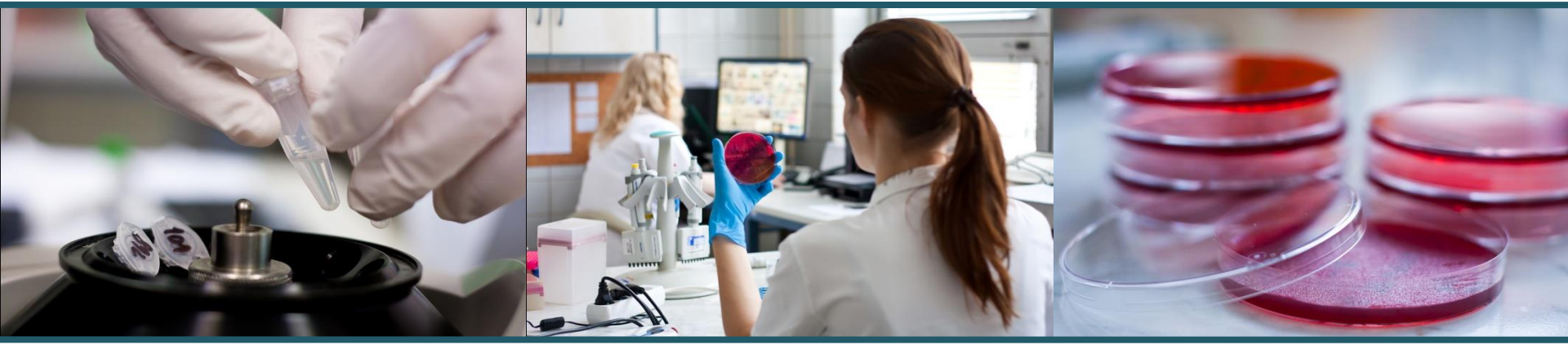
BIOMEDICAL CENTER

CHARLES UNIVERSITY
Faculty of Medicine in Pilsen



Současné trendy v epidemiologii antimikrobiální rezistence v ČR – humánní medicína (CPO, ESBL, MRSA, VRE)

Kateřina Chudějová

Katerina.Chudejova@lfp.cuni.cz

Ústav mikrobiologie FN Plzeň a LF UK v Plzni

National Institute of Virology and Bacteriology

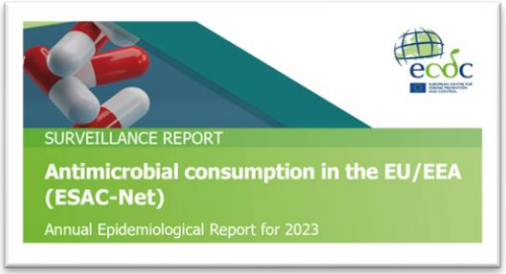
FAKULTNÍ NEMOCNICE PLZEŇ

Funded by the European Union
NextGenerationEU

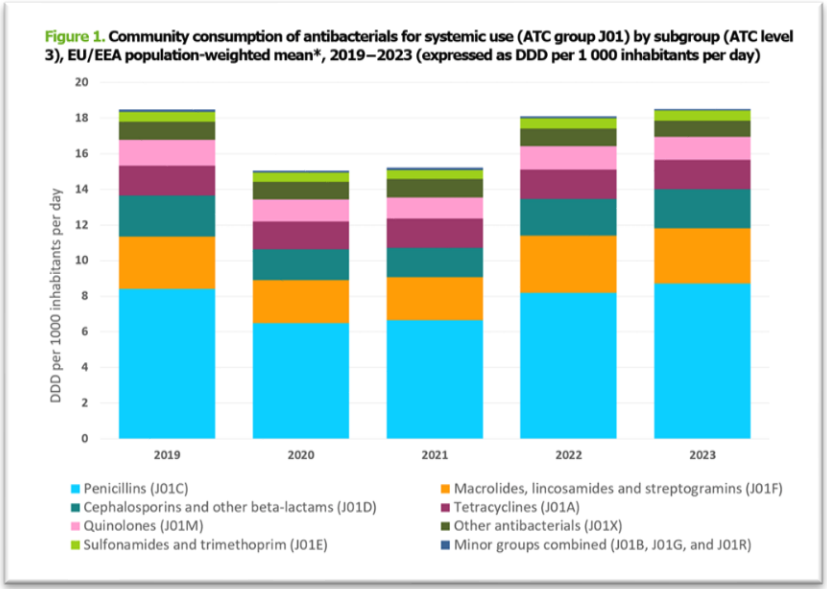
MINISTRY OF EDUCATION, YOUTH AND SPORTS

CZECH RECOVERY PLAN

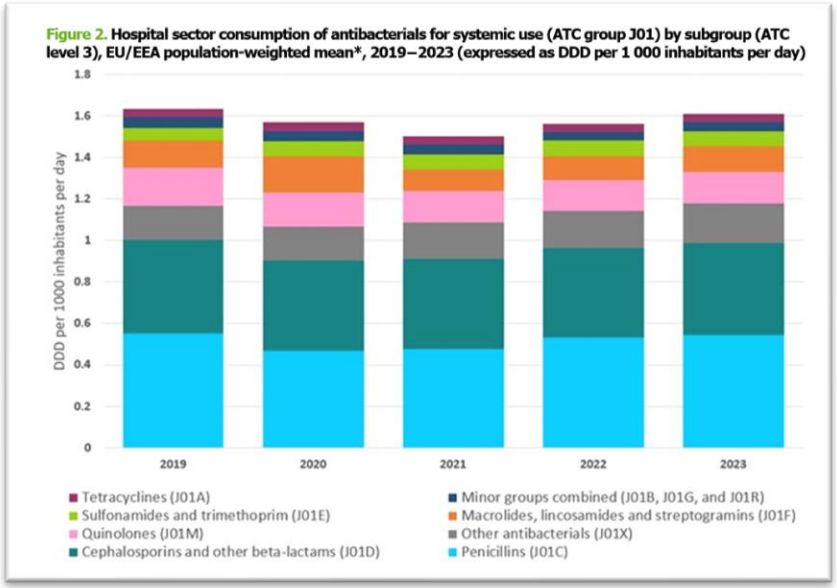
Spotřeba ATB v EU/EEA 2019-2023



18,3 DDD/1000 obyv.



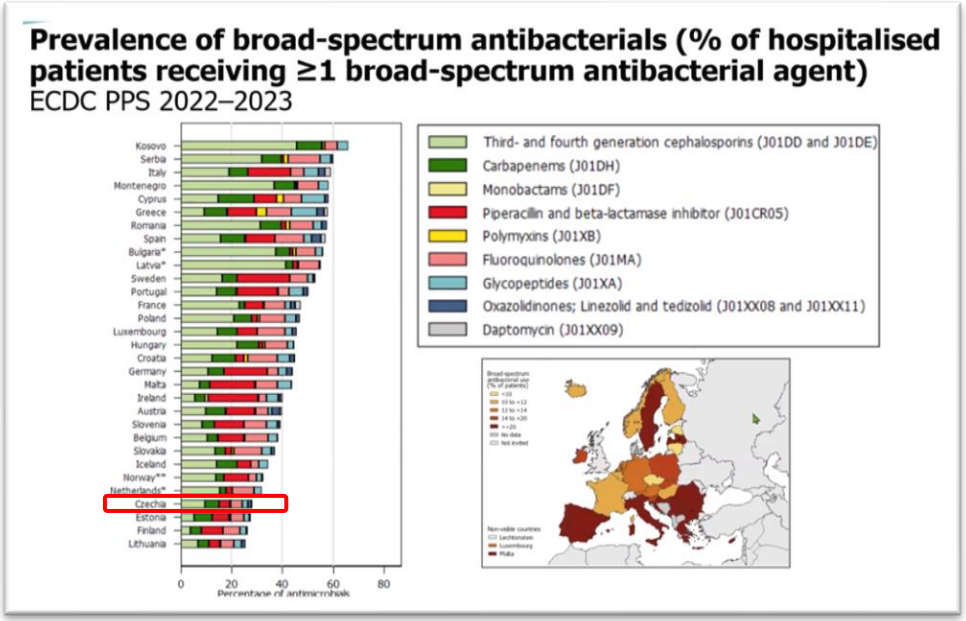
1,6 DDD/1000 obyv.

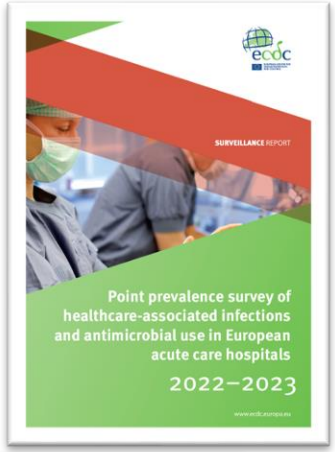


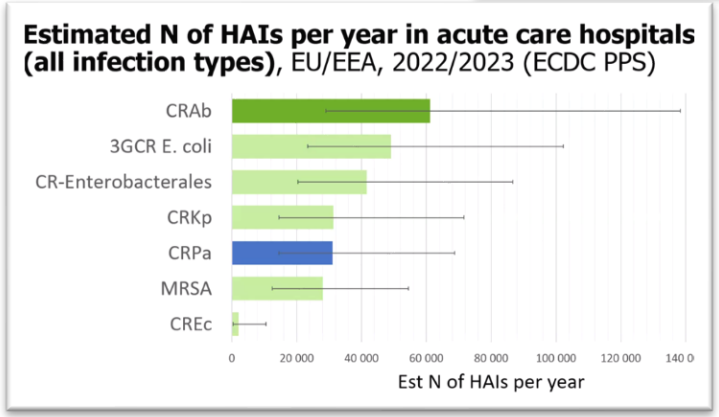
https://www.ecdc.europa.eu/en/publications-data/antimicrobial-consumption-eueea-esac-net-annual-epidemiological-report-2023

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Prevalence MDR u HAI 2022-2023 ECDC







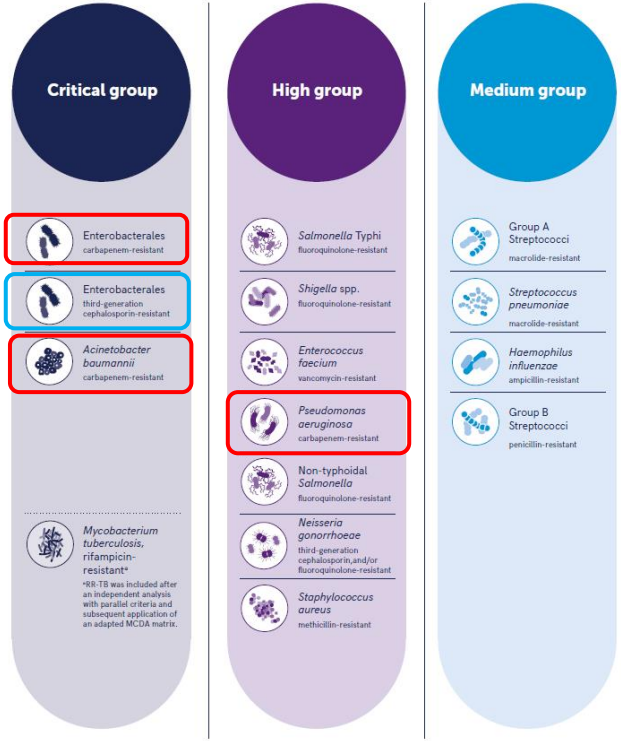
https://www.who.int/publications/i/item/9789240093461

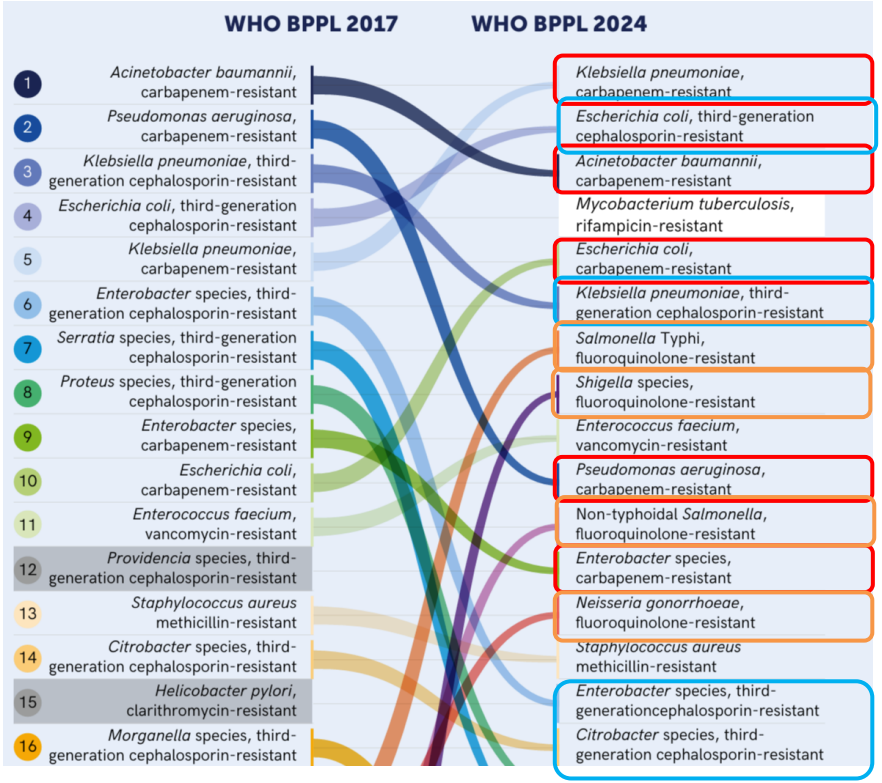
National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Bacterial Priority Pathogens List, WHO 17/05/2024

World Health Organization

List prioritních bakteriálních patogenů – WHO 2024
https://www.who.int/publications/i/item/9789240093461

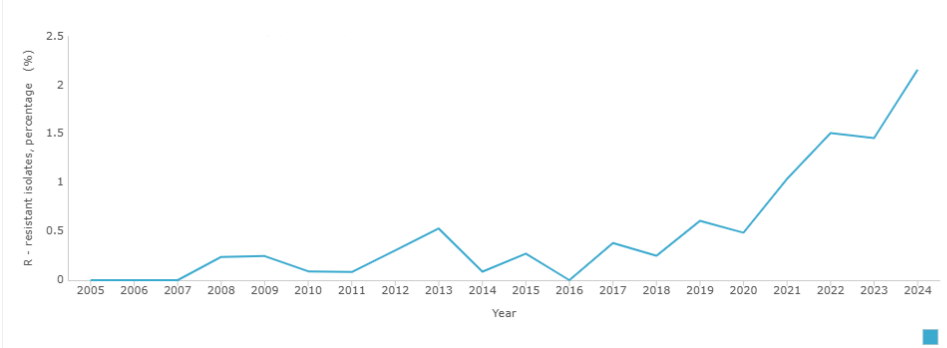


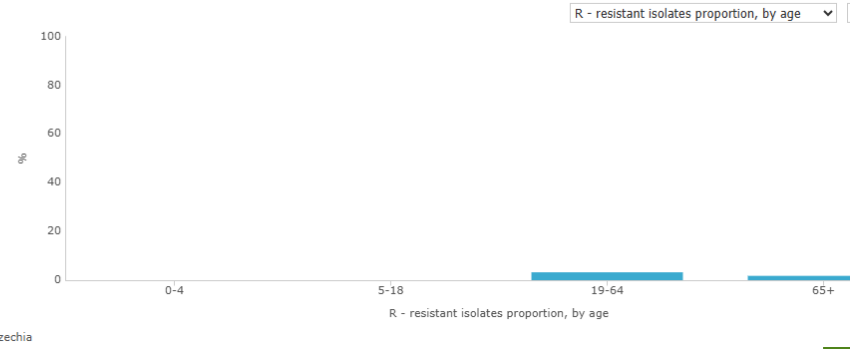


National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Rezistence *K. pneumoniae* ke karbapenemům v Evropě a ČR

Region	R - resistant isolates, percentage (%)	Total tested isolates (N)	R - resistant isolates (N)	I - 'susceptible, increased exposure' isolates (N)	S - susceptible isolates (N)
Austria	1.5	1624	24	2	1598
Belgium	1.9	1116	21	12	1083
Bulgaria	67.6	466	315	1	150
Croatia	31.3	498	156	31	311
Cyprus	48.5	324	157	4	163
Czechia	2.2	1437	31	4	1402
Denmark	0.4	1361	6	4	1351
Estonia	1.7	235	4	3	228
Finland	0.2	868	2	0	866
France	1.2	6051	73	27	5951
Germany	1.2	10928	136	11	10781
Greece	60.2	1748	1053	26	669
Hungary	6.7	1249	84	7	1158
Iceland	0.0	41	0	0	41
Ireland	0.2	493	1	1	491

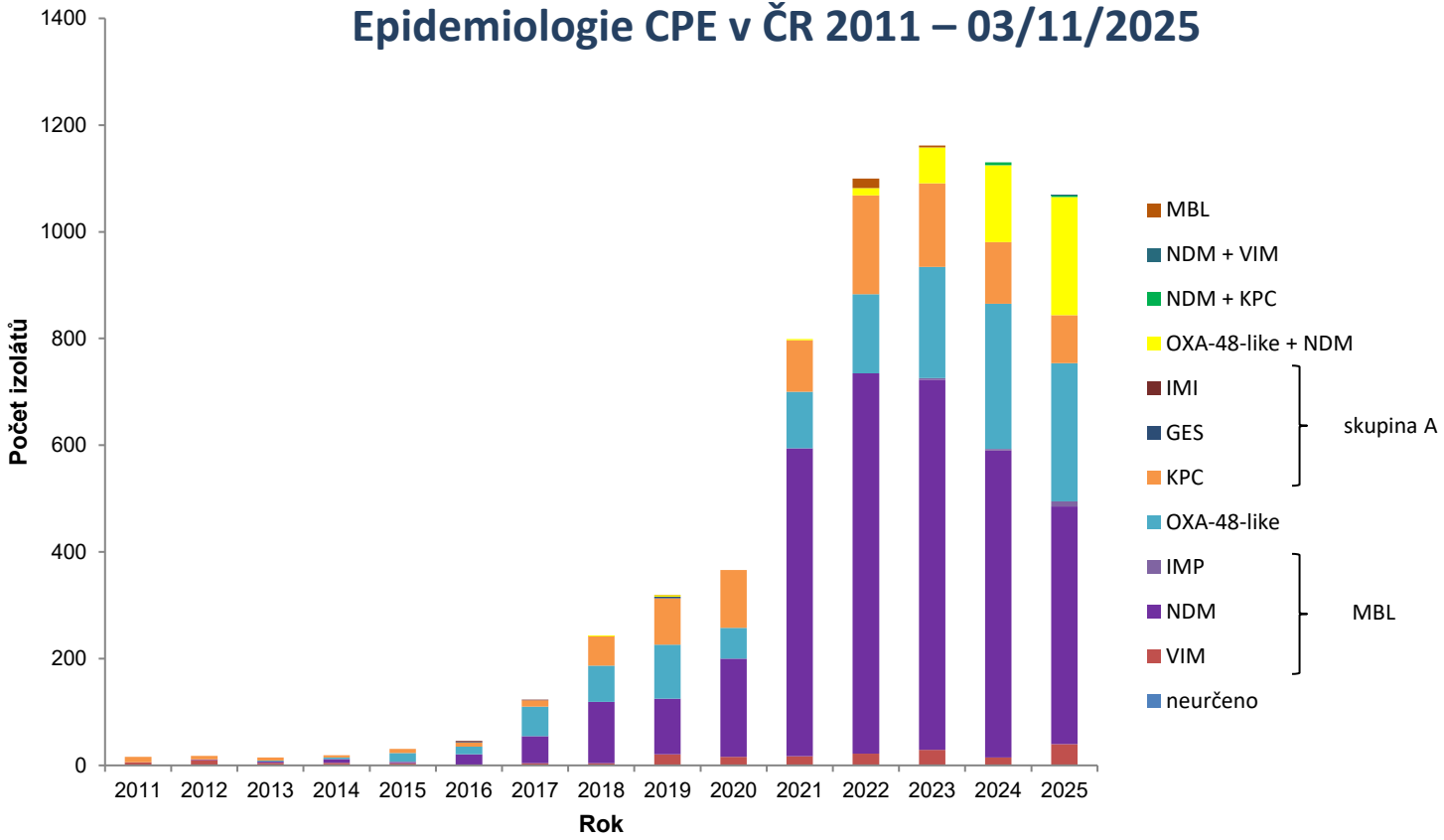




EARS-Net, ECDC

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Epidemiologie CPE v ČR 2011 – 03/11/2025



data NRL + LF Plzeň

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Producenti NDM + OXA-48-like

- první detekce v Maroku v Marakéši v roce 2012
- zejména ***Klebsiella pneumoniae***
- často **hypervirulentní kmeny** (hypervirulentní plasmidy – cca 220 kb) → podobné vlastnosti jako PVL MSSA/MRSA → komunita, opakované infekce, jakýkoliv věk, těžké destruující/devastující infekce, monomikrobiální infekce, …
- produkce **OXA-48-like** (OXA-48, -181, -232, …) + **NDM-1 / NDM-5**
- dominují **epidemiologicky úspěšné klony** → ST307, ST147, ST11, …
- lokalizace rezistenčních genů na **mobilních genetických elementech** → plasmidy, transpozony => šíření mezi jednotlivými ST a možnost mezidruhového přenosu
- většinou **panrezistence => problematická terapie**
- riziko **kolonizace** => šíření do komunity
- outbreaky popisovány celosvětově → v řadě zemí je to aktuální hlavní epidemiologický problém (endemické šíření v rámci ZdrZaz)

Loqman, S. et al. Antibiotics, 10(5), 492.

Producenti NDM + OXA-48-like – epidemiologie ČR

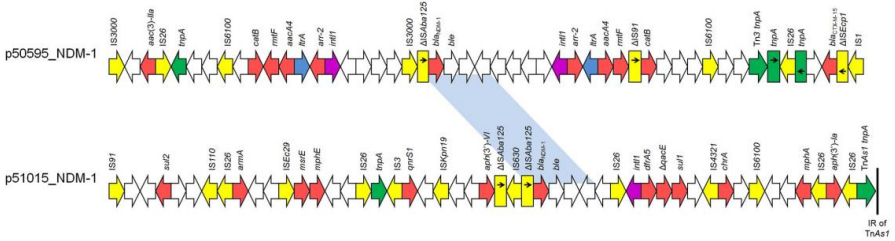
2018	2019	2020	2021	2022	2023	2024	3/11/2025
1	4	0	2	14	67	144	221

Genetic Plurality of OXA/NDM-Encoding Features Characterized From *Enterobacterales* Recovered From Czech Hospitals

frontiers in Microbiology

2018-2019

Katerina Chudejova[1,2], Lucie Kraftova[1,2], Vittoria Mattioni Marchetti[1,2], Jaroslav Hrabak[1,2], Costas C. Papagiannitsis[1,2,3] and Ibrahim Bitar[1,2]*

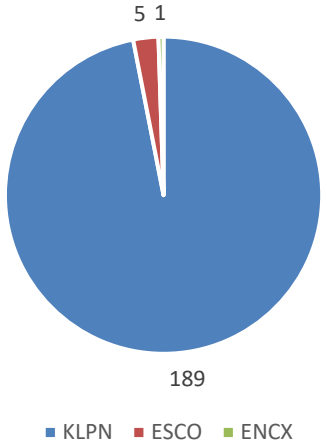


- 4 pacienti – 4 různé nemocnice v ČR
- cestovní anamnéza nebo hospitalizace v zahraničí (1x Indie, 3x Severní Afrika)
- *K. pneumoniae* (**ST11**, **147**, 15) a *E. coli* (ST167)
- geny lokalizovány většinou na **plasmidu** => riziko **horizontálního přenosu a šíření**
- geny rezistence k BL lokalizovány v **MDR oblasti** (AMG, CMP, RIF, BL, SUL, FQs)

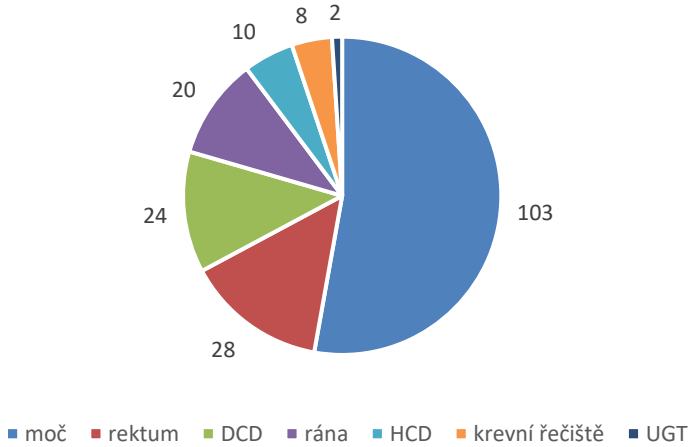
National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Producenti NDM + OXA-48-like – epidemiologie ČR (2018-17/01/2025)

Izoláty



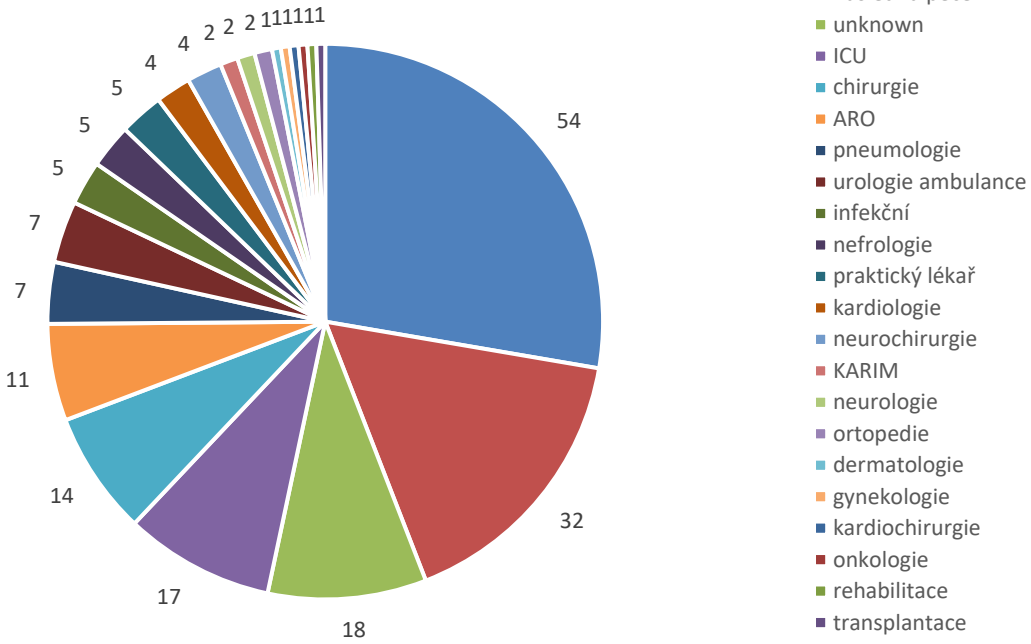
Primární materiál



National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Producenti NDM + OXA-48-like – epidemiologie ČR (2018-17/01/2025)

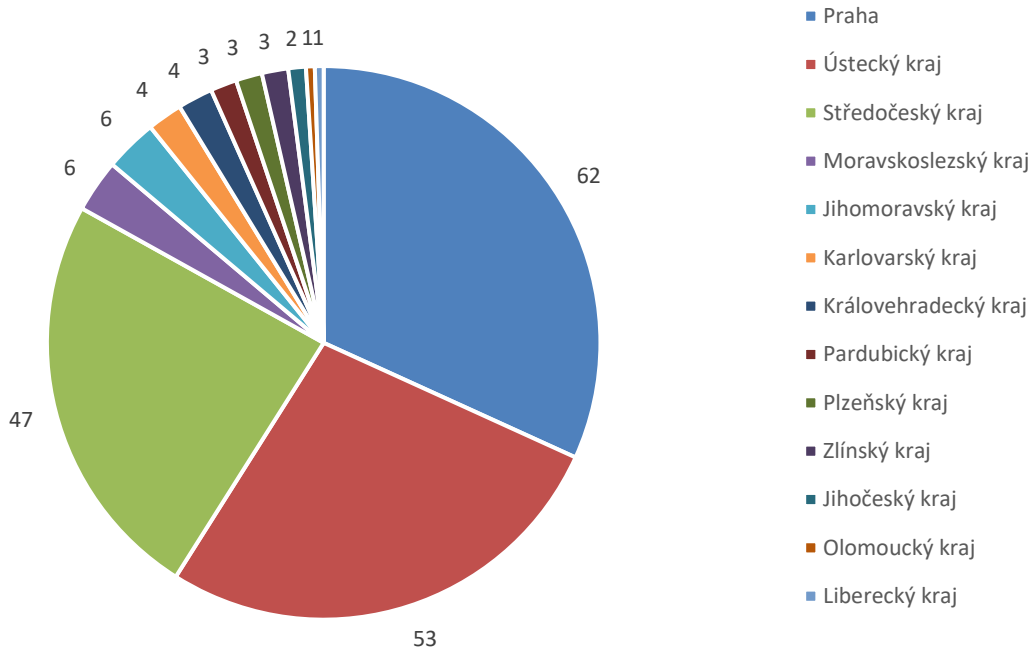
Oddělení



National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

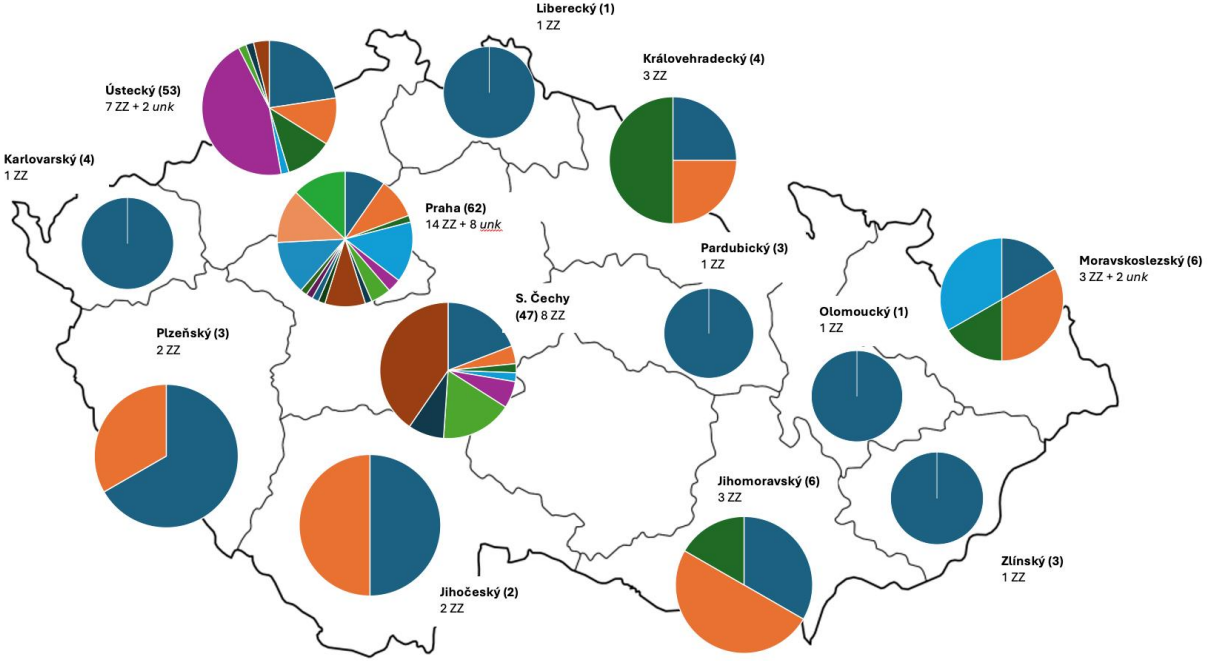
Producenti NDM + OXA-48-like – epidemiologie ČR (2018-17/01/2025)

Distribuce izolátů dle krajů



National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Producenti NDM + OXA-48-like – epidemiologie ČR (2018-17/01/2025)



ZZ = zdravotnické zařízení
unk = unknown

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

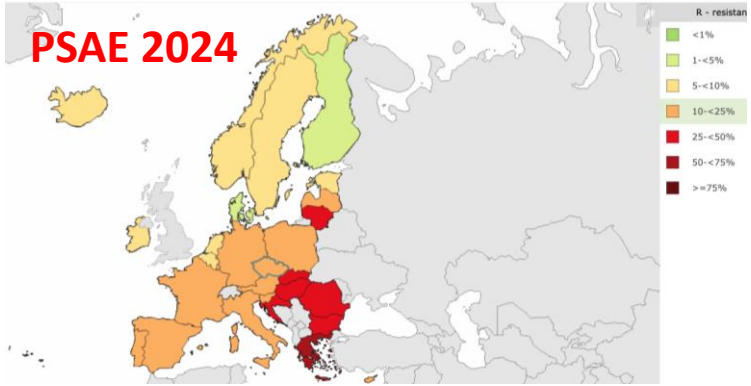
Producenti NDM + OXA-48-like – epidemiologie ČR (2021 až doposud)

- ze 401 izolátů zatím celogenomově osekvenováno 78 kmenů (20%)
- okolo 15 % cestovatelská anamnéza nebo cizinec (UA, Makedonie, Bělorusko, Moldávie, Tunis, Egypt)
- 72 ***Klebsiella pneumoniae***, 2 ***Enterobacter cloacae komplex*** a 4 ***Escherichia coli***
- 54/72 KLPN hypervirulentní kmeny (75 %)
  - *iucA* – aeroaktinový siderofor → metabolismus železa
  - *rmpA, rmpA2* → zvýšená tvorba pouzdra
  - *peg344* → transportér neznámé funkce
- 39 KLPN **ST147**, 6 KLPN **ST11**, 4 KLPN ST39, 5 KLPN ST395, 4 KLPN **ST307**, …
- většina sekvenovaných izolátů **citlivá pouze ke COL, FDC a AZT/AVI**

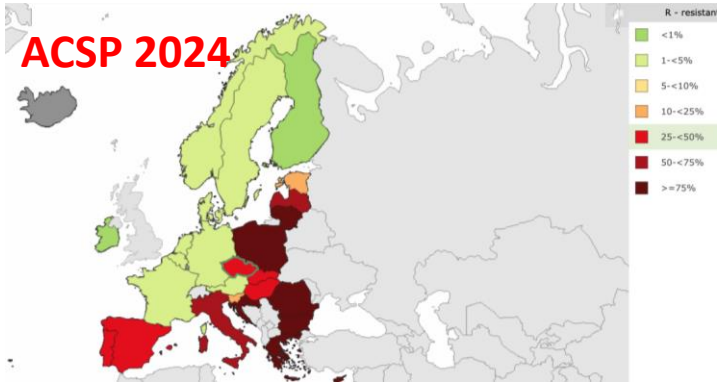
Hypervirulent KLPN Review – Russo et al. Clin Microbiol Rev. 2019 May 15;32(3)

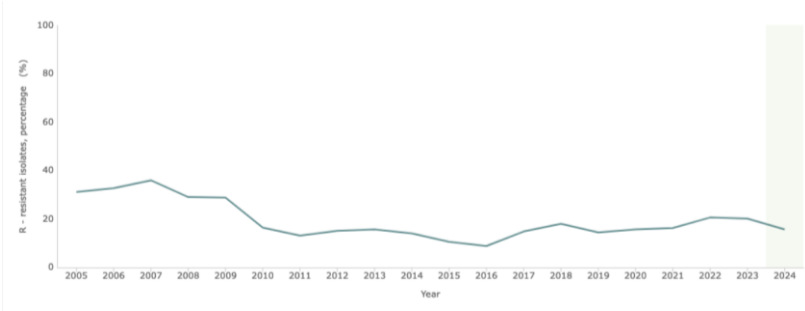
Rezistence PSAE a ACSP ke karbapenemům v Evropě a ČR

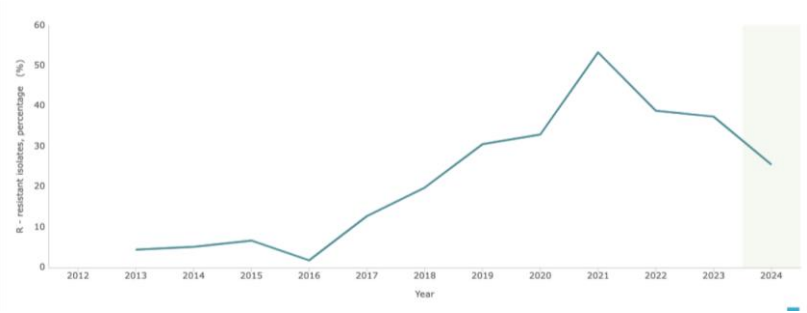
PSAE 2024



ACSP 2024

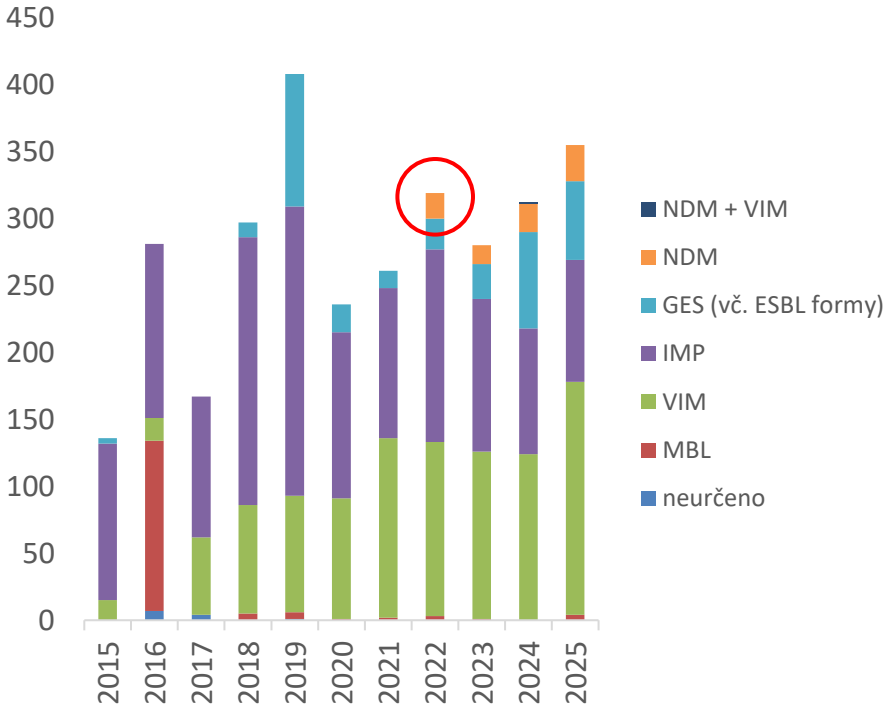


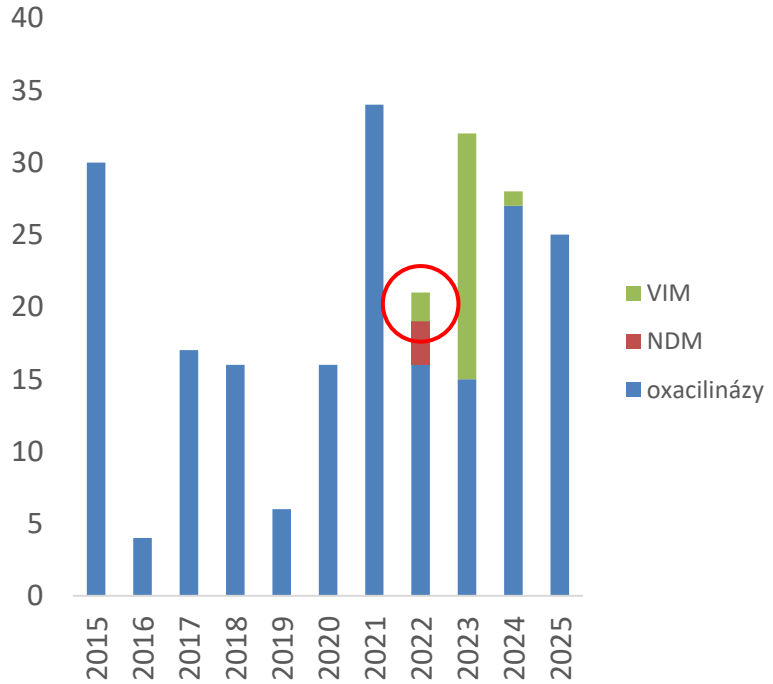




EARS-Net, ECDC

Epidemiologie CPP a CRAB v ČR (2015-03/11/2025)





data NRL + LF Plzeň

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Case report

Pseudomonas aeruginosa

- lokální outbreak 05/22 – 11/22
- nemocnice **A** ⟶ 18 izolátů
- nemocnice **B** (200 km) ⟶ 1 izolát
- nemocnice **C** (140 km) ⟶ 1 izolát
- produkce **NDM**
- XDR/PDR

ID	Datum izolace	Materiál	Nemocnice	Cestovní / hospitalizační anamnéza	Jiní producenti karbapenemáz	Karbapenemy	Status
1	23.5.2022	rektum	A	UA + transplantace KD v Turecku		MER (7d)	
2	2.7.2022	krev	A				†
3	11.8.2022	moč	A		KLPN NDM, ENCX NDM		
4	13.8.2022	rektum	A			MER (18d)	
5	15.8.2022	krev	A			MER (7d)	†
6	23.8.2022	rektum	A				
7	29.8.2022	rektum	A		KLPN NDM, ENCX NDM		
8	6.9.2022	rektum	A			MER (5d)	
9	13.9.2022	krev	A				†
10	20.9.2022	rektum	A			MER (6d)	
11	23.9.2022	krev	A				†
12	3.10.2022	moč PMC	A			MER (4d)	
13	3.10.2022	rektum	A				
14	7.10.2022	rektum	B	Tunisko	ACBA NDM, KLPN OXA-48+NDM	MER (3d)	
15	19.10.2022	rána	C	UA			
16	25.10.2022	krev	A	UA			†
17	1.11.2022	moč	A		ENCX NDM	MER (14d)	
18	12.11.2022	rektum	A				
19	18.11.2022	rektum	A			MER (5d)	
20	21.11.2022	moč	A			MER (7d)	

Chudějová (publikace v recenzním řízení)

Case report – antibiogram

ID	AMS	PIP	PPT	CTZ	AZT	MER	GEN	AMI	COL	CIP	TGC	COT
1	>128	64	64	>16	1	>16	>32	>64	1	>8	2	>4
2	>128	64	64	>16	2	>16	>32	>64	1	>8	4	>4
3	>128	128	128	>16	2	>16	>32	>64	1	>8	>8	>4
4	>128	128	128	>16	2	>16	>32	>64	1	>8	4	>4
5	>128	64	64	>16	2	>16	>32	>64	1	>8	8	>4
6	>128	128	64	>16	1	>16	>32	>64	1	>8	8	>4
7	>128	64	64	>16	1	>16	>32	>64	1	>8	4	>4
8	>128	64	128	>16	1	>16	>32	>64	1	>8	4	>4
9	>128	128	64	>16	0,5	>16	>32	>64	2	>8	8	>4
10	>128	64	64	>16	2	>16	>32	>64	1	>8	4	>4
11	>128	128	128	>16	1	>16	>32	>64	1	>8	4	>4
12	>128	16	16	>16	1	>16	>32	>64	2	>8	8	>4
13	>128	32	64	>16	1	>16	>32	>64	1	>8	2	>4
14	>128	128	128	>16	1	>16	>32	>64	2	>8	>8	>4
15	>128	128	128	>16	1	>16	>32	>64	1	>8	>8	>4
16	>128	64	64	>16	1	>16	>32	>64	1	>8	8	>4
17	>128	128	128	>16	2	>16	>32	>64	1	>8	8	>4
18	>128	64	64	>16	1	>16	>32	>64	1	>8	4	>4
19	>128	128	128	>16	2	>16	>32	>64	2	>8	8	>4
20	>128	128	128	>16	2	>16	>32	>64	2	>8	8	>4

+ FDC, AZT/AVI, (FOS)

Chudějová (publikace v recenzním řízení)

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Case report – WGS analýza

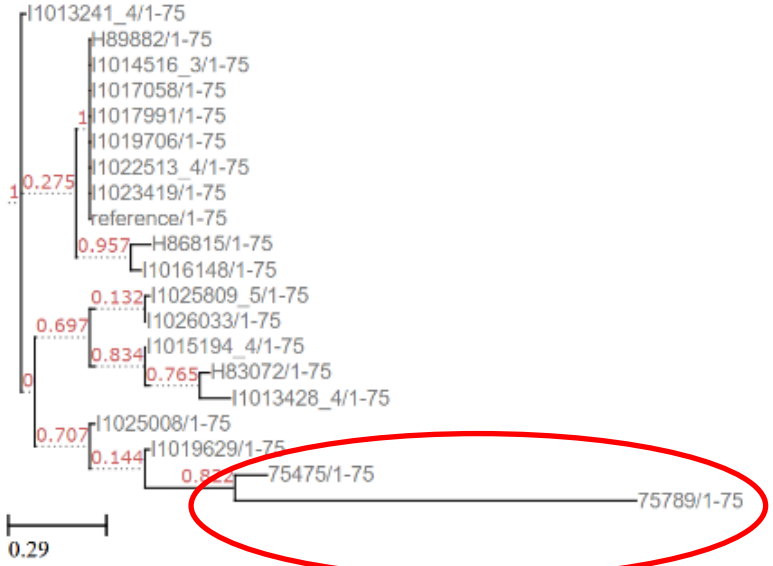
+ několik kopií profágů

					Beta-lactames						Aminoglycosides				FQs		SUL	FOS	CPM	TET	Efflux	Toxins
Sample ID	Strain	Serogroup	ST	Plasmids	NDM-1	OXA-50	OXA-395	OXA-396	OXA-494	PAO	aadA10	aadA11	aph(3')-IIb	rmtB	crpP	qnrVC1	sul1	fosA	catB7	tet(G)	qacE	
1	PSAE	O11	773	X																		exoT, exoU, exoY, toxA
2	PSAE	O11	773	X																		
3	PSAE	O11	773	X																		
4	PSAE	O11	773	X																		
5	PSAE	O11	773	X																		
6	PSAE	O11	773	X																		
7	PSAE	O11	773	X																		
8	PSAE	O11	773	X																		
9	PSAE	O11	773	X																		
10	PSAE	O11	773	X																		
11	PSAE	O11	773	X																		
12	PSAE	O11	773	X																		
13	PSAE	O11	773	X																		
14	PSAE	O11	773	X																		
15	PSAE	O11	773	X																		
16	PSAE	O11	773	X																		
17	PSAE	O11	773	X																		
18	PSAE	O11	773	X																		
19	PSAE	O11	773	X																		
20	PSAE	O11	773	X																		

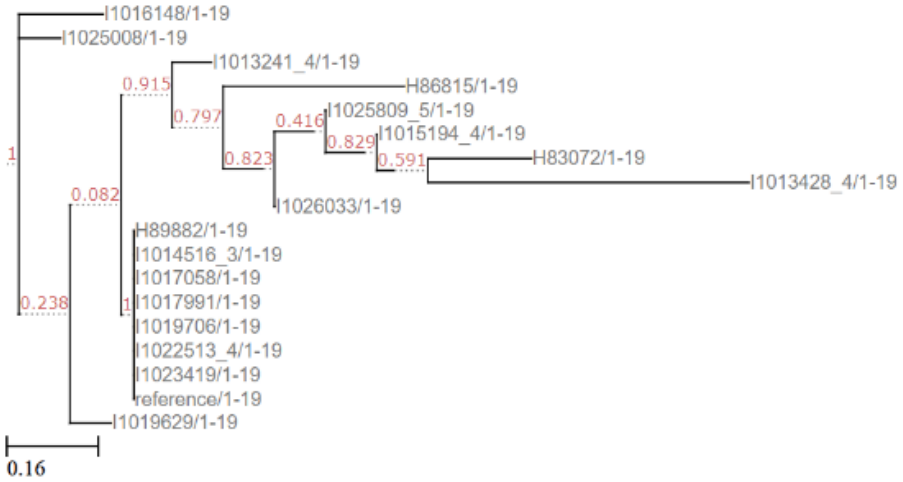
Chudějová (publikace v recenzním řízení)

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Case report – fylogenetická analýza (SNPs)



všechny izoláty – 0-53 SNPs

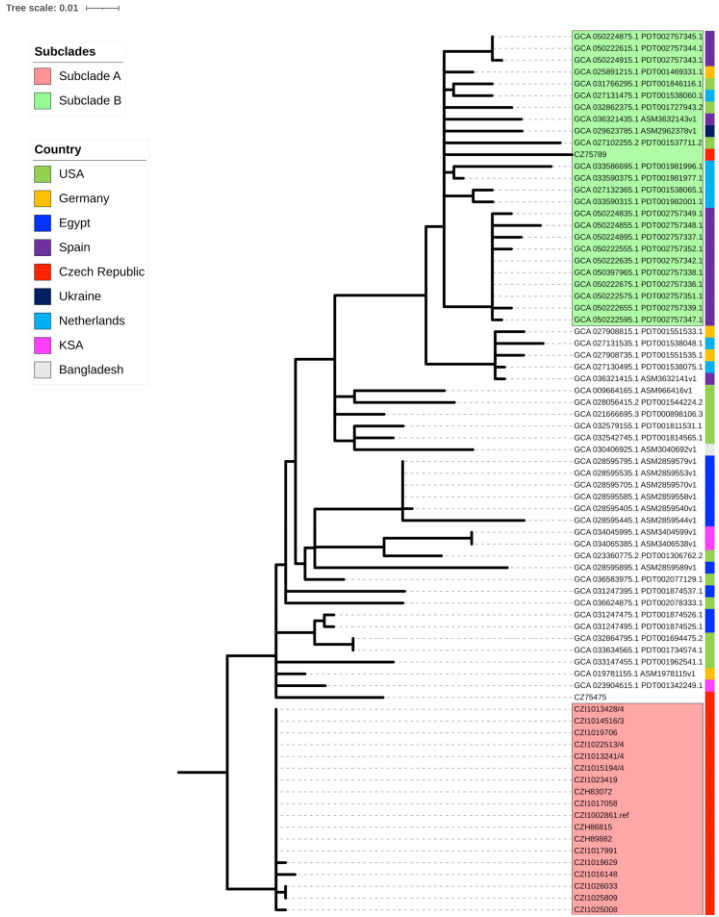


bez izolátů B a C – 0-11 SNPs

Chudějová (publikace v recenzním řízení)

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Case report – fylogenetická analýza v rámci všech ST773 v NCBI databázi



Chudějová (publikace v recenzním řízení)

National Institute of Virology and Bacteriology

CHARLES UNIVERSITY
Faculty of Medicine in Pilsen

Funded by the European Union
NextGenerationEU

MINISTRY OF EDUCATION, YOUTH AND SPORTS

CZECH RECOVERY PLAN

Case report – závěr

- izoláty velmi blízce příbuzné
- izolát B a C nejsou součástí outbreaku
- ST773 high-risk clone

Contents lists available at ScienceDirect

Journal of Global Antimicrobial Resistance

journal homepage: www.elsevier.com/locate/jgar

Genome Note

Complete genome sequence of an extensively drug-resistant *Pseudomonas aeruginosa* ST773 clinical isolate from North India

Sanjay Singh[a,1], Chanakya Pachi Pulusu[b,1], Ashutosh Pathak[a], Bulagonda Eswarappa Pradeep[b], Kashi Nath Prasad[a,c,*]

JOURNAL OF MEDICAL MICROBIOLOGY

SHORT COMMUNICATION

Kocsis, *et al.*, *Journal of Medical Microbiology* 2019;68:336–336

DOI 10.1099/jmm.0.000927

MICROBIOLOGY SOCIETY

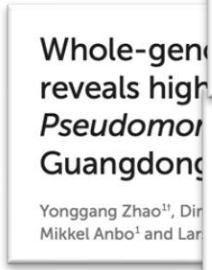
Acquired *qnrVC1* and *bla*$_{NDM-1}$ resistance markers in an international high-risk *Pseudomonas aeruginosa* ST773 clone

Bela Kocsis[1,*], Akos Toth[2], Daniel Gulyas[1], Balazs Ligeti[1,3], Katalin Katona[4], Laszlo Rokusz[5] and Dora Szabo[1]

Simultaneous clonal spread of NDM-1–producing *Pseudomonas aeruginosa* ST773 from Ukrainian patients in the Netherlands and Spain

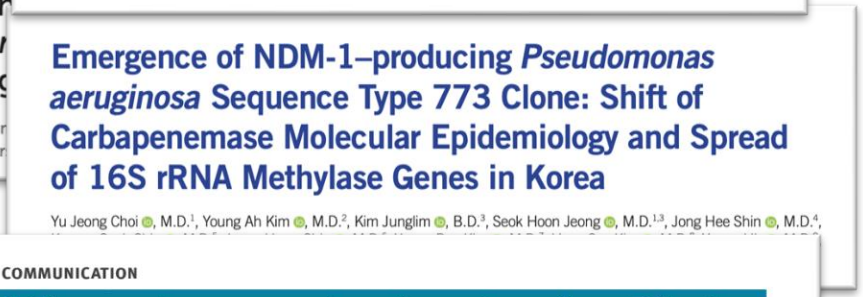
Marta Hernández-García[1,2,†], Manuel González de Aledo[1,2,†], Manuel Ponce-Alonso[1,2], Beatriz González-Blanco[3], Esther Viedma[3], Jennifer Villa[3], María Tomás[4], Antoni P.A. Hendrickx[5], Patricia Ruiz-Garbajosa[1,2,*], Rafael Cantón[1,2]

[1] *Servicio de Microbiología, Hospital Universitario Ramón y Cajal and Instituto Ramón y Cajal de Investigación Sanitaria (IRYCIS), Madrid, Spain*
[2] *CIBER de Enfermedades Infecciosas (CIBERINFEC), Instituto de Salud Carlos III, Madrid, Spain*
[3] *Servicio de Microbiología, Hospital 12 de Octubre, Madrid, Spain and Instituto de Investigación Hospital 12 de Octubre (imas12), Madrid, Spain*
[4] *Grupo de Microbiología Traslacional y Multidisciplinar (MicroTM)-Servicio de Microbiología Instituto de Investigación Biomédica A Coruña (INIBIC), Hospital A Coruña (CHUAC), A Coruña, Spain*
[5] *Centre for infectious disease control (Cib), National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands*



Whole-gen
reveals high
Pseudomon
Guangdong

Yonggang Zhao[1†], Dir
Mikkel Anbo[1] and Lar



Emergence of NDM-1–producing *Pseudomonas aeruginosa* Sequence Type 773 Clone: Shift of Carbapenemase Molecular Epidemiology and Spread of 16S rRNA Methylase Genes in Korea

Yu Jeong Choi, M.D.[1], Young Ah Kim, M.D.[2], Kim Junglim, B.D.[3], Seok Hoon Jeong, M.D.[1,3], Jong Hee Shin, M.D.[4],

RAPID COMMUNICATION

Multidrug-resistant organisms in patients from Ukraine in the Netherlands, March to August 2022

Romy D Zwittink[1,*], Cornelia CH Wielders[1,*], Daan W Notermans[1], Nelianne J Verkaik[2], Annelot F Schoffelen[1], Sandra Witteveen[1], Varisha A Ganesh[1], Angela de Haan[1], Jeroen Bos[1], Jacinta Bakker[1], Caroline Schneeberger-van der Linden[1], Ed J Kuijper[1,], Sabine C de Greeff[1,**], Antoni PA Hendrickx[1,**], on behalf of the Dutch CPE and MRSA Surveillance Study Groups[3]**

1. Centre for Infectious Disease Control (Cib), National Institute for Public Health and the Environment (RIVM), Bilthoven, the Netherlands
2. SWAB Working Group Surveillance of Antibiotic Resistance, Department of Medical Microbiology and Infectious Diseases, Erasmus University Medical Center, Rotterdam, the Netherlands
3. The members of the network are acknowledged at the end of the article

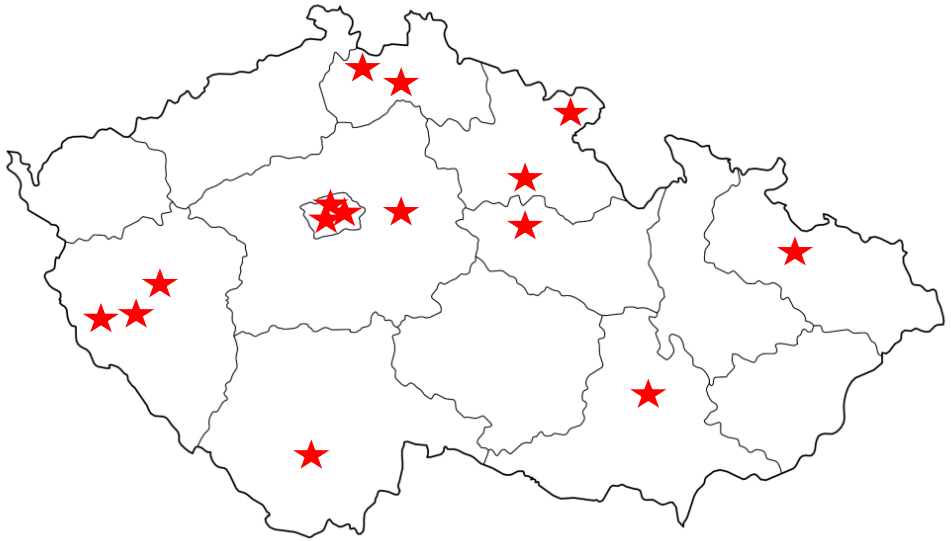
* These authors contributed equally to this article and share first authorship
** These authors contributed equally to this work and share last authorship

Correspondence: Antoni P.A. Hendrickx (antoni.hendrickx@rivm.nl)

ním řízení)

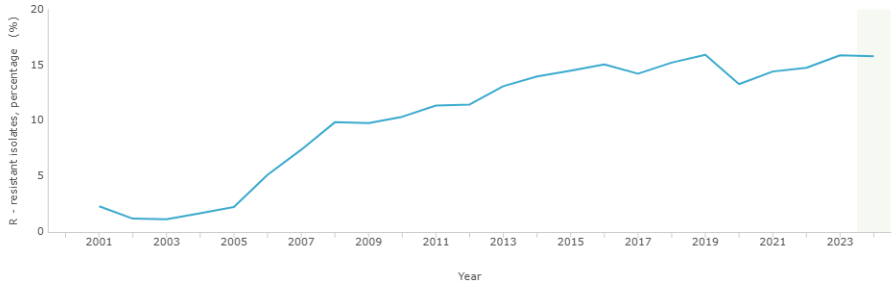
PSAE NDM – aktuální info

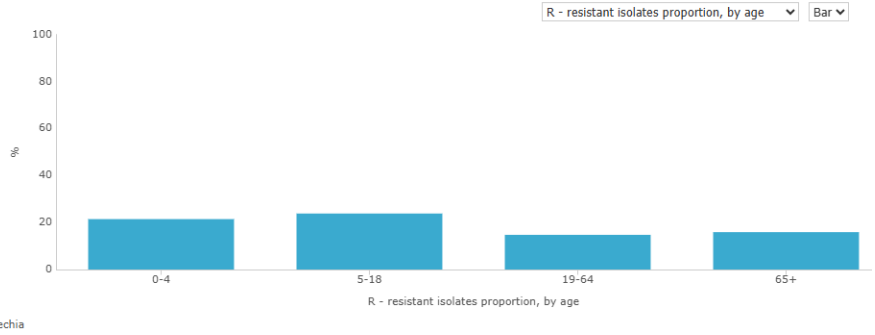
- dosud celkem detekováno 82 izolátů
  - **outbreak 2022** – 20 izolátů ⟶ 3 nemocnice => dle SNPs analýzy pravděpodobně 3 zdroje
  - **2023** – 14 izolátů ⟶ 5 nemocnic
  - **2024** – 21 izolátů ⟶ 8 nemocnic
  - **11/2025** – 27 izoláty ⟶ 8 nemocnice



Rezistence *E. coli* k cefalosporinům 3. generace v Evropě a ČR

Region	R - resistant isolates, percentage (%)	Total tested isolates (N)	R - resistant isolates (N)	I - 'susceptible, increased exposure' isolates (N)	S - susceptible isolates (N)
Austria	10.6	6170	651	25	5494
Belgium	11.9	5311	633	42	4636
Bulgaria	34.5	336	116	0	220
Croatia	19.4	1057	205	4	848
Cyprus	38.8	400	155	15	230
Czechia	15.8	4269	674	41	3554
Denmark	6.8	5369	363	49	4957
Estonia	9.9	1116	111	9	996
Finland	7.5	4132	308	19	3805
France	10.5	21395	2240	151	19004
Germany	10.6	47131	5000	211	41920
Greece	25.5	1498	382	8	1108
Hungary	20.7	3067	636	5	2426
Iceland	14.1	290	41	1	248
Ireland	11.9	2879	343	40	2496





EARS-Net, ECDC

National Institute of Virology and Bacteriology

CHARLES UNIVERSITY Faculty of Medicine in Pilsen

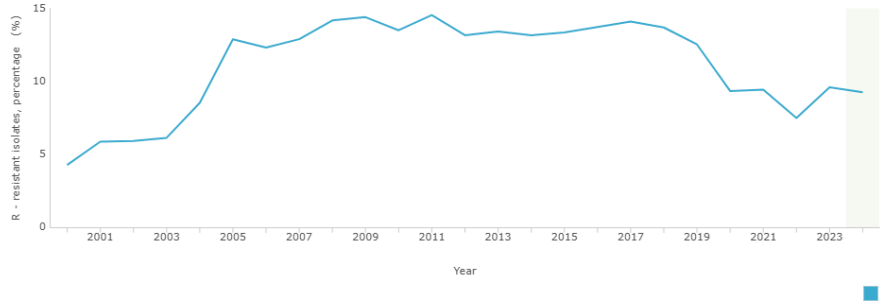
Funded by the European Union NextGenerationEU

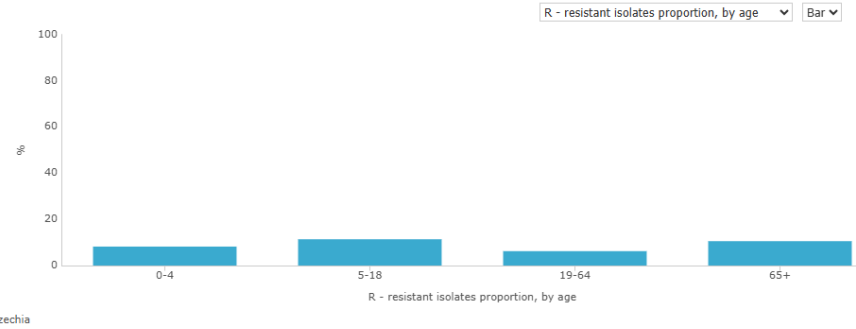
MINISTRY OF EDUCATION, YOUTH AND SPORTS

CZECH RECOVERY PLAN

Rezistence *S. aureus* k meticilinu (MRSA) v Evropě a ČR

Region	R - resistant isolates, percentage (%)	Total tested isolates (N)	R - resistant isolates (N)
Austria	5.3	3404	182
Belgium	7.4	1882	140
Bulgaria	10.9	320	35
Croatia	29.8	587	175
Cyprus	46.0	235	108
Czechia	9.3	2301	213
Denmark	1.9	1763	33
Estonia	3.4	442	15
Finland	3.7	2294	85
France	9.9	12060	1195
Germany	4.2	23887	1013
Greece	40.5	967	392
Hungary	17.3	2204	381
Iceland	5.6	143	8
Ireland	11.0	1060	117



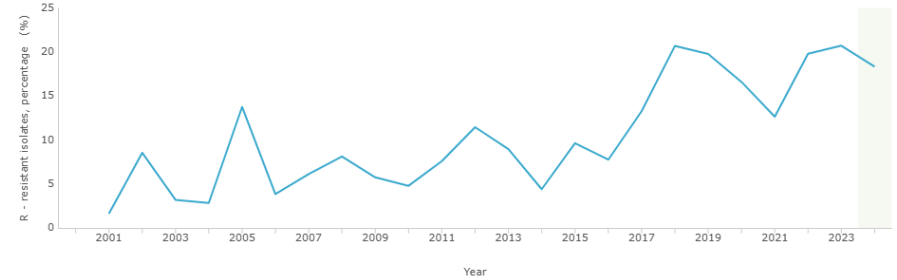


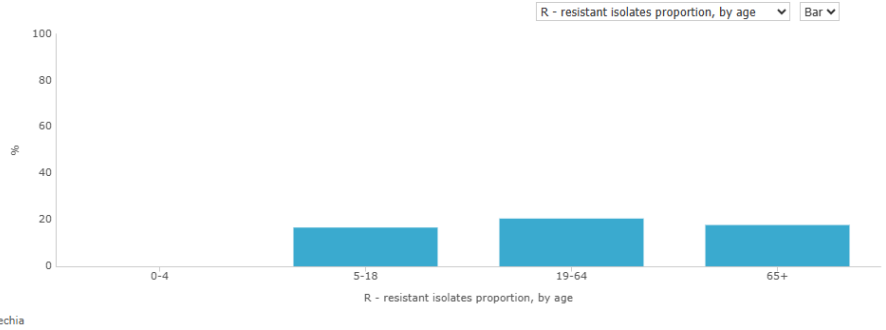
EARS-Net, ECDC

National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Rezistence *E. faecium* k vankomycinu (VRE) v Evropě a ČR

Region	R - resistant isolates, percentage (%)	Total tested isolates (N)	R - resistant isolates (N)	I - 'susceptible, increased exposure' isolates (N)	S - susceptible isolates (N)
Austria	3.2	617	20	0	597
Belgium	3.4	526	18	0	508
Bulgaria	14.5	131	19	0	112
Croatia	55.5	137	76	0	61
Cyprus	53.7	147	79	0	68
Czechia	18.3	415	76	0	339
Denmark	13.4	584	78	0	506
Estonia	4.4	68	3	0	65
Finland	0.6	154	1	0	153
France	0.5	2056	11	0	2045
Germany	10.8	6650	719	0	5931
Greece	58.9	981	578	0	403
Hungary	36.0	456	164	0	292
Iceland	0.0	28	0	0	28
Ireland	21.1	512	108	0	404





EARS-Net, ECDC

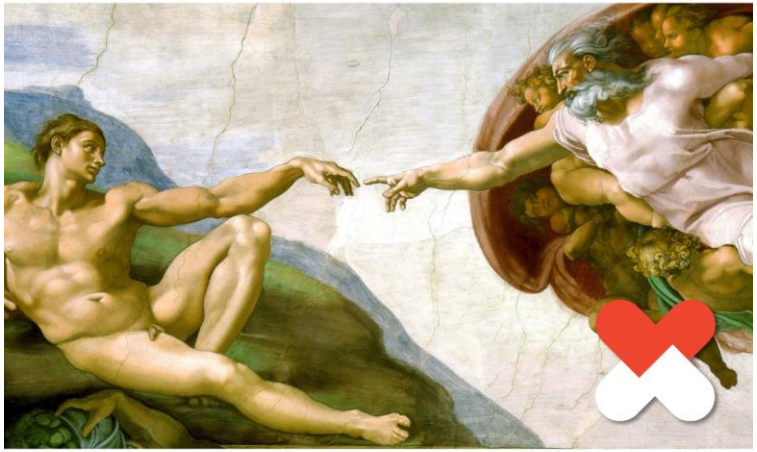
National Institute of Virology and Bacteriology
CHARLES UNIVERSITY Faculty of Medicine in Pilsen
Funded by the European Union NextGenerationEU
MINISTRY OF EDUCATION, YOUTH AND SPORTS
CZECH RECOVERY PLAN

Závěr

- V ČR jsou **největším problémem producenti karbapenemáz** – zejména **producenti NDM**, a kombinace **NDM + OXA-48-like**, převážně v rámci high-risk klonů *K. pneumoniae* (ST147, ST307, ST11)
- ***P. aeruginosa* NDM** (ST773) představuje nově vznikající hrozbu s jasným outbreakovým chováním a mezinemocničním šířením
- **Hypervirulence *K. pneumoniae*** zásadně zvyšuje klinickou závažnost infekcí
- ESBL, MRSA a VRE zůstávají více méně stabilní

- klíčová je národní surveillance za plošnějšího využití WGS + trasování + řešení outbreaků lokálními epidemiology + spolupráce s nadnárodními organizacemi

Hey buddy,
have you washed your hands?



EU-JAMRAI Joint Action Antimicrobial Resistance and Healthcare-Associated Infections

EUROPEAN ANTIBIOTIC AWARENESS DAY
A EUROPEAN HEALTH INITIATIVE

Děkuji za pozornost ☺

National Institute of Virology and Bacteriology

CHARLES UNIVERSITY
Faculty of Medicine in Pilsen

Funded by the European Union
NextGenerationEU

MINISTRY OF EDUCATION, YOUTH AND SPORTS

CZECH RECOVERY PLAN