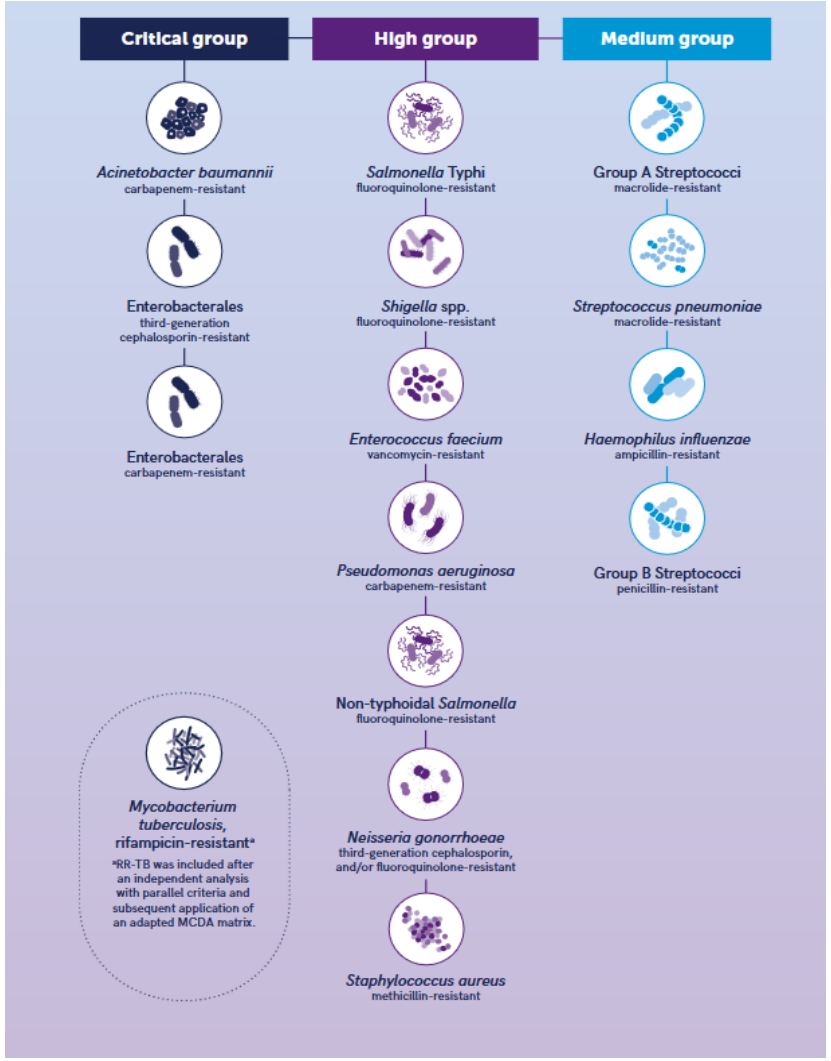
Surveillance of Novel or Rare Antimicrobial resistant Organisms (NRAO) in Ireland, 2025

Introduction

- The emergence of Novel or Rare Antimicrobial resistant Organisms (NRAO) is an evolving health threat that challenges the effectiveness of existing treatments. Research and development of new antimicrobial agents (antibiotics) have not kept pace with the rapid evolution of antibiotic resistance, meaning that bacterial infections are becoming harder to treat.
- In 2017, WHO developed the first Bacterial Priority Pathogens List (BPPL) to guide investment into the R&D of new antibiotics. Since its launch, the BPPL, shown here, has been used to evaluate new antibiotics that are in development, and the results have been published in annual WHO reports.
- The updated 2024 BPPL builds on the 2017 list and includes 15 families of antibiotic resistant (ABR) pathogens, grouped into critical, high and medium categories of priority for R&D and for public health measures.
- The purpose of the BPPL is to address current challenges, guide resource allocation, guide and promote R&D of novel antibacterial agents and support development of effective strategies to prevent, control and treat infections caused by priority pathogens.
- The list has been shown to be a valuable public health tool for guiding AMR surveillance, prevention and control.
- The WHO Bacterial Priority Pathogen's List can be found here



WHO Bacterial Priority Pathogens List, 2024: bacterial pathogens of public health importance to guide research, development and strategies to prevent and control antimicrobial resistance. Geneva: World Health Organization; 2024.

NRAO Case Definition

Case Definition

Clinical criteria

Not relevant for surveillance purposes.

Laboratory criteria

The identification of an organism from any specimen, whether a diagnostic (invasive, non-invasive infection or colonisation, also known as carriage) or a screening specimen (colonisation, also known as carriage), with a confirmed pattern of antimicrobial resistance of clinical concern and not previously reported (novel) or rarely reported in Ireland.

For this purpose, “clinical concern” means that the pattern of resistance is likely to impact on efficacy of antimicrobial agents that would normally be used to treat the species in question. The “confirmed pattern of antimicrobial resistance” should always be confirmed in a second laboratory (generally a reference laboratory). Guidance on what constitutes a NRAO should be sought from the relevant reference laboratory and the Health Protection Surveillance Centre.

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Epidemiological criteria

Not relevant for surveillance purposes.

Case classification

- Possible case: Not applicable
- Probable case: Not applicable
- Confirmed case: Any person meeting the laboratory criteria

Outbreak

An outbreak of a novel or rare antimicrobial resistant organism is defined as two or more confirmed cases of the same antimicrobial resistance pattern (causing any of invasive or non-invasive infection or colonisation) that are linked epidemiologically in time and place.

Note: Given that chains of transmission of organisms are generally silent, assessment of linkage may be challenging. Guidance on what constitutes a NRAO and an outbreak of a NRAO should be sought from the relevant reference laboratory, the Health Protection Surveillance Centre and local Department of Public Health. If deemed indicated, an outbreak control team should be convened. As of 2026 the term NRAO generally applies to the following ***but is not limited to*** *the following: Carbapenemase producing Acinetobacter species, Carbapenemase producing Pseudomonas aeruginosa, Candidozyma auris, Linezolid-resistant Enterococcus species, Glycopeptide-resistant Staphylococcus species, Linezolid-resistant Staphylococcus species, Daptomycin-resistant Staphylococcus species, Colistin-resistant Enterobacterales, Haemophilus influenzae resistant to third generation cephalosporins, Penicillin-resistant S. pyogenes or S. agalactiae, Azole-resistant Aspergillus fumigatus*

Overview

- The Health Protection Surveillance Centre (HPSC) collects data on Novel or rare antimicrobial resistant organisms on an annual basis using an MS Excel based data collection tool.
- A total of thirty-seven laboratories nationally participate in this surveillance programme, in accordance with the case definition shown.
- The number of NRAO identified decreased from 93 in 2024 to **67** in **2025** while the number of reporting laboratories (with one or more NRAO to report) increased slightly from twelve to fifteen.

Year	2022	2023	2024	2025
Total number of NRAO reported	**32**	**67**	**93**	**67**
Number of laboratories who submitted NRAOs*	11	12	12	15

* Not including labs with Nil or Zero return (n=22)

Galway Reference Laboratory Report (2025)

- The NSSLRL National *Salmonella, Shigella & Listeria* (NSSLRL) and National Carbapenemase Producing Enterobacterales (CPE) Reference Laboratories) are based in the Department of Medical Microbiology in Galway University Hospital and offer services to all medical laboratories in hospitals throughout Ireland.
- Table 8 of the Reference Laboratory Report shows a breakdown of NRAO harbouring a carbapenemase gene received by the reference laboratory in 2024 and 2025 from human isolates. This includes Enterobacterales, *Pseudomonas* species and *Acinetobacter* species.
- Figures in this report may differ from those reported by the NSSRL, as not all isolates are submitted to the Reference Laboratory for further testing.

Carbapenemase-producing *Acinetobacter* spp.

- Carbapenemase-producing *Acinetobacter* spp. (CPA) is a significant healthcare concern due to its high resistance to many antibiotics, including carbapenems.
- Carbapenemase-producing *Acinetobacter baumannii* (CRAb) is the most common cause of nosocomial (healthcare associated) infections caused by CPA accounting for **88%** (n=7) of cases in **2025** and 64% of total cases between 2022 and 2024.
- **NDM** represented the most common enzyme identified in **2025** accounting for 60% of cases where an enzyme was reported (n=5).
- OXA-23 accounted for 40% of cases where an enzyme was reported, similar to 2024 where it accounted for 33% of cases.

***Acinetobacter* spp.**		**2022**	**2023**	**2024**	**2025**
Carbapenemase-producers					
	A. baumannii (CRAb)	3	12	8	7
	Other *acinetobacters*	2	4	7	1
	Total	**5**	**16**	**15**	**8**
	NDM	1	3	9	3
	IMP-1	1	0	1	0
	GES-56	1	0	0	0
	OXA-23	1	12	5	2
	OXA-24	0	1	0	0
	Other carbapenem-R	1	0	0	0
	Not specified	0	0	0	3
	Total	**5**	**16**	**15**	**8**

Carbapenemase-producing *Acinetobacter* spp.

Acinetobacter outbreaks

Two healthcare-associated outbreaks of Carbapenemase-producing *Acinetobacter baumannii* (CRAb) were notified on CIDR in 2025.

ECDC genomic-based survey of carbapenem-resistant *Acinetobacter baumannii* (CRAb)

HPSC participated in a genomic survey of carbapenem-resistant *Acinetobacter baumannii* (CRAb) which was launched by ECDC in July 2024 with the aim of collecting data from hospitals from EU/EEA, Western Balkan countries and Türkiye.

The survey also aimed to help countries enhance their capacities for detecting and controlling infections caused by CRAb. This includes strengthening national capabilities for implementing advanced genetic techniques to monitor CRAb and understanding the factors that lead to CRAb infections.

The final survey results will inform national and European CRAb preparedness, prevention and control activities.

The survey, which was conducted through ECDC's European Antimicrobial Resistance Genes Surveillance Network (EURGen-Net), began in October 2024 and ran until June 2025. The results of this survey will be published in the Summer of 2026.

Fluconazole-resistant *Candidozyma auris*

- *Candidozyma auris* was first identified in 2009 and has emerged as a cause of healthcare-associated infections in countries worldwide.
- Five cases of ***C. auris*** have been reported in Ireland since it became notifiable in 2017 the most recent of which was a fluconazole-resistant case which occurred in **Q4 2025** which was likely travel related.
- No cases of fluconazole-resistant *Candida auris* were reported in 2024.
- One travel-related case of *C. auris* was reported in 2023 – this was noted as fluconazole-resistant (but sensitive to other antifungals) and was isolated from a wound swab.
- Three cases of fluconazole-resistant *Candida auris* were reported in 2022. All three were travel-related and there were no common epidemiological linkages identified. Two of these cases were isolated from wound swabs, while the third was identified from an ear swab.
- HPSC has not received any reports of *C. auris* bloodstream infection being detected in Irish hospitals to date.

	2022	2023	2024	2025
Candidozyma auris				
Fluconazole-R	3	1	0	1
Other* *Candida* spp.				
Fluconazole-R	0	0	3	1

** 2 Candida albicans and 2 Candida tropicalis*

Staphylococci with unusual resistance

2025

- In 2025 six cases of *S. aureus* with unusual resistance - one teicoplanin-resistant, two daptomycin-resistant and three mupirocin-resistant were detected.
- Two outbreaks of methicillin-resistant PVL toxin positive *S. aureus* were reported to CIDR in 2025 – one was associated with a healthcare facility, and one occurred in a private residence.
- Eleven cases of linezolid-resistant *S. epidermidis* were reported in 2025. Ninety-one percent (10/11) of these cases were isolated from blood culture.
- One case of daptomycin-resistant *S. capitis* and two cases of linezolid-resistant *S. haemolyticus* were identified in 2025, all of which were isolated from blood culture.
- One case of methicillin-resistant mecA positive *S. lugdunensis* was identified in 2025.

2022 - 2024

- Between 2022 and 2024, there were eight cases of *S. aureus* with unusual resistance or important virulence factor identified – one methicillin-sensitive PVL toxin positive, one hGISA (reduced glycopeptide susceptibility), two teicoplanin-resistant and three daptomycin-resistant.
- Forty-nine cases of linezolid-resistant *S. epidermidis* were reported between 2022 and 2024. Fifty percent of these cases reported over this three-year period were isolated from blood culture. One case of teicoplanin-resistant *S. epidermidis* was also reported during this time (2022).
- The last recorded resistant strain of *S. capitis* prior to 2025 occurred in 2023 and was a teicoplanin-resistant blood culture isolate, while there were three cases of linezolid-resistant of *S. haemolyticus* identified between 2022 and 2024, all from blood culture.

Staphylococci		2022	2023	2024	2025
S. aureus					
Reduced glycopeptide susceptibility (includes hGISA)		0	0	1	0
	Daptomycin-R	1	1	1	2
	Teicoplanin-R	0	1	2	1
	Mupirocin - R	0	0	0	3
	MSSA PVL	0	1	0	0
	Total	**1**	**3**	**4**	**6**
Other staphylococci					
S. epidermidis					
	Teicoplanin-R	1	0	0	0
	Linezolid-R	7	20	22	11
	Total	**8**	**20**	**22**	**11**
	optrA	0	0	0	0
	poxtA	0	0	0	0
	G2576T mutation	4	5	20	10
	Unknown	4	15	2	1
S. capitis					
	Teicoplanin-R	0	1	0	0
	Daptomycin-R	0	0	0	1
S. haemolyticus					
	Linezolid-R	0	1	2	2
	G2576T mutation	0	0	2	2
S. lugdunensis					
	Methicillin - R	0	0	0	1
	mecA positive	0	0	0	1

Linezolid-resistant *enterococci*

2025

- Nineteen cases of linezolid-resistant and seven cases of colistin-resistant *enterococci* were identified in 2025.
- The most common species was *E. faecium* (63%, n=12), all of which were linezolid-resistant.
- G2576T mutation (a specific genetic change that causes resistance to the antibiotic linezolid) was observed in 37% of linezolid-R cases (7 out of 19).
- One hospital-based outbreak of linezolid-resistant *Enterococcus* was reported on CIDR during 2025. Vancomycin-resistance was also identified in the cases related to this outbreak.

2022 - 2024

- Seventy-five cases of linezolid-resistant enterococci were identified between 2022 and 2024.
- The most common species was *E. faecium*, accounting for 65% of isolates.
- G2576T mutation (a specific genetic change that causes resistance to the antibiotic linezolid) was observed in just over half of cases.
- Two hospital-based outbreaks of linezolid-resistant enterococci were recognised during this period. In one outbreak, cases were first identified in the second quarter of 2022 and continued into 2023.
- A second outbreak was identified in a different healthcare facility, with cases seen over a six-month period in 2023.

Enterococci		2022	2023	2024	2025
Enterococci					
Colistin - R		**0**	**0**	**0**	**7**
	OXA-48	0	0	0	2
	VIM	0	0	0	2
	KPC	0	0	0	1
	Unknown	0	0	0	2
Linezolid-R		**13**	**22**	**40**	**19**
	optrA	2	7	10	7
	poxtA	1	1	3	0
	G2576T mutation	9	11	18	7
	Unknown	1	3	9	5

Other organisms

Hypervirulent Klebsiella spp.

2025

- One case of hypervirulent *K. pneumoniae* was reported in 2025.
- There was one hospital related outbreak of multi-drug resistant (MDR) reported to CIDR in 2025, comprising a cluster of cases identified on a single ward.

2022 - 2024

- There were two cases of hypervirulent *K. pneumoniae* identified in 2022. While both cases occurred within the same hospital over a month-long period, investigations did not identify any epidemiological link.

Klebsiella	2022	2023	2024	2025
K. pneumoniae				
Hypervirulent	2	0	0	1

MDR Pseudomonas spp.

2025

- There was one case of carbapenemase-producing *P. aeruginosa* and one case of multi-drug resistant (MDR) *P. aeruginosa* reported in 2025.

2022 - 2024

- There were three cases of carbapenemase-producing *Pseudomonas* reported in 2024, one of which (*P. aeruginosa*) was an invasive case identified from a blood sample.
- There was one case of MDR *Pseudomonas* spp. reported in 2023 in a patient who had undergone surgery overseas and had ongoing issues with post-operative infection (MRSA was also identified in this patient).

Pseudomonas spp.	2022	2023	2024	2025
Carbapenemase-producers				
P. aeruginosa : NDM	0	0	2	1
P. japonica : IMP	0	0	1	0
MDR *Pseudomonas*				
Pseudomonas spp.	0	1	0	0
P. aeruginosa	0	0	0	1

Other organisms

Colistin-resistant Citrobacter spp.

2025

- Three cases of colistin-resistant *Citrobacter freundii* were reported in 2025, two of which were identified from routine rectal screening samples and one from urine. The *mcr*-9 gene was identified in two cases.

2022 - 2024

- Three cases of colistin-resistant *Citrobacter freundii* were reported in 2024, all of which were identified via routine rectal screening.
- There were two cases of colistin-resistant *Citrobacter freundii* identified in screening samples from elderly patients in the same facility in 2023. The *mcr*-9 gene was identified in both samples. The Infection control team undertook preliminary investigations but could not identify any link between both cases.
- There were no cases of colistin-resistant *Citrobacter* spp. reported in 2022.

Citrobacter	2022	2023	2024	2025
Citrobacter freundii				
colistin-R; *mcr* -positive	0	2	3	3

Colistin-resistant *Leclercia adecarboxylata*

- There was one case of colistin-resistant *L. adecarboxylata* were reported in 2025 - the *mcr*-9 gene was identified in this isolate.

Cefotaxime-resistant *Haemophilus influenzae*

- There was a case of Cefotaxime-resistant *H. influenzae* reported in Q2 2025.

Acknowledgements

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