



M064-2 Ear (otitis externa): *Pseudomonas aeruginosa*

HISTORY A simulated ear swab collected from a 10-year old swimmer with an ear ache (otitis externa) was sent to category A and B laboratories requesting participants to set up and report as per your laboratory protocol. It was anticipated that all laboratories would report the presence *Pseudomonas aeruginosa*.

CMPT QA The sample contained 4+ *Pseudomonas aeruginosa* and 1+ viridans group streptococcus, viable for 14 days.

GRADING (maximum grade =4) A grade of 4 was assigned to identification. All 15 reference laboratories identified the organism as *Pseudomonas aeruginosa*. Laboratories had little difficulty correctly identifying the challenge organism. Participants reported using classical tests including oxidase, pigment, fluorescence, growth at 42°C, growth on cetrimide, OF dextrose, motility, TSI, H₂S, and/or nitrate with and without commercial identification methods. Table 1 summarizes the reports received and grades assigned.

Antimicrobial susceptibility testing results were not requested; however, 20 laboratories submitted an AST report, while 9 laboratories submitted one of the following comments.

- a. Susceptibility testing of topical antibiotics is not standardized and is not performed on superficial ear specimens (n=7).
- b. Uncomplicated superficial infections of the ear canal (swimmer's ear) with *Pseudomonas* do not require combination therapy (n=2).

ISOLATION AND IDENTIFICATION *Pseudomonas aeruginosa* is the most commonly encountered nonfermentative, gram-negative bacillus. These organisms grow readily on a variety of laboratory media including MacConkey agar, which may help in its isolation in mixed cultures. On 5% sheep blood

-GRADING-Maximum grade = 4

IDENTIFICATION: 100% (73/73) of category A laboratories and 97.5% (40/41) category B laboratories that processed the sample received a grade of 4/4 or 3/4.

NOTES

1. *Pseudomonas aeruginosa* and *Staphylococcus aureus*, often coexisting, are the most common causative organisms of OE.
2. Mild to moderate cases of OE are often managed empirically without microbial evaluation. Systemic antibiotics are rarely necessary and treatment usually entails the gentle cleaning away of debris and application of topical antibiotics.

agar growth is very characteristic, described as a flat, with irregular edges and a metallic sheen, and variable pigmentation either yellow-green or blue-green that may diffuse in to the media. *P. aeruginosa* is a strict aerobe, motile, oxidase positive, and exhibits a remarkably characteristic grape-like odor. It can be separated from other pseudomonads in this group by its ability to grow at 42°C¹. Identification may be made utilizing a variety of commercial methods, but for practical purposes, colonies that exhibit typical colonial morphology and odor, and are oxidase positive may be identified as *Pseudomonas aeruginosa*².

CLINICAL SIGNIFICANCE *Pseudomonas* species are organisms that are found worldwide in water, soil, and other environmental sources. *Pseudomonas aeruginosa* is the most important pathogen of this genus and has one of the broadest ranges of infectivity of all microorganisms, causing disease in plants, insects, fish, amphibians, reptiles, birds, and mammals³. In humans *P. aeruginosa* may be recovered from a variety of clinical specimens. Infections can range from superficial skin infections, otitis externa, corneal ulcers, through to hospital acquired pneumonia, and bacteremia^{1,2}.

Table 1. M64-2 Identification results received and grades assigned to category A and B laboratories.					
Report received	A	B	Methods	Total (% out of 114)	Grade
<i>Pseudomonas aeruginosa</i>	72	39	Classical only: 8 A, 3 B; Classical and Vitek2 (25 A, 3 B); Vitek (10 A, 14 B); Vitek Jr (1 B); MicroScan (21 A; 2 B); API 20E (8 B); API 20NE (1 A, 5 B); BD Phoenix (3 A); BBL Crystal (1B). Commercial method only: Vitek (1 A); Vitek 2 (3 A); API 20E (1 B) Method not indicated (1 B)	111 (97%)	4
<i>Pseudomonas aeruginosa</i> and coagulase-negative staphylococci	0	1	Vitek and classical	1	3
<i>Pseudomonas</i> species, presumptive	1	0	API 20E and classical	1	3
No report	0	1	n/a	1	0
Ear specimens not routinely processed	2	1	n/a	3	ungraded
Total	75	42	/	117	

Otitis externa (OE) or “swimmers ear” is an inflammatory infection of the external ear canal. The most common cause is excessive moisture in the ear canal which disrupts the cerumen (ear wax) barrier and increases the pH, providing optimum conditions for bacterial growth^{4,5}. Risk factors include local trauma to the external ear, high humidity and warmer temperatures, and swimming, especially in water that is high in bacterial counts. OE affects individuals of all ages and usually occurs unilaterally. Symp-

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toms include ear pain, itching and a sense of fullness with or without discharge from the ear canal and hearing loss.

Pseudomonas aeruginosa and *Staphylococcus aureus*, often coexisting, are the most common causative organisms of OE. Organisms such as *Staphylococcus epidermidis*, *Corynebacterium* species and viridans group Streptococcus are found in a healthy ear^{1,4,5,6}. Mild to moderate cases of OE are often managed empirically without microbial evaluation. Systemic antibiotics are rarely necessary and treatment usually entails the gentle cleaning away of debris and application of topical antibiotics^{4,5,6}.

Patients with compromised immune status or with diabetes are at risk for malignant otitis externa, (as described in M054-2⁸), a very severe complication of OE usually caused by *P. aeruginosa* and associated with invasion and necrosis of underlying tissue and bone^{1,7,8}. Malignant OE requires systemic treatment and a full susceptibility should be performed when this diagnosis is suspected.

REFERENCES

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