Antimikrobiyaller
i Dikkatli Kullan!!!

Antibiyotik Tüketimi ve Direnç İlişkisi; Güncel Durum

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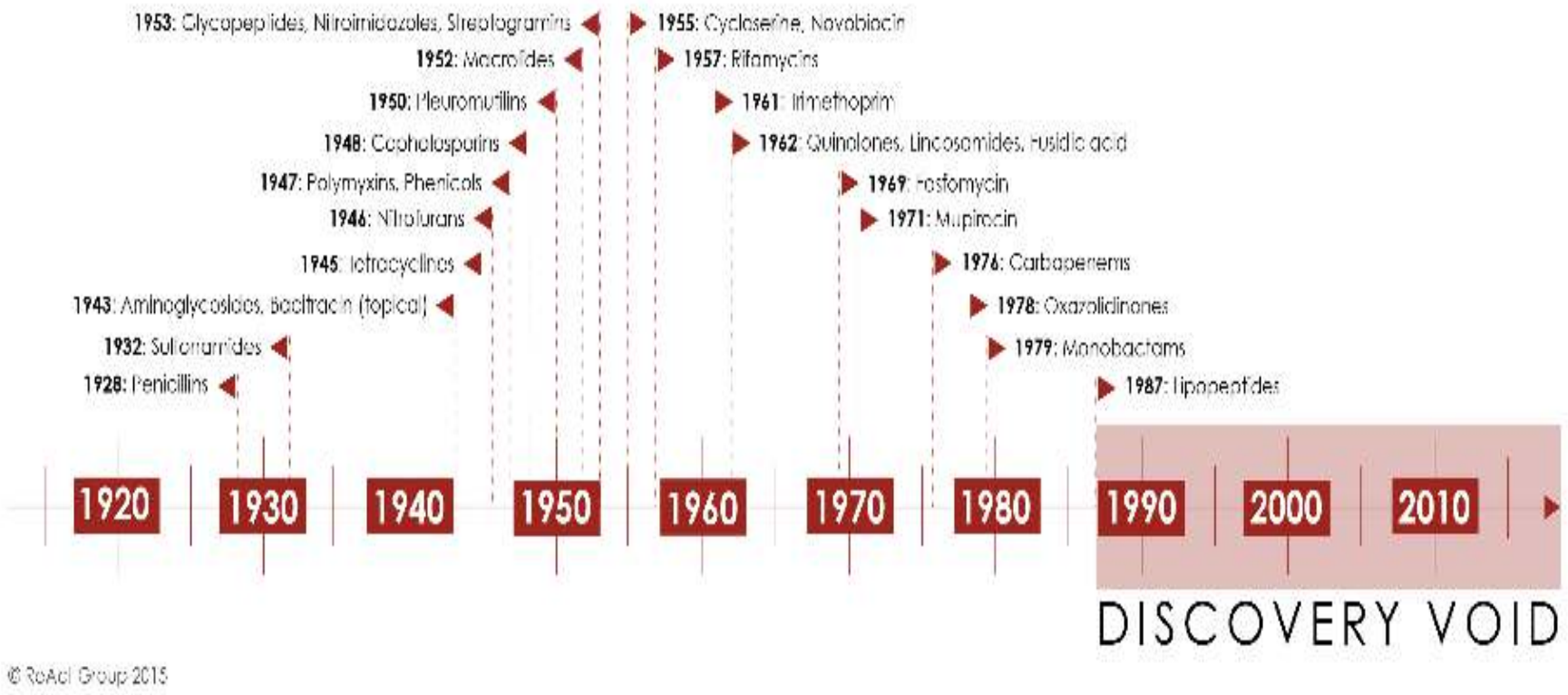
Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji Kliniği

Sunum planı

- Antibiyotik keşif süreci
- Antibiyotik kullanımı ve direnç
- Türkiye’de antibiyotik kullanımı ve direnç sorunu

Antibiyotiklerin Keşfi



https://www.reactgroup.org/news-and-views/news-and-opinions/year-2021/the-world-needs-new-antibiotics-so-why-arent-they-developed/

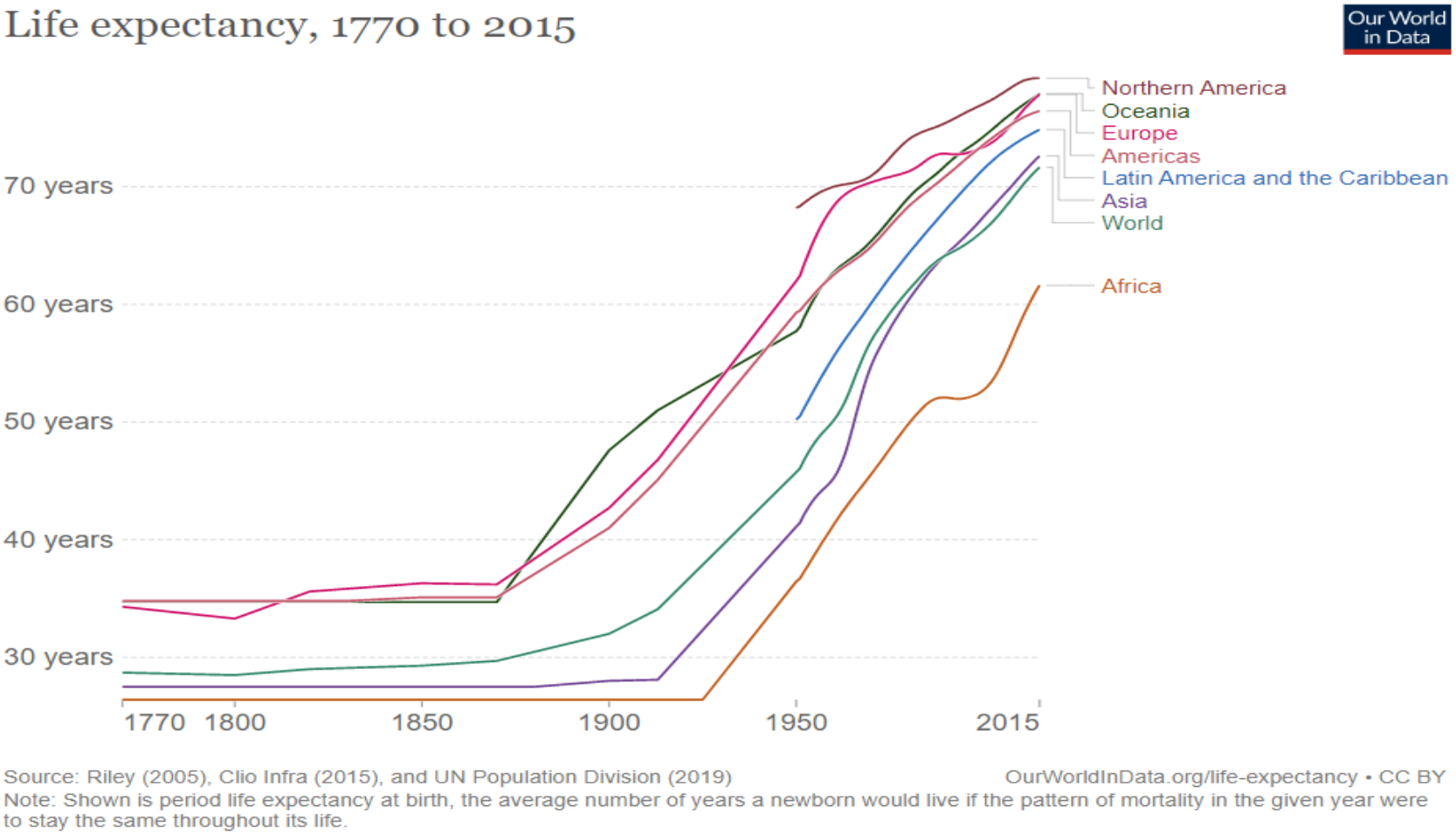
Bulaşıcı hastalıkların çoğu artık açığa çıktı. Birçok hastalık tamamen ortadan kalkacak.

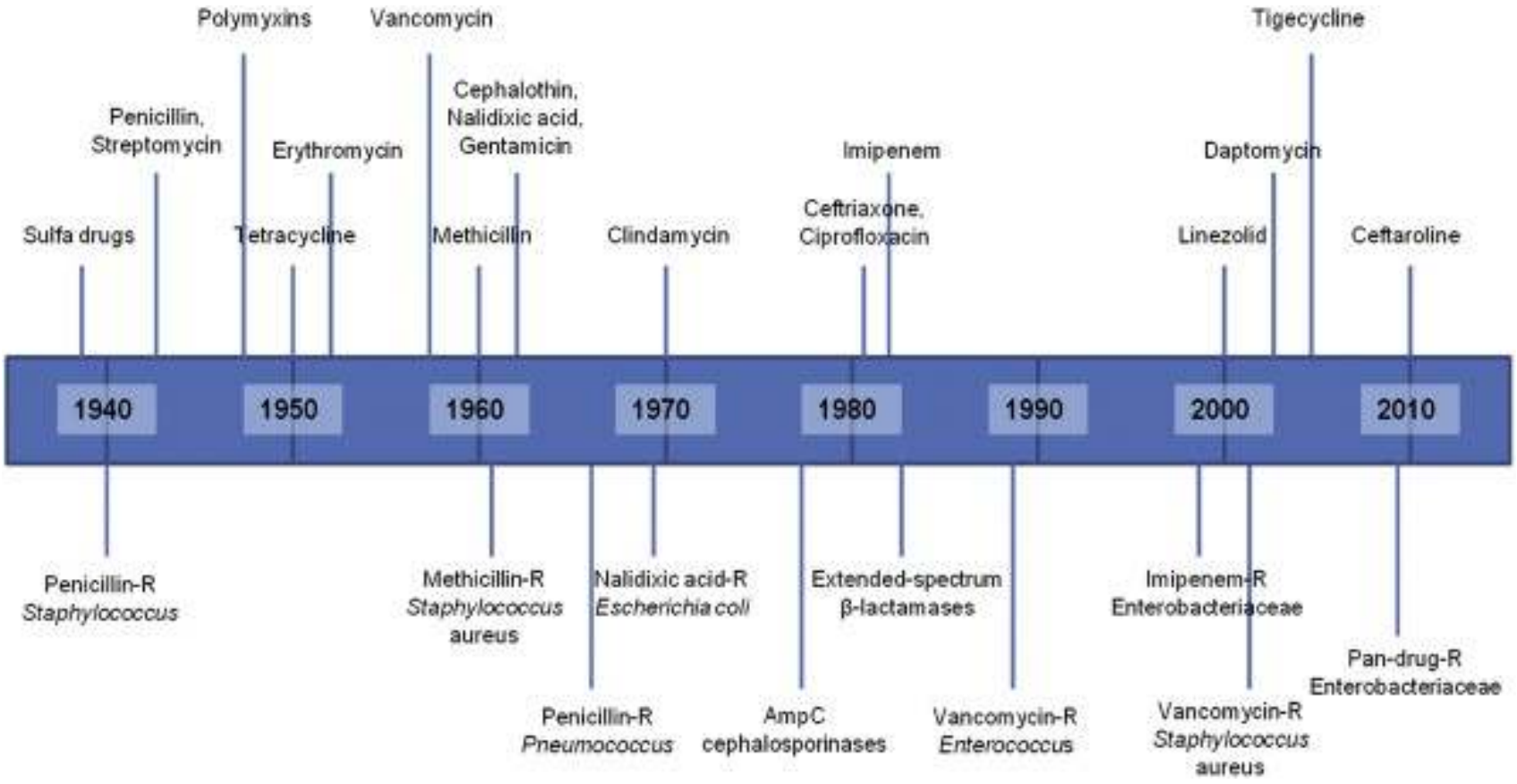
- “Most of the infectious diseases have now yielded up their secrets. Many illnesses have been completely exterminated”
  - Dr. Henry Sigerist (1931)

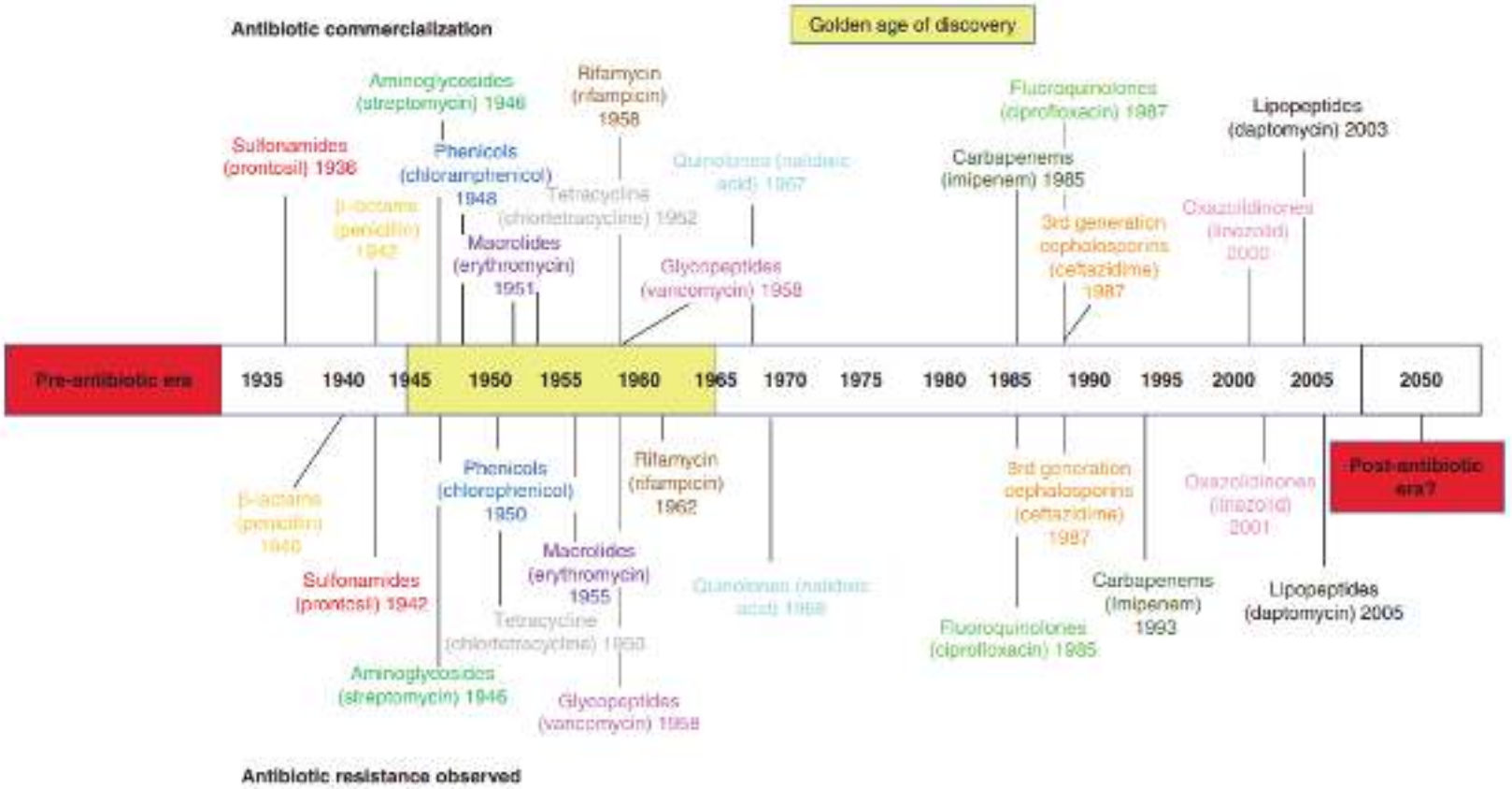
- “It is time to close the book on infectious diseases”
  - Surgeon General William Stewart (1969)

Bulaşıcı hastalıklar kitabını kapatmanın zamanı geldi.

Antibiyotiklerin Keşfi ve Yaşam süresi

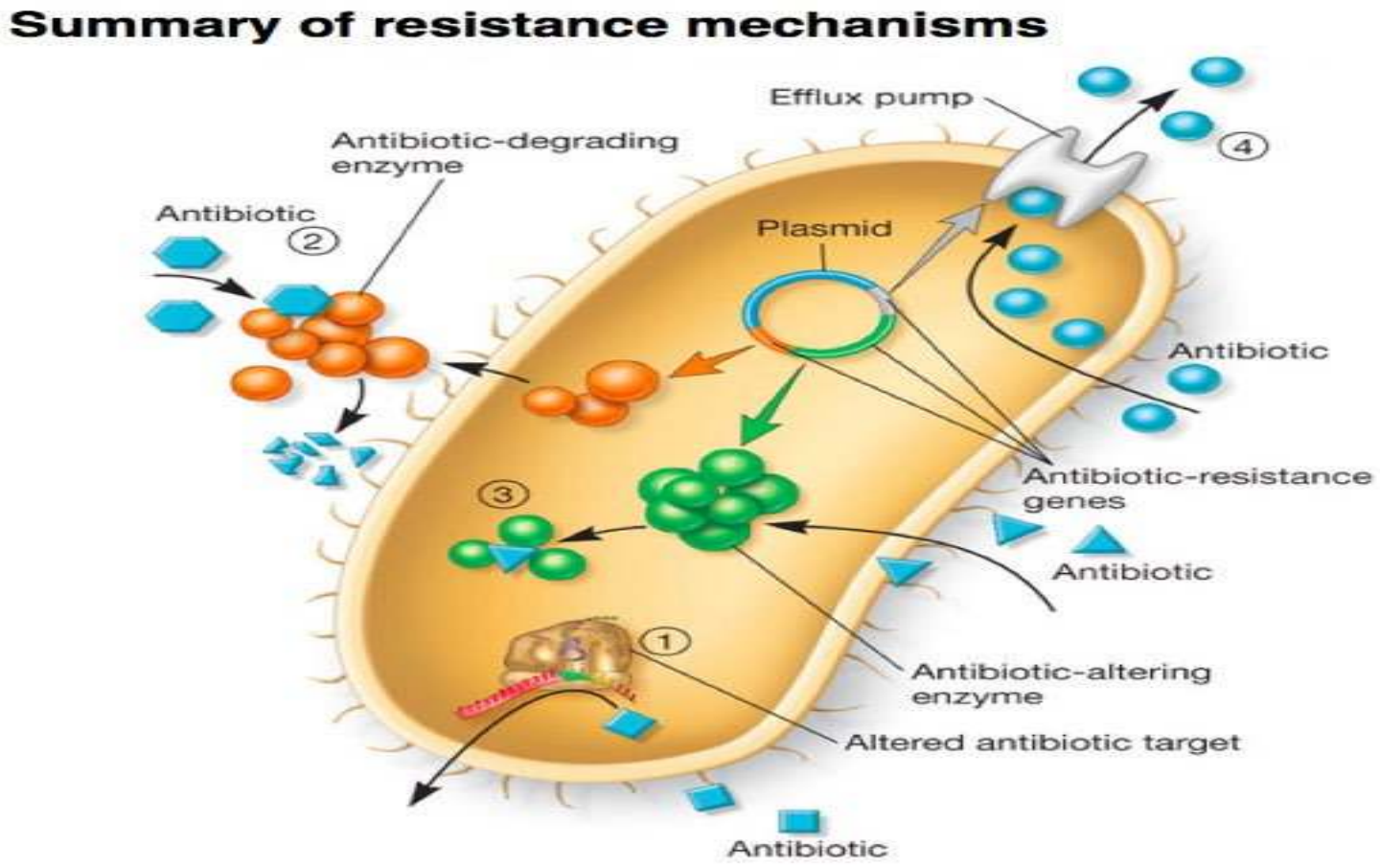



Polymyxins
Vancomycin
Tigecycline
Penicillin, Streptomycin
Cephalothin, Nalidixic acid, Gentamicin
Erythromycin
Imipenem
Daptomycin
Ceftriaxone, Ciprofloxacin
Sulfa drugs
Tetracycline
Methicillin
Clindamycin
Linezolid
Ceftaroline
1940
1950
1960
1970
1980
1990
2000
2010
Penicillin-R Staphylococcus
Methicillin-R Staphylococcus aureus
Nalidixic acid-R Escherichia coli
Extended-spectrum β-lactamases
Imipenem-R Enterobacteriaceae
Pan-drug-R Enterobacteriaceae
Penicillin-R Pneumococcus
AmpC cephalosporinases
Vancomycin-R Enterococcus
Vancomycin-R Staphylococcus aureus

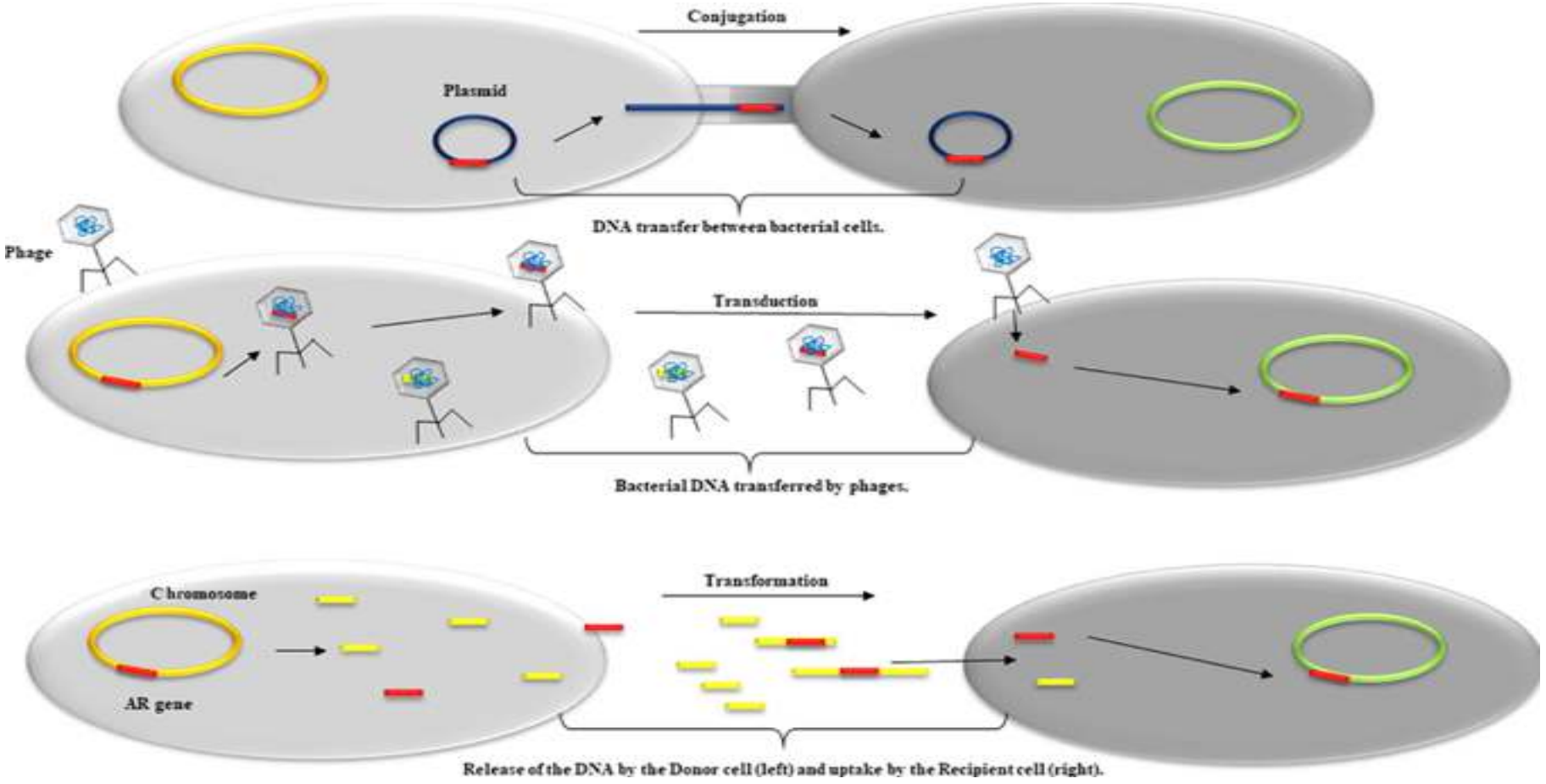


Stephens LJ et Al. Antimicrobial innovation: a current update and perspective on the antibiotic drug development pipeline. Future Med Chem. 2020 Nov;12(22)

Bakterilerin Antimikrobiyaller ile Savaşı



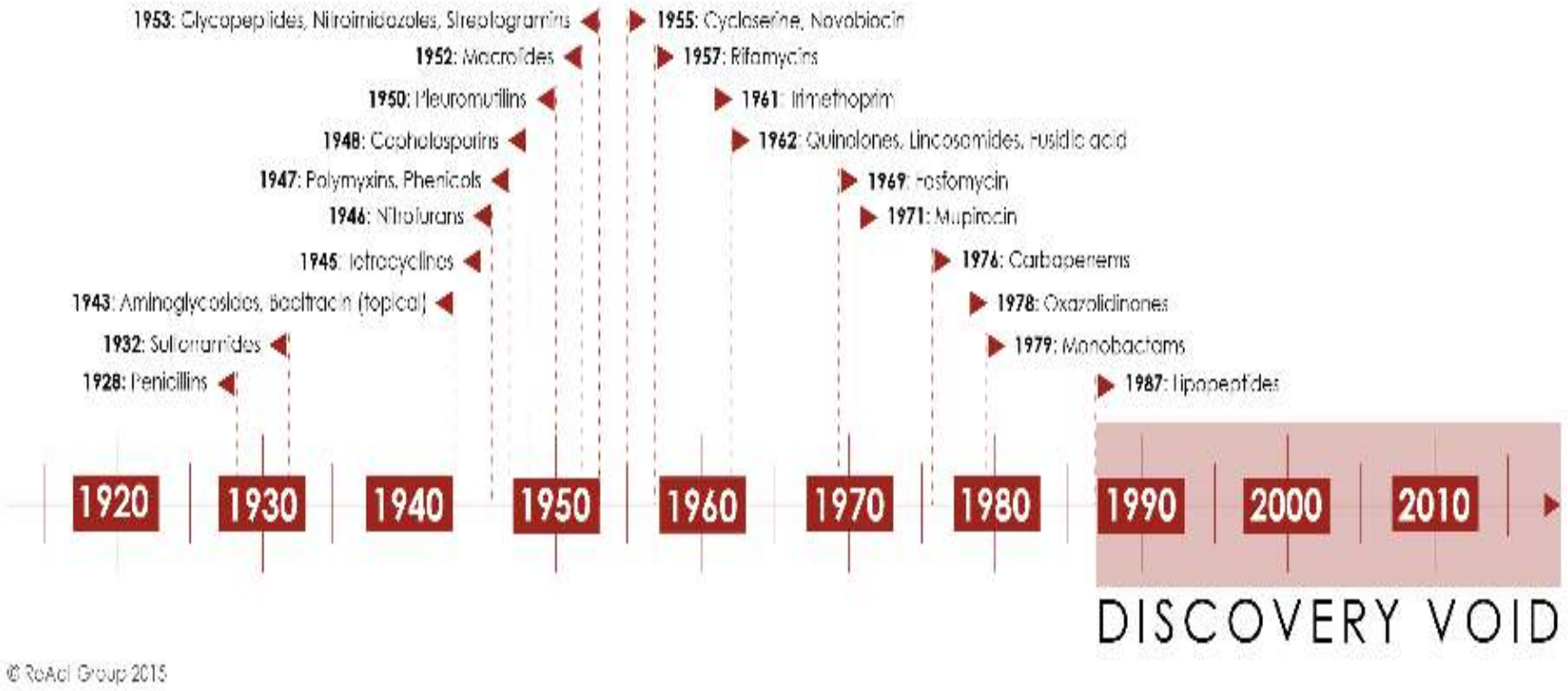
Direnç Plazmidlerinin Aktarımı



Vrancianu CO et al. Targeting Plasmids to Limit Acquisition and Transmission of Antimicrobial Resistance. Front Microbiol. 2020 May 6;11:761

https://images.slideplayer.com/21/6268598/slides/slide_3.jpg

Neden Yeni Antibiyotik Keşfi Yok

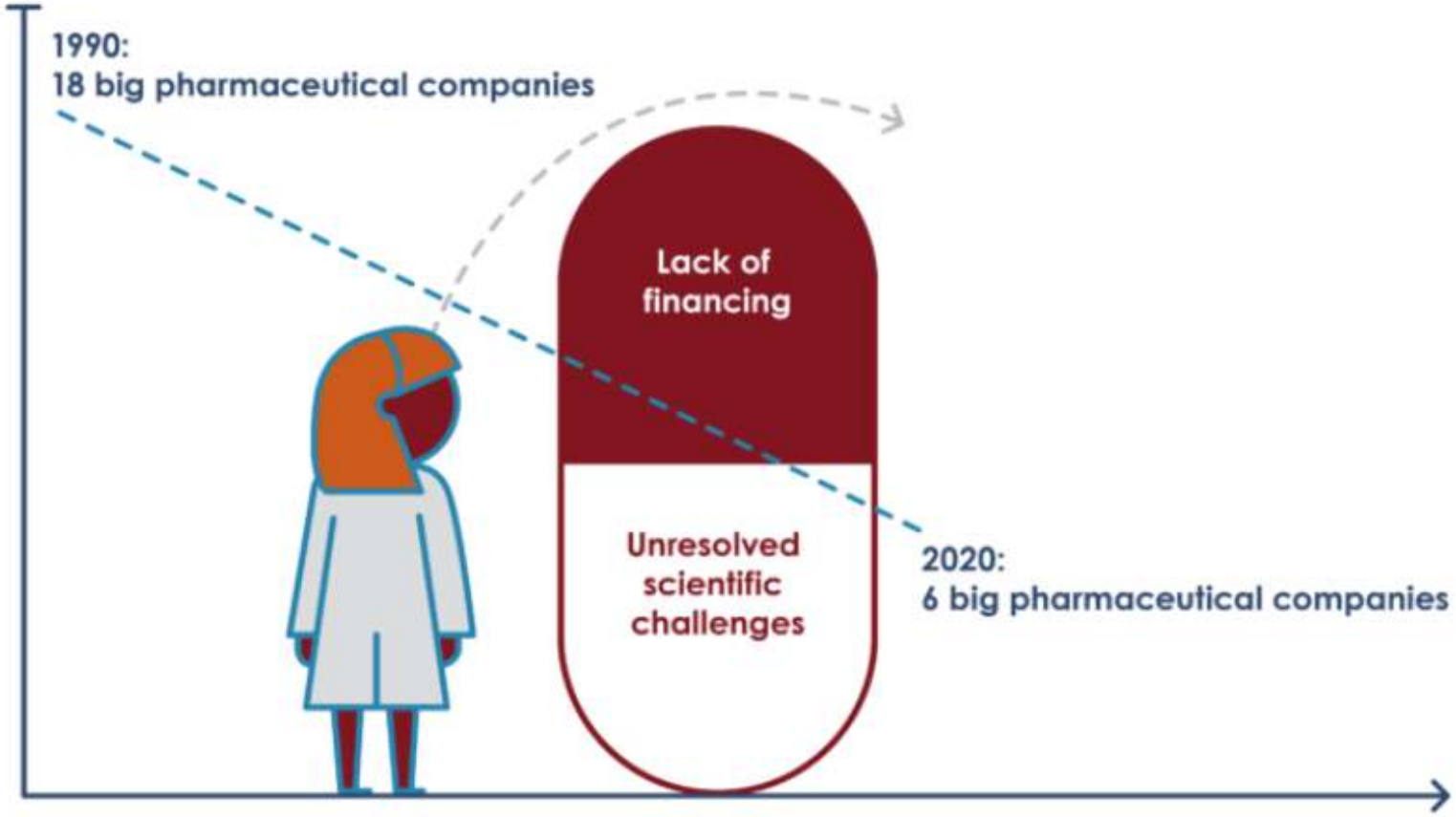


https://www.reactgroup.org/news-and-views/news-and-opinions/year-2021/the-world-needs-new-antibiotics-so-why-arent-they-developed/

İlaç Endüstrisi

- Hepatit C'de tam kür elde edildi,
- Kombine antiretroviral tedaviler ile HIV ile enfekte hastalarda yaşam beklentisi enfekte olmayanlara yakın oldu
- Hepatit B'de de tam kür sağlanamasa da siroz ve HCC çok azaldı.

- Neden yeni antibakteriyel keşfi yok??



https://www.reactgroup.org/news-and-views/news-and-opinions/year-2021/the-world-needs-new-antibiotics-so-why-arent-they-developed/

İlaç Şirketleri

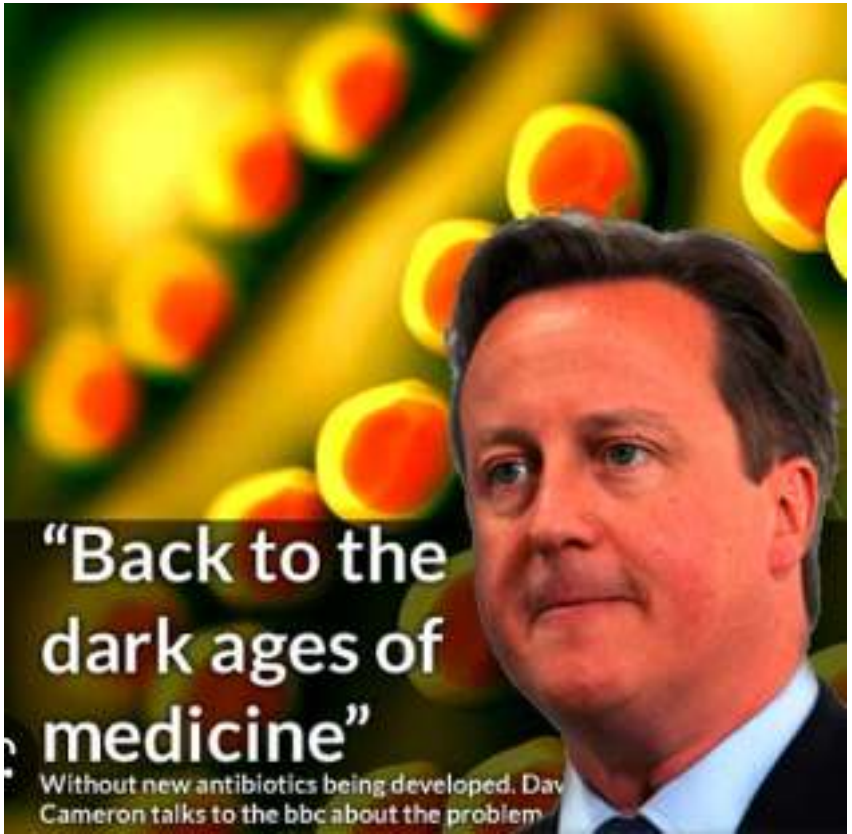
- 2011 yılında, Pfizer antibiyotik araştırma merkezini kapattı .
- 2016 ve 2018 yılları arasında dört büyük şirket – AstraZeneca, Sanofi, Novartis ve Allergan – hepsi antibiyotik Ar-Ge'sinden çıktı.
- 2014'te Merck, uzun süredir devam eden enfektif ilaç şirketi Cubist'i satın aldı. Ancak bu sevindirici gelişme de kısa sürdü. Sadece 3 ay sonra Merck 120 araştırmacıyı işten çıkardı ve Cubist'in erken aşamadaki keşif araştırma birimini kapattı.

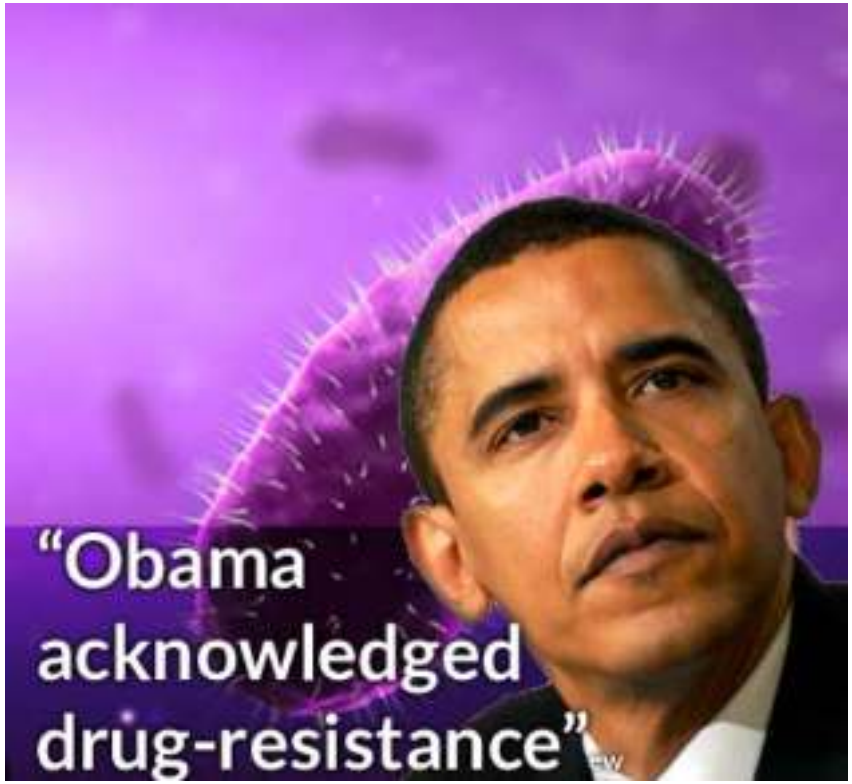
https://www.reactgroup.org/news-and-views/news-and-opinions/year-2021/the-world-needs-new-antibiotics-so-why-arent-they-developed/

Plazomicin vakası

- Plazomisin bir aminoglikozid türevi.
- Bir ABD ilaç şirketi (Achaogen) piyasaya sürmek için FDA onayı istiyor.
- FDA sadece alternatif tedavi seçeneği olmayan dirençli bakterilerin neden olduğu İYE için 2018 yılında onay veriyor.
- Kan dolaşımı enfeksiyonları için yetersiz veri olduğu için onay vermiyor.
- Analistler, plazomisin için yaklaşık 500 milyon dolar pik satış öngörüyorlar. Ancak, piyasaya sürüldükten altı ay sonra, satış gelirleri bir milyon dolardan daha az oluyor. İlacı piyasaya süren Achaogen firması, FDA'nın Plazomicin'i onaylamasından sadece bir yıl sonra, 2019'da iflas başvurusunda bulunuyor.
- Daha sonra Hintli şirket Cipla plazomisini satın alıyor. EMA'ya başvuruyor. Ancak şirket EMA Pazar maliyetlerini göz önüne alarak başvuruyu geri çekiyor.

Plazomicin (Zemdri)


"Back to the dark ages of medicine"
Without new antibiotics being developed. Dav
Cameron talks to the bbc about the problem

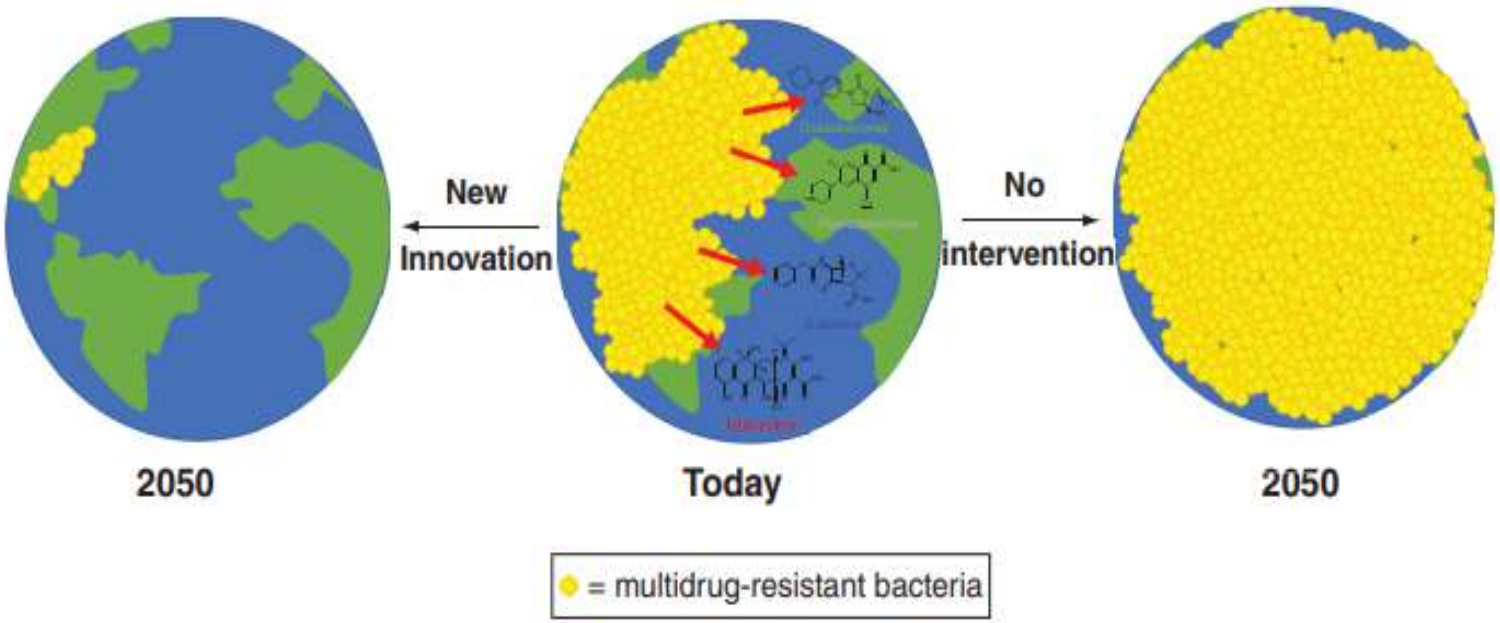

"Obama acknowledged drug-resistance"

Etkili Antibiyotiklerin Olmadığı Bir Dünya??

- Küresel yaşam beklentisi yaklaşık 50 yıla düşecektir.
- Bulaşıcı hastalıklar yine küresel olarak başlıca ölüm nedenleri haline gelecektir.
- İlaç endüstrisinin başlıca gelir kaynakları, kanser, kalp ve damar hastalıkları ve uzun süreli tedavi gerektiren diğer kronik hastalıklara karşı kullanılan ve bu nedenle ağırlıklı olarak 40 yaş ve üstü nüfusa satılan ilaçlardır. Dolayısı ile İlaç endüstrisinin gelir kaynakları düşecektir.

https://www.reactgroup.org/news-and-views/news-and-opinions/year-2021/the-world-needs-new-antibiotics-so-why-arent-they-developed/

Yenilikçi Çözümler Olmaz ise…



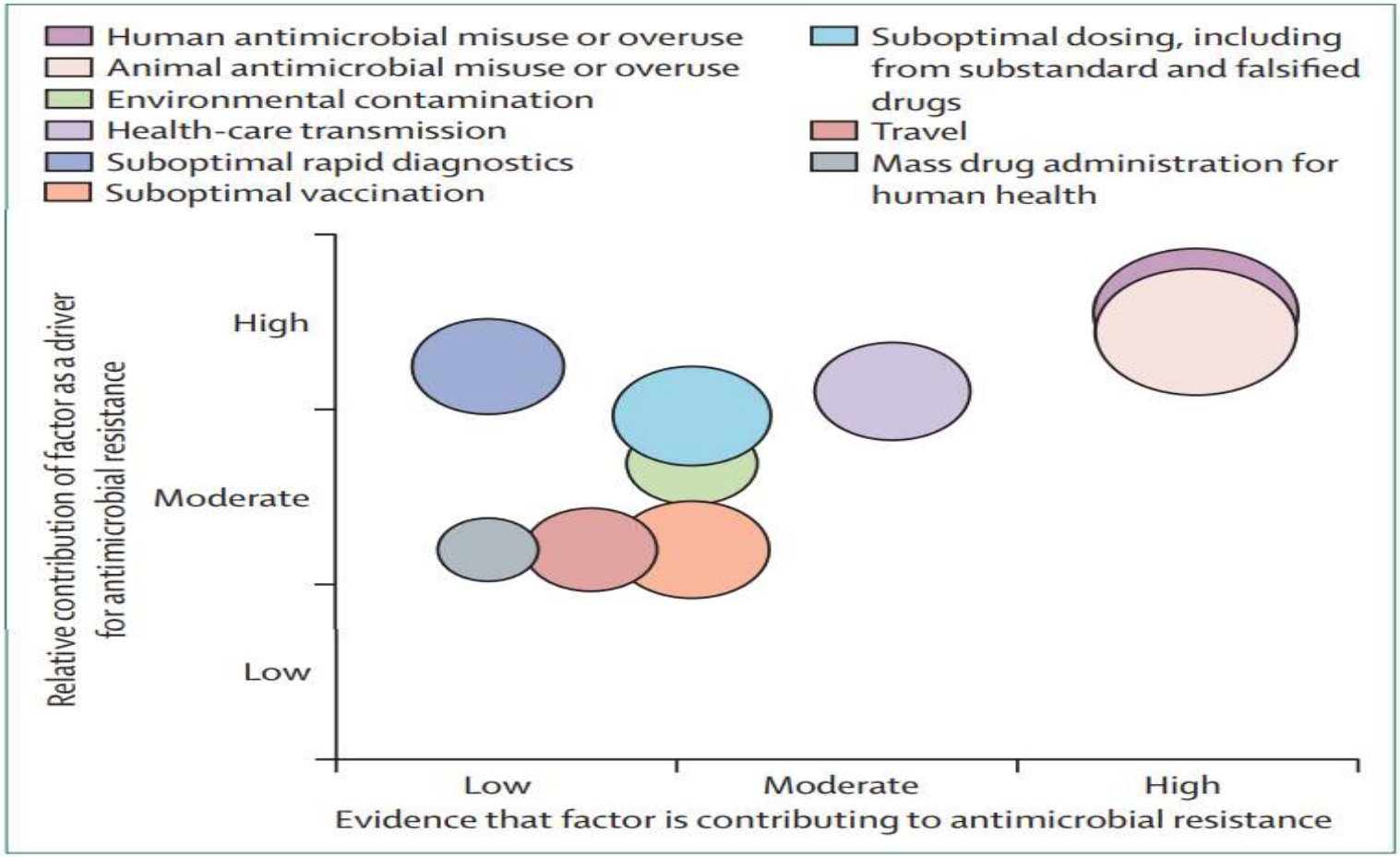
Stephens LJ et Al. Antimicrobial innovation: a current update and perspective on the antibiotic drug development pipeline. Future Med Chem. 2020 Nov;12(22)

Antibiyotiklerin kullanım alanları

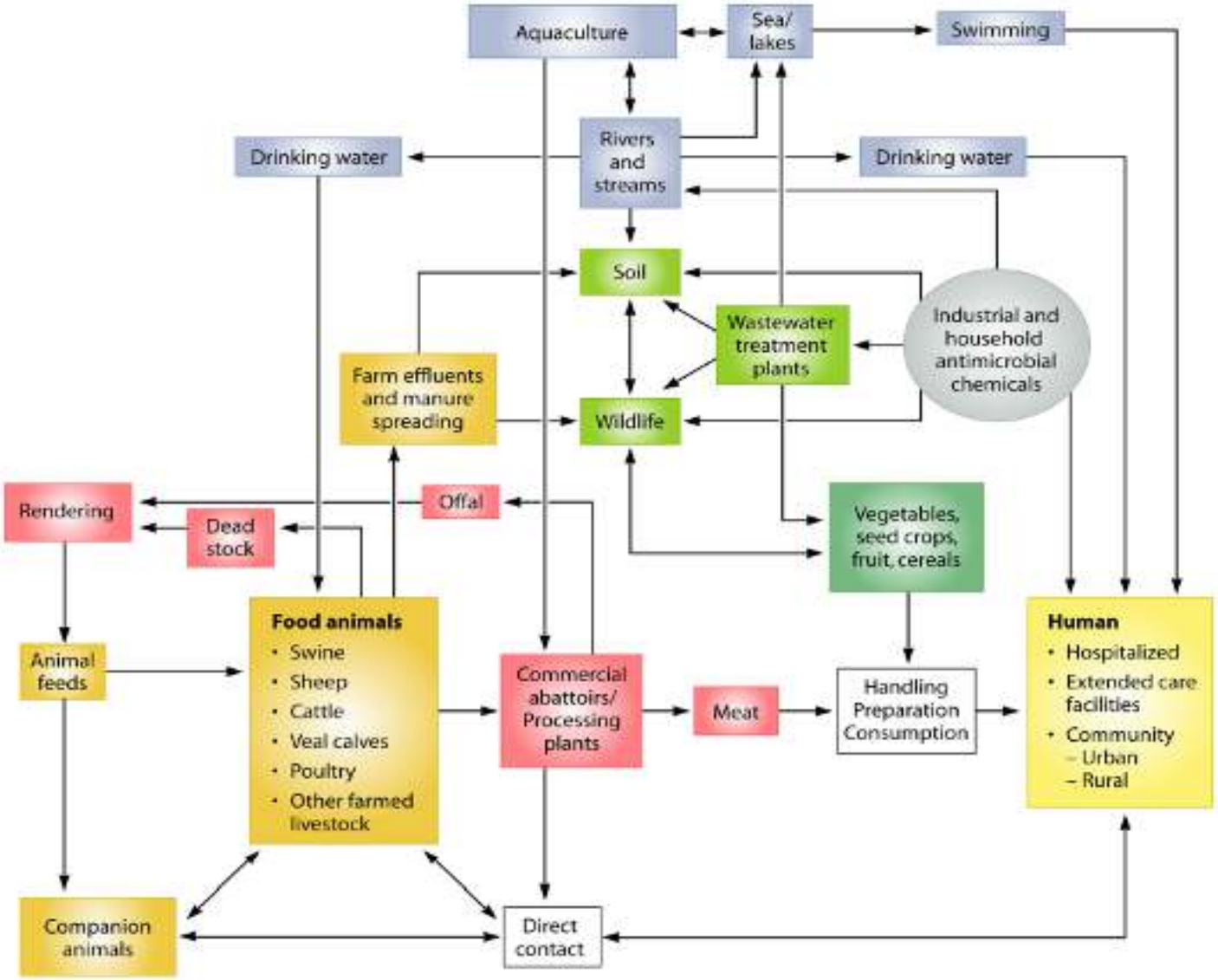
- Hayvanlarda büyümeyi destekleme/profilaktik kullanım
- İnsanlarda terapötik/profilaktik kullanım
- Su ürünleri yetiştiriciliğinde terapötik/profilaktik kullanım
- Evcil hayvanlarda terapötik/profilaktik kullanım
- Bitkiler ve tarım için haşere kontrolü/klonlama
- Banyo malzemeleri, el bakımı ve ev temizlik ürünlerinde biyosit olarak kullanım
- **İnsanlarda terapötik kullanım, ticari olarak üretilen tüm antibiyotik uygulamalarının yarısından daha azını oluşturmaktadır.**

Davies J, Davies D. Origins and evolution of antibiotic resistance. Microbiol Mol Biol Rev. 2010 Sep;74(3):417-33.

Çeşitli faktörlerin antimikrobiyal direnç katkıları



Holmes, A. H., et al. Kar ey A., Guerin PJ and Piddoc LJV Understanding the mechanisms and drivers of antimicrobial resistance.. *Lancet* 387 (2016): 176-187.



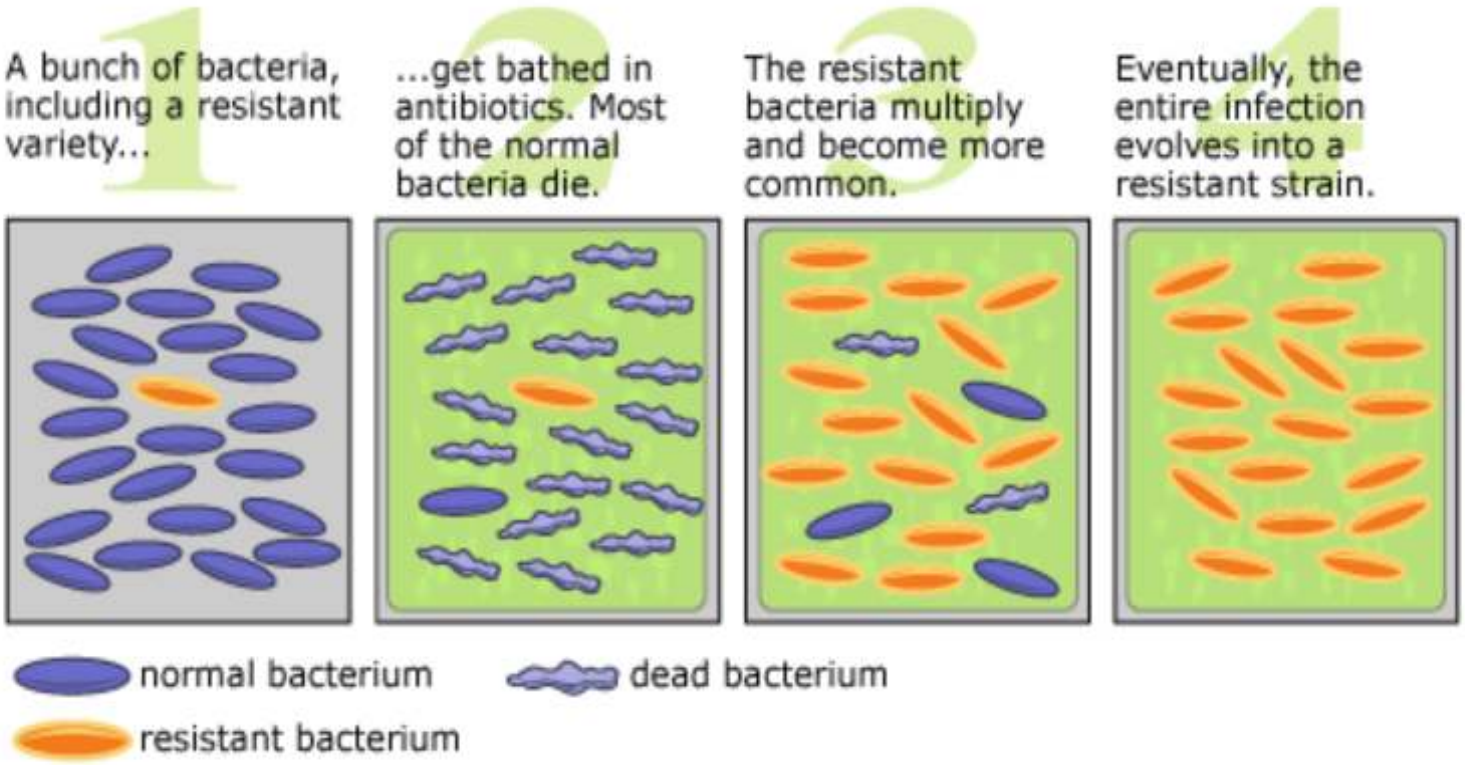
Davies J, Davies D. Origins and evolution of antibiotic resistance. Microbiol Mol Biol Rev. 2010 Sep;74(3):417-33.

Direnç Nasıl Gelişiyor

- *S.aureus*
- 2,8 × 10^6 genom boyutu ve 10^{10} baz çifti başına 1 dirençli mutasyon
- Tek bir *S.aureus* genomundaki her bir baz çifti 30 saatte 30 kez mutasyona uğrayan bir popülasyona dönüşür.
- Antibiyotik alınmaya başlandığında yaklaşık bir iki gün içinde dirençli mutantlar oluşmaya başlar.
- Antibiyotik alma süresi uzadıkça ortama dirençli suşlar hakim olmaya başlar.

Pray, L. Antibiotic resistance, mutation rates and MRSA. *Nature Education* (2008) 1(1):30

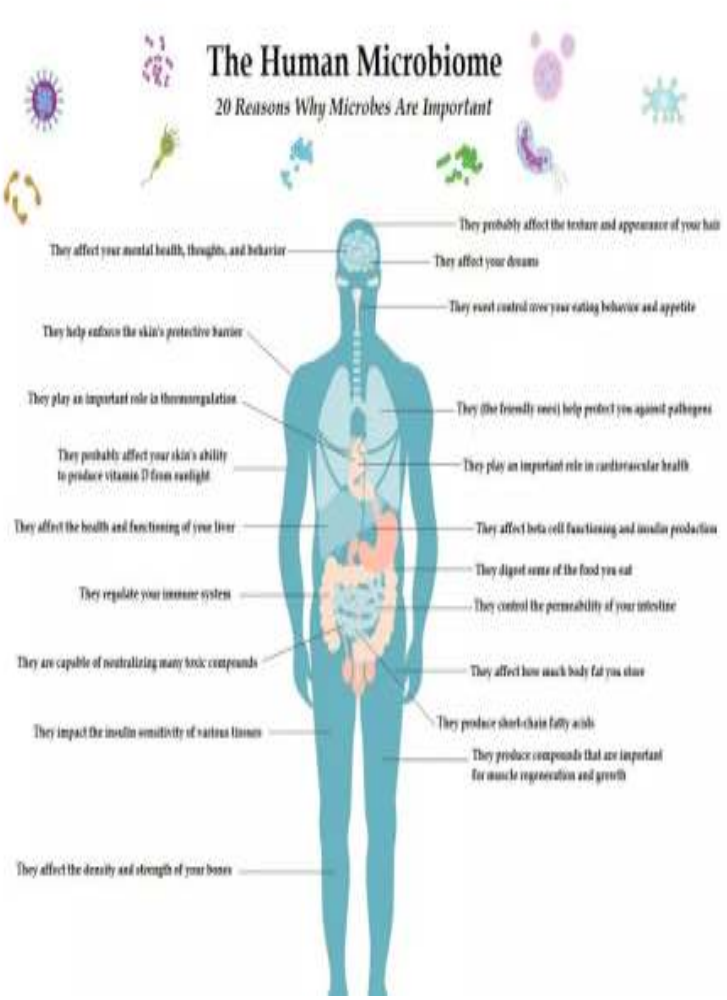
Direnç Nasıl gelişir?



https://evolution.berkeley.edu/battling-bacterial-evolution/resisting-our-drugs/

İnsan vücudunda mikroorganizmalar

- İnsan vücudu 10^{13} hücreden oluşmaktadır.
- İnsan vücudunda 10^{14} mikroorganizma bulunmaktadır.
- Mikroorganizmalar insan hücrelerinden 10 kat daha fazladır.



Türkiye’de Antibiyotik Tüketimi

Ayaktan Hastalarda Antibiyotik Reçeteleme Oranları

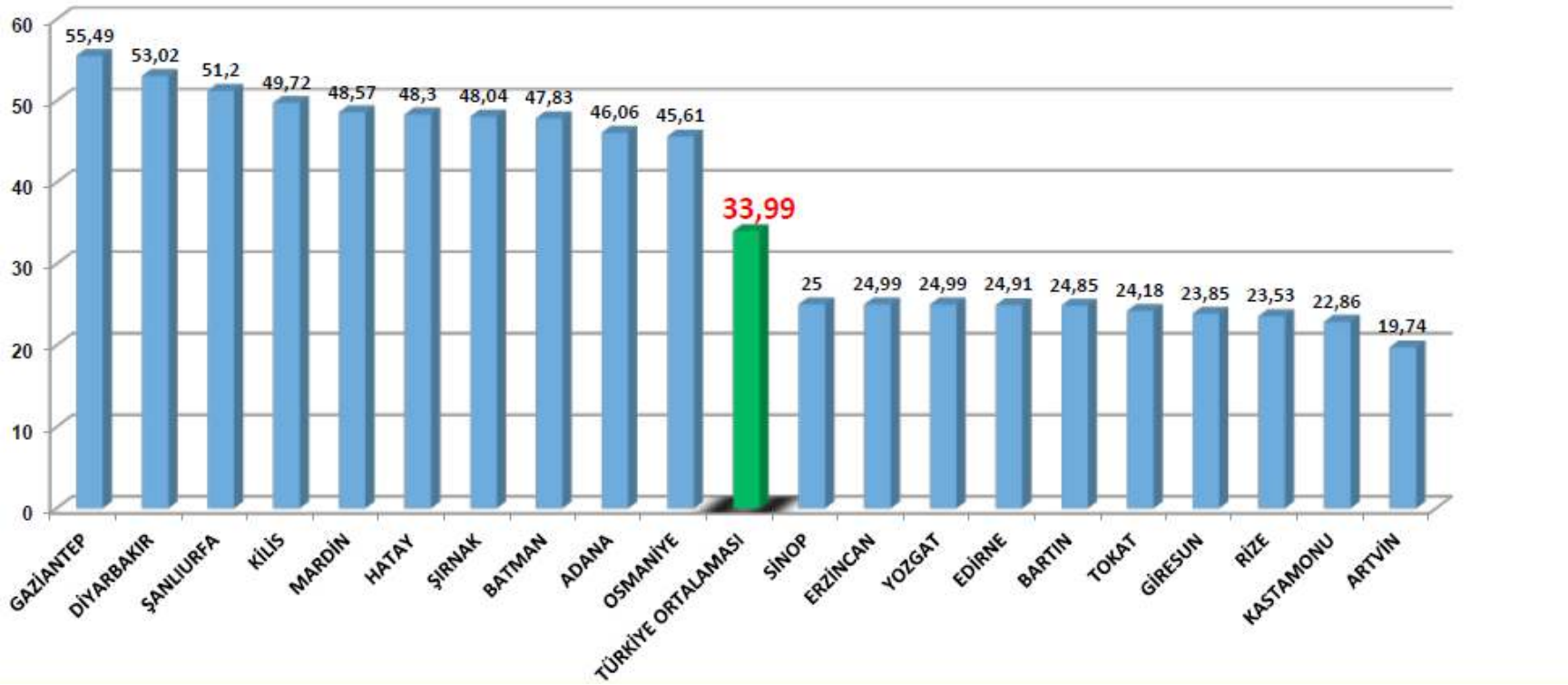
YIL	2011		2012	
Tanı ve İlaç Olan Protokol Sayısı	129.953.746		112.327.089	
Antibiyotik Yazılan Protokol Sayısı	**45.400.799**	**%34,94**	**38.177.660**	**%33,99**
Enjeksiyon Yazılan Protokol Sayısı	8.132.203	%6,26	7.568.318	%6,74
Enj. Antibiyotik Yazılan Protokol Sayısı	2.578.291	%1,98	2.253.429	%2,01

Ecz. Mesil Aksoy'un slaytlarından

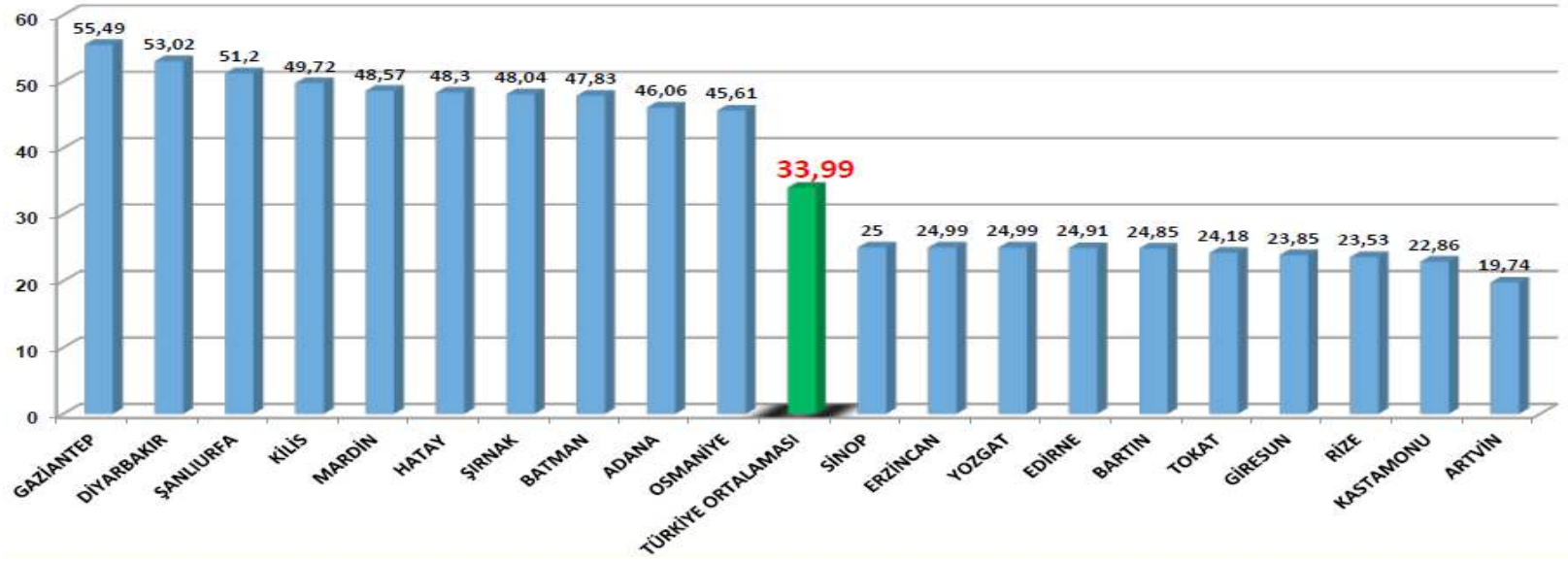
Ayaktan Hastalarda Antibiyotik Reçeteleme Oranları

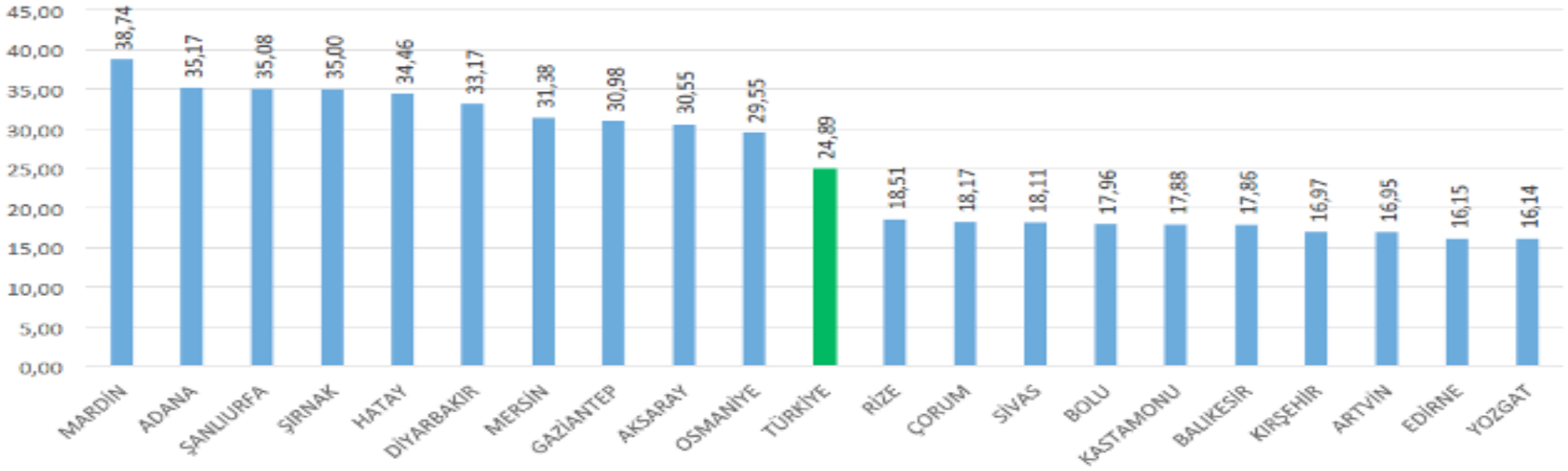
	Aile Hekimi				Diğer Hekimler			
YIL	2013	2014	2015	2016	2013	2014	2015	2016
Reçete Sayısı	116.063.545	137.313.632	128.524.357	133.142.652	64.610.084	104.419.608	104.260.408	34.799.825
Antibiyotik Bulunan Reçete Sayısı	39.403.316 % 33,95	43.214.090 % 31,47	39.932.198 % 31,07	39.315.905 %29,53	24.974.170 % 38,65	38.002.128 % 36,39	37.591.482 % 36,06	12.073.851 %34,7

2012 YILI DURUM TESPİTİ
Aile Hekimleri Antibiyotik Bulunan Reçete Yüzdesi



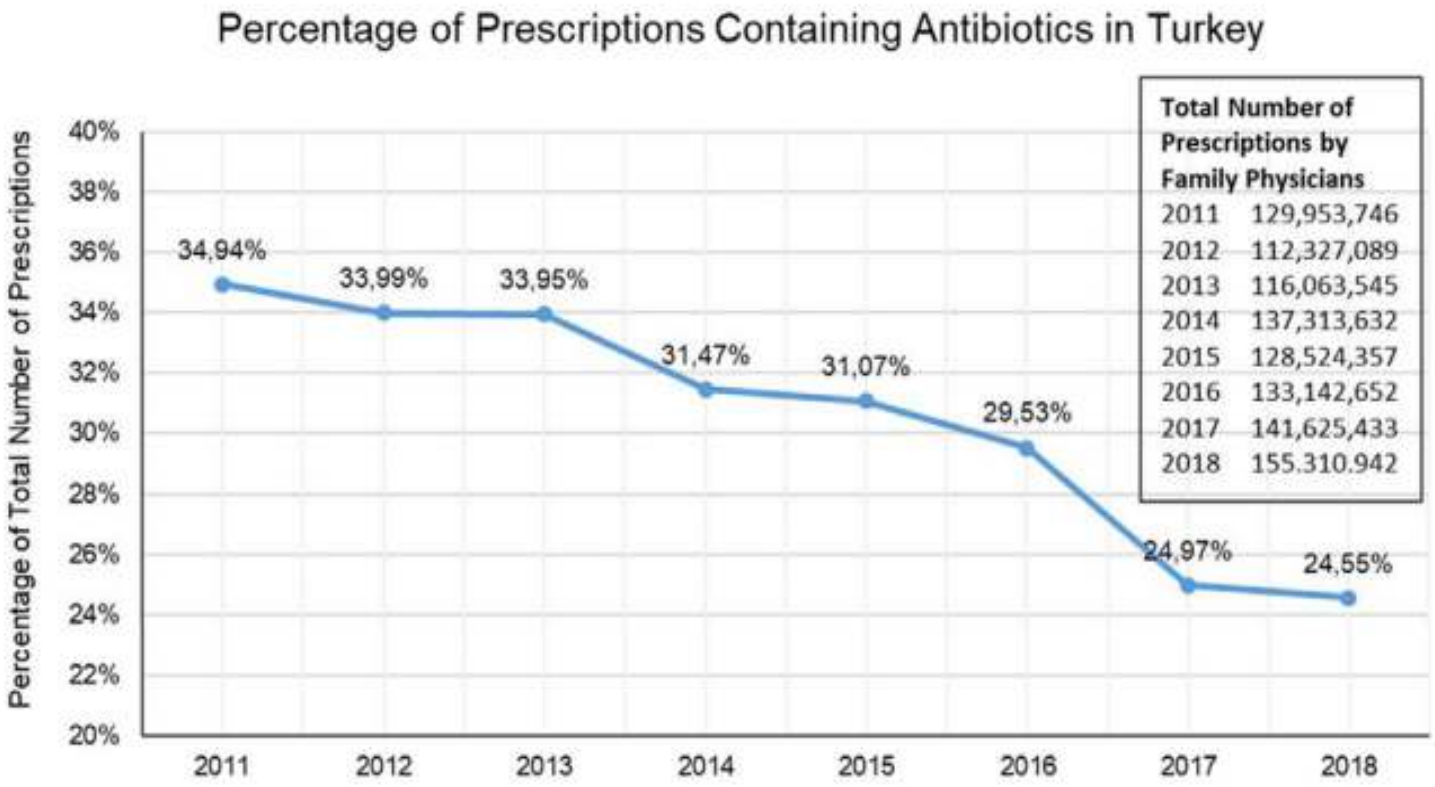
Reçetelemeye Müdahale Sonrası Antibiyotik Yazma Oranları



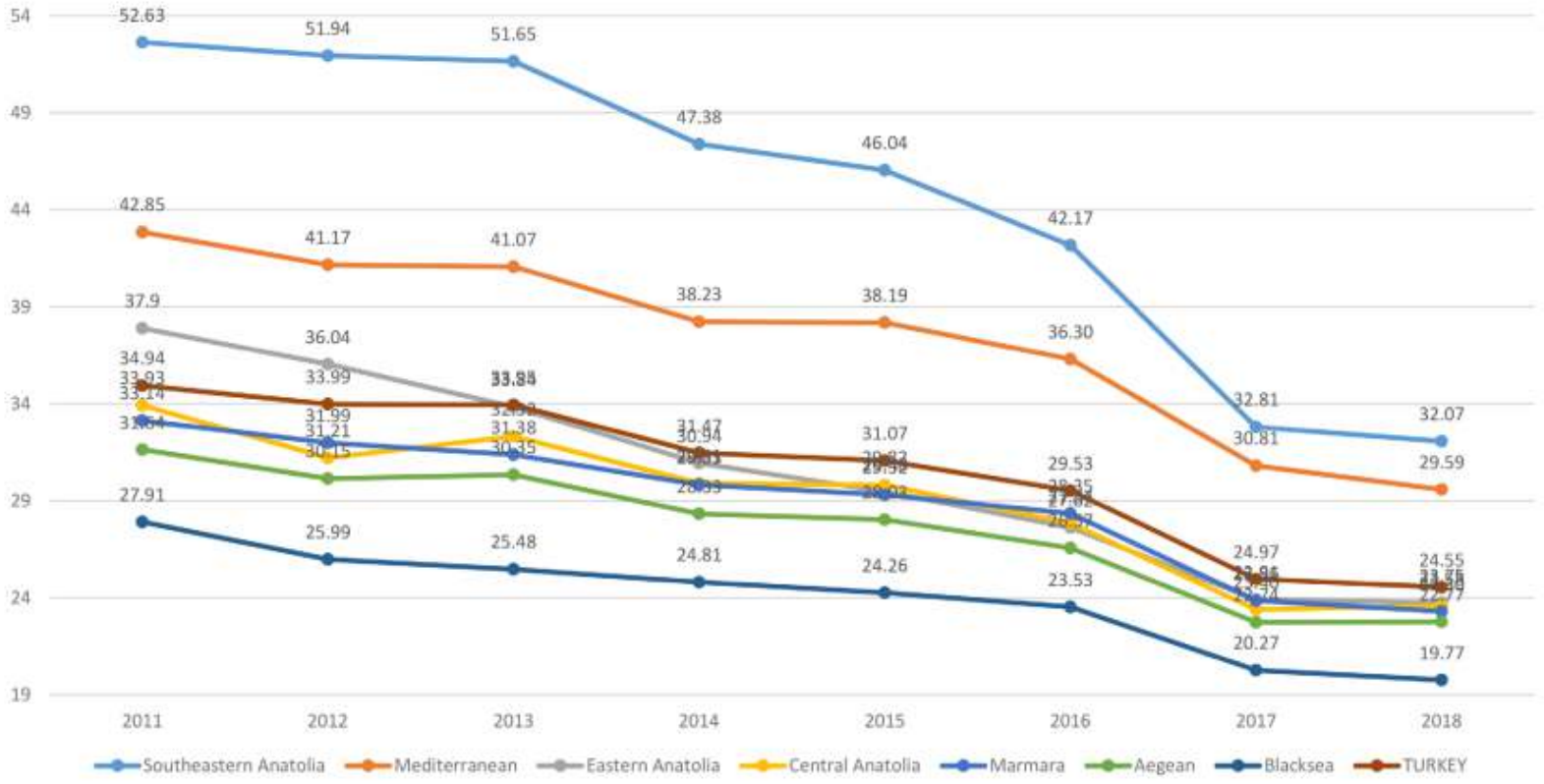


2017 Yılında Aile Hekimlerinde Antibiyotik Bulunan Reçete Yüzdeleri

Isli F, Aksoy M, Aydıngoz Emre S, Kadı E. Rational Use of Antibiotics By Family Physicians in Turkey During Primary Healthcare Service: A CrossSectional Analysis Through The Prescription Information System. TJFMPC, 2020;14(1): 87-95.

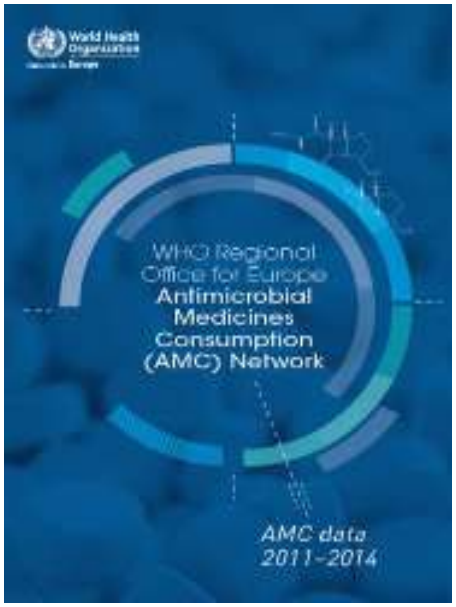


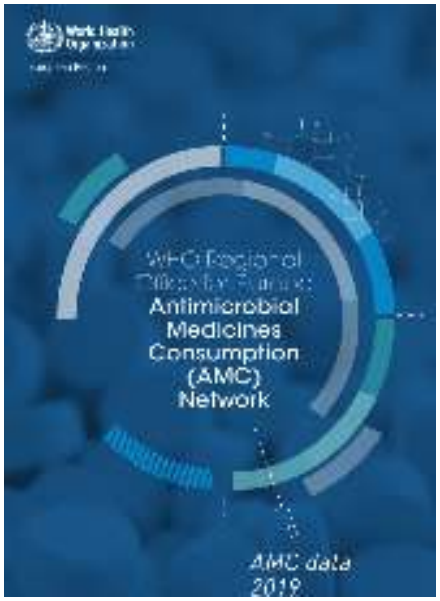
Aksoy M at al. Evaluation of more than one billion outpatient prescriptions and eight-year trend showing a remarkable reduction in antibiotic prescription in Turkey: A success model of governmental interventions at national level. Pharmacoepidemiol Drug Saf. 2021 Sep;30(9):1242-1249.

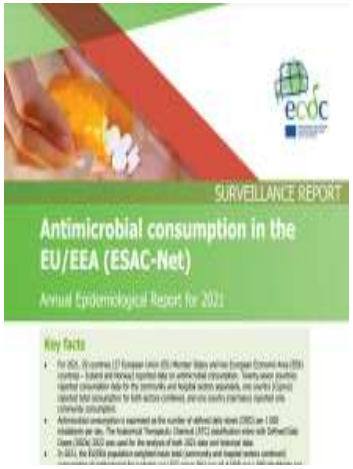


Aksoy M at al. Evaluation of more than one billion outpatient prescriptions and eight-year trend showing a remarkable reduction in antibiotic prescription in Turkey: A success model of governmental interventions at national level. Pharmacoepidemiol Drug Saf. 2021 Sep;30(9):1242-1249.

Dünya Sağlık Örgütü (DSÖ) Antibiyotik Tüketimi ve Antimikrobiyal Direnç Takibi





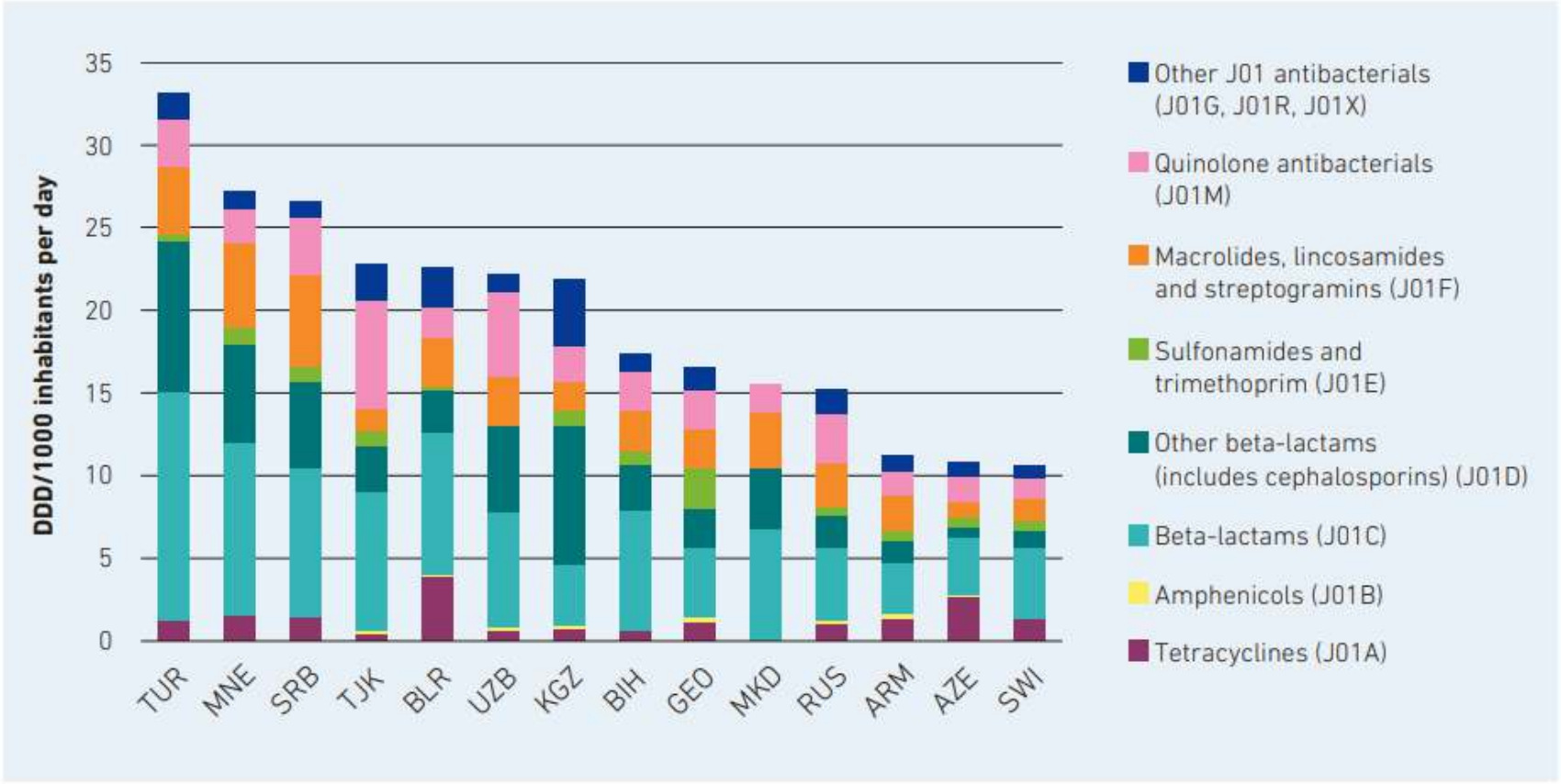


DSÖ Avrupa Antimikrobiyal İlaç Tüketimi 2014

Fig. 16.2 Total consumption of J01 antibacterials by pharmacological subgroup (2014)

DDD: defined daily dose.

DSÖ Avrupa Antimikrobiyal İlaç Tüketimi 2014-2019

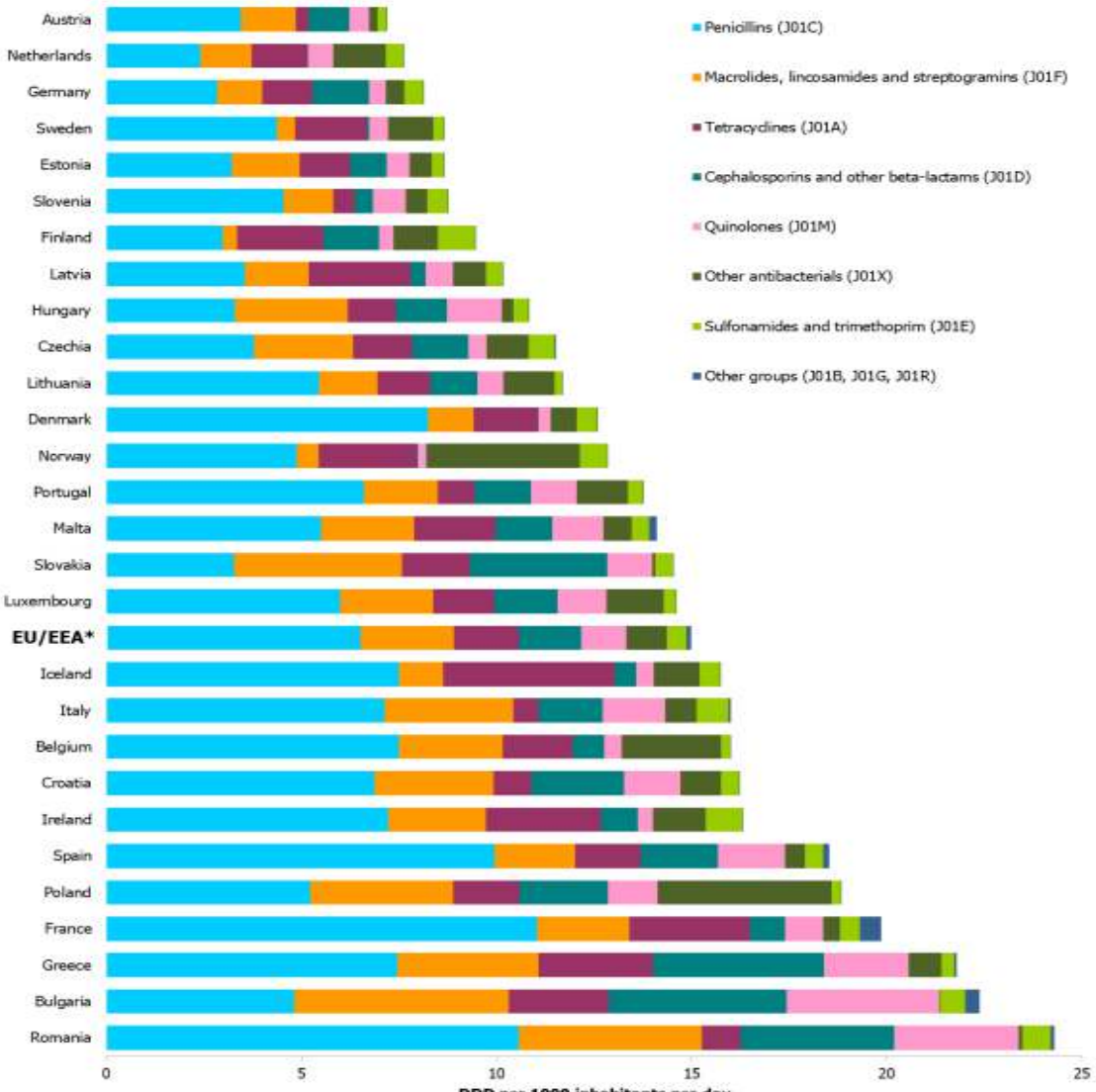


DDD: daily defined dose.

https://www.who.int/europe/publications/i/item/9789289058278

Avrupa'da Antibiyotik Tüketimi-2021

Figure 3. Community consumption of antibacterials for systemic use (ATC group J01) at ATC level 3 sub-group, EU/EEA countries, 2021 (expressed as DDD per 1 000 inhabitants per day)



Orta Asya ve Doğu Avrupa'da Antibiyotik Tüketimi 2014-2019

Table 3.3 Trends in consumption of J01 antibacterials, 2014–2019

Country	Total consumption of J01 antibacterials in DDD/1000 inhabitants per day						CAGR[a]	Trend line, 2014–2019	Trend[b]
	2014	2015	2016	2017	2018	2019			
ALB	19.6	16.3	16.5	18.7	19.0	–	-0.7%	–	
ARM	12.7	9.4	9.4	12.0	12.1	11.2	-3.2%		
AZE	6.4	7.4	9.5	7.8	8.9	10.8	13.8%		↑
BIH	15.3	16.3	18.0	17.4	19.3	17.4	3.2%		
BLR	18.3	17.1	16.9	20.0	18.9	22.6	5.4%		
GEO	17.9	24.2	23.6	25.1	20.8	16.5	-2.0%		
KAZ	–	17.4	15.7	14.3	15.1	–	–	–	
KGZ	–	16.7	21.3	16.9	11.2	21.9	–	–	
MDA	16.7	12.9	16.7	17.1	14.2	–	-4.1%	–	
MKD	16.3	16.7	17.0	16.9	16.6	15.6	-1.1%		
MNE	26.7	29.0	28.9	27.1	27.0	27.1	0.4%		
RUS	13.4	14.1	14.9	15.1	14.7	15.2	3.2%		↑
SRB	25.3	31.0	26.2	21.3	22.7	26.6	1.2%		
SWI	–	–	–	10.4	10.6	10.6	–	–	
TJK	31.0	21.7	20.9	16.3	19.0	22.8	-7.4%		
TUR	34.7	35.5	35.3	31.0	30.9	33.2	-1.2%		
UKR	9.5	12.1	8.3	10.7	11.7	–	5.3%	–	
UZB	–	–	25.1	16.3	18.2	22.2	–	–	

CAGR = compound average growth rate.
[a] The CAGR was only calculated where there was five years of data (2014–2018) available for the country. [b] Linear regression analysis.
↑↓ indicates statistically significant change.

Avrupa'da Antibiyotik Tüketimi

Table 3. Community consumption of antibacterials for systemic use (ATC group J01), EU/EEA and UK, 2012–2021 (expressed as DDD per 1 000 inhabitants per day)

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Time series 2012–2021	Trend	Compound annual growth rate (CAGR)
Austria	12.2	14.2	12.1	12.1	11.4	11.9	10.4	9.8	7.1	7.2		↓	-5.7%
Belgium	23.9	22.6	22.4	22.8	22.5	21.1	20.7	19.8	15.3	16.0		↓	-4.4%
Bulgaria	16.1	17.3	18.6	18.8	17.6	18.9	19.5	19.1	20.7	22.4		↑	3.7%
Croatia	18.3	17.6	17.8	18.0	17.1	16.8	17.0	16.9	14.0	16.2		↓	-1.3%
Cyprus												N/A	N/A
Czechia	15.7	16.9	17.1	17.4						11.5		N/A	N/A
Denmark	15.7	15.7	15.2	15.3	15.2	14.3	13.6	13.4	12.5	12.6		↓	-2.4%
Estonia	10.3	10.3	10.2	10.5	10.4	9.9	10.2	10.2	8.8	8.7		↓	-2.0%
Finland	18.0	16.9	16.6	15.8	15.0	13.6	13.2	12.6	10.0	9.4		↓	-6.9%
France	24.0	24.1	23.1	23.8	23.9	23.0	23.6	23.3	18.7	19.9		↓	-2.1%
Germany	13.7	14.5	13.4	13.1	12.8	12.6	11.7	11.4	8.9	8.1		↓	-5.6%
Greece	28.2	28.0	29.2	31.3	31.0	32.1	32.5	32.4	26.4	21.8		-	-2.8%
Hungary	13.0	13.4	14.0	14.7	13.3	13.4	13.7	13.3	10.0	10.8		↓	-2.0%
Iceland			17.2	17.5	18.3	19.1	18.8	18.0	15.4	15.7		-	-1.3%
Ireland	19.5	20.0	19.5	21.3	20.4	19.3	20.7	21.0	17.1	16.3		-	-1.9%
Italy	22.5	23.3	22.6	22.4	21.8	19.0	19.5	19.8	16.5	16.0		↓	-3.7%
Latvia	11.0	11.3	10.6	11.1	11.1	12.1	11.5	12.0	10.0	10.2		-	-0.8%
Lithuania	13.3	15.1	13.1	13.6	14.3	14.4	14.0	13.8	11.9	11.7		-	-1.4%
Luxembourg	23.1	23.1	21.6	21.8	21.4	20.9	20.7	19.8	14.8	14.6		N/A	N/A
Malta	19.5	20.7	20.5	18.8	18.4	19.8	18.0	18.7	14.4	14.1		↓	-3.5%
Netherlands	10.1	9.6	9.4	9.5	9.2	8.9	8.9	8.7	7.8	7.6		↓	-3.1%
Norway	16.5	15.8	15.5	15.4	14.9	14.4	14.0	13.6	12.8	12.8		↓	-2.8%
Poland	19.9	20.5	19.9	22.8	20.7	23.8	23.0	22.2	17.1	18.8		-	-0.6%
Portugal	18.7	16.1	16.6	17.3	17.5	16.9	17.7	17.9	13.7	13.7		-	-3.4%
Romania								24.0	23.7	24.3		N/A	N/A
Slovakia	17.9	21.1	18.9	22.0	21.3	18.5	20.2	18.0	13.2	14.5		-	-2.3%
Slovenia	11.8	11.9	11.6	11.9	11.5	11.6	11.7	11.5	8.8	8.7		↓	-3.3%
Spain	15.7†	16.2†	17.1†	17.5†	25.6	25.0	24.6	23.3	18.2	18.5		N/A	N/A
Sweden	13.7	12.6	12.5	11.9	11.7	11.3	10.8	10.3	8.9	8.7		↓	-5.0%
EU/EEA*	**19.3**	**19.8**	**19.4**	**19.9**	**19.2**	**18.7**	**18.6**	**18.3**	**15.0**	**15.0**		↓	**-2.8%**
United Kingdom	*17.7*	*18.3*	*18.5*	*17.9*	*17.5*	*17.0*	*16.3*	*15.6*				*N/A*	*N/A*
*Crude EU/EEA***	*18.1*	*18.6*	*18.2*	*18.5*	*18.9*	*18.4*	*18.2*	*18.0*	*15.0*	*15.0*		*N/A*	*N/A*

All country data are shown as they are reported to The European Surveillance System.

Türkiye'de *E.coli* ve *K.pneumoniae*'de Direnç Oranları- 2014

Table 29. Resistance levels for *E. coli* and *K. pneumoniae* among blood and CSF isolates in Turkey

2014

Antibiotic class	*E. coli*		*K. pneumoniae*	
	N	Resistance (%)	N	Resistance (%)
Aminopenicillins (R)[a]	1 424	67	NA	NA
3rd-generation cephalosporins (R)[b]	2 223	44	1 168	56
3rd-generation cephalosporins (I+R)[b]	2 223	45	1 168	59
Aminoglycosides (R)[c]	2 401	22	1 280	30
Fluoroquinolones (R)[d]	2 020	41	1 171	34
Fluoroquinolones (I+R)[d]	2 020	42	1 171	39
Carbapenems (R)[e]	2 046	4	1 083	11
Carbapenems (I+R)[e]	2 046	5	1 083	15

NA: not applicable.
[a] The aminopenicillins group consists of amoxicillin and ampicillin.
[b] The third-generation cephalosporin group consists of cefotaxime, ceftriaxone and ceftazidime.
[c] The aminoglycoside group consists of amikacin, gentamicin and tobramycin.
[d] The fluoroquinolone group consists of ciprofloxacin, ofloxacin and levofloxacin.
[e] The carbapenem group consists of imipenem and meropenem.

Türkiye'de *E.coli* ve *K.pneumoniae*'de Direnç Oranları- 2019

Table 6.70 Resistance levels for *E. coli* and *K. pneumoniae* among blood and CSF isolates in Turkey in 2019

Antibiotic (group)	*E. coli*			*K. pneumoniae*		
	N	%R	%I	N	%R	%I
Ampicillin/amoxicillin	4289	79	0	NA	NA	NA
Amoxicillin-clavulanic acid	3487	61**	0**	2772	75**	0**
Piperacillin-tazobactam	4369	22	4	3565	60	7
Cefotaxime/ceftriaxone	4598	53	1	3602	73	1
Ceftazidime	4537	47	6	3742	70	3
Ertapenem	4559	9	0	3647	51	0
Imipenem/meropenem	4965	3	1	4028	39	6
Gentamicin/tobramycin	4616	26	1	3925	45	2
Amikacin	4552	2	4	3760	27	5
Ciprofloxacin/levofloxacin/ofloxacin	4852	52	5	3933	65	5
Multidrug resistance[a]	4495	18	NA	3689	40	NA

NA = not applicable.

** Less than 70% of isolates were tested for this antibiotic (group), and the percentage resistance should be interpreted with caution.

[a] Multidrug resistance is defined as combined resistance to at least one representative of three antimicrobial groups: fluoroquinolones (ciprofloxacin, levofloxacin and/or ofloxacin), third-generation cephalosporins (cefotaxime, ceftriaxone and/or ceftazidime) and aminoglycosides (gentamicin and/or tobramycin). Isolates with missing data on one or more of the groups are excluded from the analysis of multidrug resistance.

İsviçre'de *E.coli* ve *K.pneumoniae*'de Direnç Oranları- 2014

Table 17. Resistance levels for *E. coli* and *K. pneumoniae* among blood and CSF isolates in Switzerland

2014

Antibiotic class	*E. coli*		*K. pneumoniae*	
	N	Resistance (%)	N	Resistance (%)
Aminopenicillins (R)[a]	3 687	49	NA	NA
3rd-generation cephalosporins (R)[b]	3 983	7	707	7
3rd-generation cephalosporins (I+R)[b]	3 983	8	707	8
Aminoglycosides (R)[c]	3 991	8	705	5
Fluoroquinolones (R)[d]	3 992	16	706	6
Fluoroquinolones (I+R)[d]	3 992	17	706	7
Carbapenems (R)[e]	3 990	0	706	1
Carbapenems (I+R)[e]	3 990	0	706	1

NA: not applicable.
[a] The aminopenicillins group consists of amoxicillin and ampicillin.
[b] The third-generation cephalosporin group consists of cefotaxime, ceftriaxone and ceftazidime.
[c] The aminoglycoside group consists of amikacin, gentamicin and tobramycin.
[d] The fluoroquinolone group consists of ciprofloxacin, ofloxacin and levofloxacin.
[e] The carbapenem group consists of imipenem and meropenem.

İsviçre'de *E.coli* ve *K.pneumoniae*'de Direnç Oranları- 2019

Table 6.63 Resistance levels for *E. coli* and *K. pneumoniae* among blood and CSF isolates in Switzerland in 2019

Antibiotic (group)	*E. coli*			*K. pneumoniae*		
	N	%R	%I	N	%R	%I
Ampicillin/amoxicillin	5407	49	1	NA	NA	NA
Amoxicillin-clavulanic acid	5757	24	5	1180	12	2
Piperacillin-tazobactam	5539	5	3	1129	7	5
Cefotaxime/ceftriaxone	5763	10	0	1179	7	0
Ceftazidime	5655	8	2	1164	7	1
Ertapenem	3712	0**	0**	733	1**	0**
Imipenem/meropenem	5734	0	0	1179	0	0
Gentamicin/tobramycin	5675	9	0	1169	4	0
Amikacin	4208	2	2	891	1	1
Ciprofloxacin/levofloxacin/ofloxacin	5765	16	2	1183	9	1
Multidrug resistance[a]	5667	4	NA	1169	3	NA

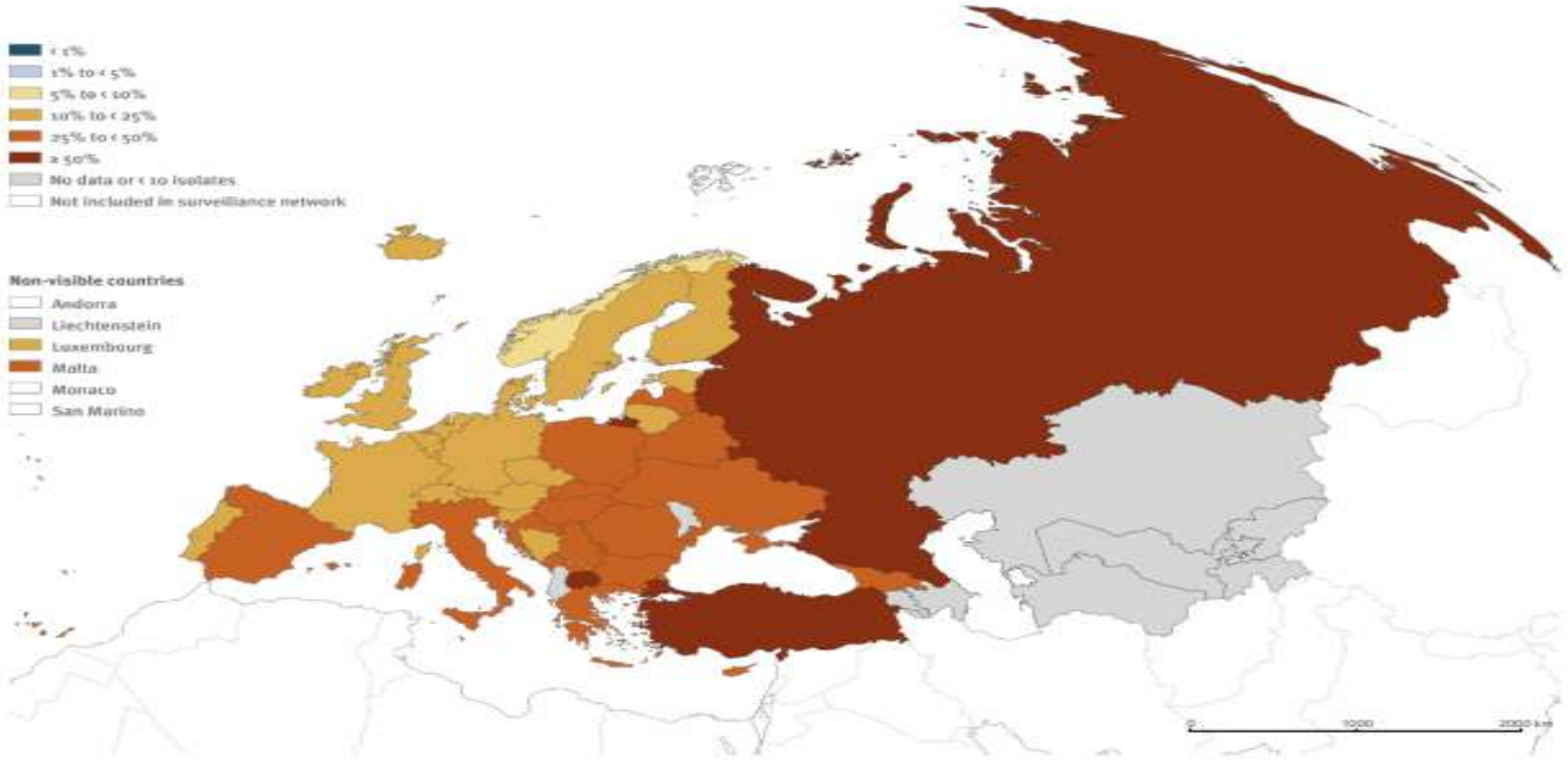
NA = not applicable.

** Less than 70% of isolates were tested for this antibiotic (group), and the percentage resistance should be interpreted with caution.

[a] Multidrug resistance is defined as combined resistance to at least one representative of three antimicrobial groups: fluoroquinolones (ciprofloxacin, levofloxacin and/or ofloxacin), third-generation cephalosporins (cefotaxime, ceftriaxone and/or ceftazidime) and aminoglycosides (gentamicin and/or tobramycin). Isolates with missing data on one or more of the groups are excluded from the analysis of multidrug resistance.

Avrupa'da Antimikrobiyal Direnç Sürveyansı- 2020 verileri

Fig. 1 *E. coli*: percentage of invasive isolates resistant to fluoroquinolones (ciprofloxacin/levofloxacin/ofloxacin), by country/area, WHO European Region, 2020



Note: data for Serbia and Kosovo (All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council resolution 1244 (1999)) were combined for this map. Data for the United Kingdom for 2020 do not include Scotland and Wales.

Data sources: 2020 data from the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR, ©WHO 2021. All rights reserved.) and 2020 data from the European Antimicrobial Resistance Surveillance Network (EARS–Net, ©ECDC 2021).
Map production: ©WHO.

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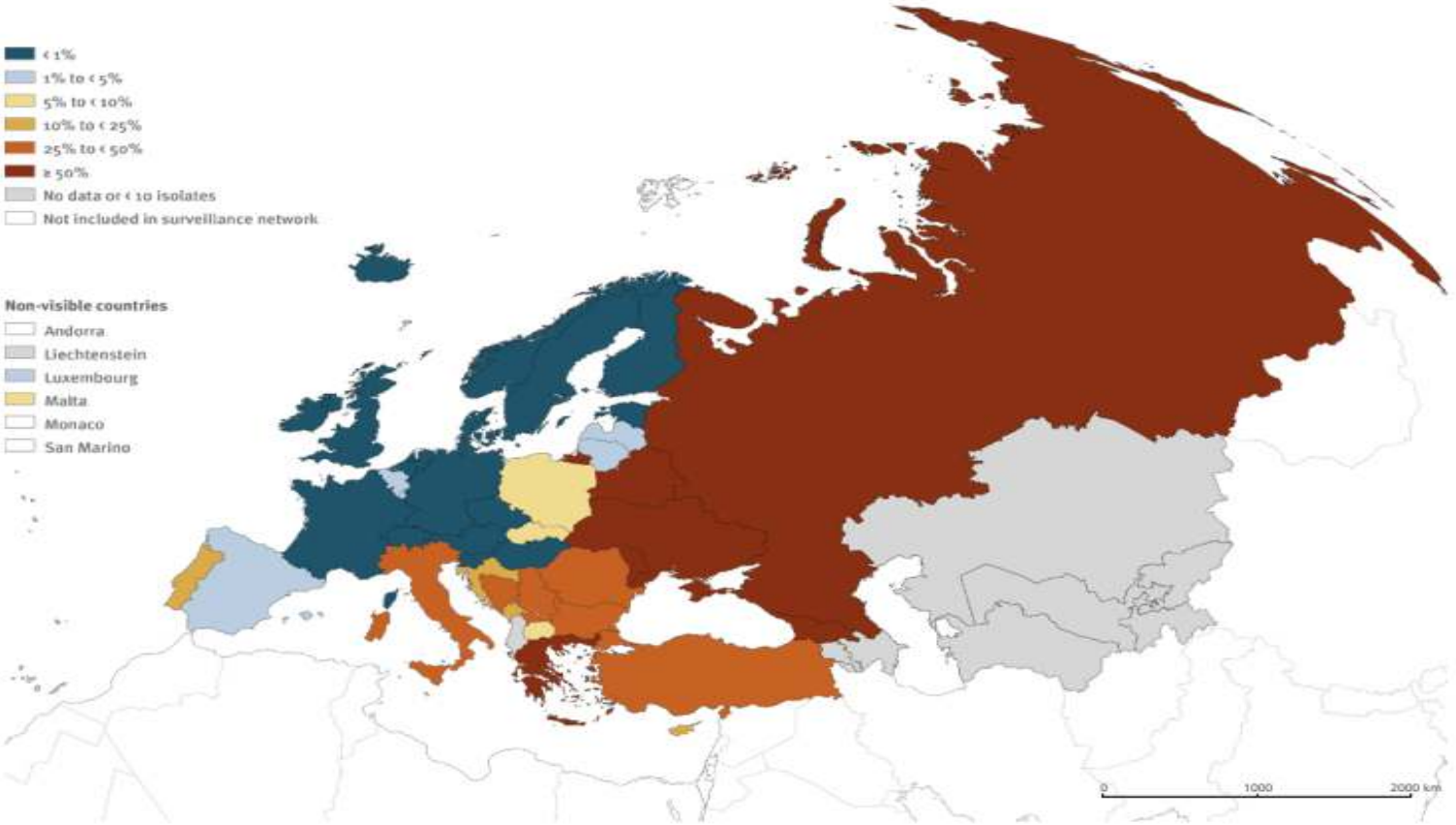
Avrupa'da Antimikrobiyal Direnç Sürveyansı- 2020 verileri

Fig. 5 *K. pneumoniae*: percentage of invasive isolates resistant to carbapenems (imipenem/meropenem), by country/area, WHO European Region, 2020



Note: data for Serbia and Kosovo (All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council resolution 1244 (1999)) were combined for this map. Data for the United Kingdom for 2020 do not include Scotland and Wales.

Data sources: 2020 data from the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR, ©WHO 2021. All rights reserved.) and 2020 data from the European Antimicrobial Resistance Surveillance Network (EARS–Net, ©ECDC 2021).
Map production: ©WHO.

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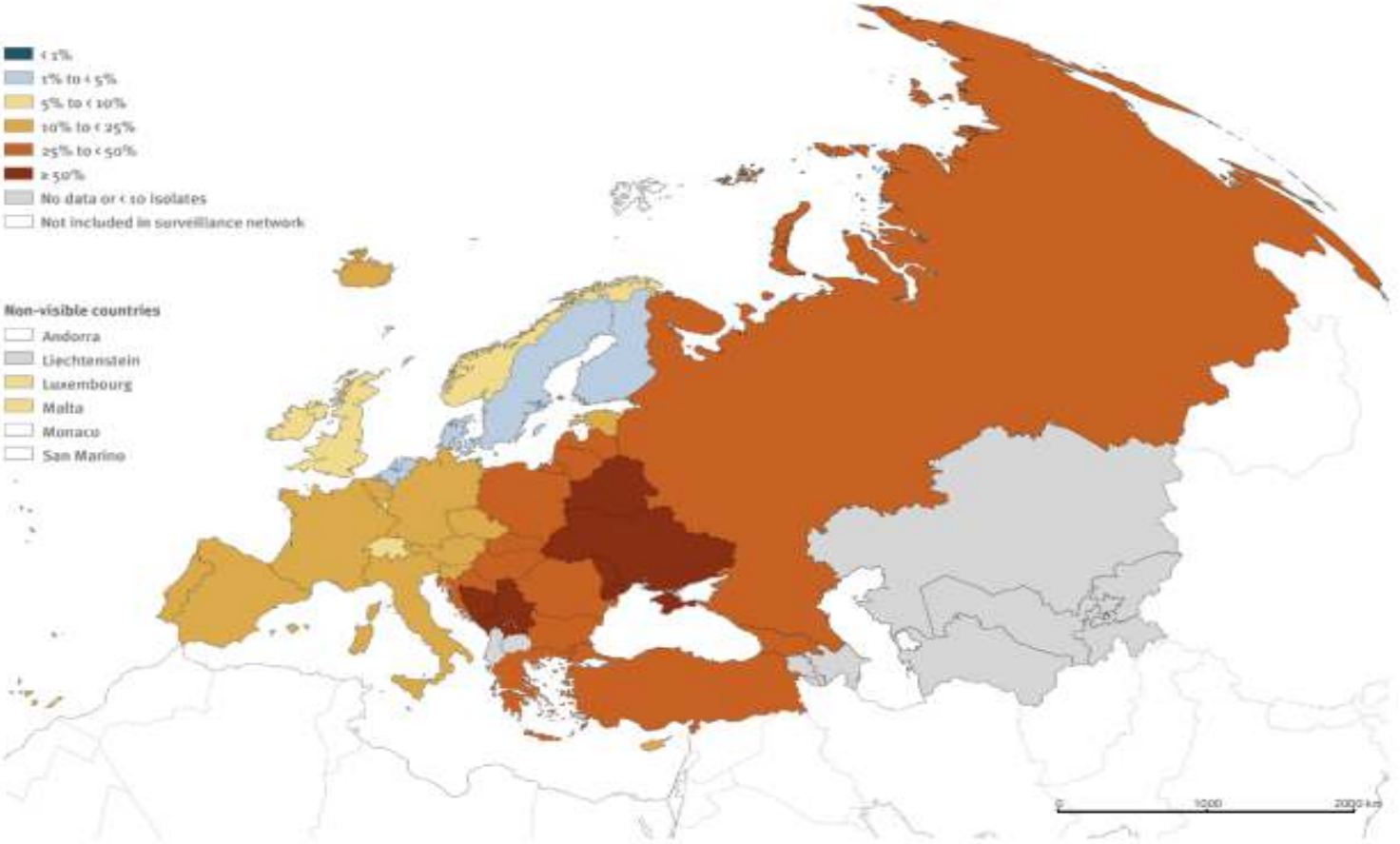
Avrupa'da Antimikrobiyal Direnç Sürveyansı- 2020 verileri

Fig. 6 *P. aeruginosa*: percentage of invasive isolates with resistance to carbapenems (imipenem/meropenem), by country/area, WHO European Region, 2020



Note: data for Serbia and Kosovo (All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council resolution 1244 (1999)) were combined for this map. Data for the United Kingdom for 2020 do not include Scotland and Wales.

Data sources: 2020 data from the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR, ©WHO 2021. All rights reserved.) and 2020 data from the European Antimicrobial Resistance Surveillance Network (EARS-Net, ©ECDC 2021).
Map production: ©WHO.

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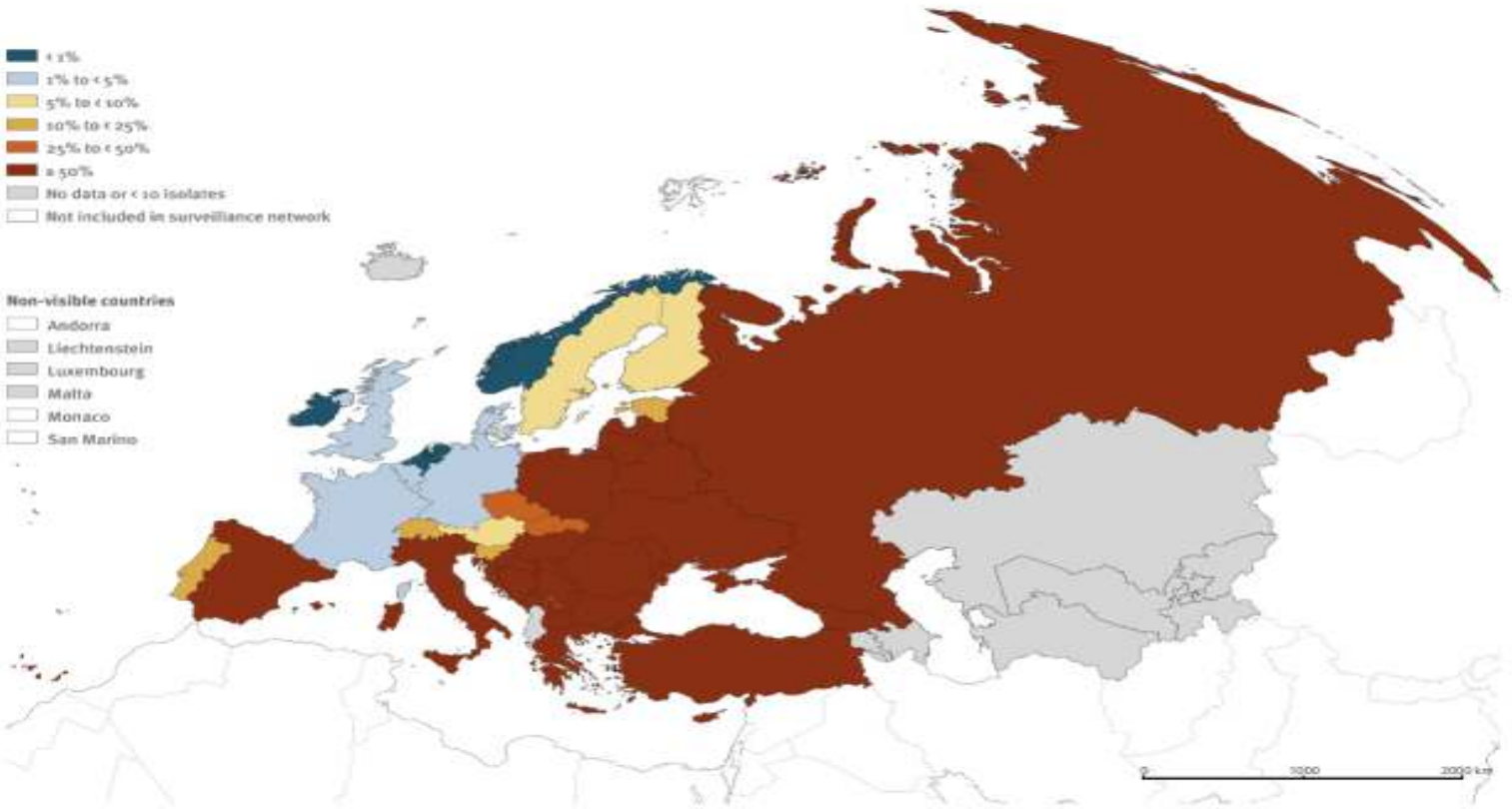
Avrupa'da Antimikrobiyal Direnç Sürveyansı- 2020 verileri

Fig. 7 *Acinetobacter* spp.: percentage of invasive isolates with resistance to carbapenems (imipenem/meropenem), by country/area, WHO European Region, 2020



Note: data for Serbia and Kosovo (All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council resolution 1244 (1999)) were combined for this map. Data for the United Kingdom for 2020 do not include Scotland and Wales.

Data sources: 2020 data from the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR, ©WHO 2021. All rights reserved.) and 2020 data from the European Antimicrobial Resistance Surveillance Network (EARS-Net, ©ECDC 2021).
Map production: ©WHO.

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Avrupa'da Antimikrobiyal Direnç Sürveyansı- 2020 verileri

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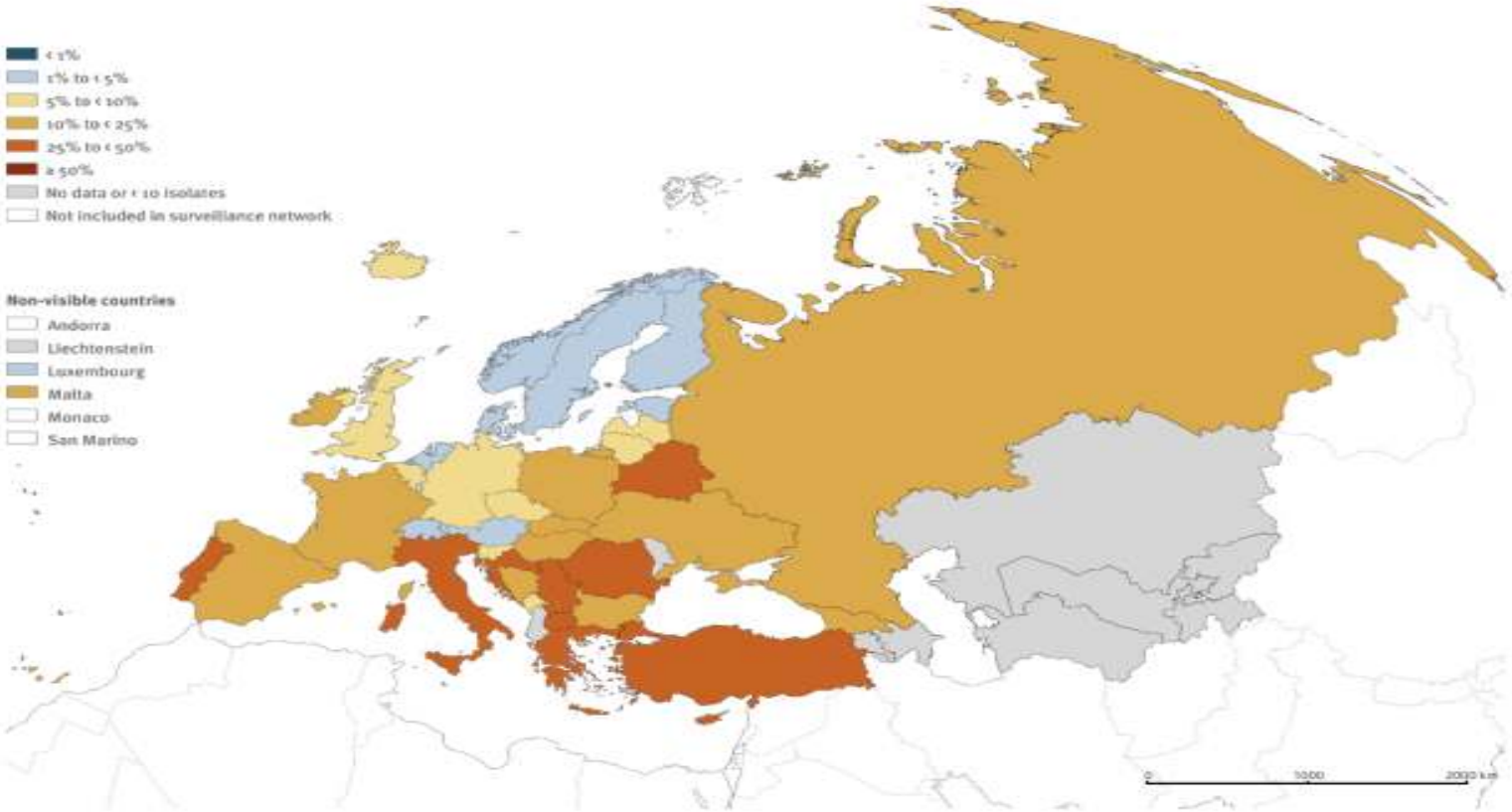
Fig. 8 *S. aureus*: percentage of invasive isolates resistant to methicillin (MRSA),[a] by country/area, WHO European Region, 2020



Note: data for Serbia and Kosovo (All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council resolution 1244 (1999)) were combined for this map. Data for the United Kingdom for 2020 do not include Scotland and Wales.

[a] For EARS-Net, MRSA is based on oxacillin or cefoxitin, but AST results reported as cloxacillin, dicloxacillin, flucloxacillin or methicillin are accepted as a marker for oxacillin resistance if oxacillin is not reported. EARS-Net also includes data from molecular confirmation tests (detection of *mecA* gene by PCR or a positive PBP2A-agglutination test), which are given priority over phenotypic AST results. For CAESAR, MRSA is based on results for cefoxitin or, if not available, oxacillin.

Data sources: 2020 data from the Central Asian and European Surveillance of Antimicrobial Resistance (CAESAR, ©WHO 2021. All rights reserved.) and 2020 data from the European Antimicrobial Resistance Surveillance Network (EARS-Net, ©ECDC 2021).
Map production: ©WHO.

Sonuç

- Ne kadar çok antibiyotik tüketimi o kadar çok direnç
- Türkiye en çok antibiyotik tüketen ülkelerden biri
- Buna paralel olarak ta direnç oranlarımız çok yüksek
- Yeni antibiyotik keşfi yok. Şu an için en iyi önlem antibiyotik tüketimini azaltmak,
- Başlanan antibiyotiğin süresini de mümkün olduğunca kısa tutmak,

Öneriler

- Hastanelerde antibiyotiğin en çok tüketildiği yerler yoğun bakımlar;

- **Yoğun bakımlar insanların son anlarını geçirdiği yer olmaktan çıkarılmalı**
- İnsanlara huzur içinde ölme hakkı verilmeli,
- Yoğun bakımların değil, yaşlı bakım evlerinin sayısı arttırılmalı

Öneriler

- Poliklinik hizmeti veren hekimler için

- Erişkinlerde ateş olsa dahi üst solunum yolu enfeksiyonlarının yaklaşık %90'dan fazlasına antibiyotik gerekmediği her zaman akılda tutulmalı,

- İdrar yolu enfeksiyonu semptomu olmayan hiçbir hastadan (Gebe ve ürolojik girişim yapılacaklar hariç) kesinlikle idrar kültürü istenmemeli,
- Asemptomatik bakteriüri kesinlikle tedavi edilmemeli (Gebe ve ürolojik girişim yapılacaklar hariç)


#10yearschallenge
2009
2019

Teşekkürler…