Prevention, Management, and Reporting of Carbapenem-Resistant Enterobacteriaceae

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Understanding multidrug-resistance

- Multidrug-resistant organisms (MDROs) are a group of bacteria with important resistance patterns
- Sometimes just one key drug will define a MDRO
  - Methicillin-resistance in Staphylococcus aureus
- Gram-negative bacteria can develop resistance to multiple classes of antibiotics
  - Resistance elements travel together so one bacteria can become resistant to many classes: Penicillins, cephalosporins, carbapenems, fluoroquinolones, aminogylcosides
- Seen in Enterobacteriaceae, Pseudomonas and Acinetobacter

Understanding multidrug-resistance cont.

- Limited treatment options
- Increased length of stay, costs, mortality
- Possibly more pathogenic/virulent

Important gram-negative bacteria

Family	***Genus***	**Common species**	**Common culture sites**
Enterobacteriacea	*Escherichia*	*E. coli*	Urine
	Klebsiella	*K. pneumoniae and K. oxytoca*	Urine, resp.
	Enterobacter	*E. cloacae* and *E. aerogenes*	Urine
Not ***Enterobacteriacea***	*Pseudomonas*	*P. aeruginosa*	Urine, resp., wound
	Acintobacter	*A. baumannii*	Urine, resp.

ABCs of MDROs

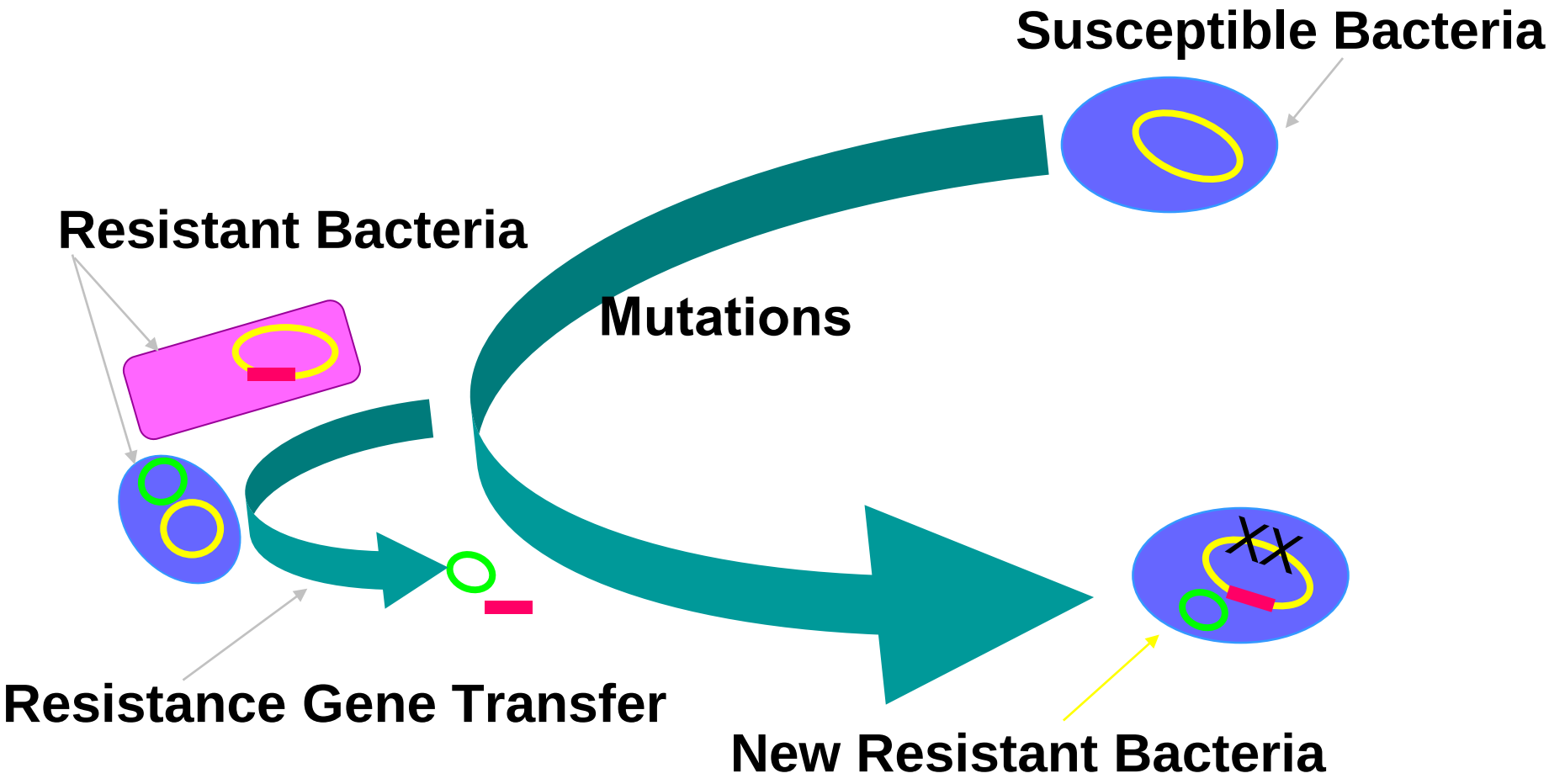
Bacteria	Abbrev.	Antibiotic Resistance
Enterobacteriaceae	ESBL	Extended spectrum penicillins and cephalosporin
Enterobacteriaceae	CRE	Carbapenem
Klebsiella pneumoniae	CRKP	Carbapenem
Pseudomonas/ Acinetobacter	CRPA/CRAB	Carbapenem

Carbapenemase	Abbrev.	Antibiotic Resistance
Klebsiella pneumoniae carbapenemase	KPC	Carbapenem

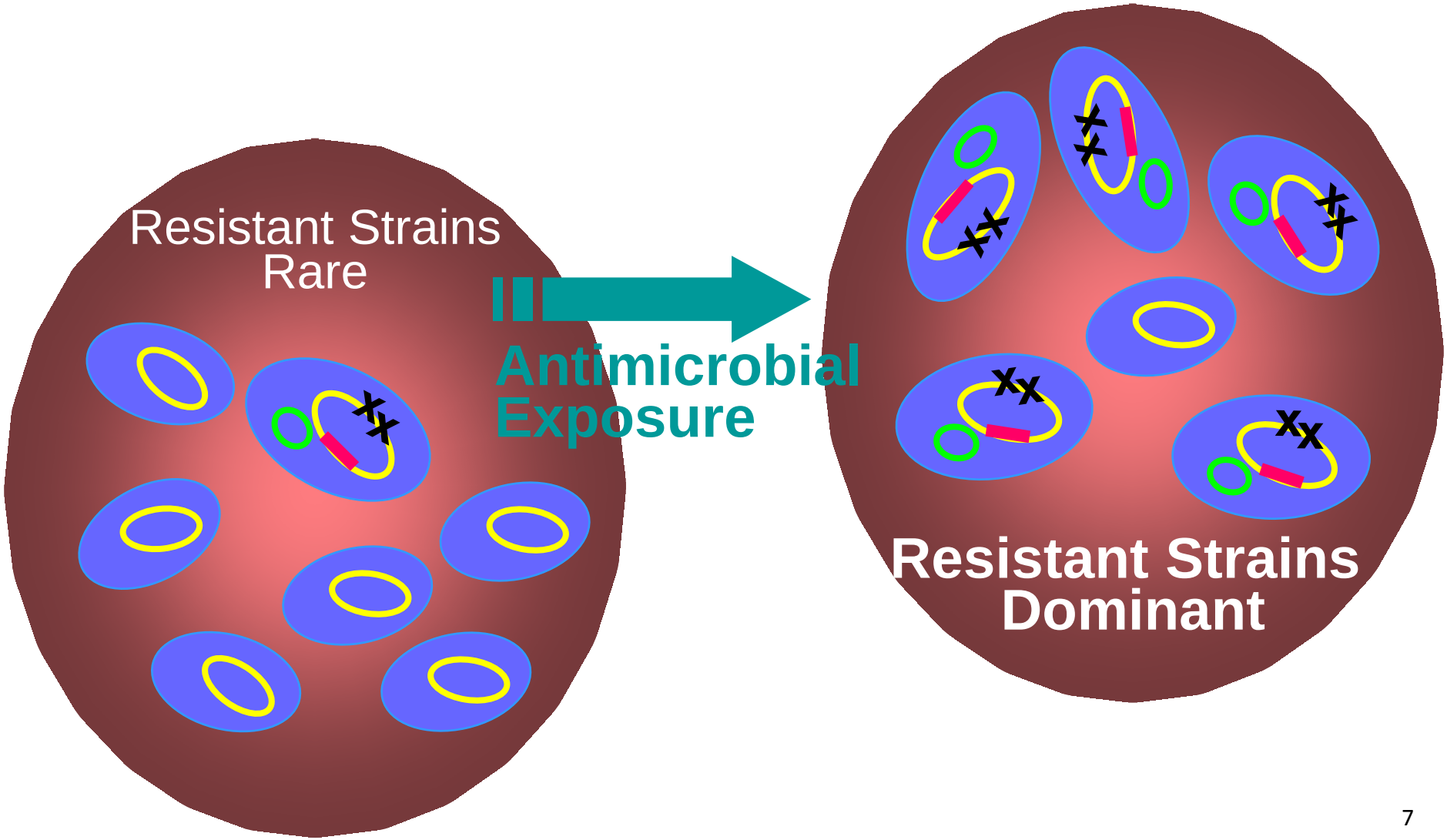
Emergence of MDROs

- Increasing numbers of patients with MDROs over past several decades
- Overuse or inappropriate use of antibiotics selects for resistant pathogens
- Transfer of genetic material between bacteria so that bacteria acquires resistance
- Spread facilitated by susceptible patients and poor adherence to infection prevention practices

Emergence of Antimicrobial Resistance

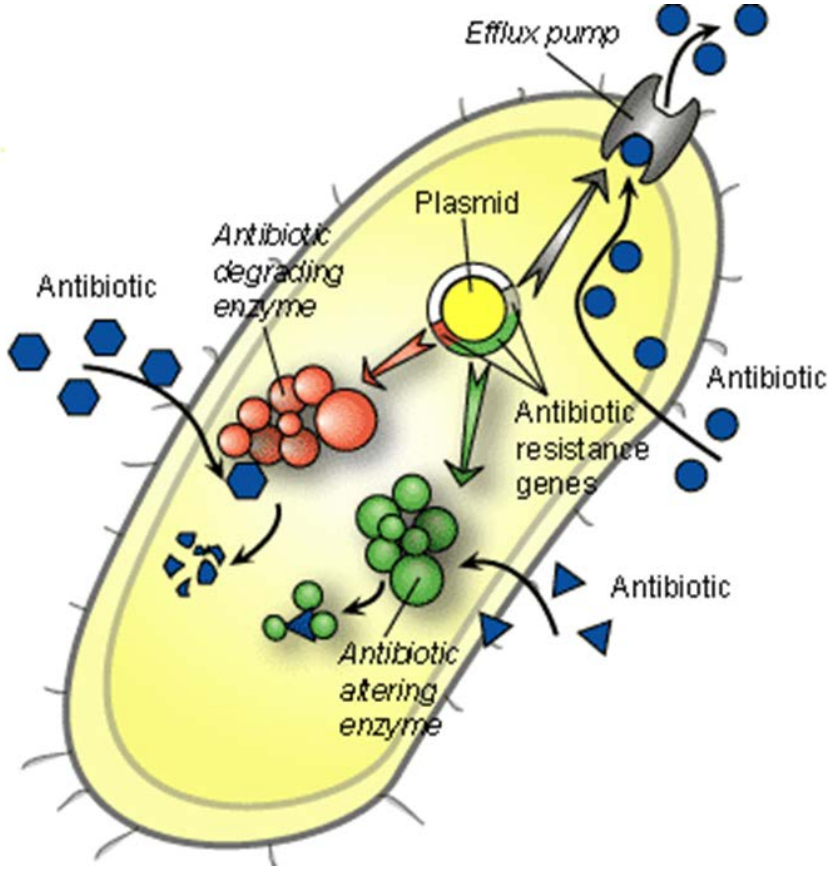


Selection for antimicrobial-resistant Strains



Mechanisms of antibiotic resistance

- Reduce exposure
  - Pump antibiotics out
  - Increase cell barriers to block entry
- Change their cell structure
  - Blocks binding and function of antibiotics
- Production of proteins that destroy antibiotics
  - Beta-lactamases
  - Cephalosporinases
  - Carbapenemases



http://bioinfo.bact.wisc.edu/themicrobialworld/bactresanti.html

Common resistance patterns in Enterobacteriaceae

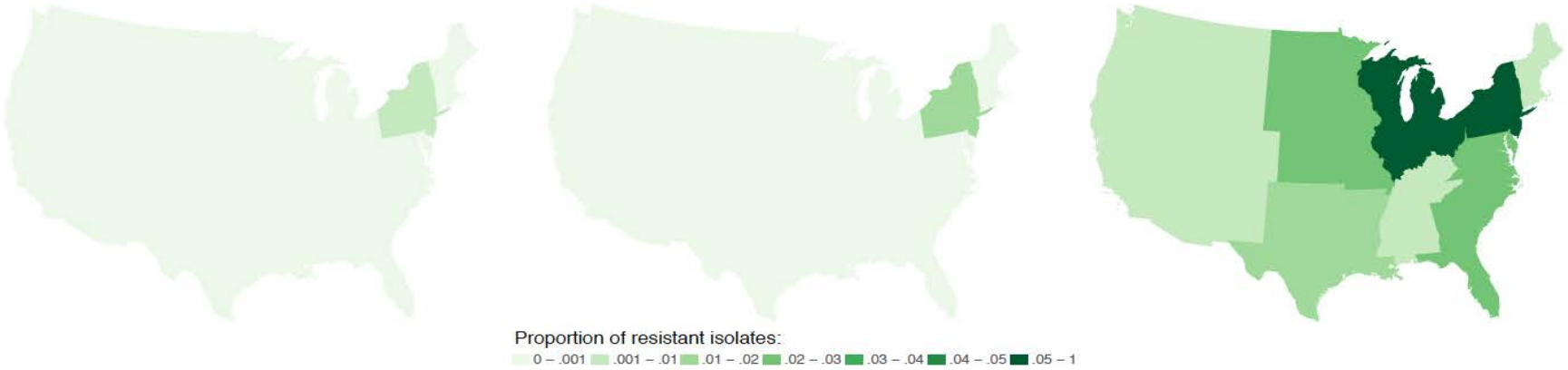
- Enterobacteriaceae: Family of gram-negative bacilli
- Named because they colonize the lower GI tract
- Cause of healthcare-associated urinary tract infections, pneumonia and blood-stream infections

Enterobacteriaceae	Abbrev.	Antibiotic Resistance
• *E. coli* • *K. pneumoniae and K. oxytoca* • *E. cloacae and E. aerogenes*	ESBL	Extended spectrum β-lactamase; causes resistance to penicillins and cephalosporins
	CRE	Carbapenem-resistance

Carbapenem Resistant Enterobacteriaceae

- Since 1985 carbapenems used to treat infections of ESBL gram-negative pathogens
- Resistance to carbapenems evolved in Enterobacteriaceae (1992)

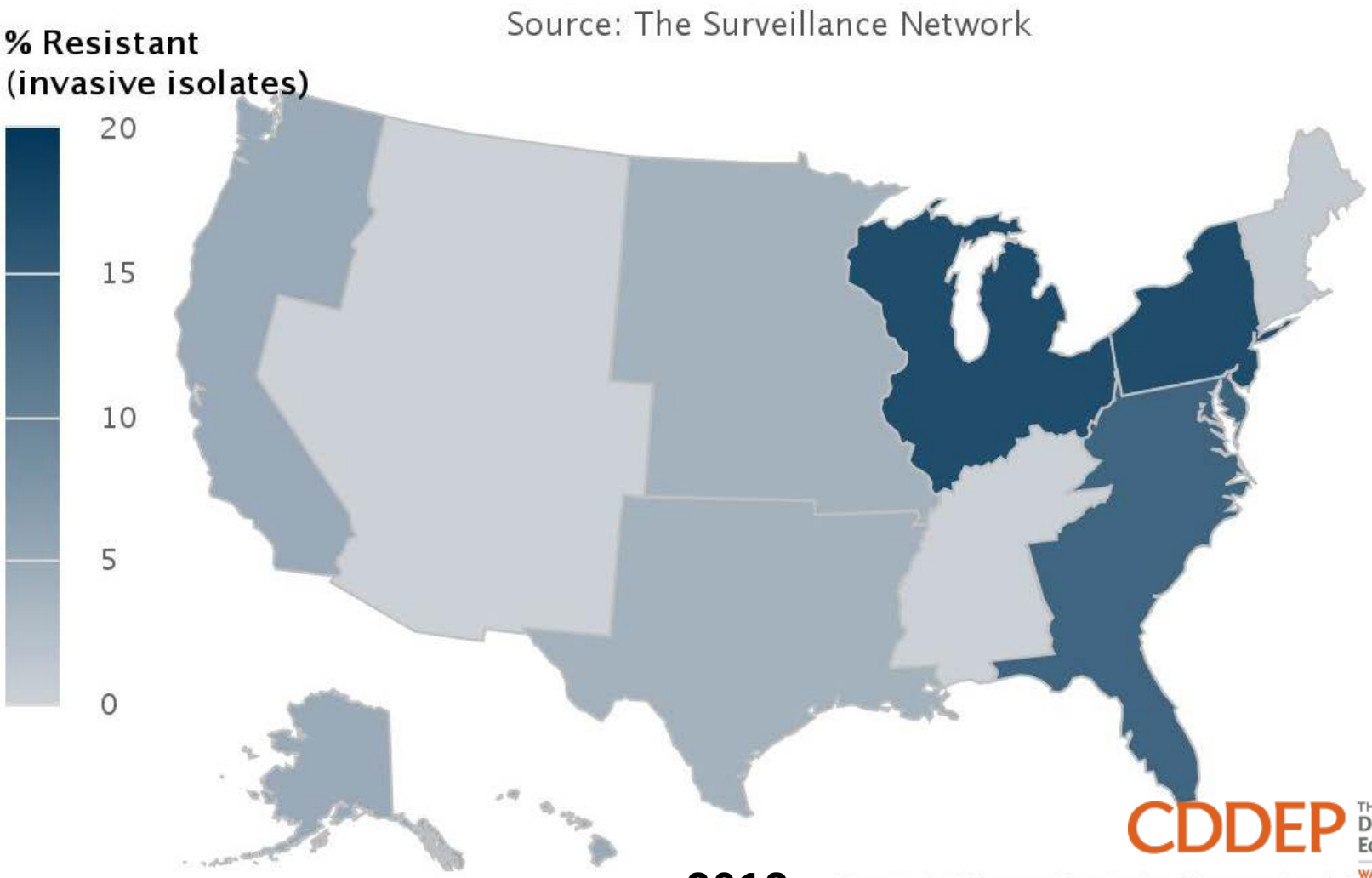
Spread of CRE *Klebsiella* in the United States: 1999–2010



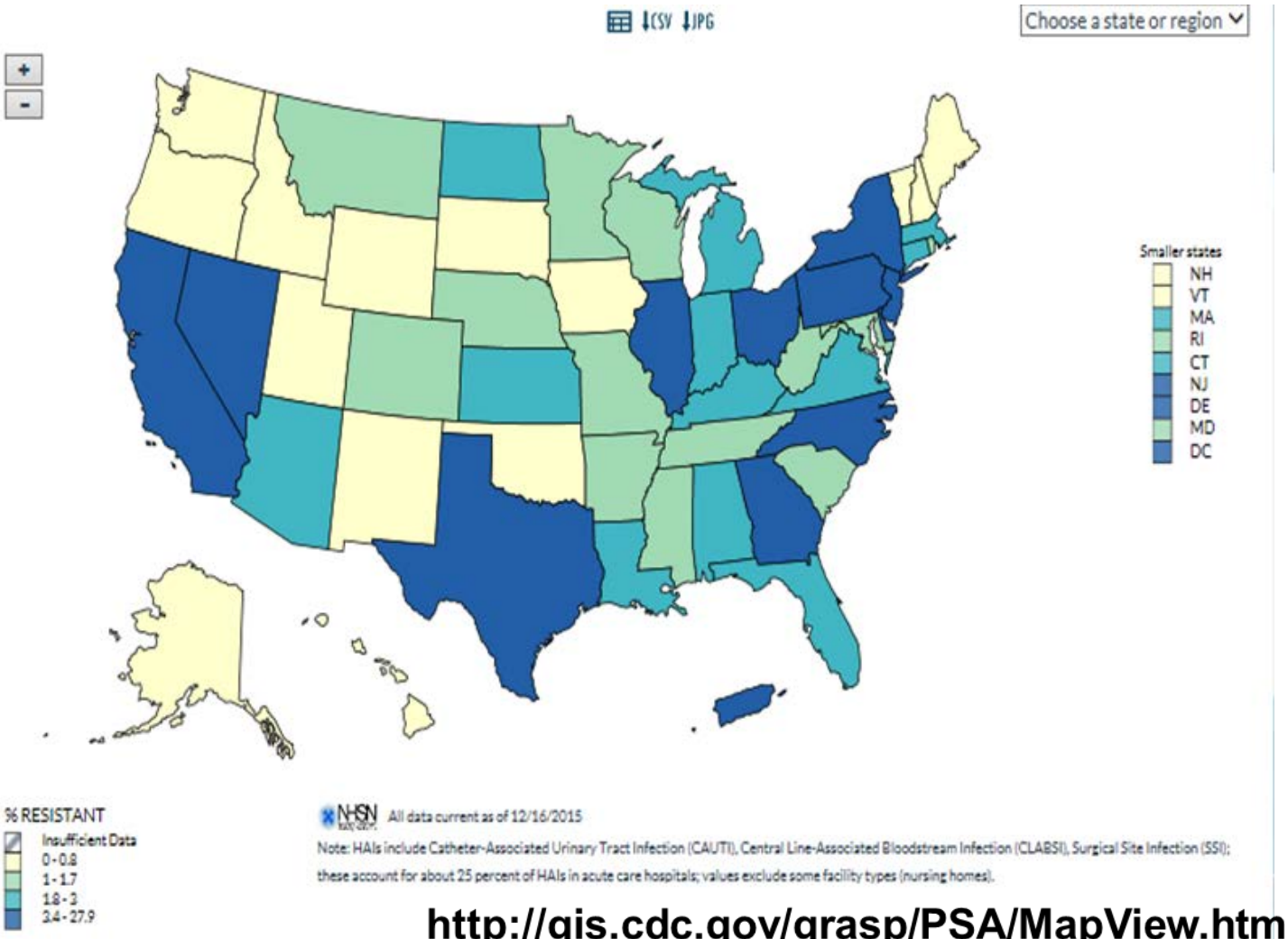
1999-2001 **2002-2005** **2006-2010**

CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy
WASHINGTON DC • NEW DELHI

Spread of CRE *Klebsiella* in the United States: 2012



Antibiotic Resistance Patient Safety Atlas: Prevalence of CRE 2015



http://gis.cdc.gov/grasp/PSA/MapView.html

Antibiotics: Beta Lactam classes

- Penicillin, methicillin, amoxicillin and ampicillin
- Extended spectrum agents: piperacillin, ticarcillin
- Can be combined with a drug to help them overcome bacterial resistance
  - Amoxicillin + clavulanate = Augmentin
  - Ampicillin + sulbactam = Unasyn
  - Piperacillin + tazobactam = Zosyn
- Cephalosporins
  - More gram positive activity: Cephalexin, Cefazolin
  - More gram negative activity: Ceftriaxone, Ceftazidime, Cefepime
  - New broader spectrum, including MRSA: Ceftaroline

Antibiotics: Carbapenems

- Extremely broad-spectrum, among the most powerful antibiotics we currently have available
- Spectrum includes *Streptococci*, susceptible *Staphylococci*, *Enterobactericeae, Pseudomonas, Acinetobacter sp.,* and anaerobic bacteria

Drug	**Route of Administration**
Imipenem	IV
Meropenem	IV
Ertapenem	IM, IV
Doripenem	IV

Mechanisms of Carbapenem Resistance

- Amp C beta lactamases
- ESBL with porin mutation
- Carbapenemases
  - *K. pneumoniae* carbapenemase (KPC)
    - Most common
    - Bla_{kpc} gene on plasmids
  - Verona -integron encoded metallo-beta-lactamase (VIM)
  - New Delhi metallo-beta lactamase (NDM)

Carbapenem-resistance in gram-negative bacteria

- Carbapenems are reserved for severe, complicated infections with multiple and often resistant bacteria
- “Extremely broad-spectrum” antibiotics
- Resistance to carbapenems significantly limits treatment options for life-threatening infections
- Emerging resistance mechanisms can be spread
- Carbapenemases are found on mobile genetic elements
- Resistance genes travel together on these mobile elements; bacteria can become resistant to many classes
- “Pan-resistant” CRE have been identified with no effective antibiotic therapies available

Sample Susceptibility Profile of CRE Organism

Antimicrobial	Interpretation	Antimicrobial	Interpretation
Amikacin	I	Chloramphenicol	R
Amox/clav	R	Ciprofloxacin	R
Ampicillin	R	Ertapenem	R
Aztreonam	R	Gentamicin	R
Cefazolin	R	Imipenem	R
Cefpodoxime	R	Meropenem	R
Cefotaxime	R	Pipercillin/Tazo	R
Cetotetan	R	Tobramycin	R
Cefoxitin	R	Trimeth/Sulfa	R
Ceftazidime	R	Polymyxin B	MIC >4µg/ml
Ceftriaxone	R	Colistin	MIC >4µg/ml
Cefepime	R	Tigecycline	S

CRE Surveillance: Awareness is key

- Know whether CRE has been detected in your community
- Contact infection prevention programs of local referral partners
- Ask the coordinator of the Healthcare-associated Infections (HAI) program at the state health department
- Know if CRE has been detected from residents receiving care in your facility
- History of CRE colonization or infection should be communicated at time of admission or transfer
- Review clinical cultures to see if CRE has been isolated from residents in your facility

Risk Factors for Colonization and Infection with MDROs

- Sharing personal items (towels, razors)
- Close contact, crowded living conditions
- Advanced age
- Severely ill
- Chronic medical conditions
- Prior exposure to antibiotics
- Invasive procedures
- Repeated contact with healthcare system

Healthcare Personnel Education

CRE Prevention Strategies

- **Identification**
  - Laboratory notification
  - Communication of CRE status during interfacility-transfer
  - Screening contacts of known CRE carriers
  - Active surveillance for CRE colonization
- **Prevention of emergence**
  - Careful use of invasive medical devices
  - Antibiotic stewardship
- **Prevention of spread**
  - Hand hygiene
  - Contact precautions
  - Cohorting of residents and staff
  - Environmental cleaning
  - Chlorhexidine bathing

CDC Definition

- Enterobacteriaceae resistant to carbapenems
  - Doripenem, meropenem, imipenem: MIC ≥ 4;
  - Ertapenem: MIC ≥ 2; or
  - Documented carbapenemase

Communication Measures

- Notification of medical director, infection prevention personnel, and antibiotic stewardship committee
- Protocols for prompt notification by laboratory
- Limit exposures to antimicrobials and invasive devices
- Education of staff
- Clear signage
- Education of case family and visitors
- Report to Public Health, especially if h/o international travel

Infection Control Measures

- Hand hygiene
- Standard/contact precautions

Challenges with contact precautions in LTC settings

- **Staff concerns about negative impact of gown/glove use on residents**
  - Unlikely to change practices if aware of an MDRO
  - Isolation could negatively impact a resident's well-being
- **Lack of private rooms / limited ability to move residents**
  - Moving rooms is disrupting to residents and staff
  - Ability to identify carriers to cohort is limited (no active surveillance in most facilities)
- **Determining duration of contact precautions**
  - Unable to restrict resident mobility and participation in social events/therapy for prolonged periods
  - Unlikely to document clearance of carriage

Contact Precautions for High Risk Patients

- Post-acute care and are still debilitated by recent hospitalization
- Totally dependent of ADLs
- Ventilator dependent
- Incontinent of stool or urine and cannot be reliably contained
- Wounds or drainage difficult to control
- Cognitively unable to maintain personal hygiene

Precautions for Low Risk Patients

- Contact precautions may not be necessary for patients:
  - Continent of urine and stool
  - Less dependent on staff for ADLs
  - Cognitively able to follow hand/personal hygiene
  - Do not have draining wounds
- These patients need not be restricted from common gatherings
- Standard precautions should **ALWAYS** be used

Discontinuation of Contact Precautions

- Case-by-case basis and based on risk factors
- Repeat culture **NOT** recommended
- **Per CDC**:
  - Patient can be re-screened 6-12 months after last (+) test
  - Only if they are not on many devices & have been off antibiotics for at least 2 weeks
  - Need 2 consecutive (-) screens 1-2 weeks apart to confirm clearance

Supplemental Precautions

- Consider cohorting patients with CRE
- Dedicate equipment on a case-by-case basis
- Consider chlorhexidine bathing particularly if there are multiple cases of CRE

Room Placement

- Private room if feasible
- If private rooms are not available, efforts to cohort with other patients with CRE
- If not feasible, cohort with patients at lowest risk for acquiring CRE
  - No indwelling devices, no open wounds, and less dependent on staff

Environmental Considerations

- Alert facility management services of the CRE patient
- Ensure daily (or more frequently if soiled) cleaning and disinfection of high-touch surfaces in room and outside room in common areas
- Ensure use of EPA detergent/disinfectant and that manufacturer's recommendations are followed
- If feasible, monitor thoroughness of cleaning (UV fluorescence marker, ATP bioluminscence monitor)

Epidemiology Assessment

- Facilities with CRE+ patient should review all lab records for the past year and every 6-12 months for other CRE cases
- Identify any patients who shared a room with newly + CRE patient during preceding 6 months
- Consider screening these roommates
- Consider testing for carbapenemases

Inter-Facility Transfer

- Notify receiving facility of patient CRE status
- Facilities with ongoing CRE outbreaks should inform receiving facilities of the presence of CRE in the facility
- Receiving facilities may screen or pre-emptively place in contact precautions

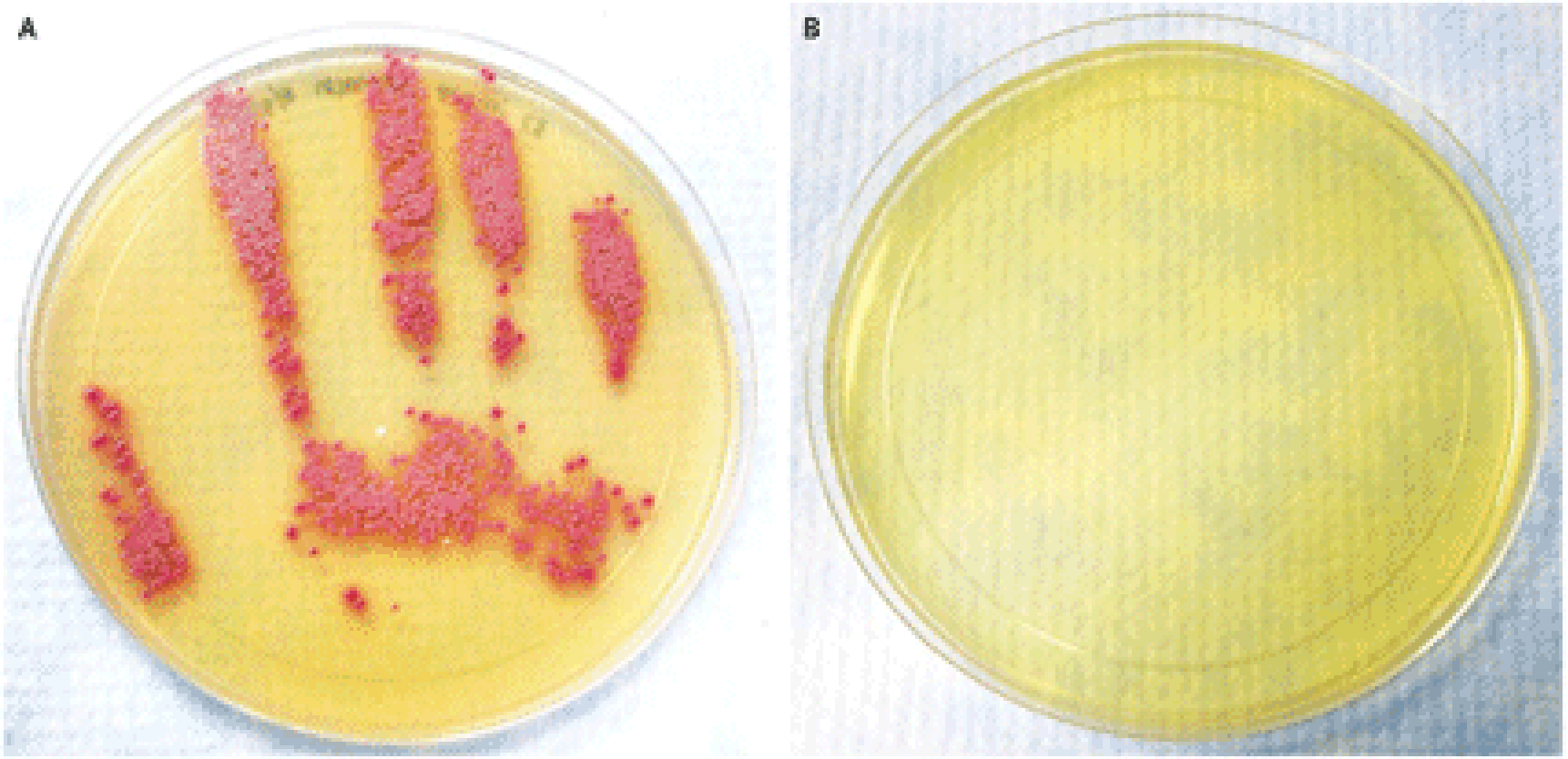
Separating colonization from infection

- "Colonizing" bacteria may not be harmful, even when they are antibiotic-resistant

  Example: CRE cultured from a rectal swab may not harm the colonized person
- Only when bacteria invade our bodies and cause signs/symptoms of illness do we need treatment with antibiotics
- Separating colonization from infection can be difficult

  Examples: Bacteriuria in an older adult; respiratory secretions from a person on a ventilator
- However, both colonized and infected people can serve as a source for spreading resistant organisms


CDC
Patient Safety
CLEAN HANDS SAVE LIVES
Protect patients, protect yourself
Candida
Staphylococcus
Influenza
RSV
Klebsiella
Pseudomonas
Enterococcus
Alcohol-rub or wash
before and after EVERY contact.
hand hygiene saves lives



Donskey and Eckstein NEJM 360 (3): e3, Figure 1 January 15, 2009

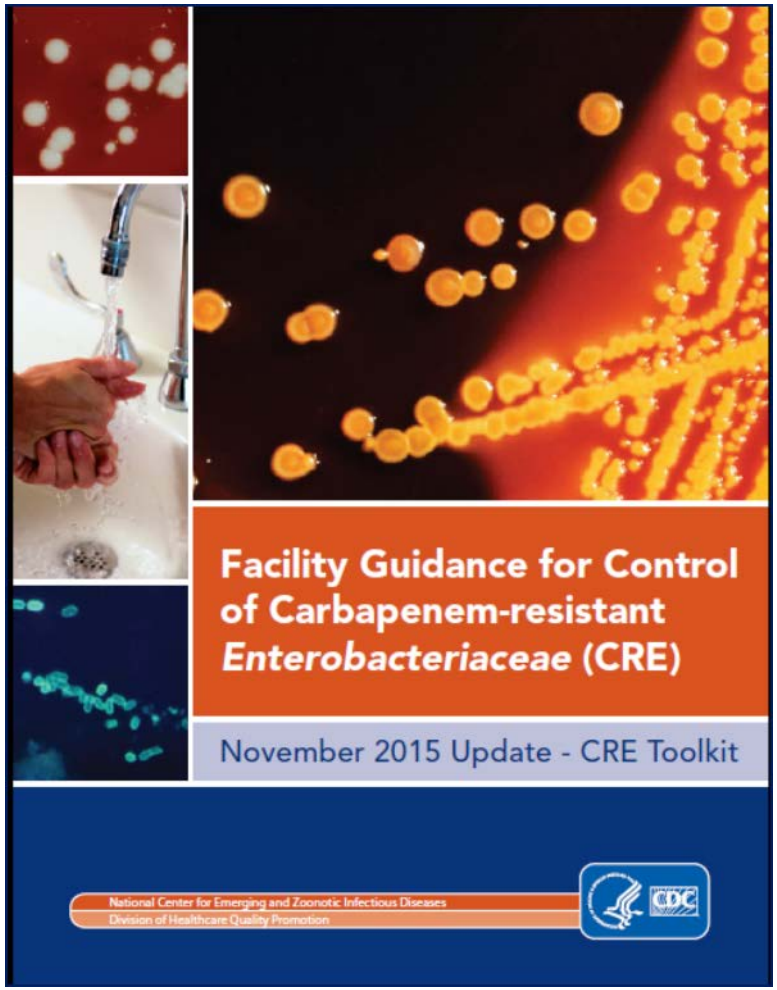
Teach and reinforce the moments for hand hygiene (HH)

- Before and after physical contact with a resident
- Before donning gloves and after removing gloves
- After handling soiled or contaminated items and equipment, including linens
- Before performing an invasive procedures
- Before handling sterile or clean supplies
- When hands are visibly dirty or soiled with blood and/or bodily fluids*
- After care of a resident with known or suspected infectious diarrhea*
- Before and after eating or handling food*
- After personal use of bathroom*

*Situations where soap and water preferred over alcohol-based hand rub

CDC CRE Toolkit Updated November 2015

- To control the spread of CRE, healthcare facilities should:
- Quantify the magnitude of CRE within the facility
- Identify colonized and infected patients within the facility
- Implement interventions designed to stop the transmission of CRE



http://www.cdc.gov/hai/organisms/cre/cre-toolkit/index.html

Los Angeles County Department of Public Health CRE and Antibiogram Health Officer Order

Review of Reporting Requirements and Instructions

February 14th, 2017

Overview

- CRE definition
- Submitting data via NHSN
  - Group info
  - Required elements
- Submitting data via Epi form – SNFs only
- Antibiogram
  - How to submit
  - Recommendations for preparation
- Questions

CRE in Los Angeles County

- Voluntary CRE data reported into NHSN in 2015 from 22 hospitals
  - Pooled mean HO rate: 0.94 per 10,000 pt days
- Public Health Lab Enhanced CRE surveillance program
  - Over 600 isolates submitted by 30 laboratories in LAC
  - Predominant carbapenemase identified: KPC
- No current estimates since 2012 CRKP surveillance

CRE and AR Health Officer Order

- Issued January 19, 2017 to acute care hospitals and skilled nursing facilities (SNFs) in Los Angeles County
- Mandated the following:
  - Facilities enrolled in NHSN report CRE via LabID
  - SNFs not enrolled in NHSN report via submission of CRE Epi form and lab report to LACDPH Morbidity Unit
  - All facilities that create an antibiogram to provide the most recent report to LACDPH

Reporting in other Health Jurisdictions

- Pasadena Public Health Department and Long Beach Department of Health and Human Services issued their own Orders with the same reporting mandate to ACHs and SNFs in their jurisdictions
  - Facilities in those jurisdictions who are enrolled in NHSN will also join the LA County CRE NHSN group to fulfill the reporting requirement
  - Facilities not enrolled in NHSN will report to their local health department

CRE Surveillance Definition

Any *Escherichia coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, or *Enterobacter spp*. demonstrating resistance by one or more of the following methods:

- Resistant to imipenem, meropenem, doripenem, or ertapenem by standard susceptibility testing methods (i.e., minimum inhibitory concentrations of ≥4 mcg/mL for doripenem, imipenem and meropenem or ≥2 mcg/mL for ertapenem) **OR**
- Production of a carbapenemase (e.g., KPC, NDM, VIM, IMP, OXA-48) demonstrated using a recognized test (e.g., polymerase chain reaction (PCR), metallo-β-lactamase test, modified-Hodge test, Carba-NP, Carbapenem Inhibition Method (CIM)).

Reporting for Facilities Enrolled in NHSN

Compliance with Reporting Via NHSN

- Join new LA County CRE Group
- Confer rights to new group
- Add CRE to monthly reporting plan
- Create custom reporting fields
- Note this applies to all healthcare facilities enrolled in NHSN within Los Angeles County, Pasadena, and Long Beach Public Health jurisdictions

Reporting for Facilities Not Enrolled in NHSN

Reporting in Other Jurisdictions

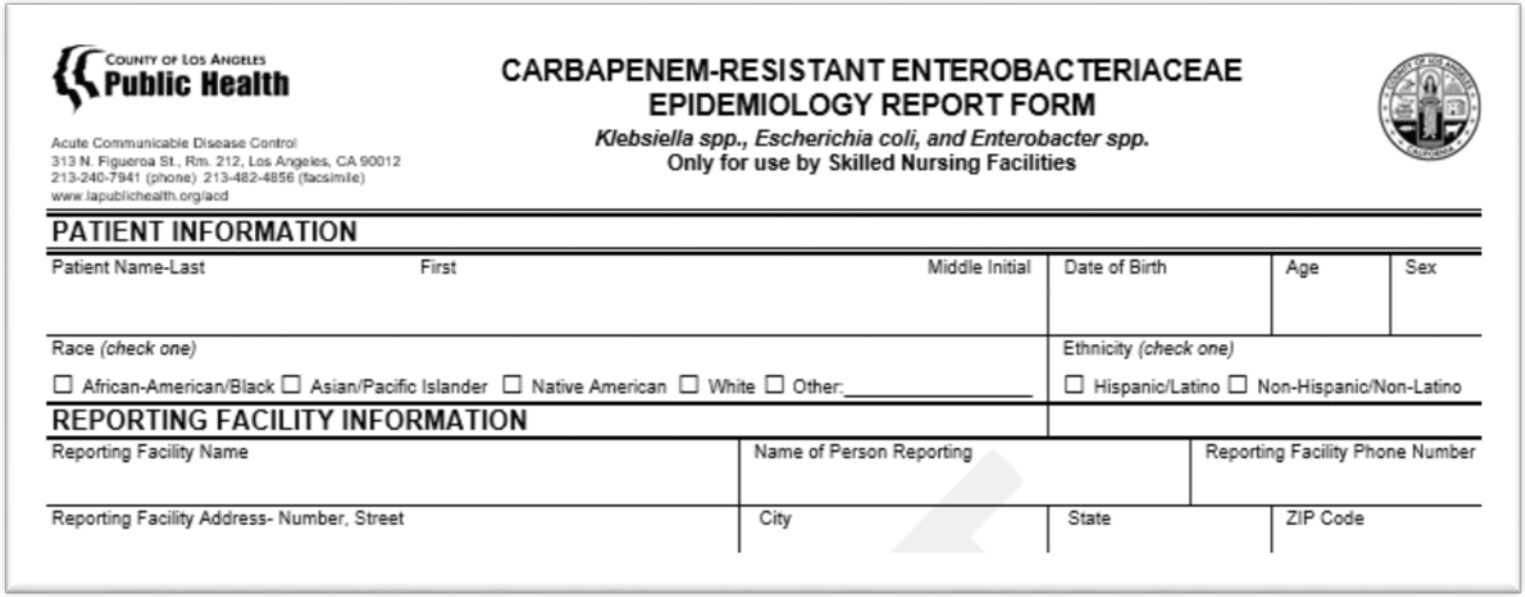
- SNFs in Pasadena Public Health Department or Long Beach Department of Health and Human Services jurisdictions will report to the appropriate health department
- Long Beach DHHS reporting info
  - Submit lab report via fax to (562) 570-4374
  - Questions to Emily Holman: emily.holman@longbeach.gov
- Pasadena PHD reporting info
  - Submit CMR and lab report via fax to (626) 744-6115
  - Questions to (626) 744-6089

Reporting to LACDPH Morbidity Unit

- Complete CRE Epi form available at http://ph.lacounty.gov/acd/EpiForms.htm
- Submit completed epi form and laboratory report with susceptibility data to the LACDPH Morbidity Unit at (888)397-3778
- Note: reference lab submission of lab report does not fulfill the reporting requirement; epi form must be submitted

CRE Epidemiology Form – Patient Information

- Similar to the confidential morbidity report form include patient information (name, DOB, etc.)
- Include reporting facility name, address, and name and phone number of the person submitting the report



County of Los Angeles Public Health

Acute Communicable Disease Control
313 N. Figueroa St., Rm. 212, Los Angeles, CA 90012
213-240-7941 (phone) 213-482-4856 (facsimile)
www.lapublichealth.org/acd

CARBAPENEM-RESISTANT ENTEROBACTERIACEAE EPIDEMIOLOGY REPORT FORM

Klebsiella spp., Escherichia coli, and Enterobacter spp.
Only for use by Skilled Nursing Facilities

PATIENT INFORMATION

Patient Name-Last	First	Middle Initial	Date of Birth	Age	Sex

Race *(check one)*

☐ African-American/Black ☐ Asian/Pacific Islander ☐ Native American ☐ White ☐ Other:_____

Ethnicity *(check one)*

☐ Hispanic/Latino ☐ Non-Hispanic/Non-Latino

REPORTING FACILITY INFORMATION

Reporting Facility Name	Name of Person Reporting	Reporting Facility Phone Number

Reporting Facility Address- Number, Street	City	State	ZIP Code

CRE Epidemiology Form - Diagnostic Information

- This section of the form is similar to the NHSN event entry form
  - Specimen and organism information
  - Testing methods
    - Was the isolate tested for carbapenemases?
    - If so, what was the result?

DIAGNOSTIC TESTS

Organism identified: ☐ *Klebsiella spp.* ☐ *E. coli* ☐ *Enterobacter spp* | Date of collection: _____

Specimen source: ☐ Blood ☐ Sputum ☐ Wound- sterile site ☐ Wound- non-sterile site ☐ Urine ☐ Rectal swab ☐ Other: _____

Patient status at time specimen was collected:
☐ Colonization ☐ Infection ☐ Unsure/unknown

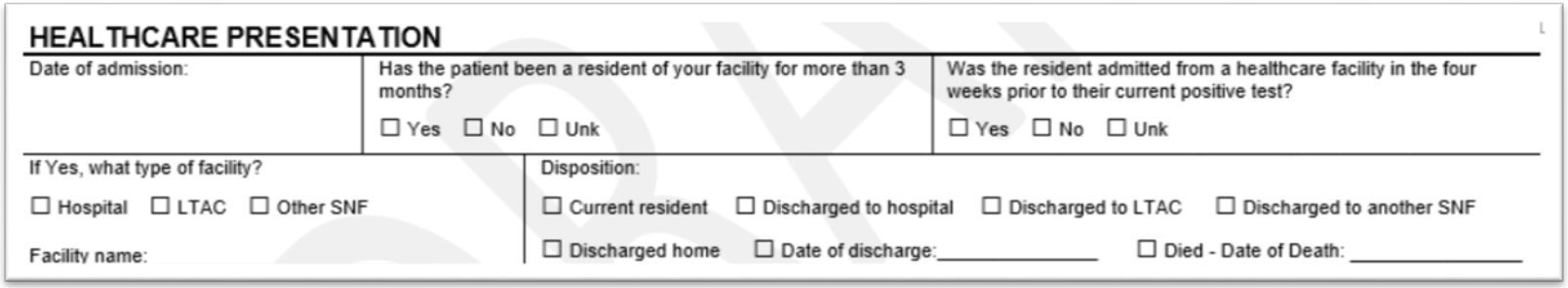
Was the bacterial isolate tested for the presence of a carbapenemase?
☐ Yes ☐ No ☐ Unk

If Yes, which tests were done *(check all performed)*:
☐ Broth MIC ☐ PCR ☐ ETest ☐ CarbaNP
☐ MHT ☐ Unk ☐ Other *(specify)*:_____

If Yes, what carbapenemase was detected *(check all that apply)*:
☐ Klebsiella pneumoniae carbapenemase (KPC) ☐ New Delhi metallo-β-lactamase (NDM) ☐ Imipenemase (IMP) ☐ OXA-48-like
☐ Verona integron-encoded metallo-β-lactamase (VIM) ☐ Negative/none detected ☐ Other specify):_____

CRE Epidemiology Form - Healthcare Presentation

- Information for this section should be taken from the resident's current admission
  - If resident admitted from a different healthcare facility in the 4 weeks prior to current positive test indicate the type of facility and name (if known)
  - Check off if the resident has been discharged or if they have died and include appropriate dates



HEALTHCARE PRESENTATION

Date of admission:	Has the patient been a resident of your facility for more than 3 months? ☐ Yes ☐ No ☐ Unk	Was the resident admitted from a healthcare facility in the four weeks prior to their current positive test? ☐ Yes ☐ No ☐ Unk
If Yes, what type of facility? ☐ Hospital ☐ LTAC ☐ Other SNF Facility name:	Disposition: ☐ Current resident ☐ Discharged to hospital ☐ Discharged to LTAC ☐ Discharged to another SNF ☐ Discharged home ☐ Date of discharge:_____ ☐ Died - Date of Death: _____	

Antibiogram Reporting Instructions

Submission of Antibiogram Data

- Mandated facilities include:
  - General acute care hospitals
  - Long-term acute care hospitals
  - Skilled nursing facilities

- Submit annual antibiograms via email by June 1st
  - LA County and Long Beach: hai@ph.lacounty.gov
  - Pasadena: hai@cityofpasadena.net

Requirements

- Submit data in Excel format (.xls or .xlsx)
- Include (%S) from all specimen sources
- Report number of isolates tested for each drug-bug combo
- Report 1 year of inpatient data only
- *Pasadena: must follow CLSI susceptibility criteria*

*More information can be found in **Section 1** of the "Instructions for Complying with the 2017 Antibiogram Reporting Requirements" document*

Recommendations for Preparation of an Antibiogram

- Include only final, verified results
- Include only drugs that are routinely tested
  - Do not include those tested on request, by reflex, or via stepped/cascade testing protocol
- Include the first isolate per patient per year
- Exclude results obtained from surveillance studies
- Use most current breakpoints (when possible)

*More information can be found in **Section 2** of the "Instructions for Complying with the 2017 Antibiogram Reporting Requirements" document*

Example Submission Template

		Ampicillin		Ceftaroline		Ceftriaxone		Ciprofloxacin	
Organism Name	Total number of isolates (N)	N isolates tested	%S	N isolates tested	%S	N isolates tested	%S	N isolates tested	%S
E. faecalis									
E. faecium									
Enterococcus spp.									
Methicillin-resistant Staphylococcus aureus									
Methicillin-sensitive Staphylococcus aureus									
Streptococcus agalactiae (Group B Strep)									
Streptococcus pneumoniae (Group A Strep)									
Streptococcus pneumoniae (meningitis)									
Streptococcus pyogenes									
N/A: not applicable									
**less than 30 isolates tested*									

1.http://publichealth.lacounty.gov/acd/antibiogram.htm

Snapshot of resistance patterns: Facility antibiograms

	# of isolates	Amox/Clav	Ampicillin	Ampicillin/Sulbact	Aztreonam	Cefazolin	Ceftazidime	Ceftriaxone	Cefuroxime	Ciprofloxacin	Clindamycin	Erythromycin	Gentamycin	Imipenum	Levofloxacin	Linezolid	Oxacillin	Penicillin	Piperacillin	Ticar/Clav (Timen	Tobramycin	Trimeth/Sulfa	Vancomycin
	Numbers are the % of isolates susceptible / systemic infections																						
GRAM NEGATIVE																							
E. coli	485	95	62	65	97	94	98	98	95	88			94	99	88				64	93	94	86	
Kl. oxytoca	24	79	8	62	83	46	79	83	79	75			88	100	92				58	67	75	88	
Kl. pneumoniae	108	99	10	87	95	94	95	95	90	94			96	100	95				83	94	95	91	
Pr. mirabilis	58	100	82	83	94	92	100	100	100	85			83	100	86				83	100	85	86	
P. aeruginosa	66				74		93	29		74			84	88	74				95	90	97		
GRAM POSITIVE																							
E. faecalis	138		98							57		6			60	99		99					100
E. Faecalis VRE	4		100							0		0			0	100		100					0
E. faecium	18		21							16		8			16	100		16					100
E. faecium VRE	30		17							0		0			0	100		14					0
S. agalactiae	60		100								85				100	100		100					100
S. aureus	130	98	18	98		99		99		87	86	75	100		86	100	100	18				100	100
S. aureus MRSA	151	0	0	0		0		0		23	35	7	99		25	100	0	0				99	100
S. epidermidis	78	22	3	22		21		21		23	48	21	67		24	100	22	3				50	100
S. pneumoniae	17	100						88				94			100	100		81				88	100

Antimicrobial Stewardship & Resources

http://publichealth.lacounty.gov/acd/AntimicrobialStewardship.htm

Acute Communicable Disease Control

- News & Updates
- Diseases & Conditions
- Health Care Professionals
  - Guidelines/Manuals
  - Reporting a Disease
  - Materials
  - Los Angeles Health Alert Network (LAHAN)
  - Skilled Nursing Facilities
  - Resources
- Info for the Public (FAQ's)
  - Report a Problem
  - Health Advisories
  - Health Ed Materials
- Reports, Publications & Presentations
- Frequently Used Links

Contact Information

County of Los Angeles
Department of Public Health
Acute Communicable Disease Control
313 N. Figueroa Street, #212
Los Angeles, CA 90012
Phone: (213) 240-7941

Acute Communicable Disease Control

Antimicrobial Stewardship

Antimicrobial stewardship is a set of coordinated approaches to improve the use of antimicrobials, such as antibiotics, within a healthcare facility. Antimicrobial stewardship is not only important in preventing the spread of antimicrobial resistance, but also improves patient outcomes and reduces costs for healthcare facilities.

Everyone in a healthcare facility has a role in making sure antimicrobials are used appropriately. Check out the additional resources below to learn more about how you and your facility can develop and/or improve your antimicrobial stewardship program.

New Resources

- 2015 Los Angeles County Department of Public Health Hospital Questionnaire Regarding Nurse Competency and Education in Antimicrobials: A Summary (10-28-16)
- 2015 LACDPH Hospital Questionnaire Regarding Antimicrobial Stewardship Programs: Final Results (6-20-16)
- NQF Antibiotic Stewardship Playbook (May 2016)
- IDSA/SHEA Guidelines for Implementing an Antibiotic Stewardship Program (May 2016)

Additional Resources

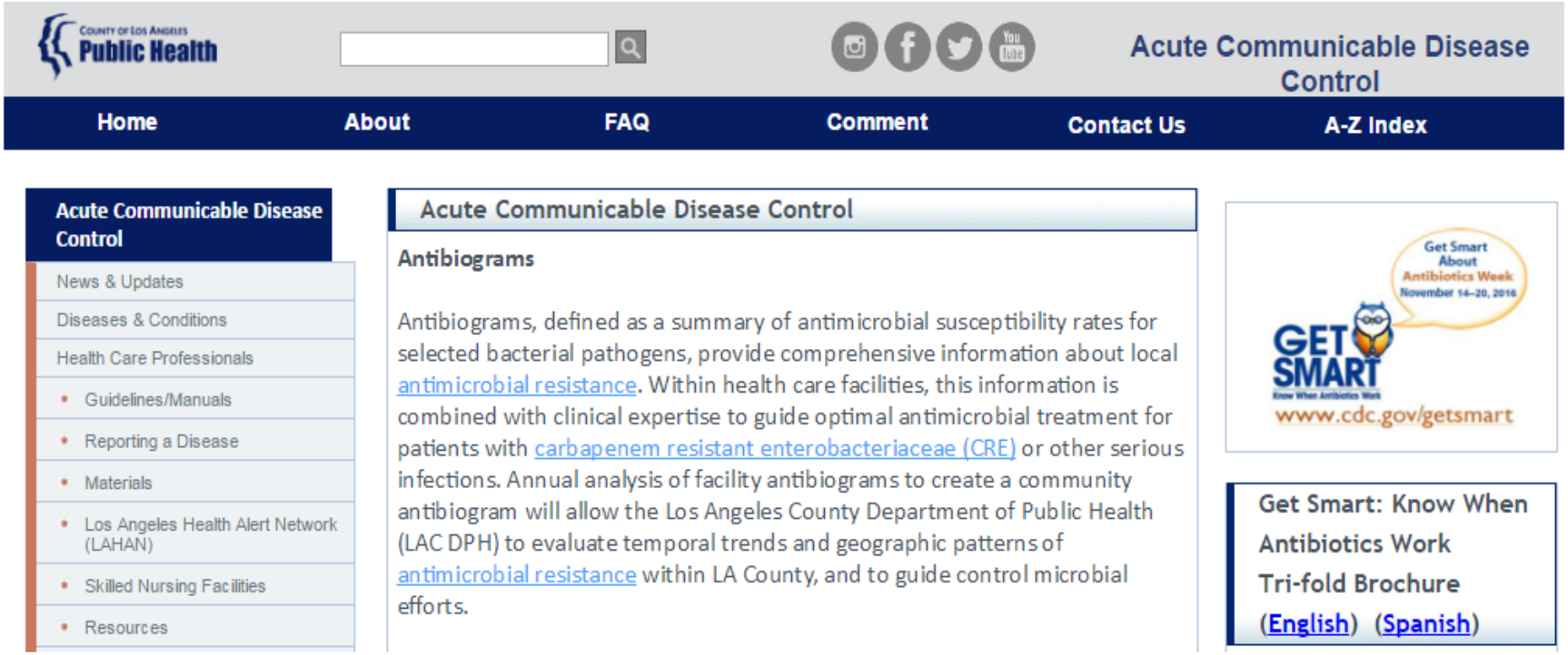
- CDC: Core Elements of Hospital Antibiotic Stewardship Program
- CDC: Core Elements of Antibiotic Stewardship for Nursing Homes
- CDC: Stewardship Program Examples
- CDPH: 2015 Antimicrobial Stewardship Program (ASP) Toolkit

Get Smart: Know When Antibiotics Work Tri-fold Brochure (English) (Spanish)

Get Smart: Know When Antibiotics Work Rx Pad

Updates & More Resources

http://publichealth.lacounty.gov/acd/antibiogram.htm



Acknowledgements

- Many slides were provided by Nimalie Stone, Centers for Disease Control and Prevention

- LA County hospitals: contact your LA County LPHN
- LA County SNFs: hai@ph.lacounty.gov

- CRE reporting updates: http://publichealth.lacounty.gov/acd/Diseases/CRE.htm
- Antibiogram reporting updates: http://publichealth.lacounty.gov/acd/antibiogram.htm