

EVOLUTION OF ANTIBIOTICS, THEIR IMPACT ON HUMAN GENETICS AND STATE OF THE ENVIRONMENT

Dariia Roshchupkina, Bachelor student, Scientific supervisor Dr. I. Klimkina, Dnipro University of Technology, Dep. of Ecology and Environmental Technologies

very and development of the research on antibiotics

tetracycline were found in the remains of a human
from the historic Sudanese region of Nubia.

Anthony van Leeuwenhoek is the first who saw bacteria
microscope

Robert Hooke presented to the Royal Society experiments with
microtatum.

Alexander Fleming notices that the fungus *Penicillium*
contaminated the entire culture plate with staphylococcus.

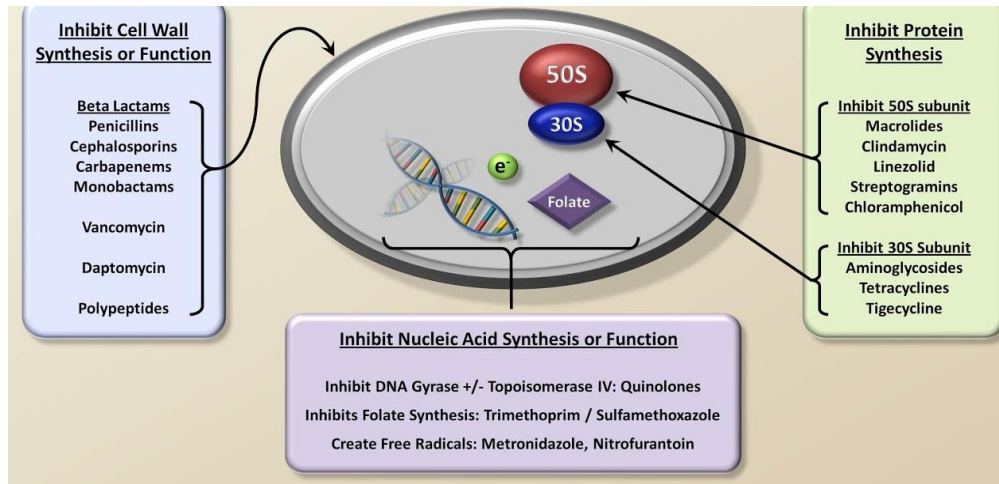
Chemical company Bayer develops the first synthetic
drug, prontosyl

"Age" of antibiotics begun. During this period, most of the
antibiotics used today for treatment, such as tetracycline and
penicillin were invented.

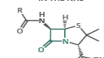
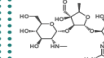
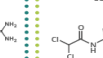
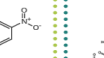
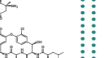
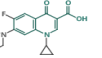
Discovery of new drugs suddenly fell. The problem of
antibiotic resistance had been growing

The mechanism of antibacterial action of the drug is mainly
explained by two mechanisms:

- chemical intervention in the synthesis or function of vital
components of bacteria and / or
- avoidance of the usual mechanisms of antibacterial
resistance.



DIFFERENT CLASSES OF ANTIBIOTICS - AN OVERVIEW

| Key: ● COMMONLY ACT AS BACTERIOSTATIC AGENTS, RESTRICTING GROWTH & REPRODUCTION | | | ● COMMONLY ACT AS BACTERICIDAL AGENTS, CAUSING BACTERIAL CELL DEATH | | |
|---|---|---|---|---|---|
| <p>β-LACTAMS</p> <p>MOST WIDELY USED ANTIBIOTICS IN THE NHS</p>  <p>All contain a beta-lactam ring</p> <p>EXAMPLES: Penicillins (shown), amoxicillin and fluoroquinolones, Cephalosporins such as cefalexin.</p> <p>MODE OF ACTION: Inhibit bacteria cell wall biosynthesis</p> | <p>AMINOGLYCOSIDES</p> <p>FAMILY OF OVER 20 ANTIBIOTICS</p>  <p>All contain aminoglycoside substructures</p> <p>EXAMPLES: Streptomycin (shown), neomycin, kanamycin, paromomycin.</p> <p>MODE OF ACTION: Inhibit the synthesis of proteins by bacteria, leading to cell death.</p> | <p>CHLORAMPHENICOL</p> <p>COMMONLY USED IN LOW INCOME COUNTRIES</p>  <p>Distinct individual compound</p> <p>MODE OF ACTION: Inhibits synthesis of proteins, preventing growth.</p> <p>No longer a first line drug in any developed nation (except for conjunctivitis) due to increased resistance and worries about safety.</p> | <p>GLYCOPEPTIDES</p> <p>COMMON 'DRUGS OF LAST RESORT'</p>  <p>Consists of carbohydrates linked to a peptide formed of amino acids</p> <p>EXAMPLES: Vancomycin (shown), teicoplanin.</p> <p>MODE OF ACTION: Inhibit bacteria cell wall biosynthesis.</p> | <p>QUINOLONES</p> <p>RESISTANCE EVOLVES RAPIDLY</p>  <p>All contain fused aromatic rings with a carboxylic acid group attached</p> <p>EXAMPLES: Ciprofloxacin (shown), levofloxacin, trovafloxacin.</p> <p>MODE OF ACTION: Interfere with bacteria DNA replication and transcription.</p> | <p>OXAZOLIDINONES</p> <p>POTENT ANTIBIOTICS COMMONLY USED AS 'DRUGS OF LAST RESORT'</p>  <p>All contain 2-oxazolidone somewhere in their structure</p> <p>EXAMPLES: Linezolid (shown), posizolid, tedacoli, cycloserine.</p> <p>MODE OF ACTION: Inhibit synthesis of proteins by bacteria, preventing growth.</p> |



Antibiotic resistance happens when bacteria change and become resistant
to treat the infections they cause.

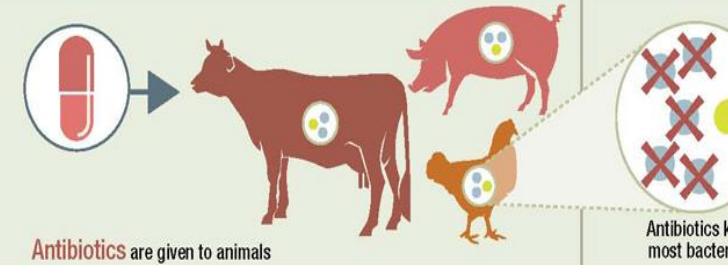


Patients not finishing their treatment

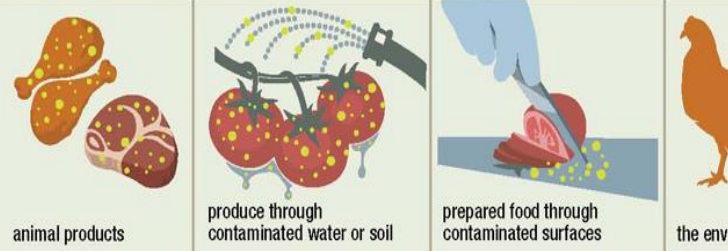


Over-use of antibiotics in livestock and fish farming

RESISTANCE All animals carry bacteria in their intestines



SPREAD Resistant bacteria can spread to...



EXPOSURE People can get sick with resistant infections



IMPACT