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# Les antibiotiques en médecine : Du Miracle au Naufrage !

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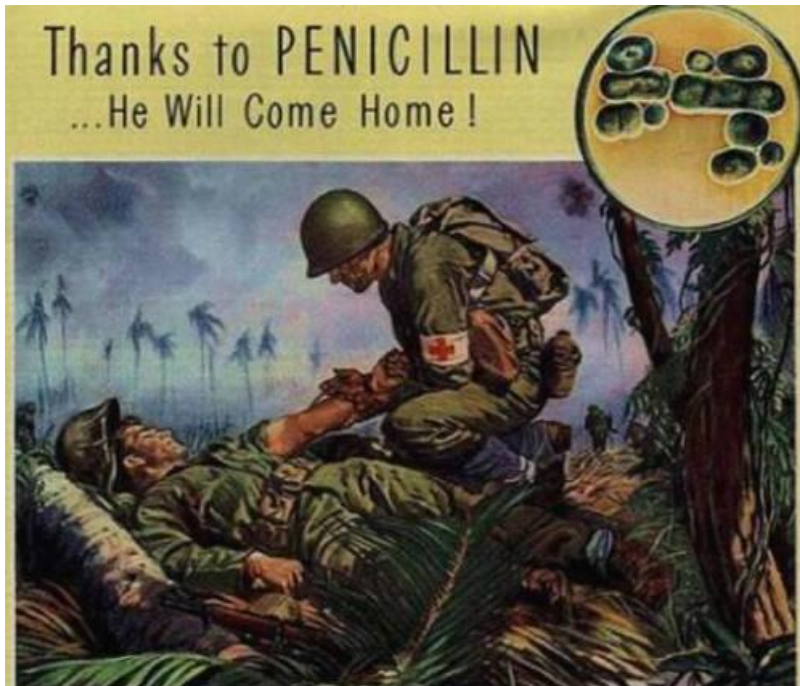
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DOI : DaVolterra (French Law Innovation and Research)

# Antibiotics are « miracle, *but...* » drugs !

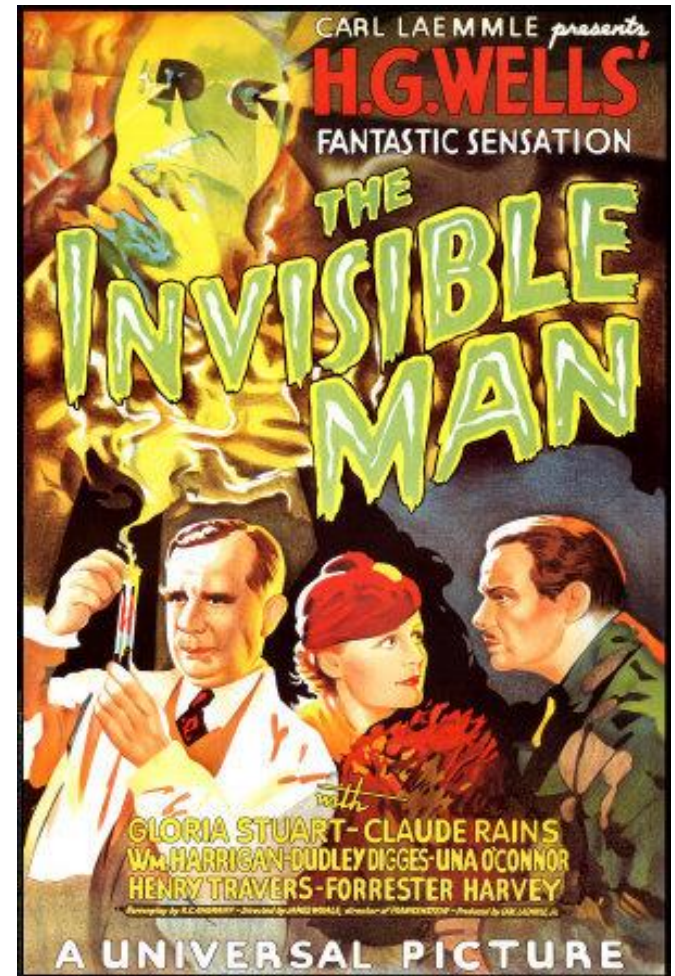


Prof. Alexander Fleming :  
the Nobel Prize winner  
father of the miracle drug



In a 1945 interview with The New York Times, he warned that **misuse of penicillin could lead to the propagation of mutant forms of bacteria that would resist the new miracle drug.**

- Everybody fears resistance
- But very few *see* it
- Because « visible » mortality is still very low...





The reason is simple:  
Usually we still do have at  
least one antibiotic active  
for each patient

But no new  
antiotics +  
resistance on  
the rise

Experts say we can fall anytime !



March 11, 2013, G8 Submit UK



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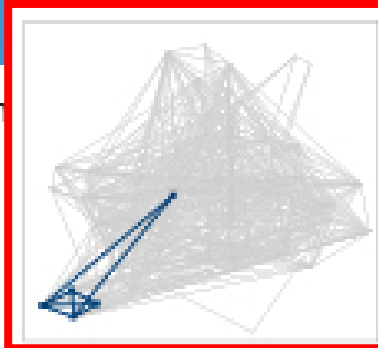
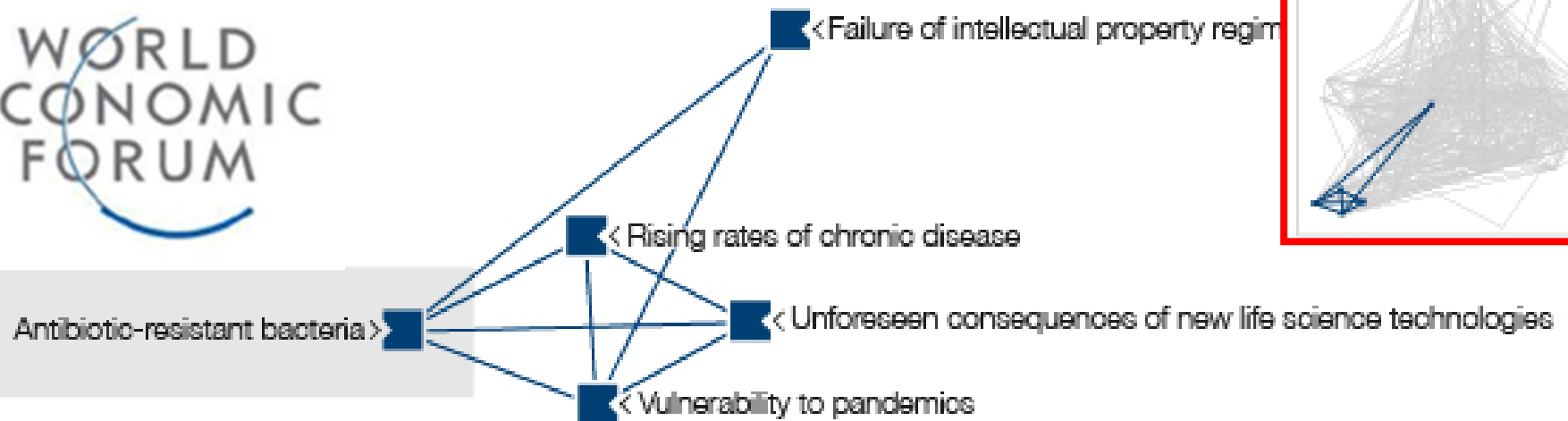
[News](#) > [Science](#)

# Chief Medical Officer Dame Sally Davies: Resistance to antibiotics risks health 'catastrophe' to rank with terrorism and climate change

# Mes deux topos de ce jours

1. Où en sommes nous en pratique : « **matin chagrin** » !
2. Qu'est-ce qui s'est passé et comment s'en sortir : « **espoir du soir** ! »

Figure 15: The Dangers of Hubris on Human Health Constellation



*A post-antibiotic era means, in effect, an end to modern medicine as we know it. Things as common as strep throat or a child's scratched knee could once again kill.<sup>2</sup>*

2. Chan, M. "Antimicrobial Resistance in the European Union and the World".

World Health Organization, <http://www.who.int/dg/speeches>

/2012/amr\_20120314/en/index.html, 2012.



Dr. Margaret CHANG  
DG, WHO

# ANTIBIOTIC ACTION

“

Antibiotic resistance - one  
of the three greatest  
threats to human health.

”

World Health Organisation, 2009

“

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3. Infections caused by drug-resistant pathogens increase mortality across all settings, and can lead to prolonged stays in hospital and increased risk of admission to intensive care units. Hospital-acquired infections with multiresistant bacteria already cause around 80 000 deaths annually in China, 30 000 in Thailand, at least 25 000 across the European Union and at least 23 000 in the United States of America.

December 6th, 2013

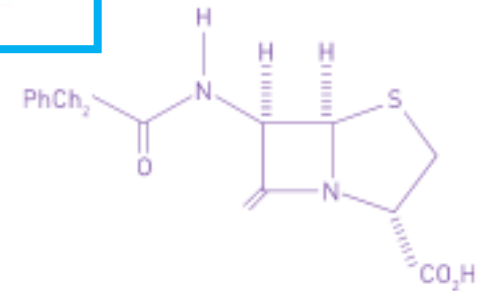




# World Health Organization

## ANTIMICROBIAL RESISTANCE

Global Report  
on surveillance  
2014



### What you need to know

WHO's first global report on antimicrobial resistance, with a focus on antibiotic resistance, reveals that it is no longer a prediction for the future. Antibiotic resistance - when bacteria change and antibiotics fail - is happening **right now**, across the world



The report is the most **comprehensive picture to date**, with data provided by 114 countries



Looking at **7 common bacteria** that cause serious diseases from bloodstream infections to gonorrhoea



**High levels of resistance** found in all regions of the world



**Significant gaps** exist in tracking of antibiotic resistance

# Drug resistant microbes – already a major threat to health



*According to analysis carried out by ECDC in 2008:*

**37,000 deaths** in EU each year from healthcare associated infections

- Comparable to the number of people who die in road traffic accidents (approx 35,000 per year)

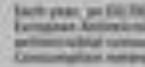
Half of these deaths (i.e. 18,500 deaths)  
caused by multi-drug resistant bacteria

Enoch: 1998, pp. 115–116.  
Furman: 2000, pp. 10–11.  
Gibson: 1997, pp. 10–11.  
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# Antibiotics be responsible

The emergence and spread of antibiotic resistance, in other words the ability of bacteria to resist the action of an antibiotic, has become a recognised global problem. Antibiotic resistance increases (and the number of antibiotics available for the treatment of diseases).

Each year, an EU-wide European Antibiotic Consumption survey

## Last EU economic figures

### Antibiotic resistance



In the US  
too the  
flag is  
down...



## NATIONAL SUMMARY DATA

Estimated minimum number of illnesses and deaths caused by antibiotic resistance\*:

At least  **2,049,442** illnesses,  
 **23,000** deaths

*\*bacteria and fungus included in this report*



Estimated minimum number of illnesses and death due to *Clostridium difficile* (*C. difficile*), a unique bacterial infection that, although not significantly resistant to the drugs used to treat it, is directly related to antibiotic use and resistance:

At least  **250,000** illnesses,  
 **14,000** deaths

### WHERE DO INFECTIONS HAPPEN?

Antibiotic-resistant infections can happen anywhere. Data show that most happen in the general community; however, most deaths related to antibiotic resistance happen in healthcare settings, such as hospitals and nursing homes.



U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention



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### WHERE DO INFECTIONS HAPPEN?

Antibiotic-resistant infections most happen in the hospital, but you know that too can happen at home. Infections related to antibiotic resistance also happen in nursing homes and long-term care facilities.

Everywhere



U.S. Department of  
Health and Human Services  
Centers for Disease  
Control and Prevention

## North America

- USA: ARB causes majority of **99,000 deaths/yr** from infections acquired in hospitals.<sup>55</sup>
- USA: Health care costs of ARB are **US\$21-34 bn/yr**.<sup>56</sup>

## South America

- Peru, Bolivia: **>51%** of hospital infections caused by ARB.<sup>57</sup>
- Brazil: Rates of ARB are up **>60%**.<sup>58</sup>

## Europe

- EU: ARB costs society ~ **€1.5 bn/yr**<sup>59</sup> & **600 million** days of lost productivity.<sup>60</sup>
- Russia: ARB a major concern<sup>60</sup> with **83.6%** of families imprudently use antibiotics at home.<sup>61</sup>

## Middle East & North Africa

- Egypt: **38%** of blood infections contracted by young cancer patients are from ARB.<sup>62</sup>
- Israel: ARB found fatal in ~ **50%** cases when resistant to our strongest antibiotics.<sup>63</sup>

## Sub-Saharan Africa

- Tanzania: Death rate of ARB infected children are **double** that of malaria.<sup>64</sup>
- Nigeria: Rapid spread of ARB that came to Africa from Asia.<sup>62</sup>

## Asia

- Thailand: **>140,000** ARB infections/yr and **>30,000/yr** patients die; **2 bn** in productivity losses/yr.<sup>49</sup>
- Japan: Extensive levels of ARB found in Tokyo's urban watershed.<sup>50</sup>
- China: Extreme over-prescription of antibiotics<sup>51</sup> and rapid growth rate of ARB.<sup>52</sup>
- India: Within 4 years (02-06) ARB went from being resistant to 7, to **21 drugs**.<sup>53</sup>
- Vietnam: Farming practices contributing to spread of ARB through environmental contamination.<sup>54</sup>
- Pakistan: **71%** of infections in newborns are from ARB.<sup>55</sup>

## Antarctica

- ARB found in Antarctic animals & water samples.<sup>64</sup>

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# CDC has categorized the risks

## HAZARD LEVEL **URGENT**



These are high-consequence antibiotic-resistant threats because of significant risks identified across several criteria. These threats may not be currently widespread but have the potential to become so and require urgent public health attention to identify infections and to limit transmission.

*Clostridium difficile* (*C. difficile*), Carbapenem-resistant Enterobacteriaceae (CRE), Drug-resistant *Neisseria gonorrhoeae* (cephalosporin resistance)

*C. dif*, CRE,  
Gono R-C3G

## HAZARD LEVEL **SERIOUS**



These are significant antibiotic-resistant threats. For varying reasons (e.g., low or declining domestic incidence or reasonable availability of therapeutic agents), they are not considered urgent, but these threats will worsen and may become urgent without ongoing public health monitoring and prevention activities.

Multidrug-resistant *Acinetobacter*, Drug-resistant *Campylobacter*, Fluconazole-resistant *Candida* (a fungus), Extended spectrum  $\beta$ -lactamase producing Enterobacteriaceae (ESBLs), Vancomycin-resistant *Enterococcus* (VRE), Multidrug-resistant *Pseudomonas aeruginosa*, Drug-resistant Non-typhoidal *Salmonella*, Drug-resistant *Salmonella* Typhi, Drug-resistant *Shigella*, Methicillin-resistant *Staphylococcus aureus* (MRSA), Drug-resistant *Streptococcus pneumoniae*, Drug-resistant tuberculosis (MDR and XDR)

MRSA,  
ESBL-E,...

## HAZARD LEVEL **CONCERNING**



These are bacteria for which the threat of antibiotic resistance is low, and/or there are multiple therapeutic options for resistant infections. These bacterial pathogens cause severe illness. Threats in this category require monitoring and in some cases rapid incident or outbreak response.

Vancomycin-resistant *Staphylococcus aureus* (VRSA), Erythromycin-resistant *Streptococcus* Group A, Clindamycin-resistant *Streptococcus* Group B

VRSA, Ere-  
R Strep A,...



Insight Report



# Global Risks 2013

## Eighth Edition

While viruses capture more headlines, the greatest risk of hubris to human health comes in the form of antibiotic-resistant bacteria.



# Portrait imaginaire d'un monde sans antibiotique...

- ✓ In the hospitals
  - Severe Health Care associated infections affecting
    - Grafts
    - Chemotherapy
    - Intensive care
    - Neonatal care
- ✓ In the community
  - Resurgence of treatment failure for common infections
    - Urinary tract infections
    - Staphylococci skin infections
    - Enteric diseases
- ✓ In food producing animals
  - Difficulties in intensive production
  - Less meat

La pan -résistance commence à émerger du  
« calme antibiotique »















La balle est entre  
nos mains !!





Paraphrasant André  
Malraux :

« ...en terme  
d'antibiothérapie, le  
XXI<sup>ème</sup> siècle sera  
écologique ou ne sera  
pas.... »