ARTIFICIAL INTELLIGENCE AND AMR

Allibert MDx Consulting

To Enhance your Vision and your Strategy in Molecular Diagnostic…

NOVEMBER 2019

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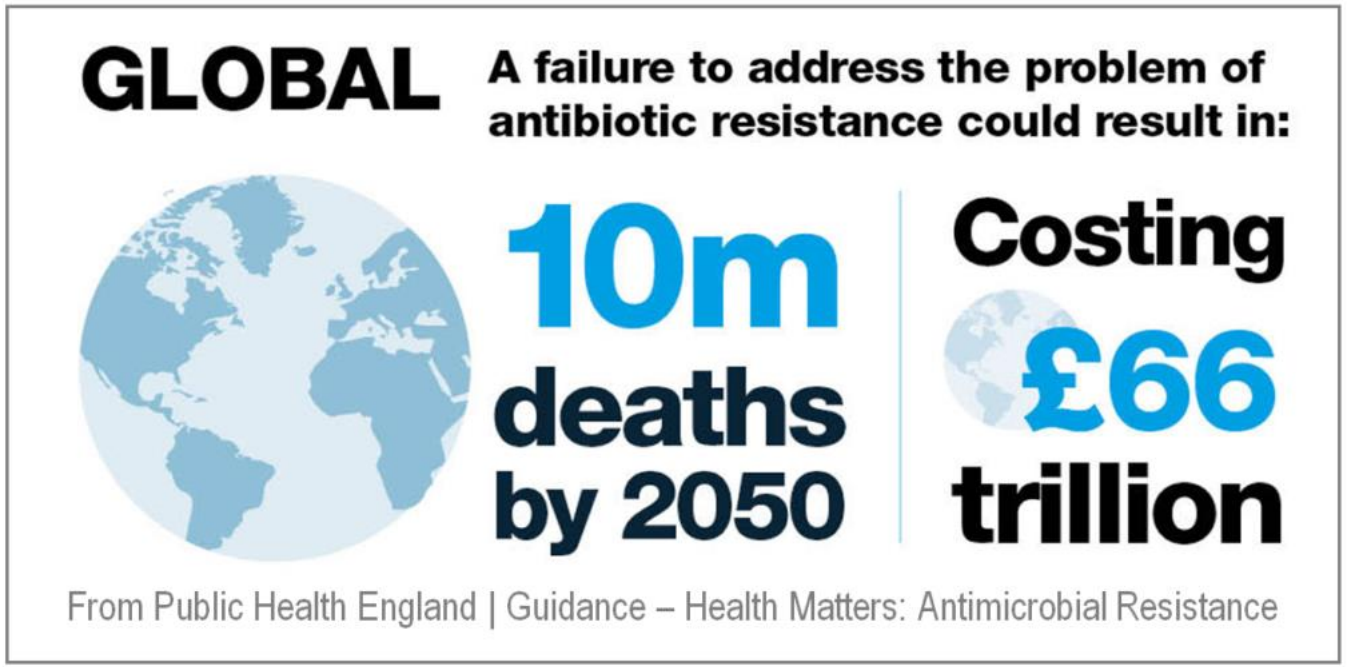
FACTS



https://www.biomerieuxconnection.com/2018/07/12/explain-antimicrobial-resistance-friends-family-infographics/

Threat Level of Drug Resistant Pathogens According to the CDC

Carbapenem resistant Enterobacteriaceae (CREs)
Clostridium difficile
Cephalosporin resistant *Neisseria gonorrhoeae*

MDR *Acinetobacter*
MDR *Pseudomonas aeruginosa*
MDR Tuberculosis
ESBL-producing Enterobacteriaceae
Vancomycin resistant enterococci (VRE)
Methicillin resistant *Staphylococcus aureus* (MRSA)
Drug resistant *Streptococcus pneumoniae*

Vancomycin resistant *Staphylococcus aureus*

New Drugs/Resistance… the race!

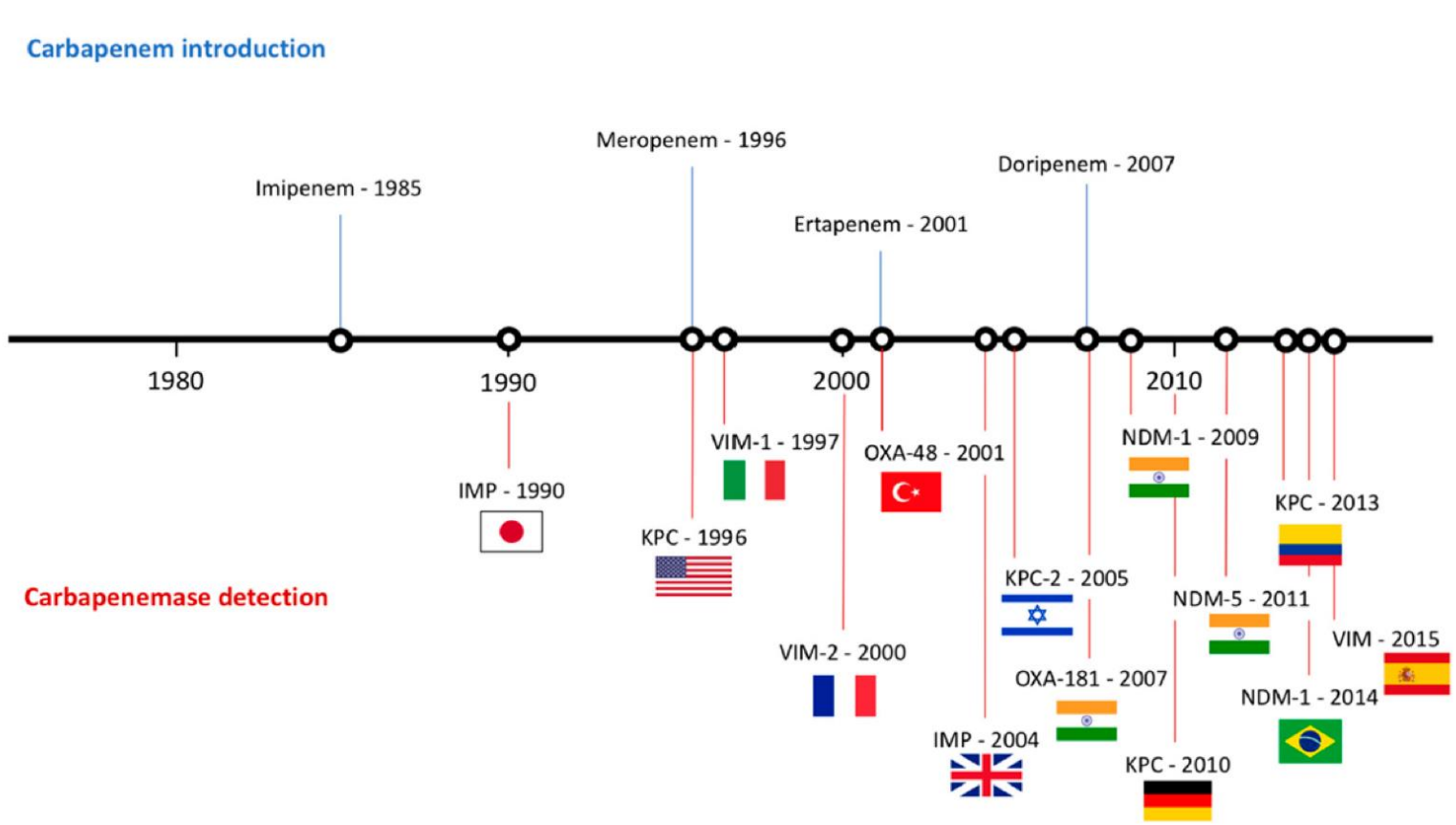


Figure 2. Timeline representing the introduction of carbapenems and the appearance of carbapenemases worldwide.

Present and Future of Carbapenem-resistant Enterobacteriaceae (CRE) Infections Beatriz Suay-García and María Teresa Pérez-Gracia *
Antibiotics, 2019, *8*, 122

AI and Infectious Diseases

- **Since 2015,** we see a significant increase of publications and interest in this important domain

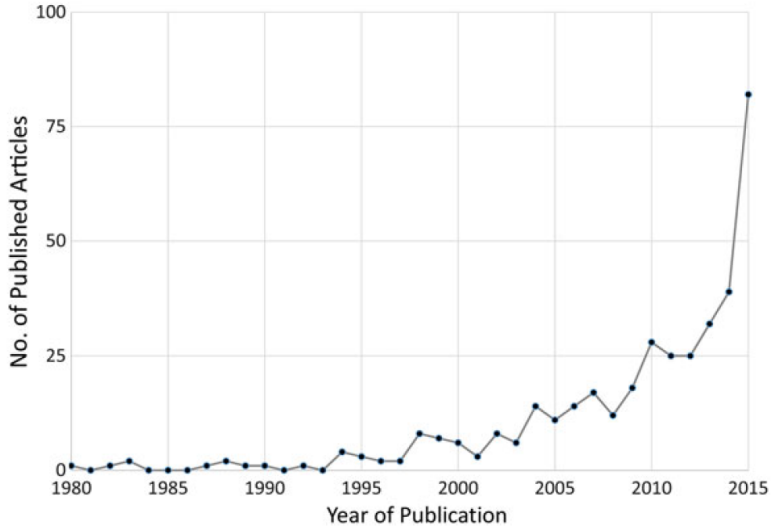
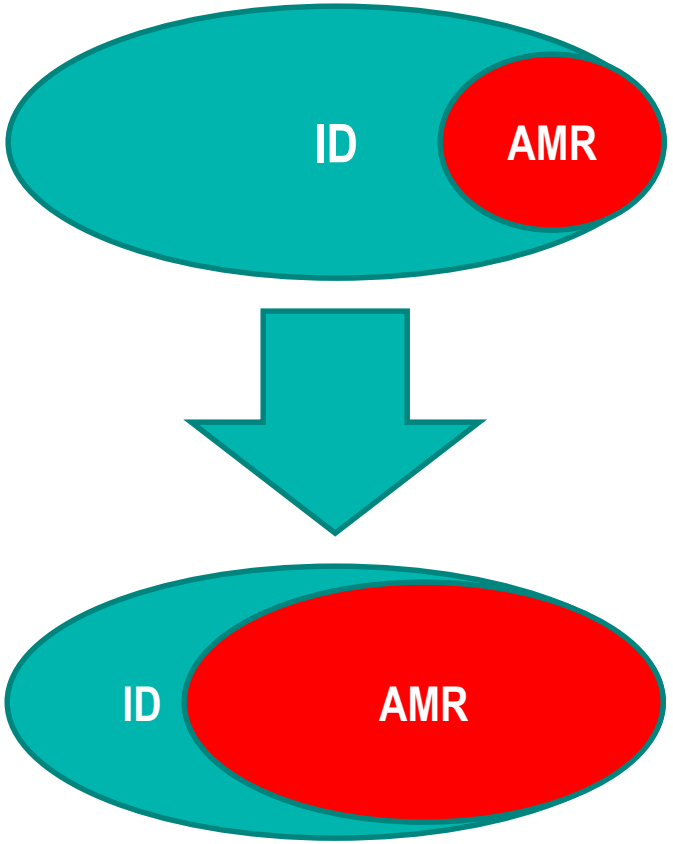


Figure 1. Exponential increase since the early 2000s in publications at the intersection of big data and infectious diseases. Annual trends in the number of publications were identified through a Scopus search for articles published between 1980 and 2015, using the following keywords: (big data AND infectious diseases) OR (big data AND epidemics) OR (digital epidemiology AND infectious diseases).

Big Data for Infectious Disease Surveillance and Modeling • JID 2016:214 (Suppl 4) • S375

Infectious Diseases and AMR

Yesterday



Tomorrow

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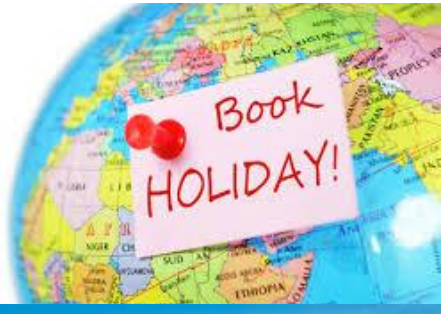
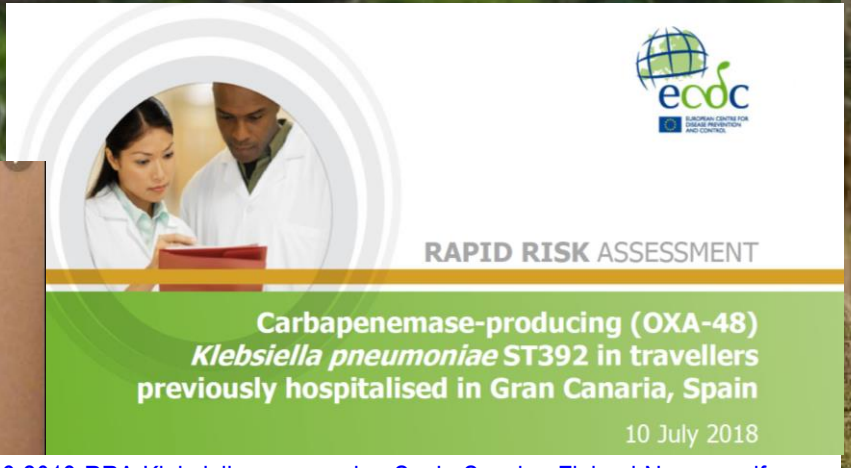
To Enhance your Vision and your Strategy in Molecular Diagnostic…

Why AMR threat will not stop…





https://ecdc.europa.eu/sites/portal/files/documents/28-06-2018-RRA-Klebsiella-pneumoniae-Spain-Sweden-Finland-Norway.pdf

How AI can help AMR?

- **In 2050, 10 millions of people will die due to AMR**:
  - We will obviously see a significant increase of Community Acquired Infection
  - Situation will not be manageable for hospitals
  - It will be impossible to consider and treat all patients at the same level

A sort of triage will be required to ”classify” patient, their exposure to AMR and their capacity to be treated

How AI can help AMR?

- **Epidemiological purpose:**
  - It is known AMR birth has multiple origins
    - **Animals** fed with antibiotics
    - **Agriculture** and soils treatments
    - **Human** overusing antibiotics
    - **Water** contaminated by AMR strains
  - It is known AMR spreading is mainly due to the movement of population
    - Travels
    - Migration of Human … but also birds!

AI and Big data can definitively help to provide regular mapping of AMR spreading.

How AI can help AMR?

- **Patient exposure to AMR**
  - We are not all equal regarding our exposure to Infectious Diseases and AMR
  - We can anticipate major problems for hospitals when they will be exposed to Community Acquired AMR outbreaks..
    - We already see a significant increase of UTI resistance to carbapenem
  - Stratification of patient exposure to AMR will help hospitals at admission for the first triage
  - Big data can help to analyse all data available and generate tools enabling this triage:
    - Where I live
    - Where I work
    - Family history
    - Friends history
    - Personal history and exposure to Infectious Diseases and AMT
    - Travel and much more ….

AI and Big data can definitively help to generate appropriate tools to evaluate the risk of the patient to AMR