CURRENT STATUS OF SUPERBUGS AND FUNGAL INFECTIONS IN SURGICAL CRITICAL CARE

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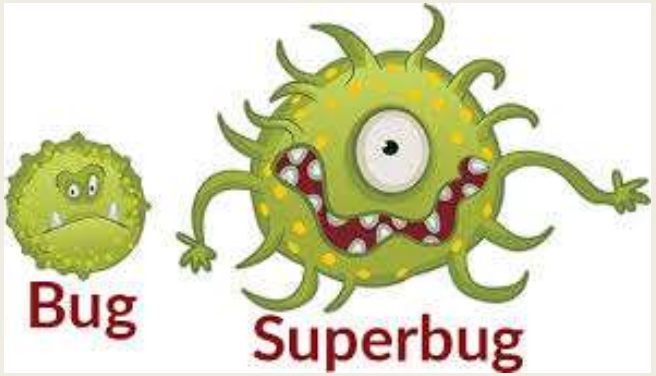
What is a superbug?

- Superbug
  - *General term used to describe bacteria that can't be killed using multiple antibiotics=Multi drug resistant (MDR) bacteria (not necessarily resistant to all antibiotics)*
  - *Currently cause an estimated 700 000 deaths worldwide*
  - *Also emerging in community with colonization of healthy hosts-screening protocols (NB CRE and MRSA)*

Superbugs

- CDC and ECDC 2012 classified superbugs as MDR (Multi), XDR (extreme) or PDR (pan)
- Gram negatives
  - *Carbapenem resistant Enterobacteriaceae (CRE)*
    - "Nightmare bacteria" 2012, from USA to SA
    - KEEPS (Klebsiella, Enterobacter, E coli, Proteus, Serratia)
  - *Acinetobacter Baumanii*
  - *Pseudomonas Aeruginosa*
  - *Antibiotic resistant Gonorrhoea*
- Gram positives
  - *Vancomycin resistant Enterococci (VRE)*
  - *Methicillin resistant Staphylococcus Aureus (MRSA)*
  - *Clostridiodes difficile (Clostridium diff. Renamed in 2016)*
- MDR Tuberculosis
- Fungi
  - *Candida Auris (+-parapsilosis)*

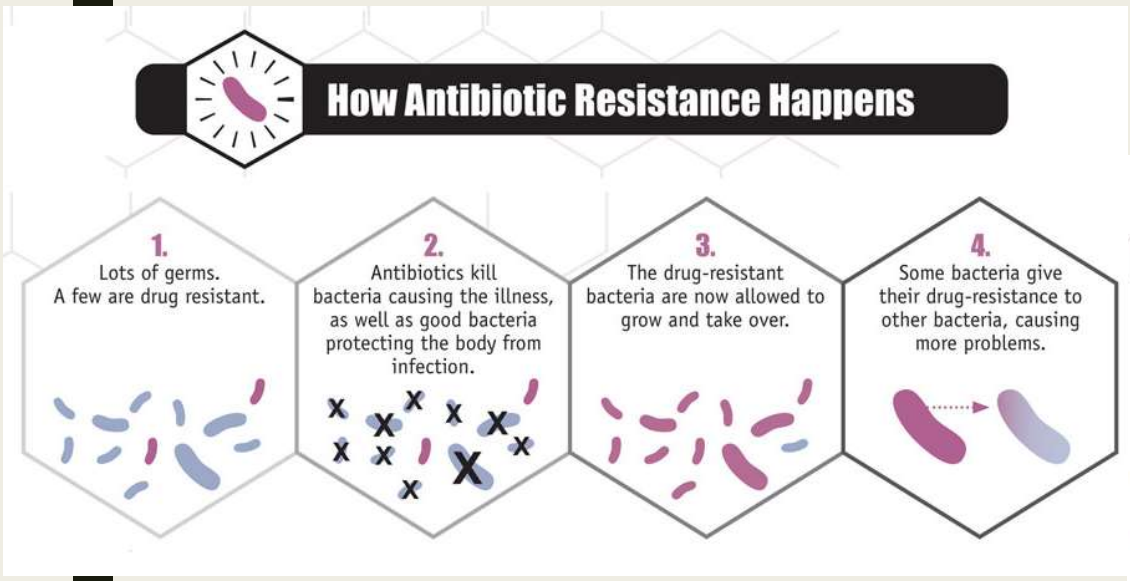


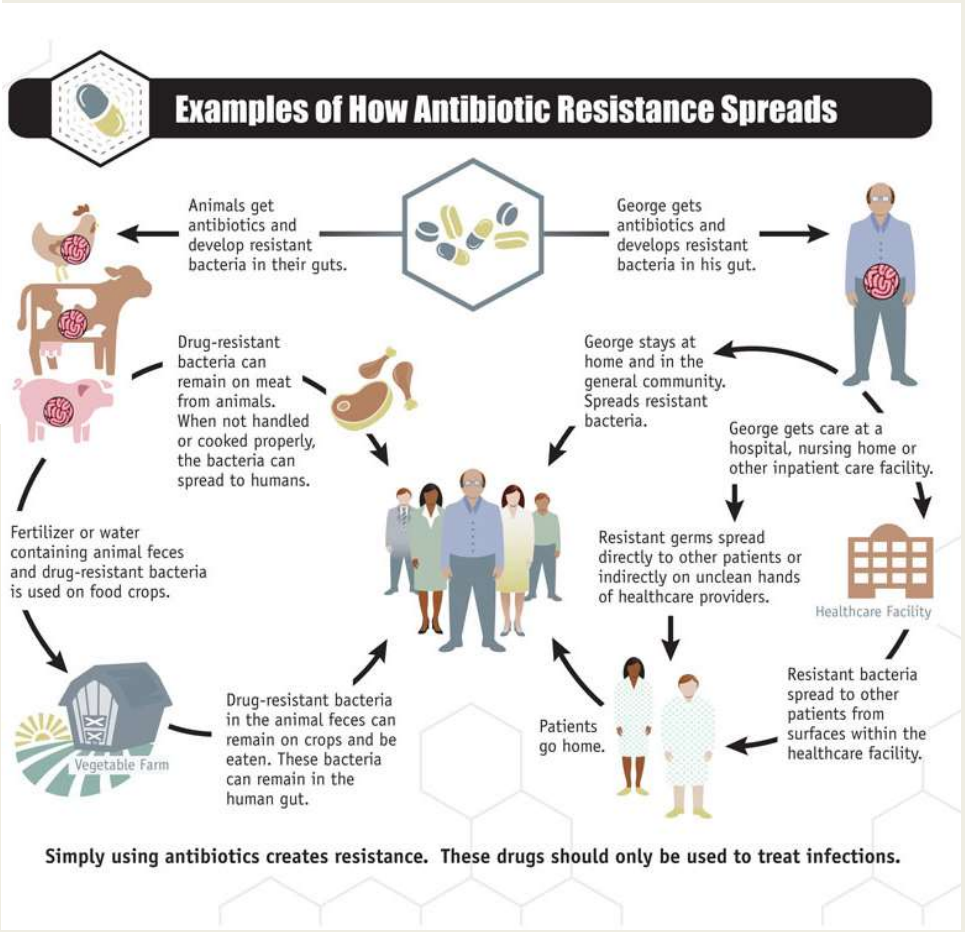
Who is most at risk to get a superbug infection?

- Neonates and young children
- Elderly
- Critically ill
- Immunocompromised
- Diabetes Mellitus
- Recent surgery, especially abdominal
- Burn patients
- Long hospital stays
- Use of indwelling catheters
- Recent/current use of antibiotics/antifungals

Multi drug resistance mechanisms

- Overuse of antibiotics in humans, farm animals and even fish-selection of resistant pathogenic organisms
- 2 mechanisms
  - *Multiple gene accumulation (plasmid transfers) each coding for resistance to a single drug*
  - *Multidrug efflux pumps*


How Antibiotic Resistance Happens
1.
Lots of germs.
A few are drug resistant.
2.
Antibiotics kill bacteria causing the illness, as well as good bacteria protecting the body from infection.
3.
The drug-resistant bacteria are now allowed to grow and take over.
4.
Some bacteria give their drug-resistance to other bacteria, causing more problems.

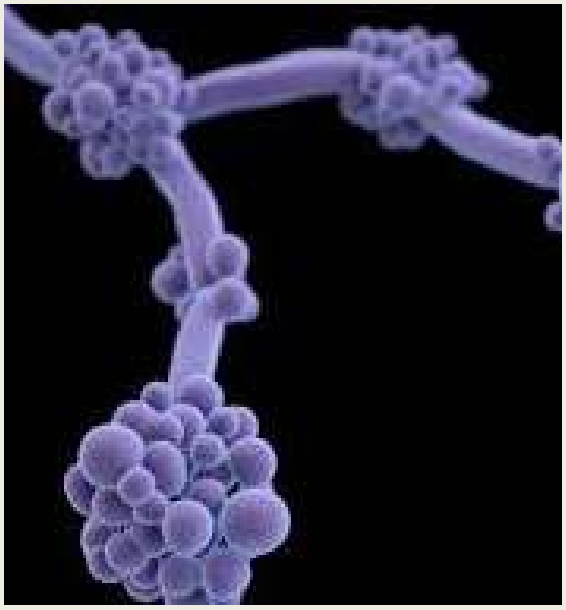

Examples of How Antibiotic Resistance Spreads
Animals get antibiotics and develop resistant bacteria in their guts.
George gets antibiotics and develops resistant bacteria in his gut.
Drug-resistant bacteria can remain on meat from animals. When not handled or cooked properly, the bacteria can spread to humans.
George stays at home and in the general community. Spreads resistant bacteria.
George gets care at a hospital, nursing home or other inpatient care facility.
Fertilizer or water containing animal feces and drug-resistant bacteria is used on food crops.
Resistant germs spread directly to other patients or indirectly on unclean hands of healthcare providers.
Healthcare Facility
Vegetable Farm
Drug-resistant bacteria in the animal feces can remain on crops and be eaten. These bacteria can remain in the human gut.
Patients go home.
Resistant bacteria spread to other patients from surfaces within the healthcare facility.
Simply using antibiotics creates resistance. These drugs should only be used to treat infections.

What can we do about it?

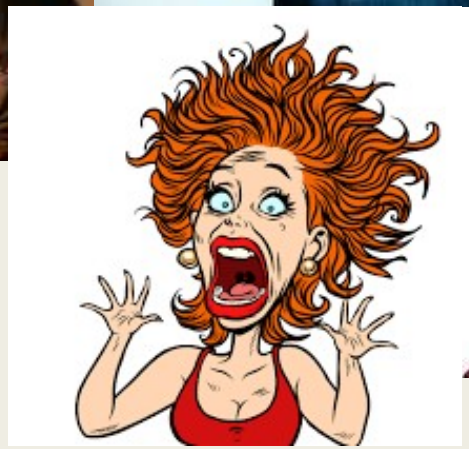
- Limit spread- Information and education to staff, patients and families
- Basic steps
  - *Spray and wash your hands*
  - *Plastic aprons and gloves*
  - *Train "spray police"*
  - *Bare below elbows, wiping and cleaning of pens, phones, stethoscopes between each patient*
  - *Alcohol dispensers visible and available*
- Care bundles
- Use of IPC teams
- Visual aids and reminders
- Practise antibiotic stewardship
- Risk identification and isolation
- Environmental cleaning and disinfection programs

New kid on the block: Candida Auris

- Yeast like fungus related to Candida Albicans
- First recognised in 2009 in Japan from a patient with an ear infection (“auris” meaning ear)
- CDC recognition as an **emerging, invasive** pathogen.
- Increasing rates in multiple countries, **GLOBAL THREAT** to healthcare
- Fungaemia/Fungal sepsis carries a 59% mortality rate-difficult to establish the direct attributable mortality rate as patients have significant underlying comorbidities
- Often multidrug resistant, even to all 3 major classes of antifungals
- Types of resistance patterns variable depending on the strain
- Nosocomial outbreaks in intensive care settings
- Outbreaks on 5 continents, 20 countries



Scary facts!!!



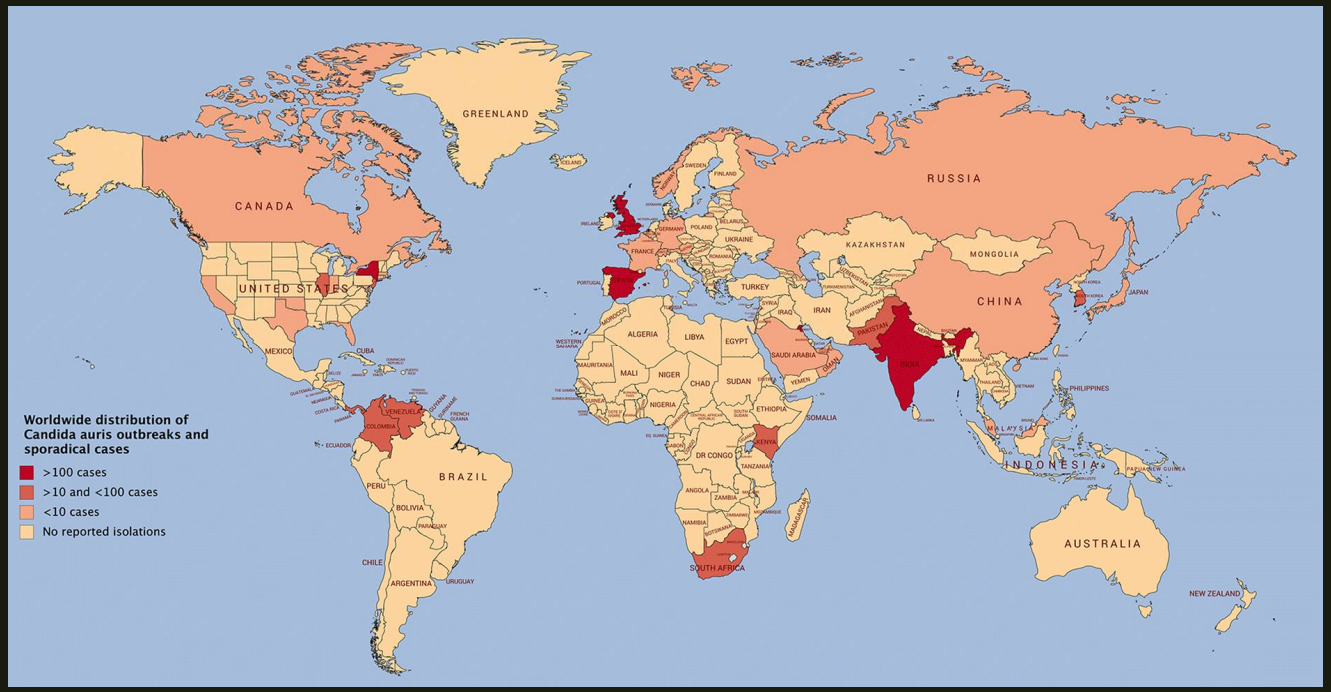
Scary facts diagnosis

- Difficult to diagnose using routine biochemical typing/blood or fluid fungal cultures
- Requires sophisticated methods, not all labs are able to identify it
- Issues with even sophisticated phenotypic and molecular diagnostic techniques
- Easily confused with other types of yeast esp. Candida haemulonni
- Due to difficulty in diagnosis⇒possibility of occurrence in more countries than reported

Scary facts transmission

- Continued transmission despite enhanced IPC measures, unclear measures of spread
- Unknown true population prevalence
- Uncertain environmental niches
- Control difficult
- Ability to form biofilm and persist on surfaces
- Evidence of contamination on dry surfaces (matrass up to 7 days)
- Colonisation of humans ⇨ possible indefinite duration

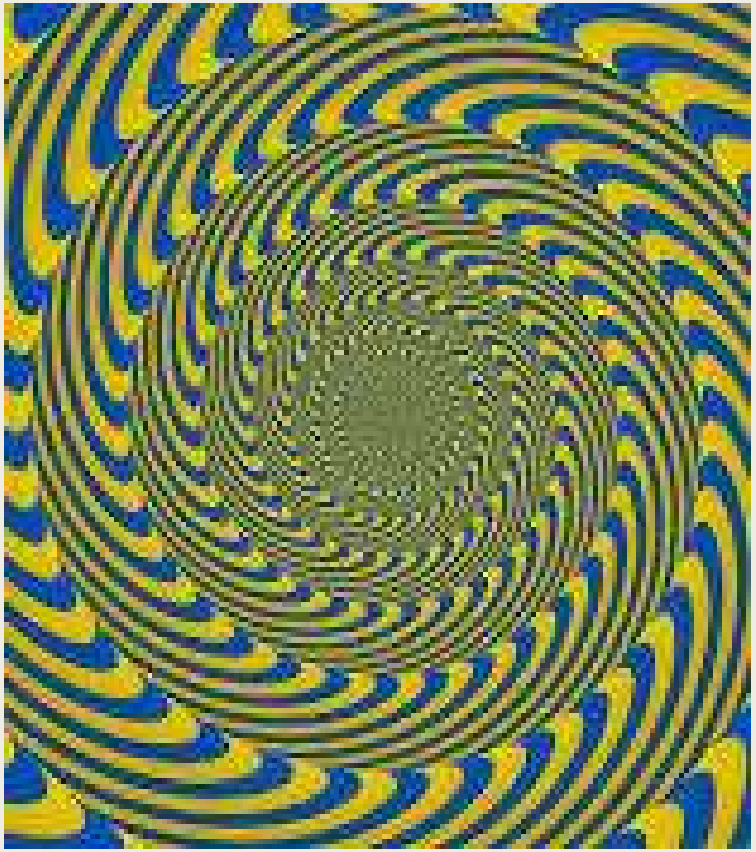
WORLDWIDE DISTRIBUTION OF CANDIDA AURIS



CDC map of countries with reported C auris

- Single cases of *C. auris* have been reported from Austria, Belgium, Iran, Malaysia, the Netherlands, Norway, Switzerland, Taiwan, and the United Arab Emirates.
- Multiple cases of *C. auris* have been reported from Australia, Canada, China, Colombia, France, Germany, India, Israel, Japan, Kenya, Kuwait, Oman, Pakistan, Panama, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Spain, the United Kingdom, the United States (primarily from the New York City area, New Jersey, and the Chicago area) and Venezuela; in some of these countries, extensive transmission of *C. auris* has been documented in more than one hospital.
- U.S. cases of *C. auris* have been found in patients who had recent stays in healthcare facilities in India, Kenya, Kuwait, Pakistan, South Africa, the United Arab Emirates, and Venezuela, which also have documented transmission.
- Other countries not highlighted on this map may also have undetected or unreported *C. auris* cases.

Most mind-boggling fact



- Genetic analysis indicates the SIMULTANEOUS emergence of separate clades of the organisms in different geographical locations, different resistance patterns
- Suggest clonal expansion and evolution
- HOW?
  - *Circulating unrecognised all along with historical separation from common ancestral strain? Unlikely, strain only isolated form 2 historical isolates and no isolates prior to 2009.*
  - *Common environmental niche?*
    - Use of broad spectrum antimicrobials and antifungals for prophylaxis and treatment- alters patient natural flora. Fluconazole use in particular may alter the balance toward colonization and infection with non-albicans species
    - Contribution of possible animal reservoirs

Antifungal treatment

- Guided by susceptibility
- Concern about resistance to triazoles and amphotericin B
- 1st line agent-Echinocandins, but ineffective against biofilms
- Micafungin highest efficacy in comparison to Fluconazole and Amphotericin in mice
- Echinocandins use more frequent-reduced susceptibility reported
- ?initial promising data for synergistic use of voriconazole and micafungin, not in other combinations
- NB- Site of infection-poor CNS penetration and poor urinary excretion-echinocandin use limited in renal tract infections and meningitis
- Novel therapy-Phase 3 trail of oral Ibrexafungerp (CARES trail)


Candida auris:
Learn how you can stop it from spreading.
This drug-resistant fungus causes serious infections and spreads in healthcare facilities.
www.cdc.gov/fungal
CDC

THANK YOU