Attachment B: CRE Instrument – Word Version

Form Approved
OMB No. 0920-0879
Expiration Date 01/31/2021

2020 Carbapenem Resistance Laboratory Survey

The purpose of this survey is to assess current activities and technologies used to detect carbapenem resistance in Enterobacteriaceae, *Pseudomonas*, and *Acinetobacter* from dogs and cats and to determine how information regarding carbapenem-resistance is shared with laboratory clients, the veterinary and scientific community, human and animal health officials, public health, and other interested parties.

This survey is being administered through the American Association of Veterinary Laboratory Diagnosticians (AAVLD) in collaboration with the Centers for Disease Control and Prevention (CDC). It contains a series of questions regarding laboratory activities and practices related to detection, carbapenem susceptibility testing, carbapenemase mechanism testing, data sharing capabilities, and emerging technologies for detecting carbapenem resistance. Use of trade names and commercial sources is for identification only and does not imply endorsement. Participation is completely voluntary.

The estimated time to complete this survey is 20 minutes. Your survey answers will be sent to a link at REDCap where data will be stored in a password protected electronic format. The information gathered in this survey may be published; data will be published in aggregate form without identifying any individual laboratory in order to protect the privacy of your laboratory and maintain confidentiality. A summary of the results from this survey will be provided to your laboratory via email.

We appreciate your participation in this survey. Please complete the survey by **(date six weeks from initial email to be input here)**. If you have any questions or concerns regarding the survey, please contact Michelle Waltenburg, DVM, MPH [nvr6@cdc.gov].

Attachment B: CRE Instrument – Word Version

Laboratory Name:

State:

Title of person completing survey:

<u>Section 1:</u> The first set of questions ask about laboratory testing scope.

Please check the appropriate response or if needed write answers or comments in the spaces provided.

1. From which of the following does your laboratory receive clinical samples (mark all that apply)?
    a. Academic veterinary practices
    b. Private practices
    c. Other veterinary diagnostic laboratories
    d. Other (please specify):

2. What proportion of samples received by your laboratory are from dogs and cats?
    a. Less than 10%
    b. Between 10% and <25%
    c. Between 25% and <50%
    d. Between 50% and <75%
    e. 75% or more

<u>Section 2:</u> The second set of questions ask about bacterial identification and antimicrobial susceptibility testing (AST).

Please check the appropriate response or if needed write answers or comments in the spaces provided.

3. Which method(s) does your laboratory currently use for Gram-negative species identification (mark all that apply)?
    a. Conventional biochemical tube tests
    b. Commercially available test strips (e.g., API® strips)
    c. Automated bacterial ID systems (e.g., Vitek® , BD Phoenix™, Sensititre™, MicroScan)
    d. MALDI-TOF system
    e. Sequencing or other molecular based methods
    f. Other (please specify):

4. Does your laboratory conduct antimicrobial susceptibility testing (AST) on any Gram-negative isolates?
    a. Yes
    b. No (if No, please skip to the submission instructions at the end of the survey)

The following attachment contains information on carbapenem breakpoints by laboratory testing guidelines. Please consult the information as needed to answer Question 5.

5. What laboratory testing standards does your laboratory use (select all that apply)?
    a. CLSI M100
    b. CLSI VET08
    c. VetCAST/EUCAST
    d. Other (please specify):
    e. Any comments you wish to share if you use multiple standards for identification and AST:

Attachment B: CRE Instrument – Word Version

<u>Section 3:</u> The following set of questions ask about Enterobacteriaceae from dogs and cats specifically. For the purpose of this survey, Enterobacteriaceae includes, but is not limited to, the following species: *E. coli*, *Salmonella* spp., *Klebsiella* spp., *Enterobacter* spp., *Citrobacter* spp., *Providencia* spp., *Proteus* spp., *and Morganella* spp.

Please check the appropriate response or if needed write answers or comments in the spaces provided.

6. Does your laboratory conduct AST on any Enterobacteriaceae isolates?
    a. Yes
    b. No (if No, please skip to Section 4)

7. Please indicate which method your laboratory uses for primary susceptibility testing of Enterobacteriaceae from dogs and cats:
    a. Kirby-Bauer disk diffusion
    b. Automated testing instrument (e.g., Vitek®, BD Phoenix™, Sensititre™, MicroScan)
    c. Other broth microdilution method (please specify):
    d. Agar dilution method
    e. Gradient diffusion method (e.g., Etest®)
    f. Other or use several methods (please specify or describe):

8. Please indicate which method(s) your laboratory uses for secondary, supplemental, or confirmatory testing of Enterobacteriaceae from dogs and cats (if performed):
    a. Kirby-Bauer disk diffusion
    b. Automated testing instrument (e.g., Vitek®, BD Phoenix™, Sensititre™, MicroScan)
    c. Other broth microdilution method (please specify):
    d. Agar dilution method
    e. Gradient diffusion method (e.g., Etest®)
    f. Other (please specify):
    g. Not performed

9. Does your laboratory currently conduct AST on Enterobacteriaceae for clinical management of individual patients?
    a. Yes
        i. 9(a): If Yes, which isolates undergo AST for clinical decision making?
            1. Most Enterobacteriaceae isolates received routinely undergo AST.
            2. Only Enterobacteriaceae isolates from suspected infections undergo AST.
            3. Only Enterobacteriaceae isolates that are requested by submitter/clinician undergo AST.
            4. Other (please specify):
    b. No

10. Does your laboratory currently conduct AST on Enterobacteriaceae for any monitoring/surveillance programs?
    a. Yes
        i. 10(a): If Yes, please select the organism(s) included in surveillance AST:
            1. *E. coli*, commensal
            2. Pathogenic *E. coli* (e.g., STEC, EHEC, AEEC)
            3. *Salmonella*

4. *Klebsiella*
5. *Enterobacter*
6. *Citrobacter*
7. *Providencia*
8. *Proteus*
9. *Morganella*
10. Other (please specify):

b. No

11. Does your laboratory currently conduct AST on Enterobacteriaceae for any research projects?
    a. Yes
        i. 11(a): If Yes, please select the organism(s) included in research project AST:
            1. *E. coli*, commensal
            2. Pathogenic *E. coli* (e.g., STEC, EHEC, AEEC)
            3. *Salmonella*
            4. *Klebsiella*
            5. *Enterobacter*
            6. *Citrobacter*
            7. *Providencia*
            8. *Proteus*
            9. *Morganella*
            10. Other (please specify):
    b. No

12. For Enterobacteriaceae, if preliminary AST suggests multidrug-resistance (e.g., resistance was detected to 2 or more classes of antibiotics), does your laboratory routinely do any additional AST or mechanism of resistance testing (e.g., ESBL, carbapenemase-production) to investigate further?
    a. Yes
    b. No
    c. At request of client

13. For Enterobacteriaceae, does your laboratory's primary AST panel for dogs and cats include one or more third generation cephalosporins (e.g., cefpodoxime, ceftiofur, cefovecin, ceftriaxone)?
    a. Yes
    a. No

14. Are any third generation cephalosporins (e.g., cefpodoxime, ceftiofur, cefovecin, ceftriaxone) included in any secondary, supplemental, or confirmatory AST for Enterobacteriaceae?
    a. Yes
    b. No

15. For Enterobacteriaceae, does your laboratory's primary AST panel for dogs and cats include one or more carbapenems?
    a. 15(a): Yes (please select all that apply):
        i. Imipenem
        ii. Meropenem
        iii. Doripenem

iv. Ertapenem
v. Other carbapenem (please specify):

b. No

16. Are any carbapenem antibiotics included in any secondary, supplemental, or confirmatory AST for Enterobacteriaceae?
    a. 16(a): Yes (please select all that apply):
        i. Imipenem
        ii. Meropenem
        iii. Doripenem
        iv. Ertapenem
        v. Other carbapenem (please specify):
    b. No (if No, please skip to Section 4)

17. Does your laboratory provide MIC interpretations for carbapenems in Enterobacteriaceae?
    a. Yes
    b. No
    c. Sometimes (specify):

18. Does your laboratory provide zone diameter interpretations for carbapenems in Enterobacteriaceae?
    a. Yes
    b. No
    c. Sometimes (specify):

<u>Section 4:</u> The following set of questions ask about *Pseudomonas aeruginosa* from dogs and cats specifically.

Please check the appropriate response or if needed write answers or comments in the spaces provided.

19. Does your laboratory conduct AST on any *Pseudomonas aeruginosa* isolates?
    a. Yes
    b. No (if No, please skip to Section 5)

20. Please indicate which method your laboratory uses for primary susceptibility testing of *Pseudomonas aeruginosa* from dogs and cats:
    a. Kirby-Bauer disk diffusion
    b. Automated testing instrument (e.g., Vitek®, BD Phoenix™, Sensititre™, MicroScan)
    c. Other broth microdilution method (please specify):
    d. Agar dilution method
    e. Gradient diffusion method (e.g., Etest®)
    f. Other or use several methods (please specify or describe):

21. Please indicate which method(s) are used for secondary, supplemental, or confirmatory testing of *Pseudomonas aeruginosa* from dogs and cats (if performed):
    a. Kirby-Bauer disk diffusion
    b. Automated testing instrument (e.g., Vitek®, BD Phoenix™, Sensititre™, MicroScan)
    c. Other broth microdilution method (please specify):
    d. Agar dilution method

e. Gradient diffusion method (e.g., Etest®)
f. Other (please specify):
g. Not performed

22. Does your laboratory currently conduct AST on *Pseudomonas aeruginosa* for clinical management of individual patients?
    a. Yes
        i. 22(a): If Yes, which isolates undergo AST for clinical decision making?
            1. Most *Pseudomonas aeruginosa* isolates routinely undergo AST.
            2. Only *Pseudomonas aeruginosa* isolates from suspected infections undergo AST.
            3. Only *Pseudomonas aeruginosa* isolates that are requested by submitter/clinician undergo AST.
            4. Other (please specify):
    b. No

23. Does your laboratory currently conduct AST on *Pseudomonas aeruginosa* for any monitoring/surveillance programs?
    a. Yes
    b. No

24. Does your laboratory currently conduct AST on *Pseudomonas aeruginosa* for any research projects?
    a. Yes
    b. No

25. For *Pseudomonas aeruginosa*, if preliminary AST suggested multidrug-resistance (e.g., resistance was detected to 2 or more classes of antibiotics), does your laboratory routinely do any additional AST or mechanism of resistance testing (e.g., carbapenemase-production, PCR) to investigate further?
    a. Yes
    b. No
    c. At request of client

26. For *Pseudomonas aeruginosa*, does your laboratory's primary AST panel for dogs and cats include one or more third generation cephalosporins (e.g., cefpodoxime, ceftiofur, cefovecin, ceftriaxone)?
    a. Yes
    b. No

27. Are any third generation cephalosporins (e.g., cefpodoxime, ceftiofur, cefovecin, ceftriaxone) included in any secondary, supplemental, or confirmatory AST for *Pseudomonas aeruginosa*?
    a. Yes
    b. No

28. For *Pseudomonas aeruginosa*, does your laboratory's primary AST panel for dogs and cats include one or more carbapenems?
    a. 28(a): Yes (please select all that apply):
        i. Imipenem
        ii. Meropenem

iii. Doripenem
iv. Other carbapenem (please specify):

b. No

29. Are any carbapenem antibiotics included in any secondary, supplemental, or confirmatory AST for *Pseudomonas aeruginosa*?
    a. 29(a): Yes (please select all that apply):
        i. Imipenem
        ii. Meropenem
        iii. Doripenem
        iv. Other carbapenem (please specify):
    b. No (if No, please skip to Section 5)

30. Does your laboratory provide MIC interpretations for carbapenems in *Pseudomonas aeruginosa*?
    a. Yes
    b. No
    c. Sometimes (specify):

31. Does your laboratory provide zone diameter interpretations for carbapenems in *Pseudomonas aeruginosa*?
    a. Yes
    b. No
    c. Sometimes (specify):

<u>Section 5:</u> The following set of questions ask about *Acinetobacter baumannii* complex from dogs and cats specifically.

Please check the appropriate response or if needed write answers or comments in the spaces provided.

32. Does your laboratory conduct AST on any *Acinetobacter baumannii* complex isolates?
    a. Yes
    b. No (if No, please skip to Section 6)

33. Please indicate which method your laboratory uses for primary susceptibility testing of *Acinetobacter baumannii* complex from dogs and cats:
    a. Kirby-Bauer disk diffusion
    b. Automated testing instrument (e.g., Vitek®, BD Phoenix™, Sensititre™, MicroScan)
    c. Other broth microdilution method (please specify):
    d. Agar dilution method
    e. Gradient diffusion method (e.g., Etest®)
    f. Other or use several methods (please specify or describe):

34. Please indicate which method(s) are used for secondary, supplemental, or confirmatory testing of *Acinetobacter baumannii* complex from dogs and cats (if performed):
    a. Kirby-Bauer disk diffusion
    b. Automated testing instrument (e.g., Vitek®, BD Phoenix™, Sensititre™, MicroScan)
    c. Other broth microdilution method (please specify):
    d. Agar dilution method

e. Gradient diffusion method (e.g., Etest®)
f. Other (please specify):
g. Not performed

35. Does your laboratory currently conduct AST on *Acinetobacter baumannii* complex for clinical management of individual patients?
    a. Yes
        i. 35(a): If Yes, which isolates undergo AST for clinical decision making?
            1. Most *Acinetobacter baumannii* complex isolates routinely undergo AST.
            2. Only *Acinetobacter baumannii* complex isolates from suspected infections undergo AST.
            3. Only *Acinetobacter baumannii* complex isolates that are requested by submitter/clinician undergo AST.
            4. Other (please specify):
    b. No

36. Does your laboratory currently conduct AST on *Acinetobacter baumannii* complex for any monitoring/surveillance programs?
    a. Yes
    b. No

37. Does your laboratory currently conduct AST on *Acinetobacter baumannii* complex for any research projects?
    a. Yes
    b. No

38. For *Acinetobacter baumannii*, if preliminary AST suggested multidrug-resistance (e.g., resistance was detected to 2 or more classes of antibiotics), does your laboratory routinely do any additional AST or mechanism of resistance testing (e.g., carbapenemase-production, PCR) to investigate further?
    a. Yes
    b. No
    c. At request of client

39. For *Acinetobacter baumannii* complex, does your laboratory's primary AST panel for dogs and cats include one or more third generation cephalosporins (e.g., cefpodoxime, ceftiofur, cefovecin, ceftriaxone)?
    a. Yes
    b. No

40. Are any third generation cephalosporins (e.g., cefpodoxime, ceftiofur, cefovecin, ceftriaxone) included in any secondary, supplemental, or confirmatory AST for *Acinetobacter baumannii* complex?
    a. Yes
    b. No

41. For *Acinetobacter baumannii* complex, does your laboratory's primary AST panel for dogs and cats include one or more carbapenems?

a. 41(a): Yes (please select all that apply):
    i. Imipenem
    ii. Meropenem
    iii. Doripenem
    iv. Other (please specify):
b. No

42. Are any carbapenem antibiotics included in any secondary, supplemental, or confirmatory AST for *Acinetobacter baumannii* complex?
    a. 42(a): Yes (please select all that apply):
        i. Imipenem
        ii. Meropenem
        iii. Doripenem
        iv. Other (please specify):
    b. No (if No, please skip to Section 6)

43. Does your laboratory provide MIC interpretations for carbapenems in *Acinetobacter baumannii* complex?
    a. Yes
    b. No
    c. Other (specify):

44. Does your laboratory provide zone diameter interpretations for carbapenems in *Acinetobacter baumannii* complex?
    a. Yes
    b. No
    c. Other (specify):

<u>Section 6</u>: The following questions ask about what is done when carbapenem resistance from dogs and cats is detected in any Gram-negative organism.

Please check the appropriate response or if needed write answers or comments in the spaces provided.

45. If carbapenem resistance was detected in any isolate from a dog or cat, which of the following action(s) would your laboratory initiate (mark all that apply)?
    a. Notify clinician at submitting facility
    b. Notify biosecurity officer or infection prevention staff at submitting facility
    c. Notify the state agriculture department
    d. Notify the state veterinarian
    e. Notify other public health official/department
    f. Perform additional laboratory testing (e.g., mCIM, CarbaNP, Modified Hodge Test [MHT], whole genome sequencing)
    g. Other (please specify):
    h. None of the above
    i. Comments:

46. If your laboratory identified a carbapenem-resistant isolate from a dog or cat, would your laboratory perform any tests to identify carbapenemase production or carbapenemase genes?
    a. Yes

i. 46(a): If Yes, for which organism(s) (mark all that apply)?
    1. Carbapenem-resistant Enterobacteriaceae
    2. Carbapenem-resistant *Pseudomonas aeruginosa*
    3. Carbapenem-resistant *Acinetobacter baumannii complex*

ii. 46(b): If Yes, what mechanism testing would your laboratory perform (mark all that apply)?
    1. Phenotypic testing (please select which organism and tests)
        a. 46(c): What phenotypic testing would your laboratory perform for carbapenem-resistant Enterobacteriaceae:
            i. Modified carbapenem-inactivation method (mCIM) or carbapenem-inactivation method (CIM)
            ii. Rapid commercial test (e.g., RAPIDEX® CarbaNP)
            iii. Modified Hodge Test (MHT)
            iv. Other (please specify):

        b. 46(d): What phenotypic testing would your laboratory perform for carbapenem-resistant *Pseudomonas aeruginosa:*
            i. Modified carbapenem-inactivation method (mCIM) or carbapenem-inactivation method (CIM)
            ii. Rapid commercial test (e.g., RAPIDEX® CarbaNP)
            iii. Modified Hodge Test (MHT)
            iv. Other (please specify):

        c. 46(e): What phenotypic testing would your laboratory perform for carbapenem-resistant *Acinetobacter baumannii* complex*:*
            i. Modified carbapenem-inactivation method (mCIM) or carbapenem-inactivation method (CIM)
            ii. Rapid commercial test (e.g., RAPIDEX® CarbaNP)
            iii. Modified Hodge Test (MHT)
            iv. Other (please specify):

    2. Commercial molecular test (e.g., Cepheid Xpert® Carba-R, BioFire® FilmArray®, VERIGENE®)

    3. 46 (f): Please indicate PCRs performed to detect which carbapenemase gene(s):
        a. bla_{KPC}
        b. bla_{NDM}
        c. $bla_{OXA\text{-}48\text{-}like}$
        d. bla_{VIM}
        e. bla_{IMP}
        f. Other (please specify):

    4. Whole genome sequencing

b. No

<u>Section 7:</u> The following set of questions ask about laboratory test results from dogs and cats. Please reference the standards your laboratory uses (e.g., CLSI M100, CLSI VET08, VetCAST/EUCAST) to define carbapenem resistance when answering the following questions.

Attachment B: CRE Instrument – Word Version

Please check the appropriate response or if needed write answers or comments in the spaces provided.

The following attachment contains information on carbapenem breakpoints for various laboratory testing guidelines. Please consult this information as needed to answer questions in Section 7.

47. Did your laboratory identify any carbapenem-resistant isolate(s) from a dog or cat in 2019 (Jan-Dec)?
    a. Yes
    b. No
    c. Unknown

48. (a) Approximately how many Enterobacteriaceae isolates from dogs and cats were tested for antibiotic susceptibility in 2019 (Jan-Dec)?
    a. 0-10
    b. 11-50
    c. 51-100
    d. 101-200
    e. ≥201
    f. Prefer not to answer

48. (b) Among the Enterobacteriaceae isolates from dogs and cats that your laboratory performed antibiotic susceptibility, how many were resistant to a carbapenem?
    a. Zero
    b. 1-5
    c. 6-10
    d. 11-15
    e. ≥16
    f. Prefer not to answer

48. (c) Among the Enterobacteriaceae isolates from dogs and cats that your laboratory performed antibiotic susceptibility, how many were resistant to a third-generation cephalosporin?
    a. 0-5
    b. 6-25
    c. 26-50
    d. 51-100
    e. ≥101
    f. Prefer not to answer

49. (a) Approximately how many *Pseudomonas aeruginosa* isolates from dogs and cats were tested for antibiotic susceptibility in 2019 (Jan-Dec)?
    a. 0-10
    b. 11-50
    c. 51-100
    d. 101-200
    e. ≥201
    f. Prefer not to answer

49. (b) Among the *Pseudomonas aeruginosa* isolates from dogs and cats that your laboratory performed antibiotic susceptibility, how many were resistant to a carbapenem?
    a. Zero
    b. 1-5
    c. 6-10
    d. 11-15
    e. ≥16
    f. Prefer not to answer

49. (c) Among the *Pseudomonas aeruginosa* isolates from dogs and cats that your laboratory performed antibiotic susceptibility, how many were resistant to a third-generation cephalosporin?
    a. Zero
    b. 1-5
    c. 6-10
    d. 11-15
    e. ≥16
    f. Prefer not to answer

50. (a) Approximately how many *Acinetobacter baumannii* isolates from dogs and cats were tested for antibiotic susceptibility in 2019 (Jan-Dec)?
    a. Zero
    b. 1-5
    c. 6-10
    d. 11-15
    e. ≥16
    f. Prefer not to answer

50. (b) Among the *Acinetobacter baumannii* isolates from dogs and cats that your laboratory performed antibiotic susceptibility, how many were resistant to a carbapenem?
    a. Zero
    b. 1-5
    c. 6-10
    d. 11-15
    e. ≥16
    f. Prefer not to answer

50. (c) Among the *Acinetobacter baumannii* isolates from dogs and cats that your laboratory performed antibiotic susceptibility, how many were resistant to a third-generation cephalosporin?
    a. Zero
    b. 1-5
    c. 6-10
    d. 11-15
    e. ≥16
    f. Prefer not to answer

51. Does your laboratory save a viable culture of carbapenem-resistant isolates?
    a. Yes

i. 51 (a): Which isolates are routinely saved (select all that apply)?
    1. Clinical sterile site
    2. Clinical non-sterile site
    3. Surveillance or research specimens
    4. Other (please specify):
ii. 51 (b): How long are carbapenem resistant isolates saved?

b. No

52. To your knowledge, are there any public health reporting mandates that require your laboratory to report the identification of any carbapenem-resistant organisms to public health?
    a. Yes (specify):
    b. No

53. May we contact your laboratory via AAVLD with questions about your survey responses?
    a. Yes
    b. No

54. Any additional comments you wish to share:

Thank you for your participation in this survey. If you have any questions or concerns regarding the survey, please contact Michelle Waltenburg [nvr6@cdc.gov].