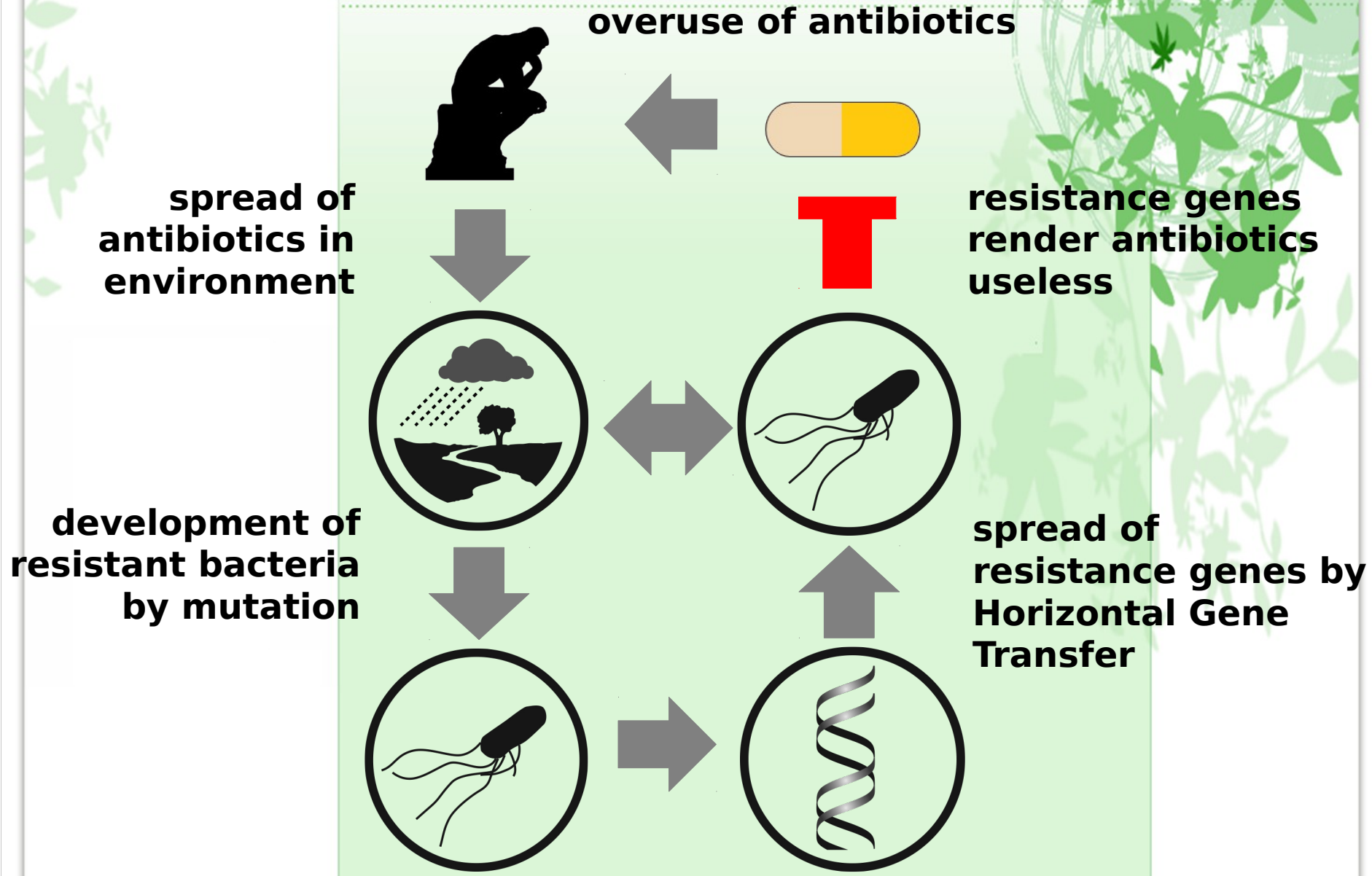
2011

- 4 companies,
- 2 new antibiotics

Antibiotics Crisis

Drug / Billion US Dollar

Antibiotics Crisis

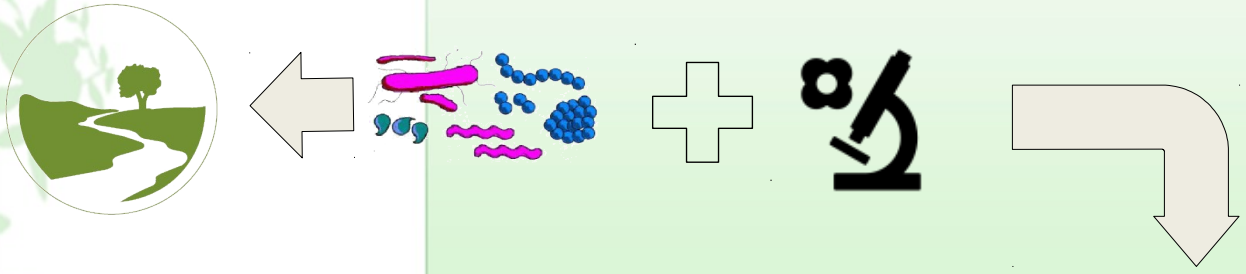


Solutions

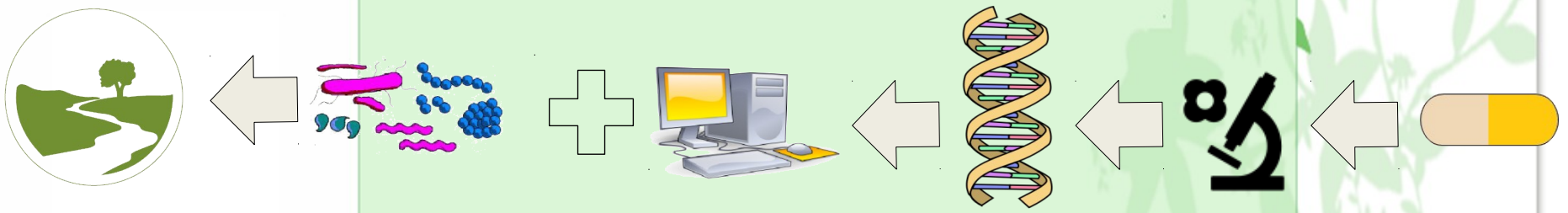
- Reduce antibiotic consumption
  - Regulation
  - Management
  - Education
- Research new antibiotics
- Find entirely new cures

Biostrike

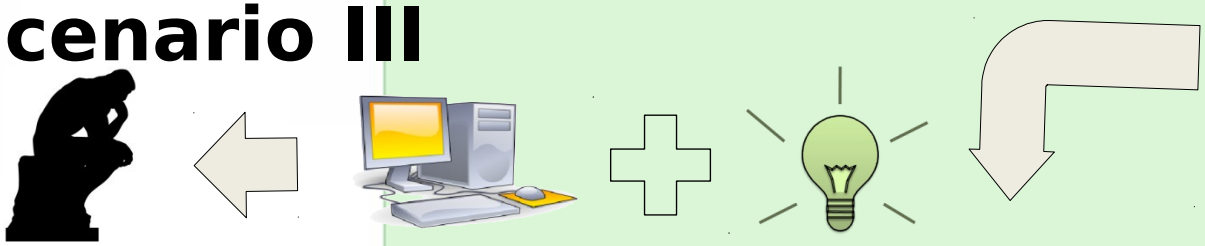
Scenario I

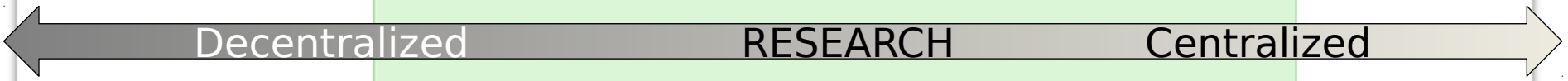


Scenario II



Scenario III





Digital biology

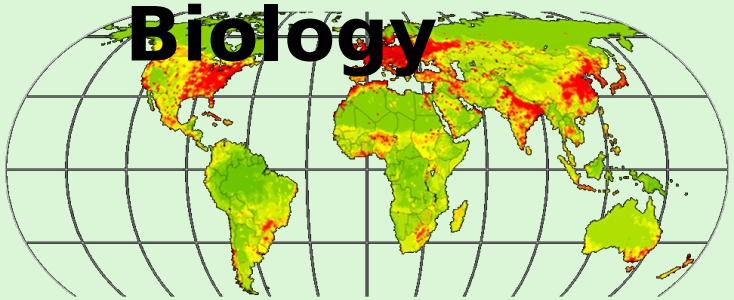
Digital Biology

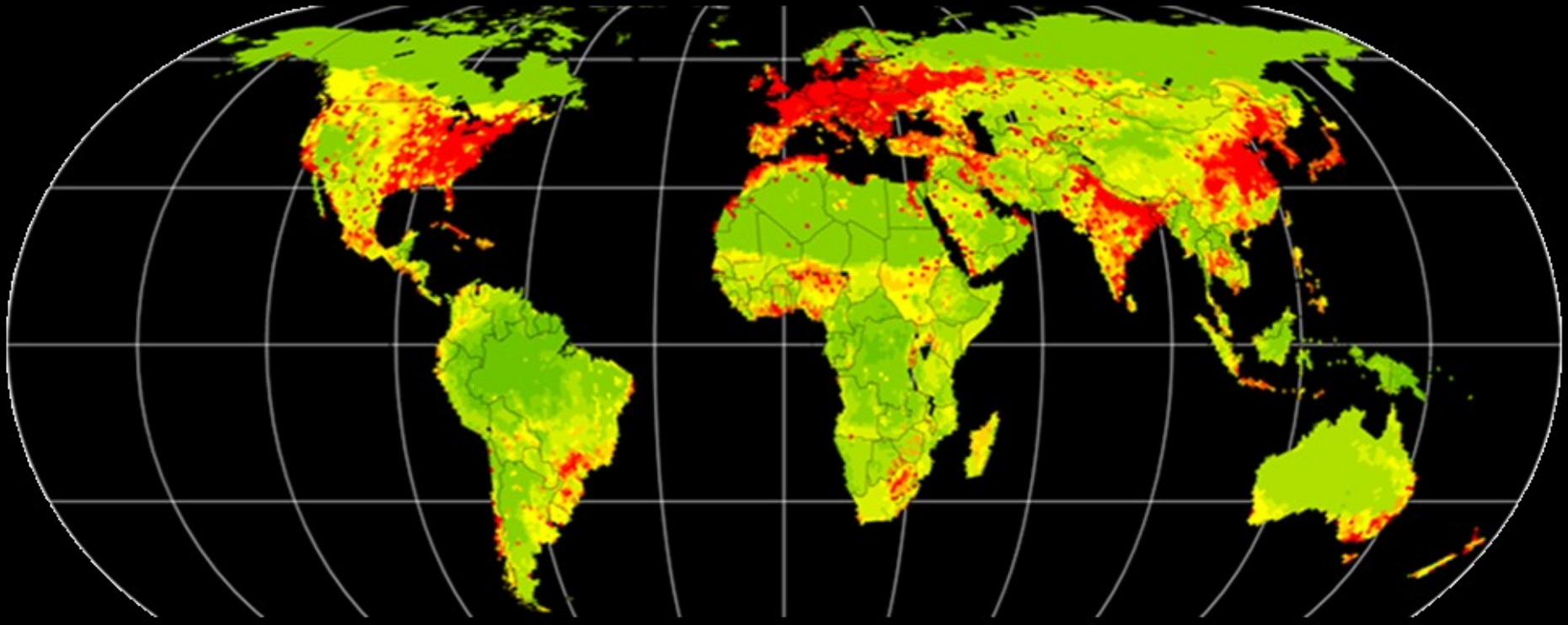
AGTC

Nanopore Sequencing

Microfluidics Synthesis

Analog Biology



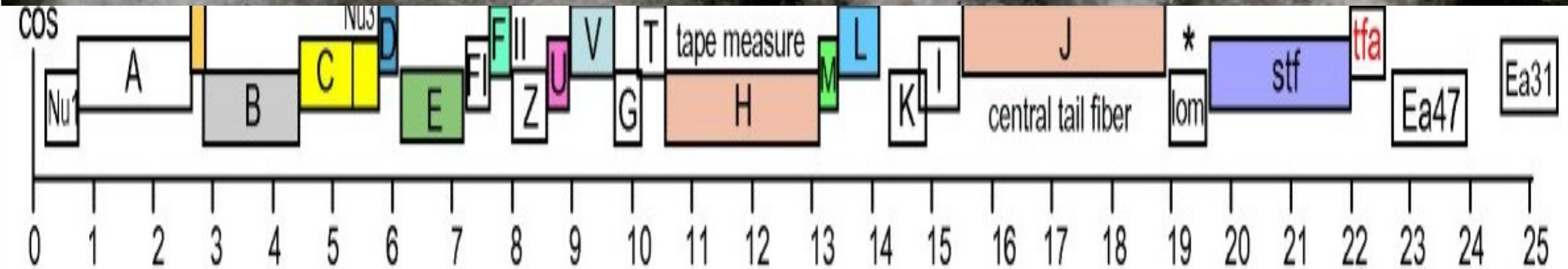


Analog Biosphere

Digital biosphere

Phage Therapy

- Well known since 100 years
- They are everywhere!
- Programmable
- Highly specific
- Safe



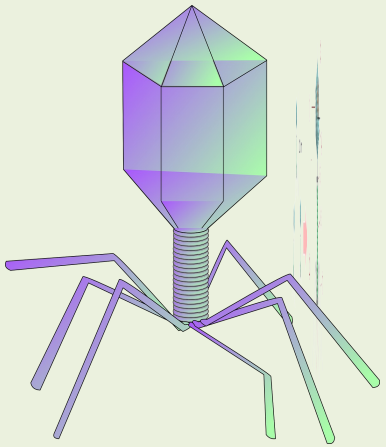
Biostrike

In a not too distant future...

Wetware

Hardware

Software



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Personalized Phages

Citizens / NGOs / Academics

Workshop

Nachweis von Ampicillinresistenz in der Umwelt (Bodenproben)

1)Vorbereiten der Bodenproben
2)Vorbereiten von Ampicillin Nährböden
3)Ausbringen der Bodenprobe auf Nährboden
4)Kultivierung in Inkubator über Nacht
5)Vernichtung der Bakterienkulturen in Autoklav

Biostrike: Hack your way out of the antibiotic crisis

An overuse of the available antibiotics and subsequent evolutionary pressure has led to the development of multi-resistant bacteria. By now, the situation is becoming urgent, as very few effective drugs are left to treat infections. Antibiotic resistance development is a natural process. Bacteria are under selective pressure and evolve mechanisms to avoid the antimicrobial effects of the antibiotics. Once developed, the genes for the resistance then rapidly spread even cross over between different species - a process called horizontal gene transfer.

It is therefore necessary to continuously develop new antibiotics to keep up pace with resistant bacteria. However, in 1990 there were 18 companies developing new antibiotics, by 2011 there were only 4. In 1990 10 new antibiotics were licensed, in 2011 only 2. The reason for a worsening of the antibiotics problem into an antibiotics crisis is a classical market failure in the pharmaceutical branch. Due to the high costs and the risky nature of drug development, there is a tendency to push for even higher shareholder revenue from a newly developed drug. Thus, there is a lack of financial incentives for the pharmaceutical industry to involve themselves in the development of drugs like antibiotics with a small profit margin.

This workshop is part of the global ‘biostrike’ project. Citizens will explore the biological mechanisms of antibiotics resistance development and discuss its socio-economic causes and consequences. Experiments will be done to detect resistant microbes from the environment and to unravel the environmental highways for horizontal gene transfer

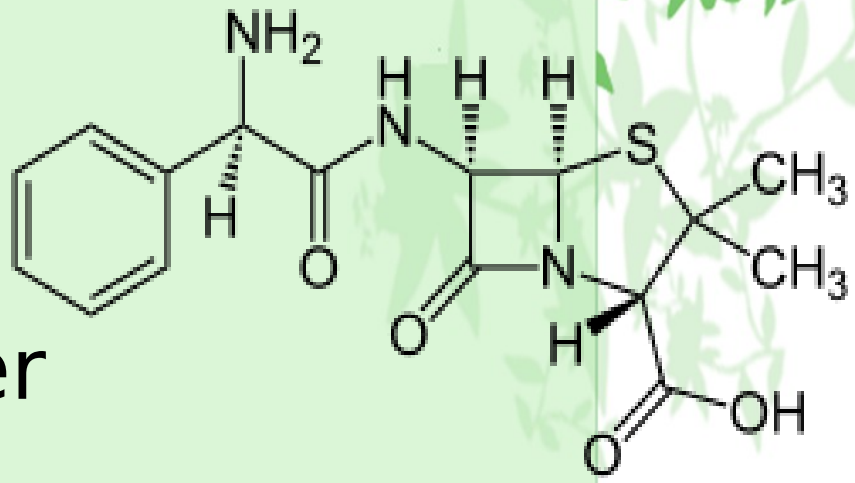
Soil sample and dilution

- Often there are so many microbes in the soil, that they would simply overgrow your plates. Therefore, we need to dilute the samples a few times.

- **Materials:**
- 3 test tubes or other container
- 1 tea spoon
- 1 pipette
- 1 cup of sterile water (boil it in a

Agar plates Material

- starch 3 g/L
- bullion (beef stock) 12,5 g/L
- milk powder 10 g/L
- Agar-agar 20 g/L
- Ampicillin 100mg/L



- In 1L destilled water

Agar plates Procedure

- Measure ingredients into marmelade jars, remember to write down exactely what you add to them.
- Boil at 25 min in the preaassure coocker - and let the pressure cooker cool.
- Add antibiotics to some of the jars in appropriate amount. NOTE: some antibiotics will degrade when boiled and must be added at cooler temperature
- poor the agar mix into the plates (using good sterile techniques)
- Let them cool down

- **Plating**
- Apply samples and dilution (se below) on prepared plates
- add tape on the plates.
- Innoculate plates at 23 or 37 C depending on what you are looking for. at least innoculate some at 37 C as plates inocculated at 23-25 degrees don’t usually shows colonies before after 2-3 days.