

# CP-CRE Testing at the MDHHS, Bureau of Laboratories

2019 Michigan CRE Surveillance and Prevention  
Initiative 4<sup>th</sup> Educational Conference

Marty K. Soehrlen, PH.D., MPH, PHLD(ABB)

Director of Infectious Disease

Bureau of Laboratories

Michigan Department of Health & Human Services

Prevent Disease – Promote Wellness – Improve Quality of Life



# Importance of CRE testing at BOL

- Major public health threat
- CP-CRE results in intensive infection control
  - CP-CREs disseminate more readily between patients than non CP-CREs
- Numerous mechanisms of resistance can lead to detection challenges



**CRE GERMS KILL UP TO HALF OF PATIENTS WHO GET BLOODSTREAM INFECTIONS FROM THEM.**

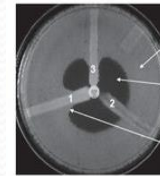
**Vitalsigns<sup>™</sup>**  
www.cdc.gov/vitalsigns



# Laboratory Testing

- Phenotypic testing for carbapenemase production
  - Modified-Hodge (outdated – NOT recommended – ceased use in 2017 at BOL)
  - CarbaNP – ceased use in early 2018 at BOL
  - mCIM – current method
- Antimicrobial susceptibility testing
  - Broth microdilution
- Mechanism testing
  - Polymerase Chain Reaction (PCR)
  - Whole Genome Sequencing (WGS)

Modified Hodge Test

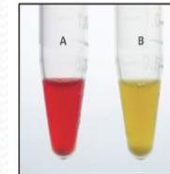


A lawn of carbapenem susceptible *E. coli* ATCC 25922

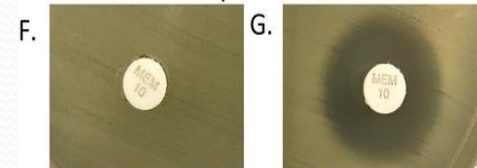
Zone of inhibition of *E. coli* ATCC 25922 by ertapenem

Indentation of *E. coli* ATCC 25922 growth (clover leaf appearance) around the streak line of the carbapenemase-producing *K. pneumoniae* ATCC BAA-1705.

Carba NP



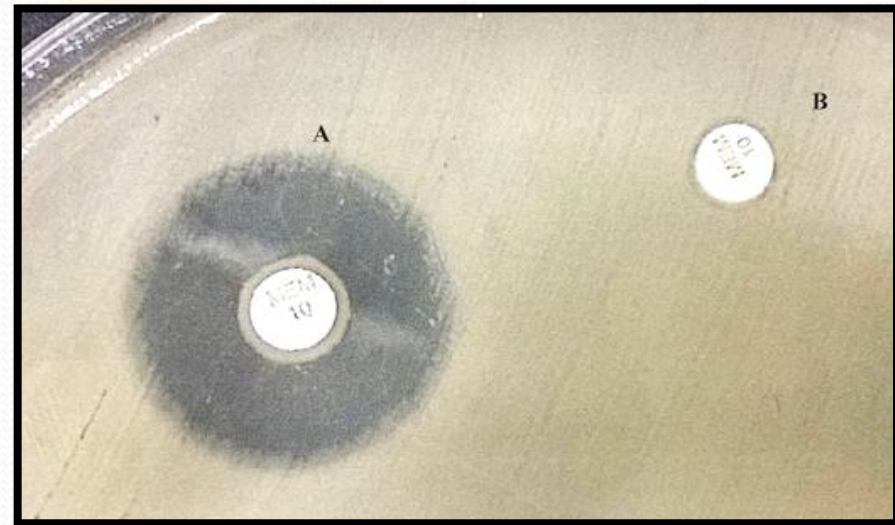
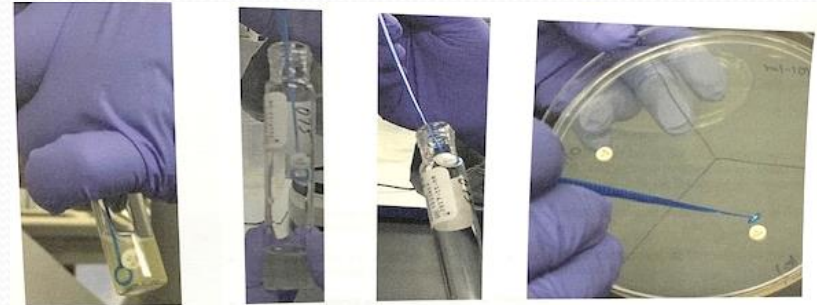
Modified Carbapenem Inactivation Method (mCIM)



# Phenotypic Carbapenemase Production

## mCIM

- ✓ Used on Enterobacteriaceae and *P. aeruginosa*
- ✓ **NOT RECOMMENDED FOR ACINETOBACTER**
- ✓ **Accuracy : 97% sensitivity and 99% specificity**
- ✓ **Limitations:** Based upon zones and pinpoint colonies can have an impact on interpretation, some mechanisms behave differently than others
- ✓ **TAT : 4 hr**
- ✓ **Estimated cost : < \$2.00**
- ✓ Regulatory status : CLSI M100 guideline



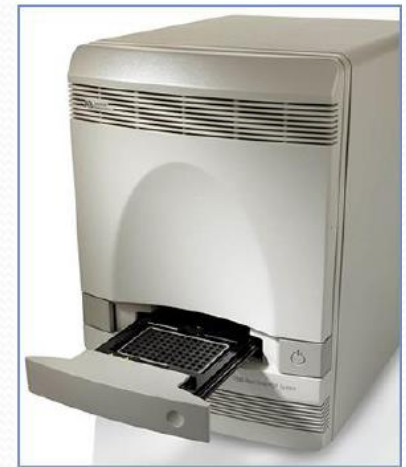
- A. **mCIM negative : *K. pneumoniae* ATCC BAA-1706**  
B. **mCIM positive : *K. pneumoniae* ATCC BAA-1705**

# Susceptibility Testing

- GNX2F Trek Sensititre broth microdilution plates
- Limitations: May lose the plasmid and therefore will look different than submitter; repeat with meropenem disk to try and recover
- Epidemiological purposes only – NOT intended for patient treatment purposes
- Extended testing from WI ARLN site for clinical testing for combo therapy: ceftazidime + avibactam, aztreonam; aztreonam + avibactam
  - Send directly to WI

# Real-time PCR

- BOL detects the following mechanisms of resistance:
  - KPC
  - NDM
  - VIM
  - OXA-48-like
  - IMP
  - MCR-1
  - MCR-2
- Whole Genome Sequencing available in outbreak situations based upon special request of state epidemiologists



# Future Testing at BOL

- Future molecular mechanism: Oxa-23
- Currently validating the Cepheid GeneXpert
  - CarbaR and Van A
  - The Carba-R Assay is not a sub-typing tool and does not detect variants of the IMP, VIM, NDM, KPC, or OXA-48 genes.
  - Advantage of more rapid turn-around time with less initial processing by lab staff



# Isolate submission instructions for testing

- ✓ Pure culture on TSA slant
- ✓ Resistant to at least one carbapenem
- ✓ Copy of submitting clinical laboratory AST results
- ✓ Microbiology/Virology Test Request Form (DCH 0583)

# State of Michigan – Laboratory Test Requisition Microbiology/ Virology

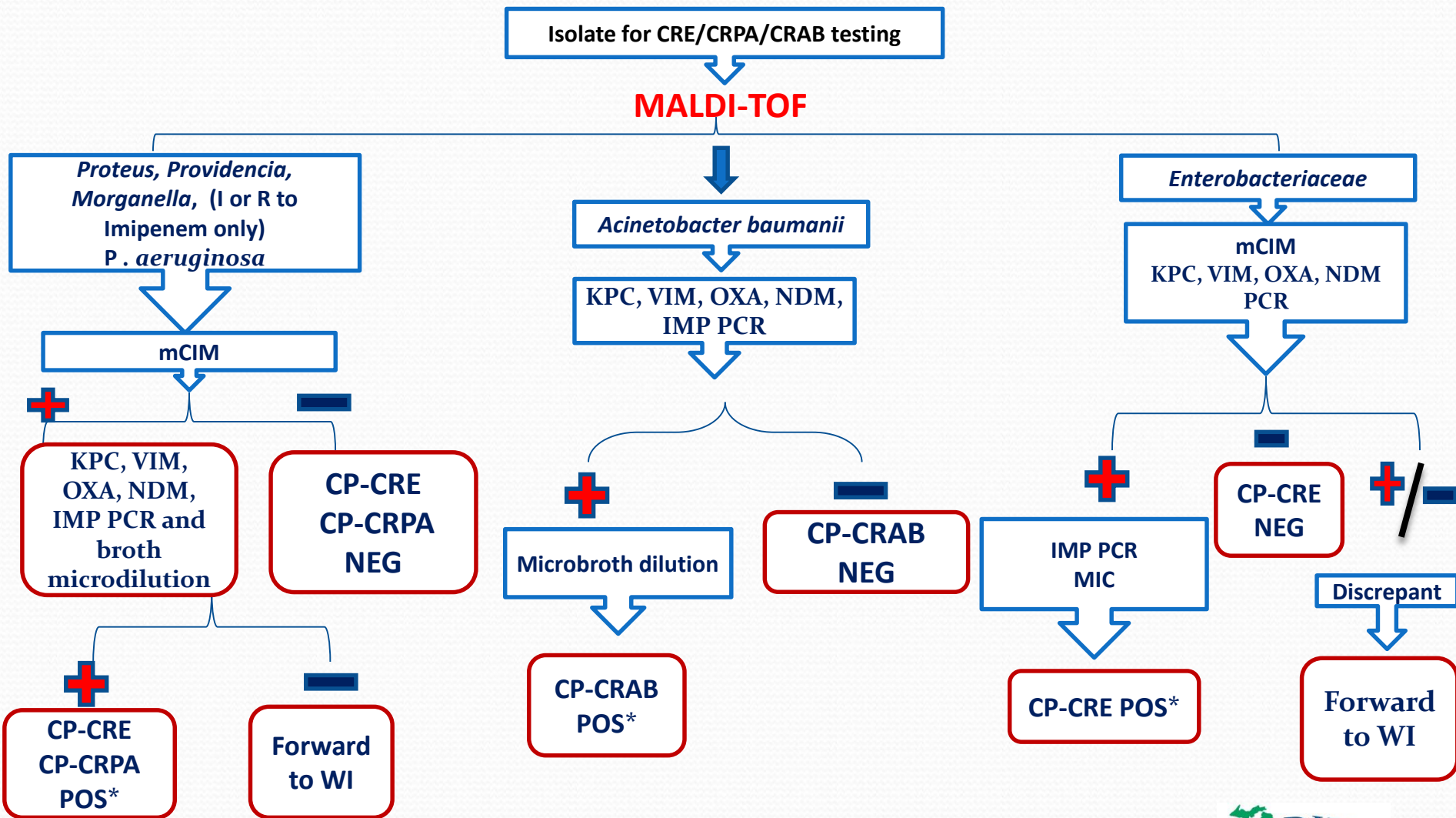
## DCH -0583

Page 1

INDICATE TEST REQUESTED		
INSTRUCTIONS FOR COMPLETION: Complete reverse side of form for corresponding numbers		
INDICATE SPECIMEN SOURCE	SEROLOGY	MICROBIOLOGY
<input type="checkbox"/> AMNIOTIC FLUID <input type="checkbox"/> BRONCHIAL <input type="checkbox"/> CERVIX <input type="checkbox"/> CSF <input type="checkbox"/> GASTRIC <input type="checkbox"/> NASOPHARYNGEAL <input type="checkbox"/> ORAL MUCOSAL TRANSUDATE <input type="checkbox"/> PLASMA <input type="checkbox"/> SERUM <input type="checkbox"/> STOOL <input type="checkbox"/> SPUTUM <input type="checkbox"/> THROAT <input type="checkbox"/> URETHRA <input type="checkbox"/> URINE <input type="checkbox"/> WHOLE BLOOD <input type="checkbox"/> FOOD-Specify: <input type="checkbox"/> OTHER-Specify:	<p style="text-align: center;">SERUM STATUS - If Applicable</p> <input type="checkbox"/> ACUTE <input type="checkbox"/> CONVALESCENT <input type="checkbox"/> ARBOVIRUS ENCEP PANEL (IgM) <p style="text-align: center;">May-Oct Includes: Eastern Equine, California, St. Louis and West Nile      CSF Only</p> <input type="checkbox"/> <i>BRUCELLA</i> SEROLOGY <input type="checkbox"/> FUNGAL SEROLOGY COMPLEMENT FIX <input type="checkbox"/> FUNGAL IMMUNODIFFUSION <input type="checkbox"/> <i>FRANCISELLA</i> SEROLOGY <input type="checkbox"/> <i>LEGIONELLA</i> - HA <input type="checkbox"/> LYME DISEASE - EIA (4) <input type="checkbox"/> MEASLES IgG <input type="checkbox"/> MUMPS IgG <input type="checkbox"/> RABIES AB SEROLOGY (3) <input type="checkbox"/> RUBELLA IgG <input type="checkbox"/> TETANUS TOXIN EIA <input type="checkbox"/> VARICELLA ZOSTER IgG	<input type="checkbox"/> AEROBIC ISOLATE ID (5) <div style="border: 2px solid red; padding: 2px;"><input checked="" type="checkbox"/> ANTIMICROBIAL RESISTANCE CONF. (5)</div> <input type="checkbox"/> AFB SLIDE/CULTURE-CLINICAL SPECIMEN <input type="checkbox"/> AFB IDENTIFICATION-ISOLATE ID <input type="checkbox"/> ENTERIC BACTERIAL CULTURE <input type="checkbox"/> FOODBORNE ILLNESS-Stool or Food (6) <input type="checkbox"/> FUNGAL IDENTIFICATION - ISOLATE ID <input type="checkbox"/> <i>LEGIONELLA</i> CULTURE <input type="checkbox"/> <i>NEISSERIA GONORRHOEAE</i> - ISOLATION <input type="checkbox"/> <i>NEISSERIA</i> - REFERRED CULTURE <input type="checkbox"/> PARASITOLOGY - BLOOD <input type="checkbox"/> PARASITOLOGY - STOOL <input type="checkbox"/> PARASITOLOGY - WORM <input type="checkbox"/> <i>PERTUSSIS</i> PCR <input type="checkbox"/> <i>SALMONELLA</i> SEROTYPING - HUMAN <input type="checkbox"/> <i>SHIGELLA</i> SEROTYPING <input type="checkbox"/> <i>E. COLI</i> SHIGA-TOXIN PRODUCER (STEC)



# MDHHS Reference Bacteriology Unit CRE/CRPA/CRAB Testing Algorithm



\* Positive results will be communicated with SHARP HAI coordinator & CDC

# Colonization Screening

- Epi approval required
- Rectal swab in Aimes Transport
- Screening performed via real-time PCR for gene of interest\*
- Turn-around Time: based on time of receipt, but generally within 48hrs



\*Eventually will be also validated on GeneXpert

# Key contact information

**Marty Soehrlen PhD, MPH, PHLD(ABB)**  
**Director, Division of Infectious Diseases**  
**BOL, MDHHS**  
**Office # 517-335-8064**  
**Email : [SoehrlenM@michigan.gov](mailto:SoehrlenM@michigan.gov)**

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**Nandhu Balakrishnan M.S., PhD**  
**Chief of Microbiology Section**  
**Infectious Disease Division**  
**BOL, MDHHS**  
**Office # 517-335-9641**  
**Email : [BalakrishnanN@michigan.gov](mailto:BalakrishnanN@michigan.gov)**

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**Ms. Kelly Jones MT(ASCP)**  
**Bacteriology Unit Manager**  
**BOL, MDHHS**  
**Office # 517-335-9638**  
**Email : [Jonesk42@michigan.gov](mailto:Jonesk42@michigan.gov)**



# Questions?

