# Summary of WHO PPL, CDC, Indian, Japanese, and ESKAPE pathogen lists

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Source: https://amr.solutions/pathogens-and-pipelines/

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| (mostly bacterial) Priority Pathogen Lists | WHO (2024) | WHO (2017) | India (2021)[1] | Japan (2021) | CDC (2019) | CDC (2013) | ESKAPE (2008-9) |
|---|---|---|---|---|---|---|---|
| *Acinetobacter baumannii*, carbapenem-R | Critical | Critical | Critical | Priority 1 | Urgent (carbapenem-R) | Serious (MDR) | Yes |
| Enterobacterales (*Enterobacteriaceae)*, carbapenem-R | Critical | Critical | Critical | Priority 1 | Urgent | Urgent | Yes |
| Enterobacterales (*Enterobacteriaceae)*, 3rd-gen ceph-R (ESBL+) | Critical | Critical | Critical | Priority 1 | Serious | Serious | Yes |
| *Pseudomonas aeruginosa*, carbapenem-R | High | Critical | Critical | Priority 1 | Serious (MDR) | Serious (MDR) | Yes |
| *Enterococcus faecium*, vancomycin-R | High | High | High | Priority 2 | Serious (VRE) | Serious (VRE) | Yes |
| *Staphylococcus aureus* | High (MRSA) | High (MRSA, Vanc-I/R) | High (R to meth, vanc, dapto, lzd) | Priority 2 (MRSA & VRSA) | Serious (MRSA) | Serious (MRSA) / Concerning (VRSA) | Yes |
| *Salmonellae*, (both typhoidal & non-typhoidal) | High (FQ-R) | High (FQ-R) | High (drug-R) | Priority 3 (drug-R) | Serious (drug-R) | Serious (drug-R) | |
| *Neisseria gonorrhoeae*, 3rd-gen ceph-R, fluoroquinolone-R | High | High | | Priority 1 | Urgent (drug-R) | Urgent (drug-R) | |
| *Shigella* spp., fluoroquinolone-R | High | Medium | Medium | Priority 3 (FQ-R) | Serious (drug-R) | Serious | |
| *Streptococcus pneumoniae* | Medium (Macrolide-R) | Medium (PCN-NS) | Medium (PCN-NS) | Priority 2 (PCN-NS) | Serious (drug-R) | Serious (drug-R) | |
| *Haemophilus influenzae*, ampicillin-R | Medium | Medium | Medium | Priority 3 | | | |
| Group A *Streptococcus* | Medium (Macrolide-R) | | | Priority 3 | Concerning (erythro-R) | Concerning (erythro-R) | |
| Group B *Streptococcus* | Medium (PCN-R) | | | Priority 3 (clinda-R) | Concerning (clinda-R) | Concerning (clinda-R) | |
| *Helicobacter pylori*, clarithromycin-R | | High | | Priority 3 | | | |
| *Campylobacter* spp., fluoroquinolone-R | | High | | Priority 3 (drug-$)d | Serious (drug-R) | Serious (drug-R) | |
| Staphylococcus, coagulase-neg, Van/Lzd-R | | | Medium | | | | |
| *Neisseria meningitidis*, 3rd-gen ceph-R, fluoroquinolone-R | | | Medium | | | | |
| *Clostridium difficile* | | | | Priority 2 | Urgent | Urgent | |
| *M. tuberculosis* | Critical (Rifampin-R)[2] | Separate[3] | | Priority 1[4] | Serious (drug-R) | Serious (drug-R) | |
| *Candida* spp. fluconazole-R | | | | Priority 1 (C. auris) / Priority 2 (Drug-R) | Urgent (C. auris) / Serious (Drug-resistant) | Serious (Flu-R) | |
| *Aspergillus fumigatus* | | | | Priority 2 (azole-R) | Watch (azole-R) | | |
| *Mycoplasma genitalium* | | | | Priority 2 (drug-R) | Watch (drug-R) | | |
| *Bordetella pertussis* | | | | | Watch (drug-R) | | |
| *Bacteroides fragilis (MDR)* | | | | Priority 3 | | | |

1. The Indian PPL sometimes differs slightly from WHO in terms of patterns of qualifying R.
2. Rifampin-R TB is flagged separately as a Critical Pathogen
3. TB is flagged in a standalone section as a global priority for R&D.
4. Non-tuberculous mycobacteria are included at Priority 1 by Japan

This is the (mostly) bacterial PPL. See next for the antifungal PPL.
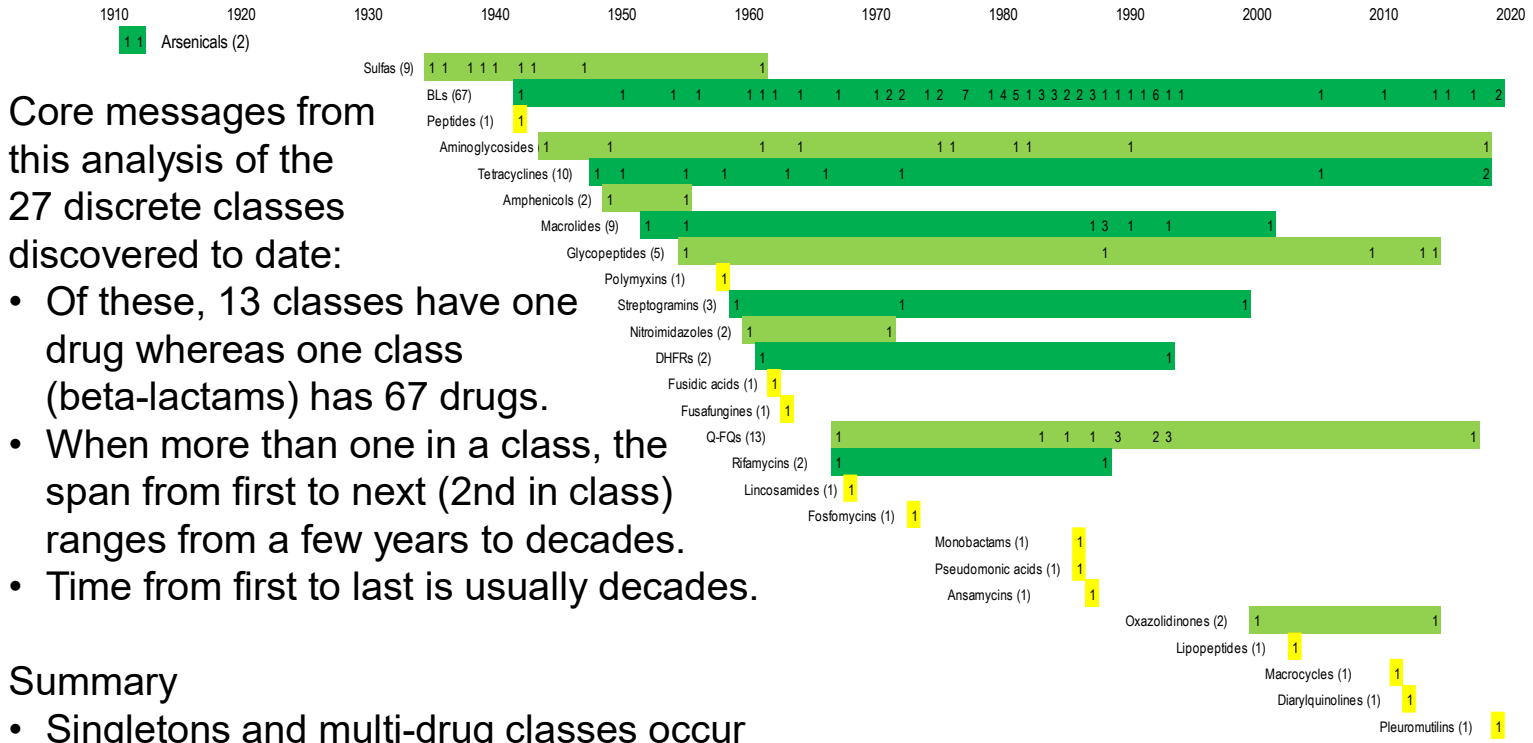
# Fungal PPL

| Fungal Priority Pathogen List | WHO 2022 | CDC (2019) | CDC (2013) |
|---|---|---|---|
| *Cryptococcus neoformans* | Critical | | |
| *Aspergillus fumigatus* | Critical | Watch (azole-R) | |
| *Candida* spp. (and related genera) | Critical (C. auris) | Urgent (C. auris) | Serious (Flu-R) |
| | Critical (C. albicans) | Serious (Drug-resistant) | |
| | High (*C. tropicalis*) | | |
| | High (*C. parapsilosis*) | | |
| | High (*Nakaseomyces glabrata; Candida glabrata*) | | |
| | Medium (*Pichia kudriavzeveii; Candida krusei*) | | |
| *Histoplasma* spp. | High | | |
| Eumycetoma causative agents | High | | |
| Mucorales | High | | |
| *Fusarium* spp. | High | | |
| *Scedosporium* spp. | Medium | | |
| *Lomentospora prolificans* | Medium | | |
| *Coccidioides* spp. | Medium | | |
| *Cryptococcus gattii* | Medium | | |
| *Talaromyces marneffei* | Medium | | |
| *Pneumocystis jirovecii* | Medium | | |
| *Paracoccidioides* spp. | Medium | | |

# Sources & References

- WHO 2024 PPL
  - https://www.who.int/publications/i/item/9789240093461
- WHO 2022 Fungal PPL
  - https://www.who.int/publications/i/item/9789240060241
- India 2021 PPL
  - http://dbtindia.gov.in/sites/default/files/IPPL_final.pdf
- Japan 2021 PPL (AMED-led)
  - https://id3catalyst.jp/apid/en/list.html
  - https://www.amed.go.jp/program/list/15/01/kansensho_iyaku_houkokusho.html
- CDC 2019 Threat List
  - Downloaded 11 Feb 2020: https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf
- WHO 2017 PPL (aka, Priority Bacterial Pathogens List)
  - Downloaded 27 Feb 2017 from http://www.who.int/medicines/publications/WHO-PPL-Short_Summary_25Feb-ET_NM_WHO.pdf
  - See also Tacconelli et al., Lancet ID, Dec 2017: http://www.thelancet.com/journals/laninf/article/PIIS1473-3099(17)30753-3/fulltext
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  - Downloaded 28 Feb 2017 from https://www.cdc.gov/drugresistance/pdf/ar-threats-2013-508.pdf
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  - Rice LB. Federal funding for the study of antimicrobial resistance in nosocomial pathogens: no ESKAPE. J Infect Dis. 2008;197(8):1079-81.
  - Boucher HW et al. Bad Bugs, No Drugs: No ESKAPE! An Update from the Infectious Diseases Society of America. Clinical Infectious Diseases. 2009;48(1):1-12.

# Background: First vs. Best

Core messages from this analysis of the 27 discrete classes discovered to date:

- Of these, 13 classes have one drug whereas one class (beta-lactams) has 67 drugs.
- When more than one in a class, the span from first to next (2nd in class) ranges from a few years to decades.
- Time from first to last is usually decades.

Summary
- Singletons and multi-drug classes occur at similar rates
- First-in-class is not necessarily best



**Decoding of the more obscure names**
Macrocycle = Fidaxomycin; Ansamycin = Rifaximin; Pseudomonic acid = Mupirocin (topical); Fusafungin = fusafungine; Peptides = Gramicidin S

Data sources: https://en.wikipedia.org/wiki/Timeline_of_antibiotics; Outterson and Rex, Translational Research 2020 (https://doi.org/10.1016/j.trsl.2020.02.006)

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# Just the timeline graphic