



CMPT Clinical Bacteriology Program

Innovation, Education, Quality Assessment, Continual Improvement

Challenge M092-5

August 2009

Wound: *Neisseria weaveri*

HISTORY

The sample was a simulated wound sample from 8 year old patient with a dog bite.

The sample was sent to category A laboratories which were requested to process and report as per their usual protocol. Participants were expected to process the sample, identify *Neisseria weaveri*, and perform susceptibility testing.

CMPT QA

The sample yielded 4+ large grey colonies on BAP and 3+ pure brown colonies on chocolate agar incubated under CO₂ conditions. The culture was viable for at least 15 days and it was identified as *Neisseria weaveri*.

SURVEY RESULTS

Identification (see Table 1)

Reference Laboratories: 8 labs reported *N. weaveri*, 4 labs reported gram negative bacilli, refer, 1 lab reported *N. elongata*, 1 lab reported *Neisseria* species, failed to grow for identification and 1 lab reported *F. nucleatum*.

Consensus was not achieved by the reference laboratories, thus the identification challenge was **ungraded**.

This was the first time *Neisseria weaveri* was sent as a challenge. Overall, up to 46% of the labs identified the microorganism as belonging to the genus *Neisseria*. Of those, 72% could further identify it as *N. weaveri*.

Pasteurella was reported by 6% of the laboratories, *Pseudomonas* by 13% and *Capnocytophaga* by 5%.

Susceptibility testing

Reference laboratories:

Penicillin (n=8): S (5), I (2), R (1)

Ciprofloxacin (n=5): all S

β-lactamase (n=6): all negative

Consensus was not achieved by the reference laboratories thus the challenge was **ungraded**.

Grading

Consensus was not achieved by the reference laboratories, thus the identification challenge was **ungraded**.

Two laboratories appear to have mixed up challenges M092-4 and M092-5.

Laboratories are advised to double check that the correct results are entered into the on-line survey results form.

IDENTIFICATION

Neisseria weaveri, formerly CDC M-5 group, was first named in 1993 in honor of Robert E. Weaver, for his substantial contributions to the characterization, identification, and classification of this species ¹.

Table –1: Reported results for M092-5 -Identification component – challenge ungraded.

Reported results	No of Labs	%
Neisseria	36	46.2
<i>Neisseria weaveri</i> , +/- presumptive, refer	23	
non-fermenting gram negative bacilli, possible <i>Neisseria weaveri</i> , refer	3	
<i>Neisseria</i> species +/- not <i>N. meningitidis</i> or <i>gonorrhoeae</i> , +/- presumptive, refer	4	
<i>Neisseria</i> species +/- not <i>N. meningitidis</i> or <i>gonorrhoeae</i> , + GBS refer	1	
<i>Neisseria elongata</i> , +/- presumptive, refer	3	
<i>Neisseria</i> species, failed to grow for further testing	1	
<i>Neisseria animaloris/zoodegmatis</i> , refer	1	
Pasteurella	5	6.4
<i>Pasteurella canis</i> , presumptive, refer	1	
<i>Pasteurella</i> species, +/- presumptive, refer	3	
gram negative bacillus, resembling <i>Pasteurella</i> species	1	

Table –1 continues on page 2

Table –1: Reported results for M092-5—Identification component – challenge ungraded—continued

Reported results (continued)	No of Labs	%
Pseudomonas	10	12.8
<i>Pseudomonas alcaligenes</i> , +/- refer	7	
<i>Pseudomonas fluor/putida</i>	1	
<i>Pseudomonas</i> species, +/- refer	2	
<i>Capnocytophaga</i> species, +/- presumptive, refer	4	5.1
<i>Acinetobacter lwoffii/junii</i>	1	1.3
gram negative bacilli, glucose non-fermenter, most closely resembling EF-4b, refer	1	1.3
CDC group EF-4, presumptive, refer	1	1.3
CDC Group O-2, presumptive, refer	1	1.3
non-fermenting gram negative bacilli, refer	4	5.1
oxidase positive gram negative bacilli, refer	2	2.6
gram negative bacilli, +/- (not <i>Enterobacteriaceae</i> or <i>Pasteurella</i>), +/- unable to ID, +/- refer	7	9.0
gram variable bacilli, refer	1	1.3
<i>Fusobacterium nucleatum</i>	1	1.3
<i>Fusobacterium</i> species, refer	1	1.3
<i>Bacillus</i> species, snnp	1	1.3
snp, refer	2	2.6
Total	78	100.0

snp - sample not normally processed

Unlike the rest of the species of the *Neisseria* genus that are true cocci, *Neisseria elongata* and *N. weaveri* are medium to large, plump rods that appear in gram-stained smears as pairs or short chains ¹⁻⁵. It has a tendency to grow in chains or longer rods in broth culture.

N. weaveri is aerobic, and grows well between 25 and 35 °C; most strains grow at 42 °C. Colonies are grey-white with an entire border, flat, slightly glistening, and smooth and variable in size. They are 1 to 2 mm in diameter after 24 hours of incubation at 35 °C and 2 to 4 mm after 48 hours of incubation on sheep blood agar plate (SBAP). A zone of alpha-hemolysis is produced on SBAP in areas of heavy growth ¹.

The species is nonmotile, strongly oxidase and catalase positive, indole negative, and does not ferment carbohydrates. It reduces nitrite but not nitrate and has a weakly positive phenylalanine deaminase reaction from culture grown on SBAP ¹⁻⁶.

For further details on the biochemical characteristics of *N. weaveri* and differential diagnosis please see Andersen 1993 ¹, Forsblom 2002 ² and Schreckenberger 2007 ⁴.

Differential diagnosis is difficult when working with samples from dog bite wounds since many species in the normal canine oral flora have similar biochemical characteristics.

As observed in this challenge, commercial identification systems commonly used in the clinical laboratory frequently fail to identify *N. weaveri*. The organism is not listed in the database of MicroScan, Phoenix, VITEK 2 or API 20NE. Other identification systems including, RapID NH and RapID NF, may give unacceptable profiles ².

Following classic phenotypic tests reference laboratories may perform cellular fatty acid profiling or do 16S rRNA sequencing to confirm organism identification.

ANTIMICROBIAL SUSCEPTIBILITY

Like several other organisms associated with dog bite wounds, *N. weaveri* strains are susceptible to penicillin, fluoroquinolones, and tetracycline ^{7,8}.

Antibiotic susceptibility testing has been performed by some groups using the BSAC (British Society for Antimicrobial Chemotherapy) method ⁹ using broth dilution and E-test. These

The committee recommends that all Proficiency Testing samples should be processed as routine samples even when there is a staff shortage or high workload.

tests showed the organism to be sensitive to penicillin, ciprofloxacin and gentamicin, but resistant to trimethoprim⁶. The chromogenic cephalosporin test can be used for detection of β -lactamase production⁶.

Currently, there is no a standardized method for susceptibility testing recommended by CLSI for this microorganism.

CLINICAL RELEVANCE

N. weaveri is a part of the normal canine oral flora (in 10 to 12% of oral flora samples), together with biochemically similar bacteria such as *Weeksella zoohelcum* (38 to 90%); EF-4 (up to 74%); *Capnocytophaga canimorsus* up to 8%); *Pasteurella multocida* (12 to 60%); other *Pasteurella* species.; *N. flavescens*; other species of *Neisseria*, *Moraxella*, *Oligella*, *Pseudomonas*, *Simonsiella*, *Alcaligenes*, *Flavobacterium*, and *Bordetella bronchiseptica*¹.

Clinical sources of *N. weaveri* are most often dog bite wounds^{5, 7}, although it has also been isolated from cat, or in one case tiger bite wounds¹⁰.

N. weaveri has been isolated from sites other than the wound site. A case of *N. weaveri* septicemia was reported in a 69-year-old man after a dog bite⁷ and the organism was isolated from sputum of a 60-year-old man admitted to the hospital because of an acute exacerbation of his bronchiectasis⁶.

TREATMENT

N. weaveri is typically susceptible to penicillin. However, in the setting of a dog bite wound, empiric coverage for other common isolates including *Pasteurella* species, *Staphylococcus aureus* and anaerobes requires a broad-spectrum agent such as amoxicillin-clavulanate. Because of the resistance of certain bacteria first generation cephalosporins, cloxacillin, clindamycin and erythromycin are not considered adequate therapy for bite wounds¹¹.

REFERENCES

1. Andersen BM, Steigerwalt AG, O'Connor SP, et al. *Neisseria weaveri* sp. nov., formerly CDC group M-5, a gram-negative bacterium associated with dog bite wounds. *J Clin Microbiol.* 1993;31:2456-2466.
2. Forsblom B, Sarkiala-Kessel E, Kanervo A et al. Characterization of aerobic gram-negative bacteria from subgingival sites of dogs - potential bite wound pathogens *J Med Microbiol.* 2002;51:207-229.
3. Janda WM, Gaydos C. *Neisseria*. In: Murray, ed. *Manual of Clinical Microbiology*. Vol 1. 9th ed. Washington, DC. ASM; 2007:601-620.
4. Schreckenberger PC, Daneshvar MI and Hollis DG. Acinetobacter, Achromobacter, Chryseobacterium, Moraxella, and Other Nonfermentative Gram-Negative Rods. In: Murray, ed *Manual of Clinical Microbiology*. Vol1. 9th ed. Washington DC ASM; 2007: 770-802.
5. Holmes B, Costas M, On SL, Vandamme P, Falsen E, Kersters K. *Neisseria weaveri* sp. nov. (formerly CDC group M-5), from dog bite wounds of humans. *Int J Syst Bacteriol.* 1993;43:687-693.
6. Panagea S, Bijoux R, Corkill JE, Al Rashidi F, Hart CA. A case of lower respiratory tract infection caused by *Neisseria weaveri* and review of the literature. *J Infect.* 2002;44:96-98.
7. Carlson P, Kontiainen S, Anttila P, Eerola E. Septicemia caused by *Neisseria weaveri*. *Clin Infect Dis.* 1997;24:739.
8. Goldstein EJ, Citron DM. Comparative activities of cefuroxime, amoxicillin-clavulanic acid, ciprofloxacin, enoxacin, and ofloxacin against aerobic and anaerobic bacteria isolated from bite wounds. *Antimicrob Agents Chemother.* 1988;32:1143-1148.
9. Andrews JM, BSAC Working Party on Susceptibility Testing. BSAC standardized disc susceptibility testing method (version 6). *J Antimicrob Chemother.* 2007;60:20-41.
10. Capitini CM, Herrero IA, Patel R, Ishitani MB, Boyce TG. Wound infection with *Neisseria weaveri* and a novel subspecies of *Pasteurella multocida* in a child who sustained a tiger bite. *Clin Infect Dis.* 2002;34:E74-6.
11. Goldstein E. Bites. In Mandell, ed *Principles and Practice of Infectious Diseases*. Vol2. 6th ed. Philadelphia PA. Elsevier; 2005:3552-3556.