

Germs Develop Antibiotic Resistance

Select Germs Showing Resistance Over Time

Since the discovery of penicillin more than 90 years ago, germs have continued to develop new types of resistance against even our most powerful drugs. While antibiotic development has slowed, antibiotic resistance has not. This table demonstrates how rapidly important types of resistance developed after approval and release of new antibiotics, including antifungals.

Antibiotic Approved or Released	Year Released	Resistant Germ Identified	Year Identified
Penicillin	1941	Penicillin-resistant <i>Staphylococcus aureus</i> ^{20, 21}	1942
		Penicillin-resistant <i>Streptococcus pneumoniae</i> ^{9,10}	1967
		Penicillinase-producing <i>Neisseria gonorrhoeae</i> ¹¹	1976
Vancomycin	1958	Plasmid-mediated vancomycin-resistant <i>Enterococcus faecium</i> ^{12,13}	1988
		Vancomycin-resistant <i>Staphylococcus aureus</i> ¹⁴	2002
Amphotericin B	1959	Amphotericin B-resistant <i>Candida auris</i> ¹⁵	2016
Methicillin	1960	Methicillin-resistant <i>Staphylococcus aureus</i> ¹⁶	1960
Extended-spectrum cephalosporins	1980 (Cefotaxime)	Extended-spectrum beta-lactamase- producing <i>Escherichia coli</i> ¹⁷	1983
Azithromycin	1980	Azithromycin-resistant <i>Neisseria gonorrhoeae</i> ¹⁸	2011
Imipenem	1985	<i>Klebsiella pneumoniae</i> carbapenemase (KPC)-producing <i>Klebsiella pneumoniae</i> ¹⁹	1996
Ciprofloxacin	1987	Ciprofloxacin-resistant <i>Neisseria gonorrhoeae</i> ²⁰	2007
Fluconazole	1990 (FDA approved)	Fluconazole-resistant <i>Candida</i> ²¹	1988
Caspofungin	2001	Caspofungin-resistant <i>Candida</i> ²²	2004
Daptomycin	2003	Daptomycin-resistant methicillin-resistant <i>Staphylococcus aureus</i> ²³	2004
Ceftazidime-avibactam	2015	Ceftazidime-avibactam-resistant KPC-producing <i>Klebsiella pneumoniae</i> ²⁴	2015

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