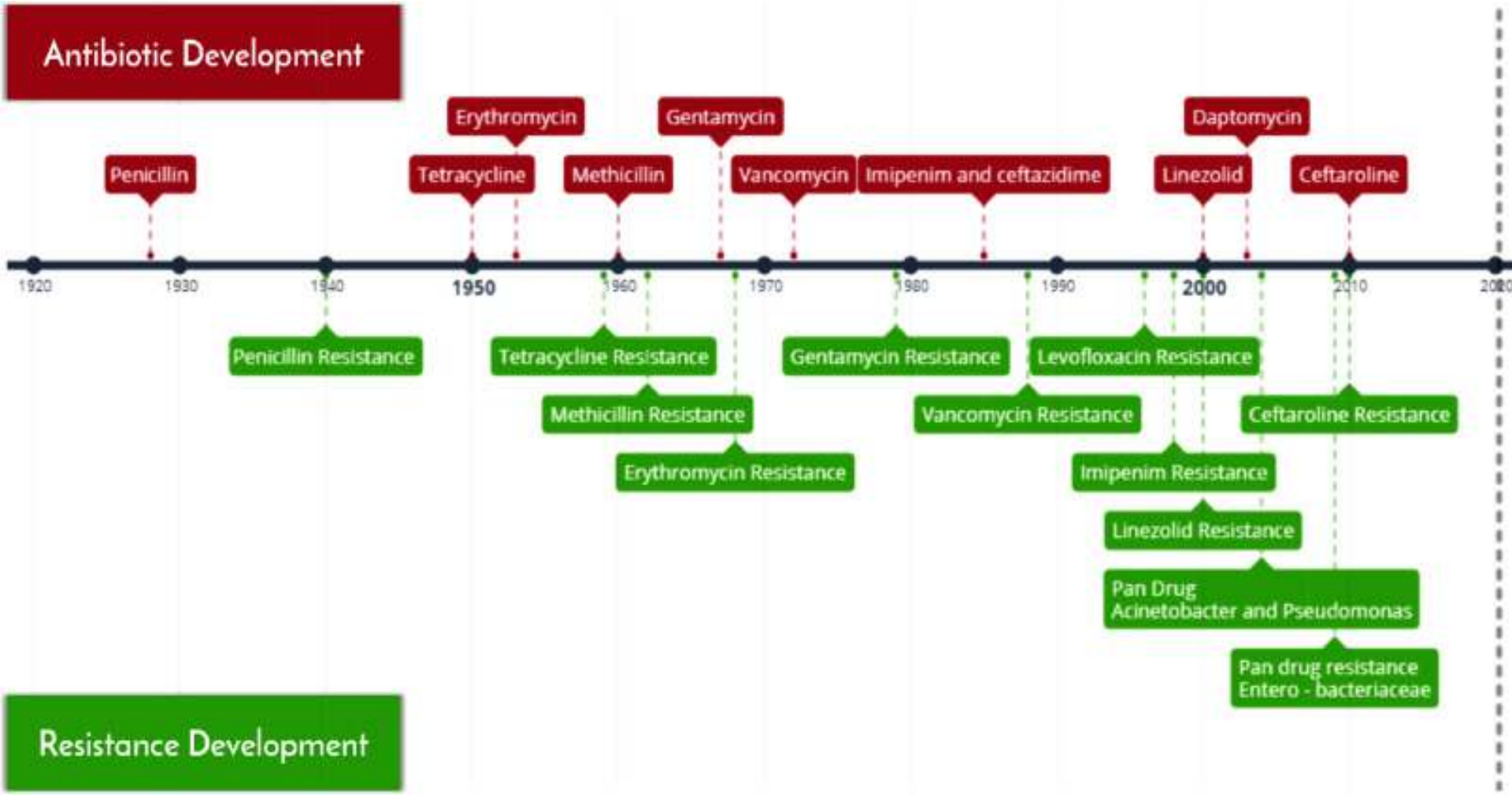
SAĞLIK BAKIMI ile İLİŞKİLİ ENFEKSİYONLARDA ANTİMİKROBİYAL DİRENÇ

Uzm. Dr. Onur Özalp

Başakşehir Çam ve Sakura Şehir Hastanesi

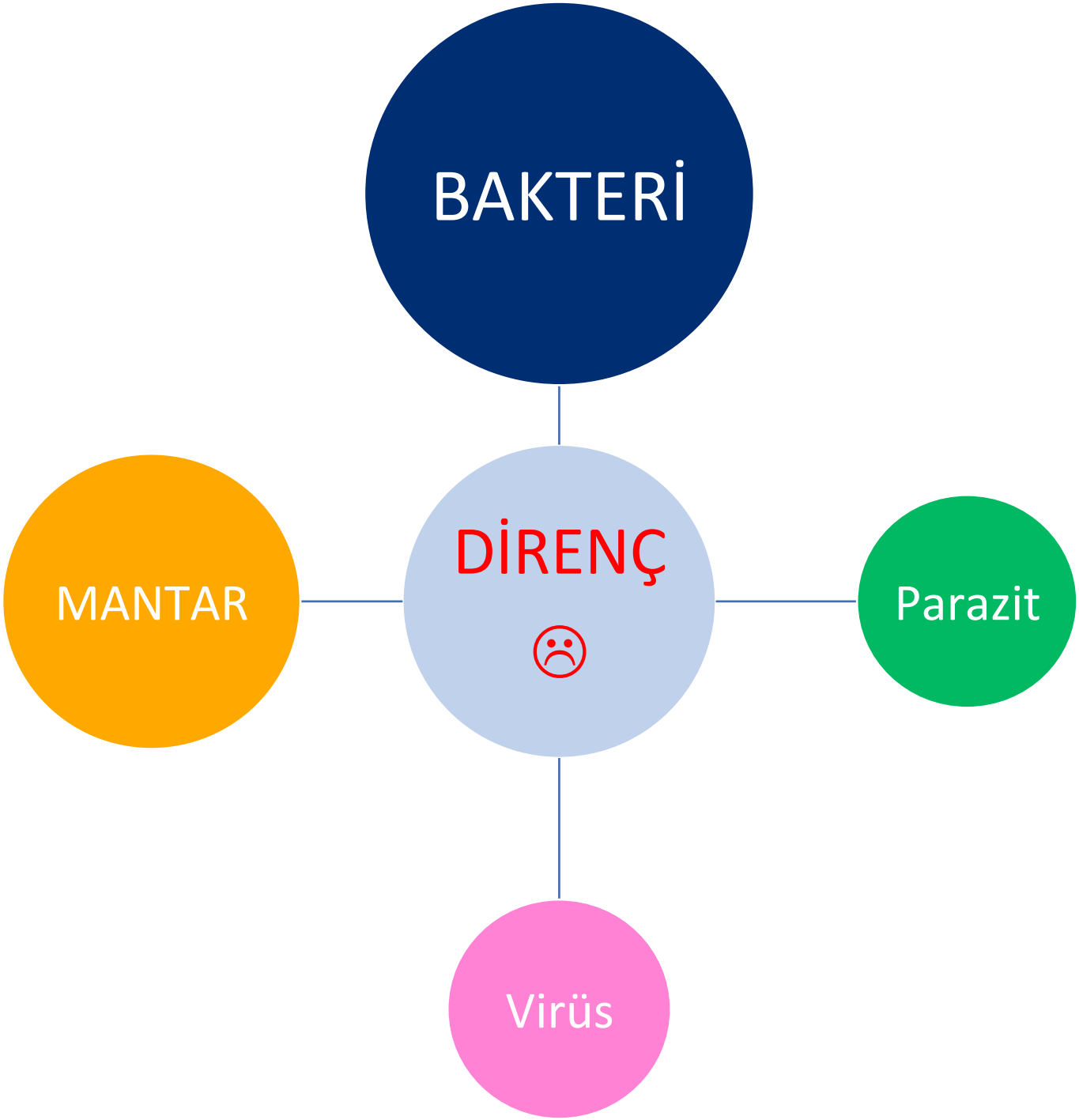
Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji



Zainab SM, Junaid M, Xu N, Malik RN. Antibiotics and antibiotic resistant genes (ARGs) in groundwater: A global review on dissemination, sources, interactions, environmental and human health risks. Water Res. 2020 Dec 15;187:116455.


Antibiotic Development
Penicillin
Erythromycin
Tetracycline
Gentamycin
Vancomycin
Daptomycin
Linezolid
Ceftaroline
1920
1930
1940
2000
2010
Penicillin Resistance
Ceftaroline Resistance
Pan Drug
Acinetobacter and Pseudomonas
Pan drug resistance
Entero - bacteriaceae
Direnç hızla gelişiyor ve
artıyor
Yeni antibiyotik keşfi az
Resistance Development

Harbarth et al. Antimicrobial resistance: one world, one fight! Antimicrobial Resistance and Infection Control (2015) 4:49 DOI 10.1186/s13756-015-0091-2


BAKTERİ
MANTAR
DİRENÇ
☹
Parazit
Virüs

ANTİBİYOTİK (AB) DİRENÇ MEKANİZMASI	Klasik örneği	Etkilediği AB	Faydalanan bakteri
ANTİBİYOTİK YIKIMI	Penisilinaz	Penisilin Sefalosporin (dar)	*S. aureus* *N. gonorrhoeae* *H. İnfluenzae* *Enterobacteriaceae*
	GSBL	Penisilin, aztreonam, 1. 2. 3. kuşak sefalosporin	*Enterobacteriaceae* *P. aeruginosa*
	AmpC enzimi	Penisilin, aztreonam, 1. 2. 3. kuşak sefalosporin	*Enterobacteriaceae* *Acineobacter spp.* *Pseudomonas spp.*
	Karbapenemaz	Karbapenem ve neredeyse tüm β-laktamlar	*Enterobacteriaceae* *Acineobacter spp.* *P. aeruginosa* *S. maltophilia*
ANTİBİYOTİK MODİFİKASYONU	AMEs CATs	Aminoglikozit Kloramfenikol	Birçok bakteri
AB AKTİVE EDİCİ ENZİM MODİFİKASYONU	Nitroredüktaz geni mutasyonu	Nitrofurantoin	*Enterobacteriaceae*

Christaki E, Marcou M, Tofarides A. Antimicrobial Resistance in Bacteria: Mechanisms, Evolution, Persistence. J Mol Evol. 2020 Jan;88(1):26-40. doi: 10.1007/s00239-019-09914-3. Epub 2019 Oct 28. PMID: 31659373

ANTİBİYOTİK (AB) DİRENÇ MEKANİZMASI	Klasik örneği	Etkilediği AB	Faydalanan bakteri
HEDEF DEĞİŞİMİ & BYPASS	PBP Peptidoglikan Dihidrofolat redüktaz Dihidropteroat sentetaz	β-laktamlar Glikopeptid Trimetoprim Sülfonamid	*S. aureus*, pnömokok Enterokok, *S. aureus* Gram - bakteri, Stafilokok Gram - bakteri
HEDEF YERİ DEĞİŞİMİ (mutasyon & enzimatik)	23SrRNA mutasyonu & metilasyonu	Linezolid Makrolid Linkozamid	Enterokok, *S. aureus*, Birçok bakteri
HEDEF YERİ KORUMASI	RPPs Qnr proteinleri	Tetrasiklin Kinolon	Birçok bakteri
HEDEFİN AŞIRI ÜRETİMİ	Dihidrofolat redüktaz aşırı üretimi	Trimetoprim	*E. coli*
DIŞ MEMBRAN GEÇİRGENLİĞİNİN ↓	Porin mutasyonu	Hidrofilik AB (β-laktam, kinolon…)	Birçok bakteri
AB EFFLUX POMPASI	Dışa akış pompası	Birçok AB	Birçok bakteri
GLOBAL HÜCRE ADAPTASYONU	Hücre homeostaz ve fosfolipid metabolizması genlerinde mutasyon	Daptomisin	*S. aureus*

Enterobacter

Mikobakteri

www.cloverbiosoft.com/the-eskape-bacteria-group-and-its-clinical-importance

Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis

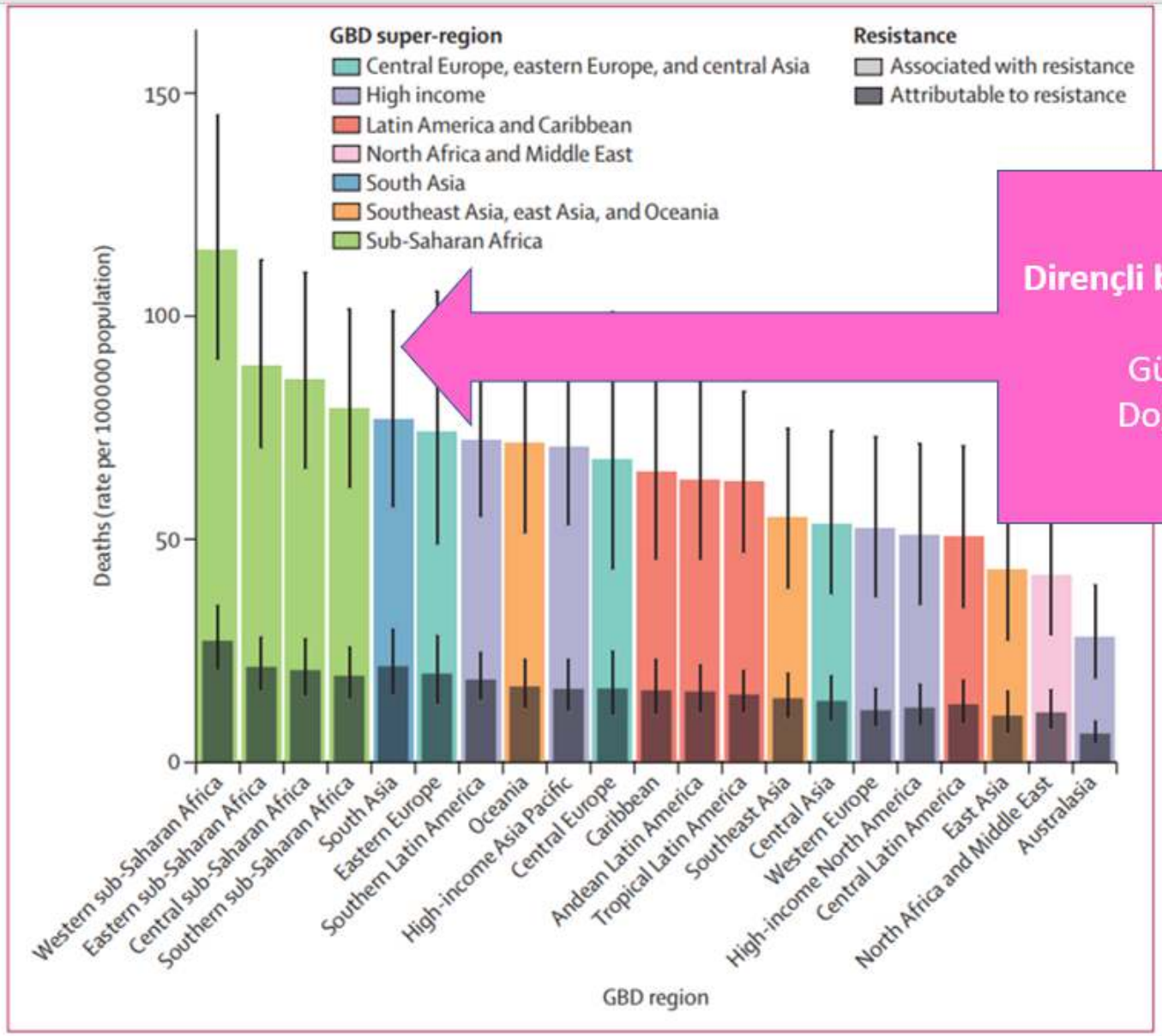


Figure 2: **All-age rate of deaths attributable to and associated with bacterial antimicrobial resistance by GBD region, 2019**

Alt solunum yolu enf. > Kan dolaşımı enf. > İntra-abdominal enf.

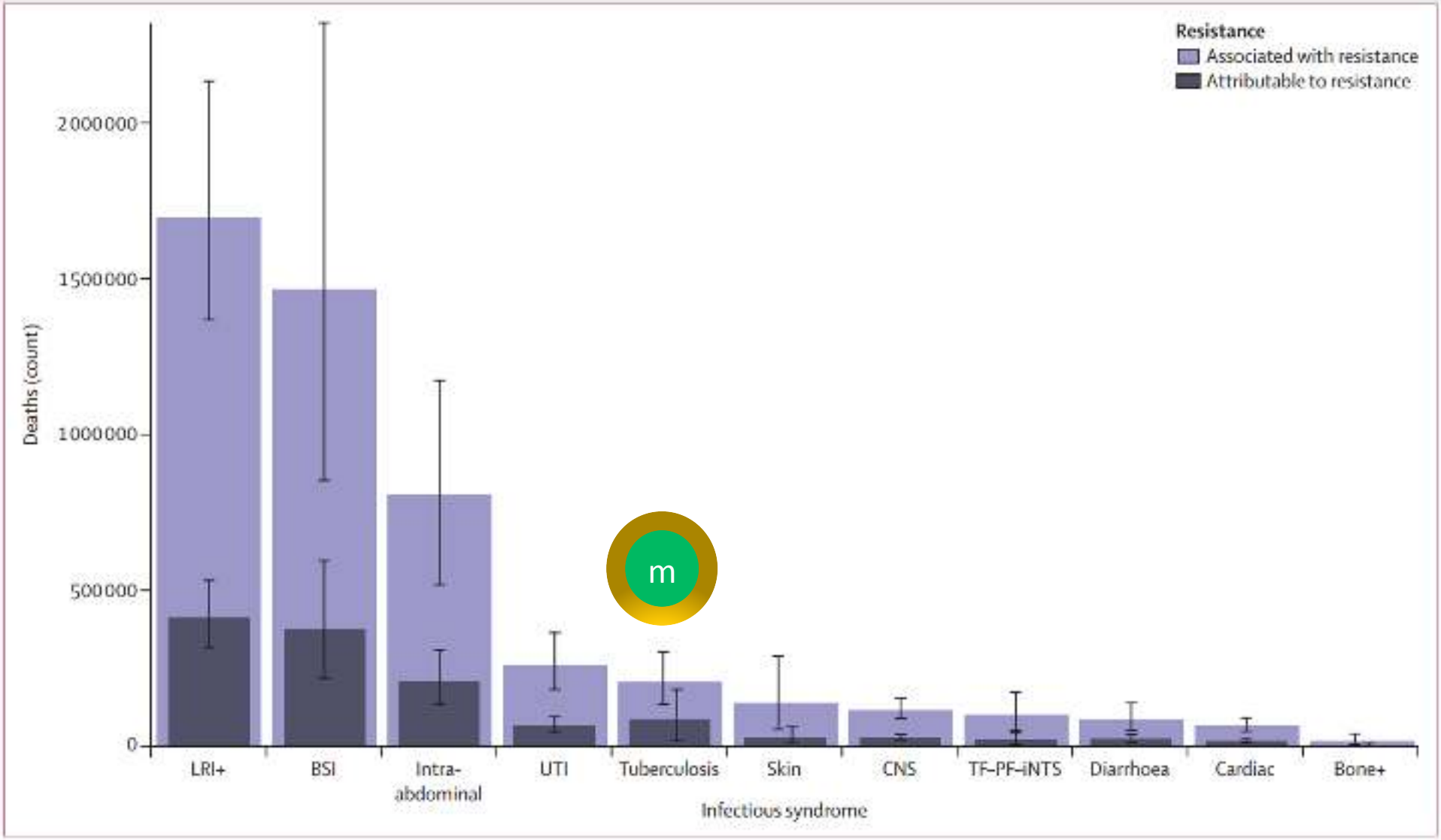
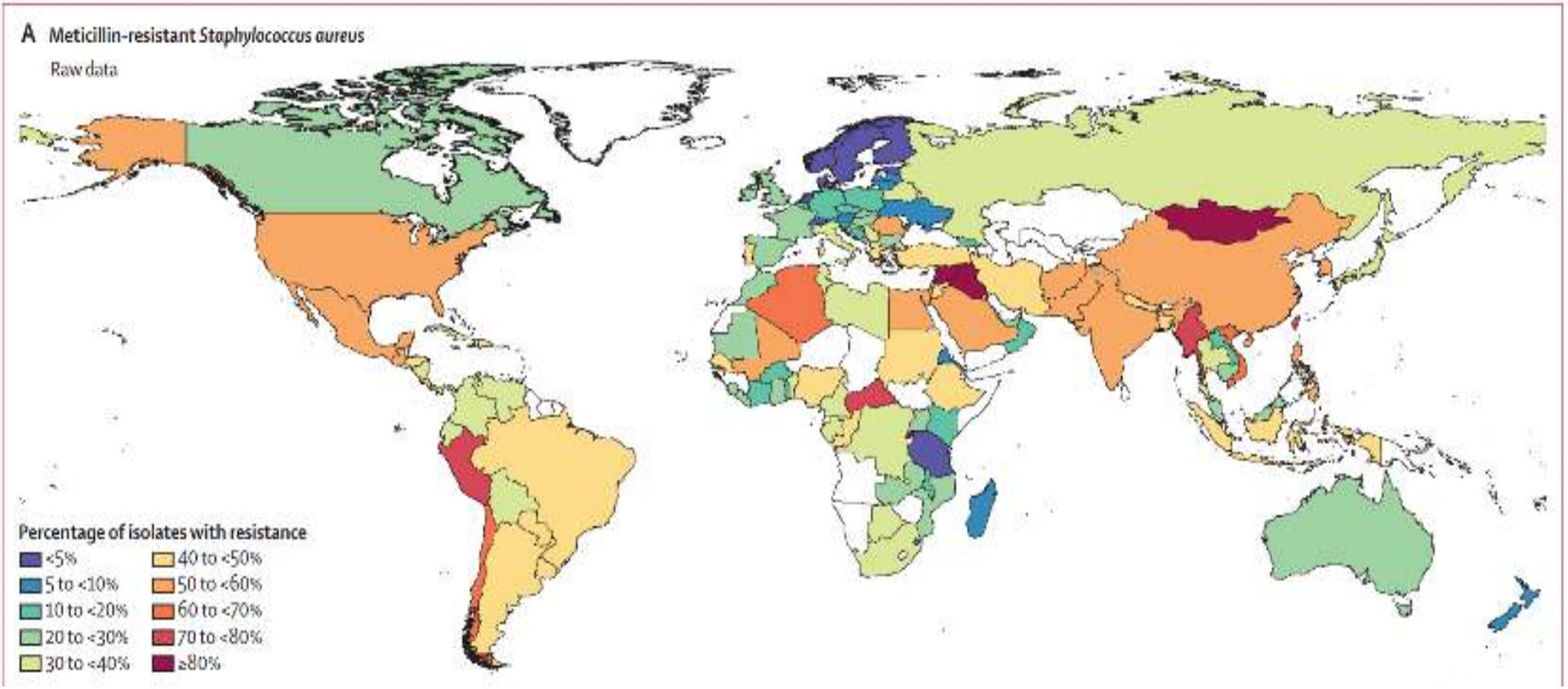
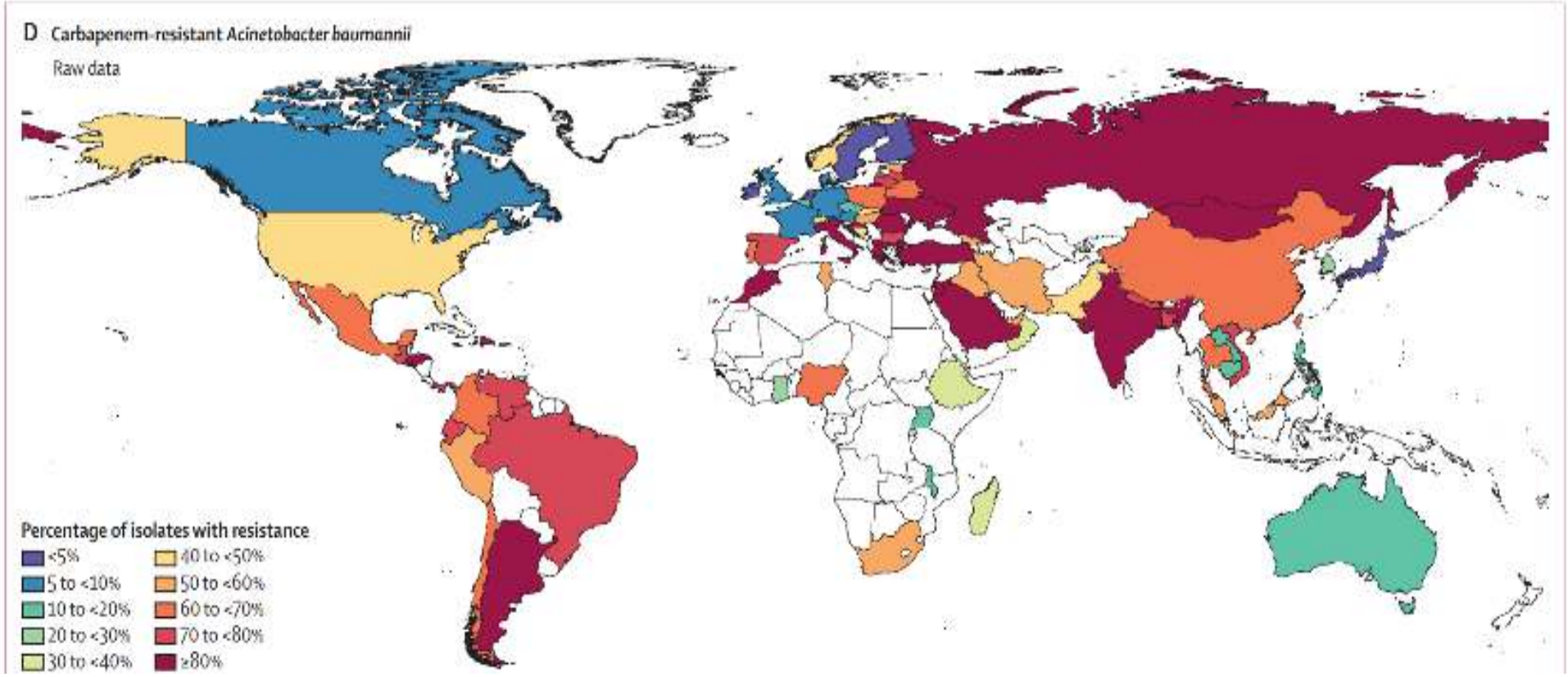
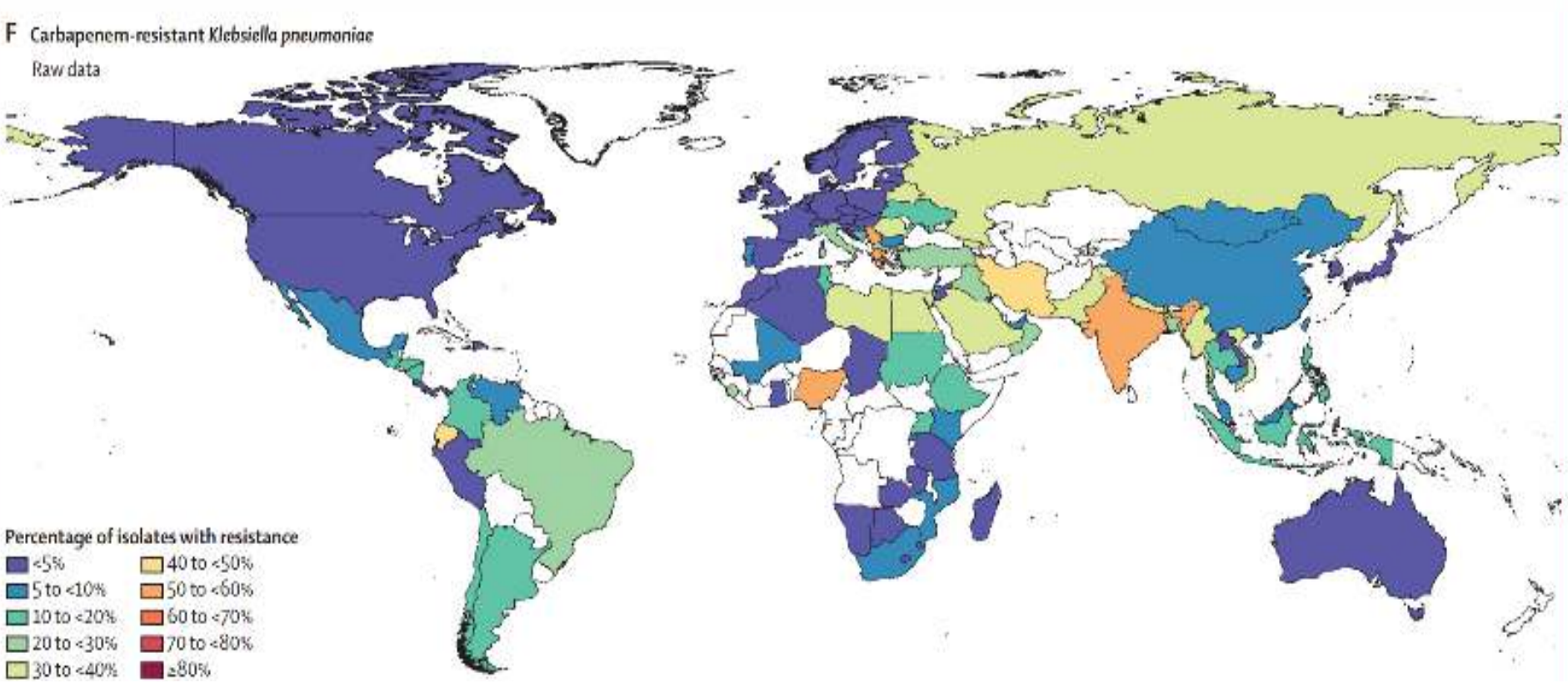
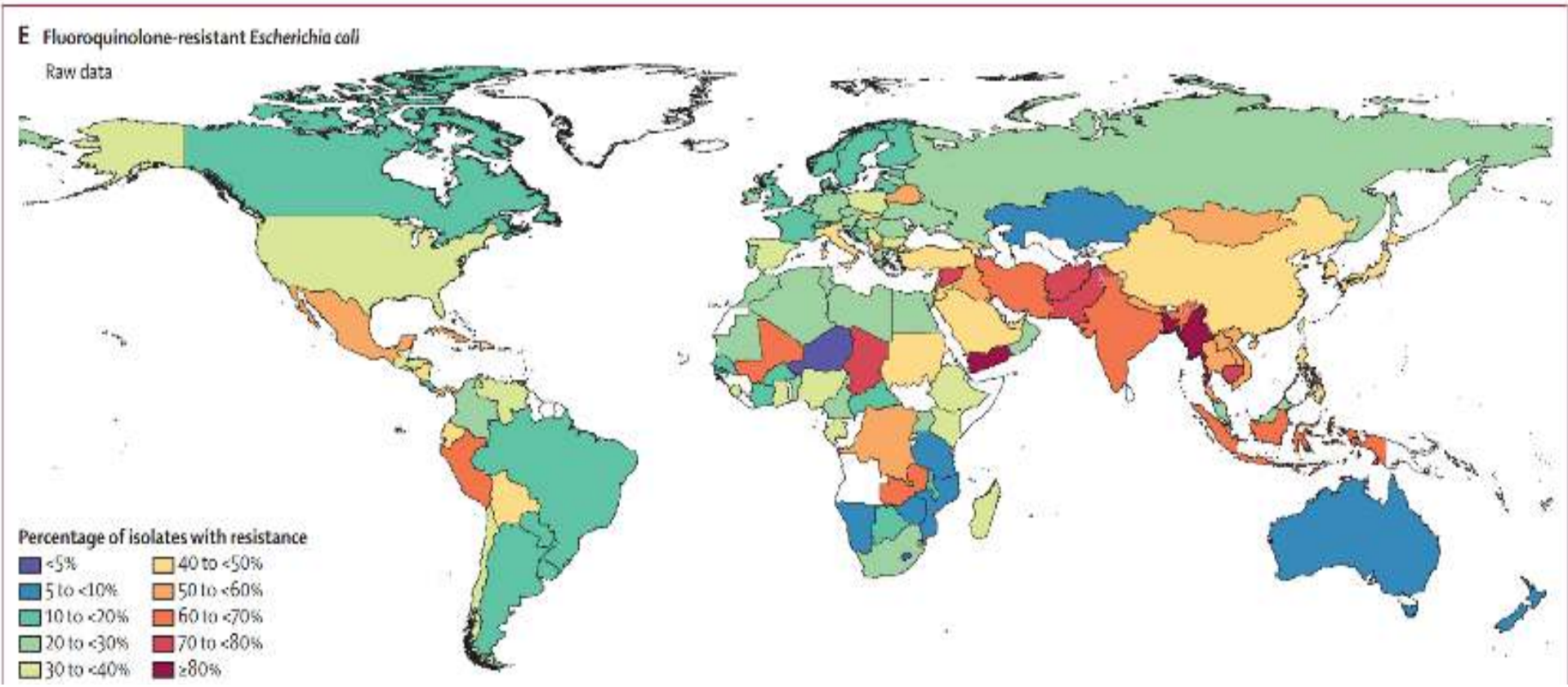


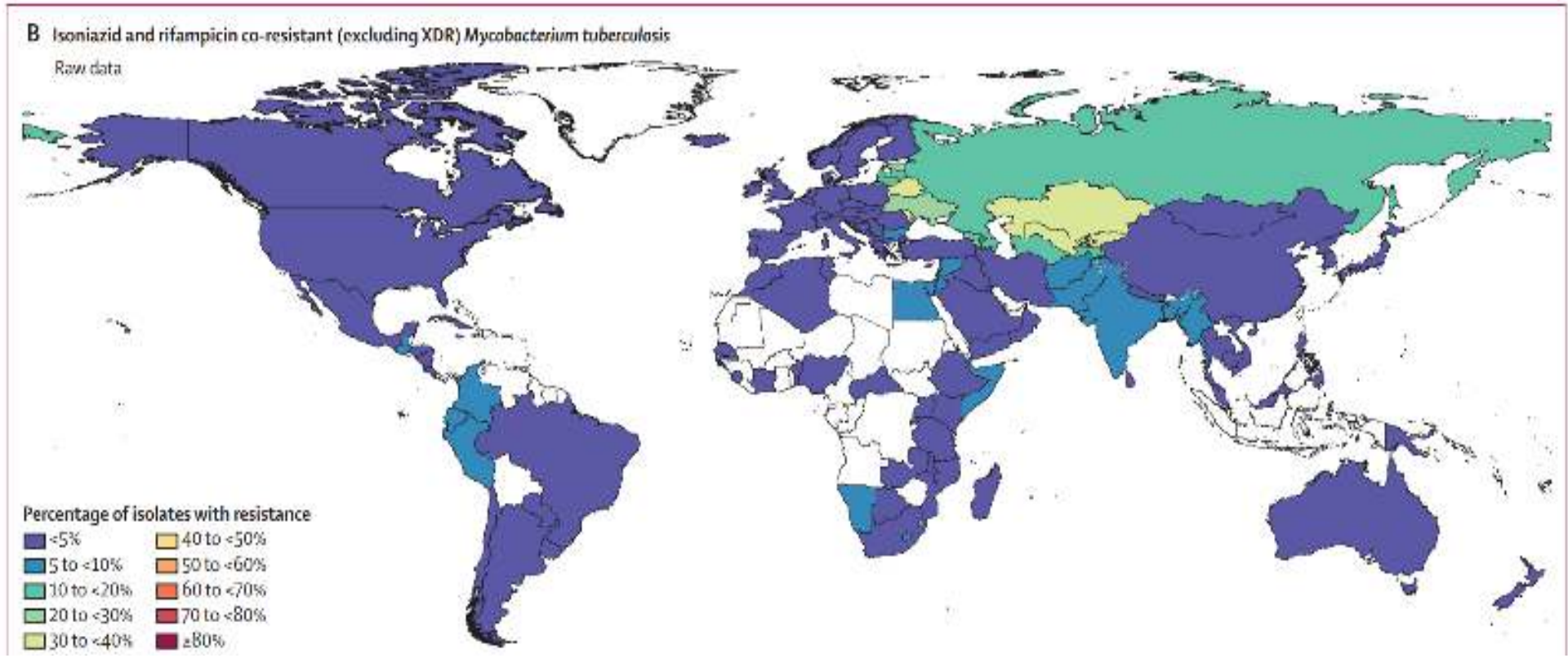
Figure 3: Global deaths (counts) attributable to and associated with bacterial antimicrobial resistance by infectious syndrome, 2019


A Meticillin-resistant Staphylococcus aureus
Raw data
Percentage of isolates with resistance
<5%
5 to <10%
10 to <20%
20 to <30%
30 to <40%
40 to <50%
50 to <60%
60 to <70%
70 to <80%
≥80%


D Carbapenem-resistant Acinetobacter baumannii
Raw data
Percentage of isolates with resistance
<5%
5 to <10%
10 to <20%
20 to <30%
30 to <40%
40 to <50%
50 to <60%
60 to <70%
70 to <80%
≥80%


F Carbapenem-resistant Klebsiella pneumoniae
Raw data
Percentage of isolates with resistance
<5%
5 to <10%
10 to <20%
20 to <30%
30 to <40%
40 to <50%
50 to <60%
60 to <70%
70 to <80%
≥80%


E Fluoroquinolone-resistant Escherichia coli
Raw data
Percentage of isolates with resistance
<5%
5 to <10%
10 to <20%
20 to <30%
30 to <40%
40 to <50%
50 to <60%
60 to <70%
70 to <80%
≥80%


B Isoniazid and rifampicin co-resistant (excluding XDR) Mycobacterium tuberculosis
Raw data
Percentage of isolates with resistance
<5%
5 to <10%
10 to <20%
20 to <30%
30 to <40%
40 to <50%
50 to <60%
60 to <70%
70 to <80%
≥80%

Emerging Microbes & Infections
2022, VOL. 11
https://doi.org/10.1080/22221751.2022.2030196

Ocak 2010 –Ekim 2020
6612 → 163 çalışma dahil

EMi
Taylor & Francis
OPEN ACCESS
Check for updates

Antibiotic resistance in hospital-acquired ESKAPE-E infections in low- and lower-middle-income countries: a systematic review and meta-analysis

Olaniyi Ayobami [a*], Simon Brinkwirth[a*], Tim Eckmanns[a] and Robby Markwart [a,b*]

[a]Unit for Healthcare Associated Infections, Surveillance of Antimicrobial Resistance and Consumption, Department of Infectious Disease Epidemiology, Robert Koch Institute, Berlin, Germany; [b]Jena University Hospital, Institute of General Practice and Family Medicine, Jena, Germany

Table 3. Comparison of resistance proportions in ESKAPE-E organisms between resource-limited countries and upper-middle-income and high-income countries[a].

Pathogen	L-LMIC countries (pooled estimates)	United States[b]	ReLAVRA[c] [50]	EU/EEA[d]	Germany[e]	Japan[f]	China[g]
S. aureus							
MRSA	48.2%	40.6%	47.7%	15.5%	9.9%	46.1%	31.4%
VRSA	0.6%	–	–	–	0.0%	0.0%	0.0%
VR-MRSA	1.7%	0.1%	–	–	–	0.0%	–
Carbapenem resistance in Gram-negative pathogens							
K. pneumoniae	34.8%	4.7%	16.5%	7.9%	0.6%	0.5%	20.9%
P. aeruginosa	37.1%	13.3%	–	16.5%	12.9%	20.0%	23.6%
E. coli	16.6%	0.6%	–	0.3%	0.0%	0.2%	1.9%
Enterobacter spp.	51.2%	4.6%	–	–	0.5%	4.7%	–
A. baumannii	72.4%	33.9%	–	32.6%	4.7%	1.8%	70.7%
Third-generation cephalosporin resistance in Gram-negative pathogens							
K. pneumoniae	78.7%	22.9%	62.2%	31.3%	13.1%%	11.4%	47.3%
E. coli	78.6%	22.0%	–	15.1%	11.8%	28.9%	59.3%
Enterobacter spp.	83.5%	9.5%	–	–	25.6%	37.2%	–

COVID-19 Impacts on

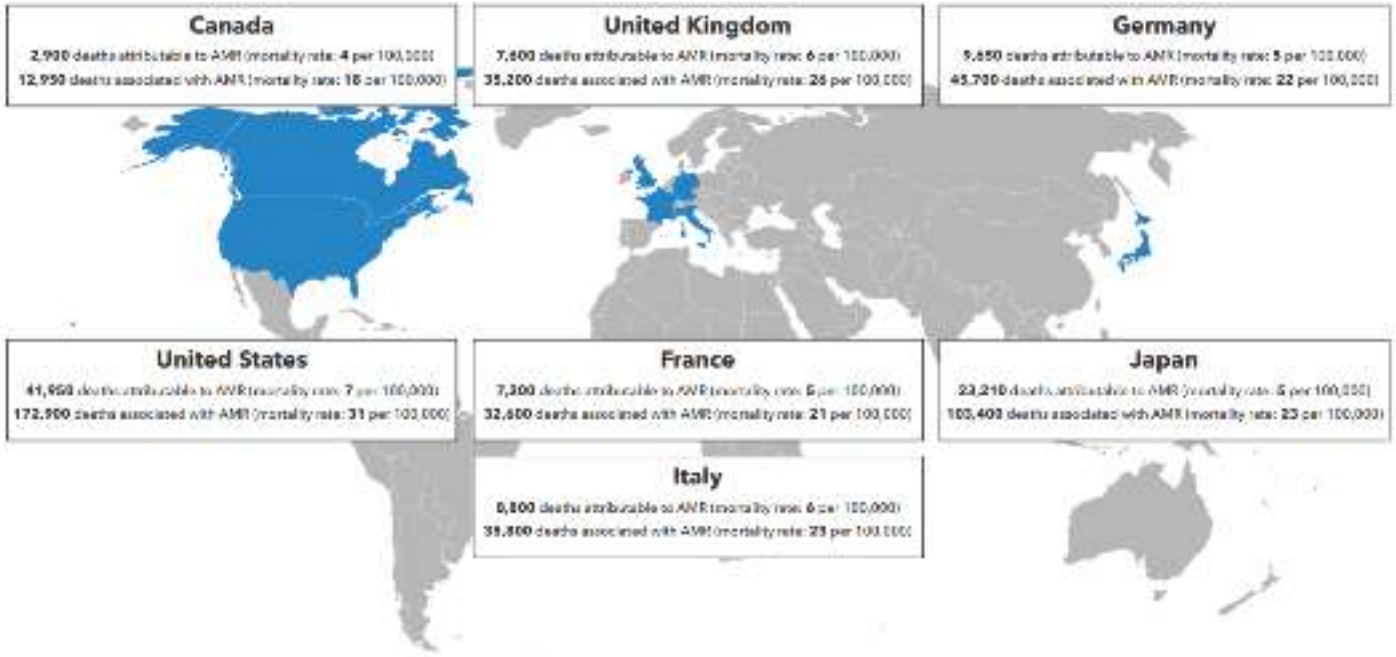
18 Antimicrobial-Resistant Bacteria and Fungi

Threat Estimates

The following table summarizes the latest national death and infection estimates for 18 antimicrobial-resistant bacteria and fungi. The pathogens are listed in three categories—urgent, serious, and concerning—based on level of concern to human health identified in 2019.

	Resistant Pathogen	2017 Threat Estimate	2018 Threat Estimate	2019 Threat Estimate	2017-2019 Change	2020 Threat Estimate and 2019-2020 Change
SERIOUS	Multidrug-resistant *Pseudomonas aeruginosa*	32,600 cases 2,700 deaths	29,500 cases 2,500 deaths	28,200 cases 2,400 deaths	Decrease*	28,800 cases 2,500 deaths Overall: Stable* **Hospital-onset: 32% increase***
SERIOUS	Drug-resistant nontyphoidal *Salmonella*	212,500 infections 70 deaths	228,290 infections	254,810 infections	Increase	Data delayed due to COVID-19 pandemic† 14% of infections were resistant, a 3% decrease
SERIOUS	Drug-resistant *Salmonella* serotype Typhi	4,100 infections <5 deaths	4,640 infections	6,130 infections	Increase	Data delayed due to COVID-19 pandemic† 85% of infections were resistant, a 10% increase
SERIOUS	Drug-resistant *Shigella*	77,000 infections <5 deaths	215,850 infections	242,020 infections	Increase	Data delayed due to COVID-19 pandemic† 46% of infections were resistant, a 2% increase
SERIOUS	Methicillin-resistant *Staphylococcus aureus*	323,700 cases 10,600 deaths	298,700 cases 10,000 deaths	306,600 cases 10,200 deaths	Stable*	279,300 cases 9,800 deaths Overall: Stable* **Hospital-onset: 13% increase***
SERIOUS	Drug-resistant *Streptococcus pneumoniae*	12,100 invasive infections 1,500 deaths†	See pathogen page if comparing data over time	12,000 invasive infections 1,200 deaths	Stable	Data delayed due to COVID-19 pandemic
SERIOUS	Drug-resistant Tuberculosis (TB)	888 cases 73 deaths†	962 cases 102 deaths	919 cases	Stable	661 cases Decrease†
CONCERNING	Erythromycin-resistant group A *Streptococcus*	5,400 infections 450 deaths†	See pathogen page if comparing data over time	6,200 infections 560 deaths	Increase	Data delayed due to COVID-19 pandemic
CONCERNING	Clindamycin-resistant group B *Streptococcus*	13,000 infections 720 deaths†	See pathogen page if comparing data over time	15,300 cases 940 deaths	Increase	Data delayed due to COVID-19 pandemic

A snapshot of the AMR landscape in the G7 countries:
Attributable and associated death counts with age-standardized mortality rates per 100,000 people



In 2019, almost **half a million deaths** could have been prevented in all G7 countries combined, if all drug-resistant infections were prevented.

IHME | UNIVERSITY of WASHINGTON

GRAM Global Research on Antimicrobial Resistance

IN COOPERATION WITH ROBERT KOCH INSTITUT

Türkiye'de Sağlık Bakımı ile İlişkili Enfeksiyonlarda Antimikrobiyal Direnç Oranları

	2019 (%)	2020 (%)	2021 (%)
Vankomisin dirençli *E. faecium*	18.90	17.66	20.03
Vankomisin dirençli E. *faecalis*	3.80	2.84	4.01
MRSA	43.91	39.23	48.19
MRKNS	66.25	66.51	85.99
E. coli Suşlarında ESBL	44.54	44.61	54.53
Klebsiella pneumoniae Suşlarında ESBL	52.13	50.24	66.00
Karbapenem dirençli *Acinetobacter baumannii*	72.60	73.18	91.11
Karbapenem dirençli *Pseudomonas aeruginosa*	34.92	39.73	64.25
Karbapenem dirençli *Klebsiella pneumoniae*	44.26	48.95	63.57
Kolistin dirençli *Acinetobacter baumannii*	5.07	3.88	10.96
Kolistin dirençli *Klebsiella pneumoniae*	11.11	12.10	31.93

Ulusal Sağlık Hizmeti İlişkili Enfeksiyonlar Sürveyans Ağı (USHİESA) Özet Raporu 2019, 2020,

2022 Sağlık Bakımı ile İlişkili Enfeksiyonlarda Antimikrobiyal Direnç Oranları

	2019 (%)	2020 (%)	2021 (%)	2022 (%)
Vankomisin dirençli *E. faecium*	18.90	17.66	20.03	66.7
Vankomisin dirençli E. *faecalis*	3.80	2.84	4.01	0
MRSA	43.91	39.23	48.19	77
MRKNS	66.25	66.51	85.99	81.8
E. coli Suşlarında ESBL	44.54	44.61	54.53	90
Klebsiella pneumoniae Suşlarında ESBL	52.13	50.24	66.00	89.7
Karbapenem dirençli *Acinetobacter baumannii*	72.60	73.18	91.11	97.7
Karbapenem dirençli *Pseudomonas aeruginosa*	34.92	39.73	64.25	61.9
Karbapenem dirençli *Klebsiella pneumoniae*	44.26	48.95	63.57	70
Kolistin dirençli *Acinetobacter baumannii*	5.07	3.88	10.96	21.2
Kolistin dirençli *Klebsiella pneumoniae*	11.11	12.10	31.93	53.6

World Health Organization

Health Topics | Countries | Newsroom | Emergencies

Home / News / Tuberculosis deaths and disease increase during the COVID-19 pandemic

Mikobakteri

Tuberculosis deaths and disease increase during the COVID-19 pandemic

27 October 2022 | News release | Reading time: 5 min (1316 words)

An estimated 10.6 million people fell ill with tuberculosis (TB) in 2021, an increase of 4.5% from 2020, and 1.6 million people died from TB (including 187 000 among HIV positive people), according to the World Health Organization's 2022 Global TB report. The burden of drug-resistant TB (DR-TB) also increased by 3% between 2020 and

World Health Organization

Health Topics | Countries | Newsroom | Emergencies

Home / News / Tuberculosis deaths and disease increase during the COVID-19 pandemic

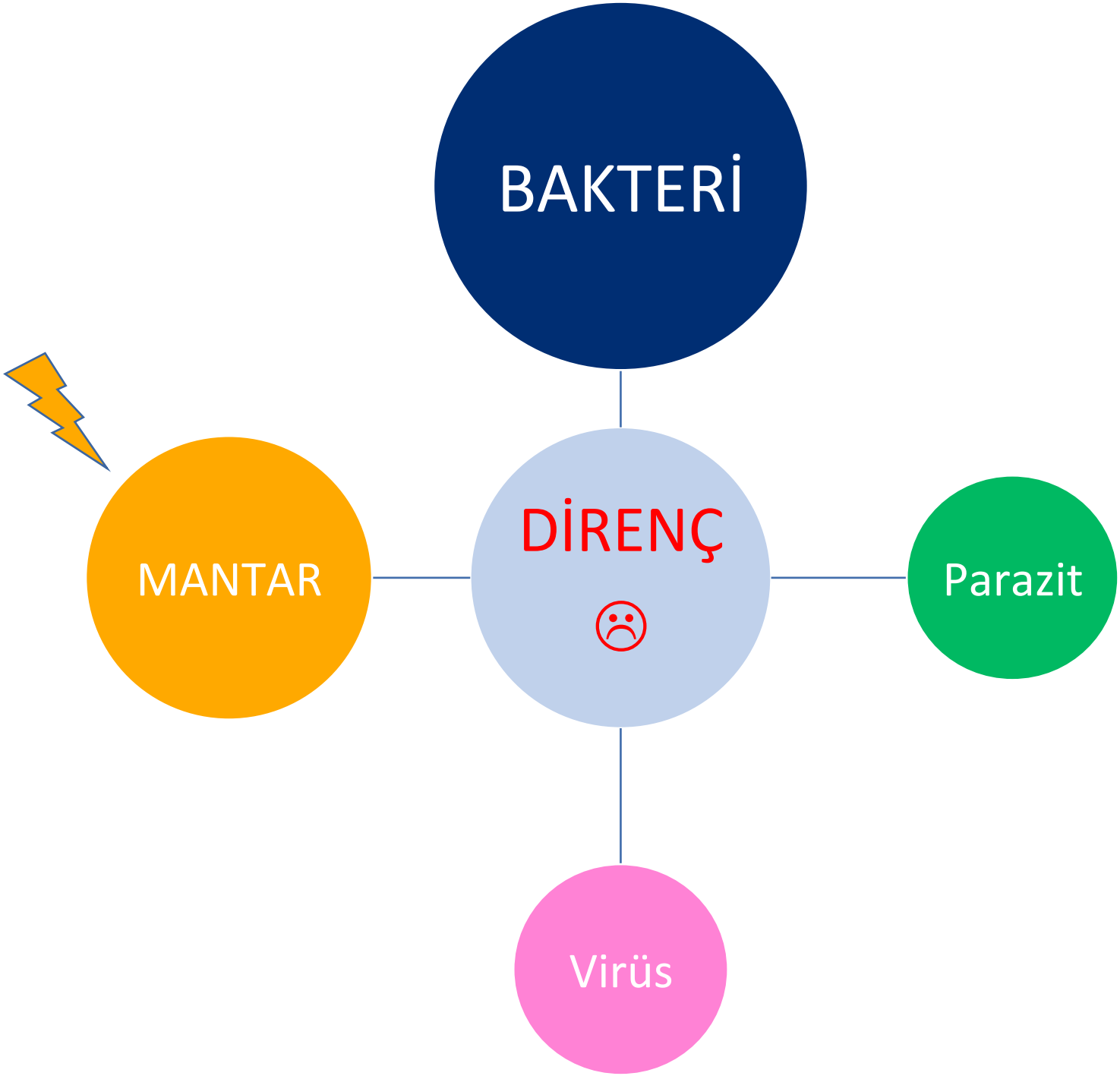
Dünya Sağlık Örgütü 2022 Global Tüberküloz (TBC) Raporu

2021'de 2020'ye göre %4.5 artışla 10.6 milyon kişi TBC
(1.6 milyon kişi TBC'den öldü)
İlaca dirençli TBC 2020 ve 2021 arasında %3 arttı
(2021'de yeni 450 000 kişi rifampisine dirençli TBC)

TBC ve ilaca dirençli TBC'de yıllardan beri ilk kez bir artış rapor edildi

27 October 2022 | News release | Reading time: 5 min (1316 words)

An estimated 10.6 million people fell ill with tuberculosis (TB) in 2021, an increase of 4.5% from 2020, and 1.6 million people died from TB (including 187 000 among HIV positive people), according to the World Health Organization's 2022 Global TB report. The burden of drug-resistant TB (DR-TB) also increased by 3% between 2020 and


BAKTERİ
MANTAR
DİRENÇ
☹
Parazit
Virüs

Agent	Impact	Geographical distribution	At-risk population	Antifungal susceptibility	Special feature
Candida albicans	Most commonly encountered species worldwide, except India	Worldwide	Premature neonates, comorbidities, prolong ICU stay, use of intravascular devices, invasive procedures, immune suppression	Fairly susceptible to all antifungals	Phenotypic switch for invasiveness, in vivo response to antifungal governed by biofilm production
Candida glabrata	20–25% IC in developed world	Worldwide	Advanced age	Inherent resistance to fluconazole	11% MDR
Candida tropicalis	Most common species in India, Highest mortality	Worldwide	Neutropenia, broad-spectrum antibiotics	Increasing azole resistance in Asia. MDR strains (azole + amphotericin B)	Persistent infection, phenotypic switch, biofilm formation
Candida parapsilosis	Bimodal affection, critically ill patients and neonates	Leading agent in South Africa, 2nd most common agent in Japan, China, South America	Critically ill patients with indwelling catheters, premature neonates on total parenteral feed	Good susceptibility, <3% strains resistant to azoles, echinocandins, or amphotericin B	Increased reporting among neonates in the USA and Australia
Candida auris	Most common Candida in Indian critically ill patients, MDR, high mortality	Healthcare settings worldwide	Critically ill patients, colonization	Varies with clade; I, MDR; II, low resistance; III, susceptible to amphotericin B; IV, variable	Increased isolation during COVID-19, easily transmitted
Candida krusei	Most common species in neonates of South African hospital	3% in Europe and north America, less in Asia pacific	Malignancy	Azole resistance reported	Emerging pathogen, neonatal outbreak
Candida blankii	>12 cases of IC reported	India	Neonates	MDR reported	Neonatal outbreak with >40% mortality
Candida africana	>50 cases of IC reported	Africa predominantly	None specified	Resistance to fluconazole and voriconazole reported	Routine diagnostics identify it as C. albicans
Candida viswanathii	>40 cases of IC reported	Different parts of world, highest cases from India	Chronic diseases, immune suppression	Increasing MIC to fluconazole reported	Routine diagnostics identify it as C. tropicalis
Clavispora lusitaniae	0.2–9% of all cases of IC	Worldwide	Neutropenia, pediatric patients on broad spectrum antibiotics	Switching susceptibility to amphotericin B	Routine diagnostics cannot different it from C. krusei and C. parapsilosis
C. kefyr (*K. marxianus*)	Low	Worldwide	Hematological malignancy	MDR reported	Need ITS2 sequencing for

Sharma M, Chakrabarti A. Candidiasis and Other Emerging Yeasts. Curr Fungal Infect Rep. 2023 Jan 31:1-10. doi: 10.1007/s12281-023-00455-3. Epub ahead of print. PMID: 36741271; PMCID: PMC9886541.

C.auris'e bağlı kandidemi gelişen 23 olgunun Anti-fungal MIC değerleri (Kasım 2020 – Mart 2022)

	MIC <0.06	MIC 0.06	MIC 0.12	MIC 0.25	MIC 0.5	MIC 1	MIC 2	MIC 4	MIC 8	MIC >8
Flukonazol	-	-	-	-	-	-	-	-	-	23
Vorikonazol	-	-	-	2	-	1	3	1	16	-
Posakonazol	2	2	1	-	1	-	2	-	15	-
Kaspofungin	-	7	7	5	1	-	-	-	3	-
Anidulafungin	-	-	13	10	-	-	-	-	-	-
Amfoterisin B	-	-	-	-	-	3	14	5	1	-

vaccines

MDPI

Review

The Development of Technology to Prevent, Diagnose, and Manage Antimicrobial Resistance in Healthcare-Associated Infections

Ayman Elbehiry [1,2,*], Eman Marzouk [1], Adil Abalkhail [1], Yasmine El-Garawany [3], Sulaiman Anagreyyah [4], Yaser Alnafea [5], Abdulaziz M. Almuzaini [6], Waleed Alwarhi [7], Mohammed Rawway [8,9] and Abdelmaged Draz [6]

MDR NEDENLİ SBİ ENF. ÖNLENMESİ	HIZLI TANI	YENİLİKÇİ YAKLAŞIMLAR
Atık su yönetimi Yüzey temizliği Tıbbi cihaz temizliği Sağlık çalışanlarının özel eşyaları ve kıyafetleri	DNA dizileme Peptid kütle parmak izi Spektrometre	Nano partikül Monoklonal antikor Bakteriyofaj Antimikrobiyal peptid Aşı

Teşekkürler …