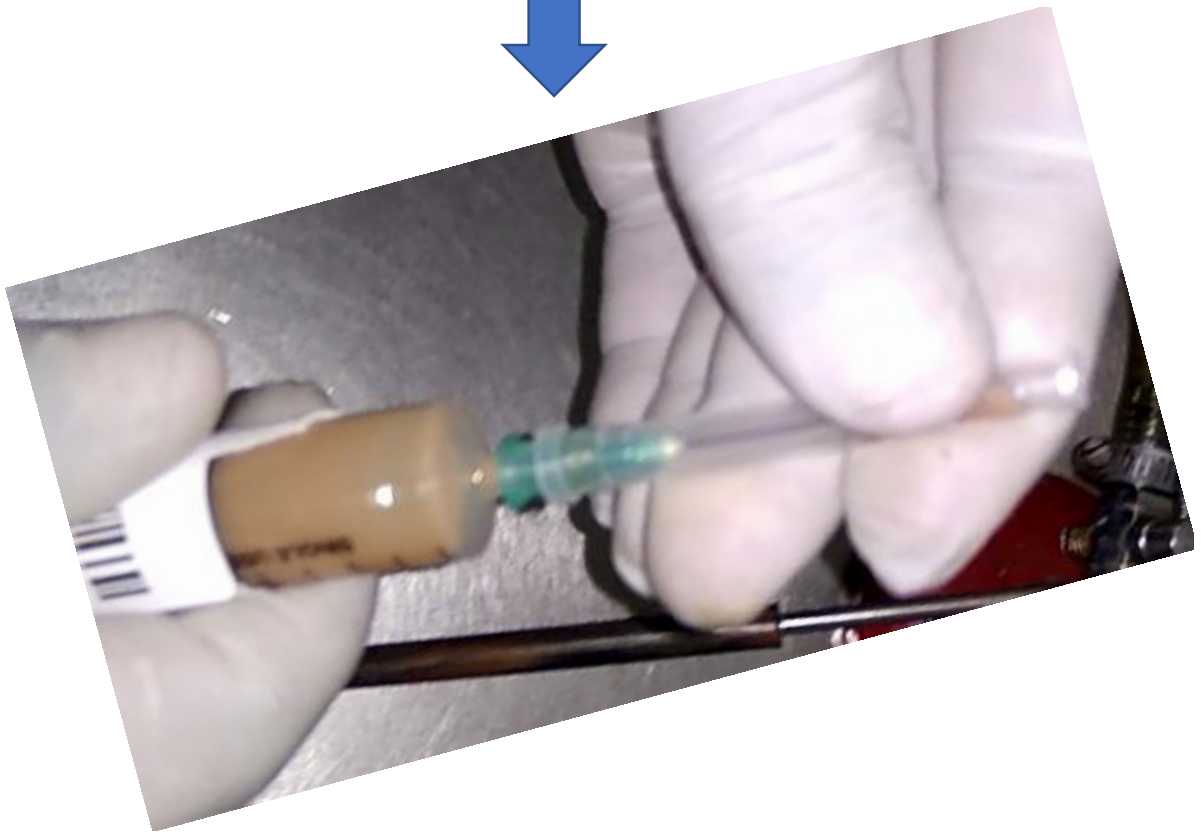
A 72 years female patient whose pus specimen was received in Microbiology laboratory for culture and sensitivity.



CHAPTER 24

Chryseobacterium, Sphingobacterium, and Similar Organisms

OBJECTIVES

1. Describe the general characteristics of the organisms discussed in this chapter.
2. Identify the normal habitat and the routes of transmission for the organisms.
3. List the appropriate media for cultivation of the organisms listed, particularly *E. meningoseptica*.
4. Describe the colonial appearance of *E. meningoseptica*.
5. Outline the tests used to differentiate the major genera in this group, including *Elizabethkingia* sp., *Myoides* spp., *Sphingobacterium* spp., physiologic and morphologic characteristics. Most are yellow-pigmented, oxidase-positive, glucose oxidizers that grow on MacConkey agar. *Sphingobacterium* spp. have an unusually large amount of sphingophospholipid compounds in their cell membranes. *Sphingobacterium mizutai*, which does not grow on MacConkey agar, is discussed in Chapter 27.

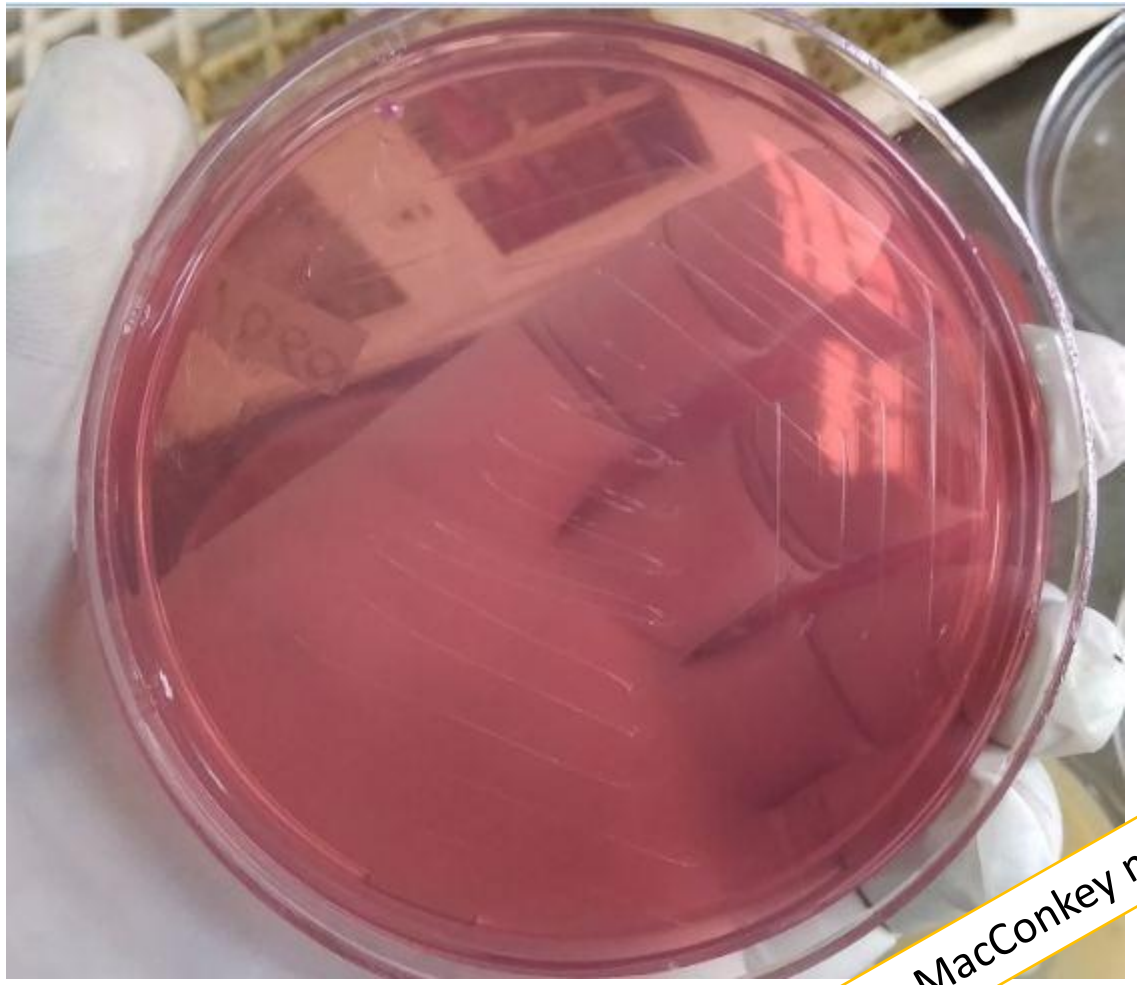
EPIDEMIOLOGY

TABLE 27-2 Colonial Appearance and Characteristics

Organism	Medium	Appearance
Acidovorax facilis	BA	No distinctive appearance
CDC group IIc	BA	No distinctive appearance but colonies sticky
CDC group IIe	BA	No distinctive appearance
CDC group IIh	BA	No distinctive appearance
CDC group IIi	BA	No distinctive appearance
CDC group 0-1, 0-2, 0-3	BA	Yellow pigment present in 0-1 and 0-2 but not in 0-3
Sphingobacterium spp.	BA	Yellow pigment present in *S. mizutaii*
Sphingomonas paucimobilis *S. parapaucimobilis*	BA	Small, circular, smooth, convex; bright yellow growth pigment

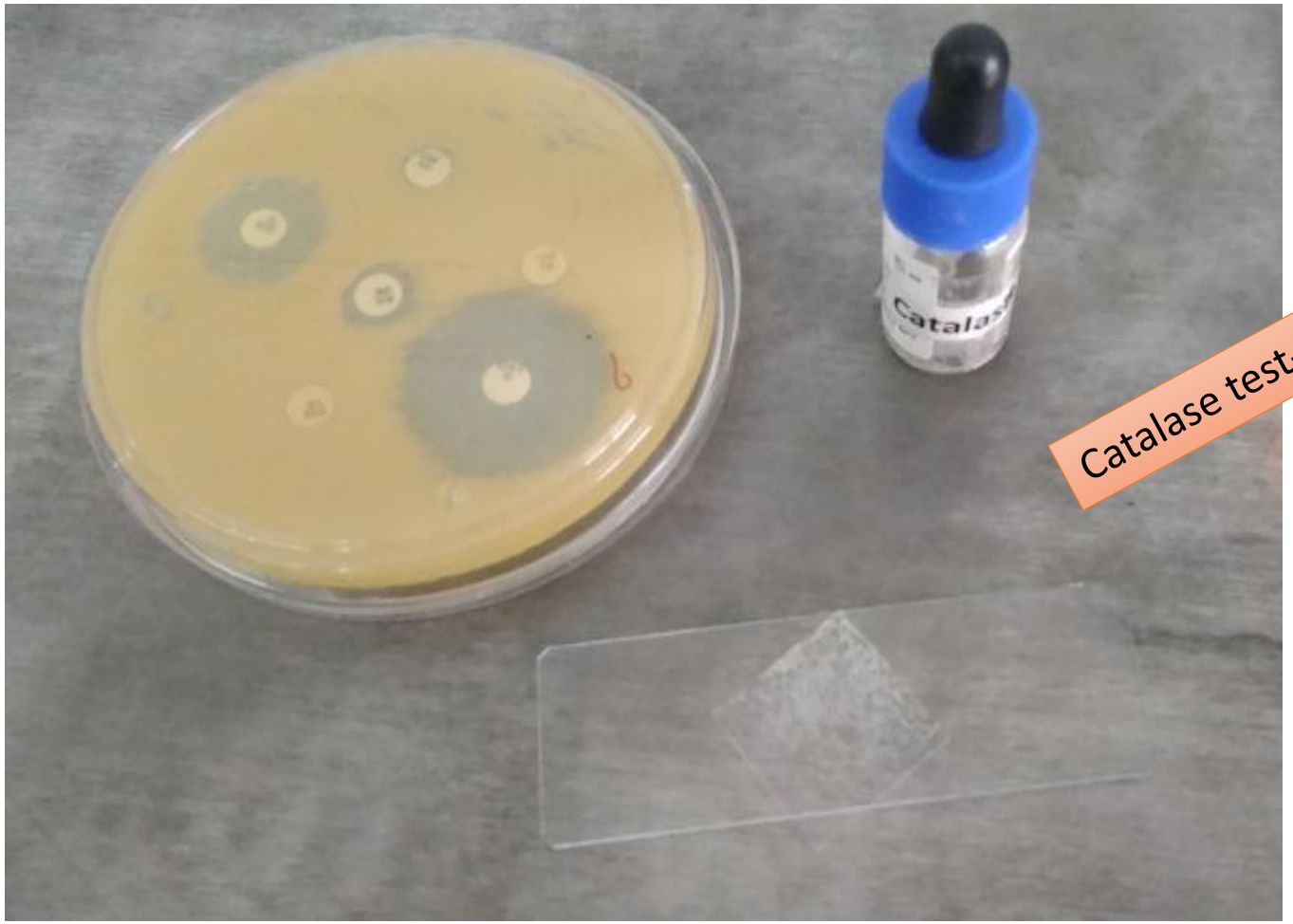
BA, 5% sheep blood agar.

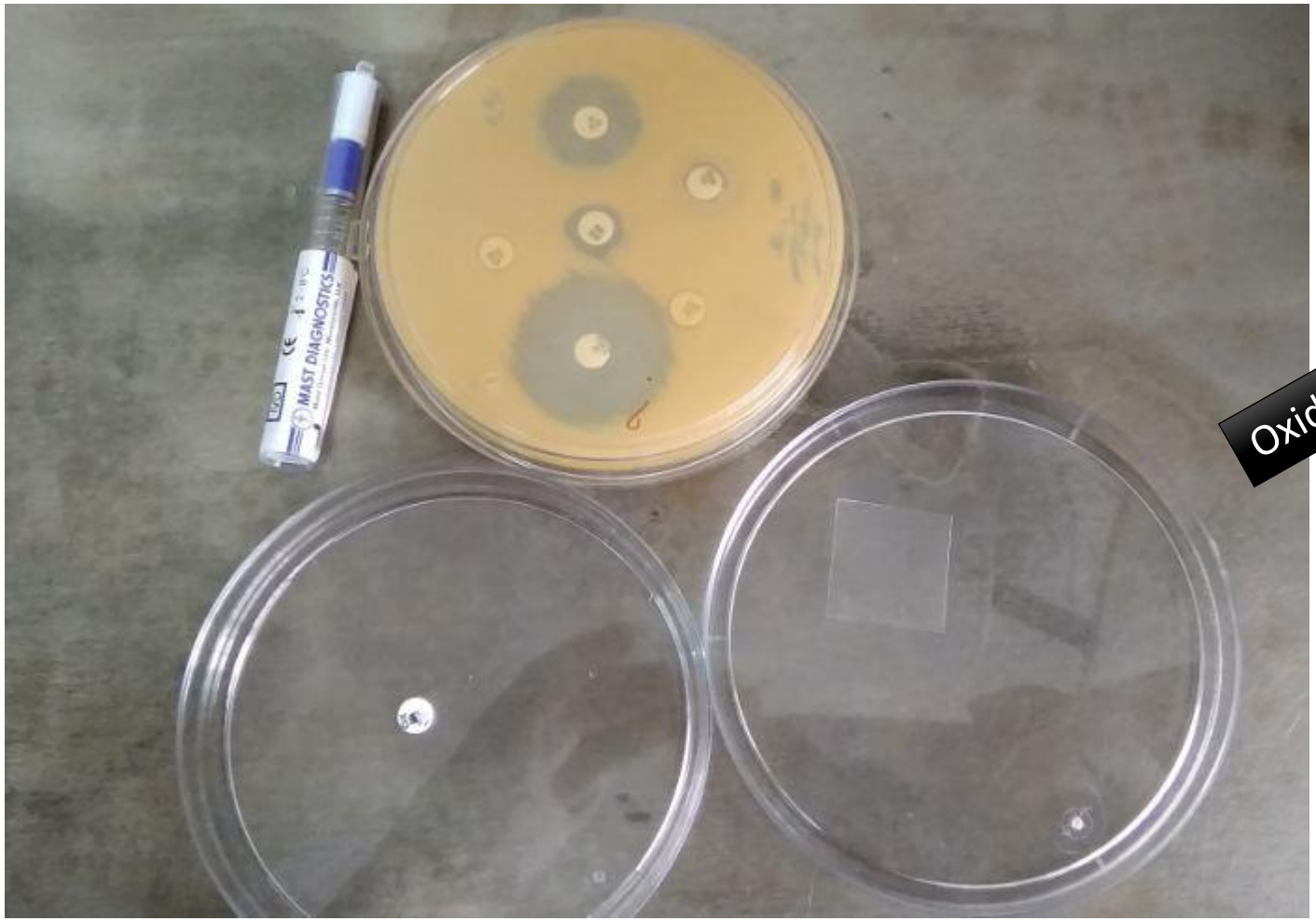
Yellow pigment in 5% sheep blood agar



No growth on MacConkey medium


Gram Negative bacilli


Catalase test-Positive



Oxidase test-Positive

laboratories. Therefore, full identification of clinically relevant isolates may require that they be sent to a reference laboratory.

Comments Regarding Specific Organisms

The growth of *Sphingobacterium spiritivorum* and *Chryseobacterium* spp. is variable on MacConkey agar. Therefore, these organisms often need to be differentiated from the yellow-pigmented, MacConkey-negative, oxidase-positive genera considered in Chapters 27 and 31.

Indole and urea hydrolysis are key biochemical tests for distinguishing *E. brevis*, *E. meningoseptica*, and *Chryseobacterium* spp. from *Sphingobacterium* spp.

SERODIAGNOSIS

Serodiagnostic techniques are not generally used for the laboratory diagnosis of infections caused by the organisms discussed in this chapter.

TSI:
Alkaline/No change
No H2S
No gas production

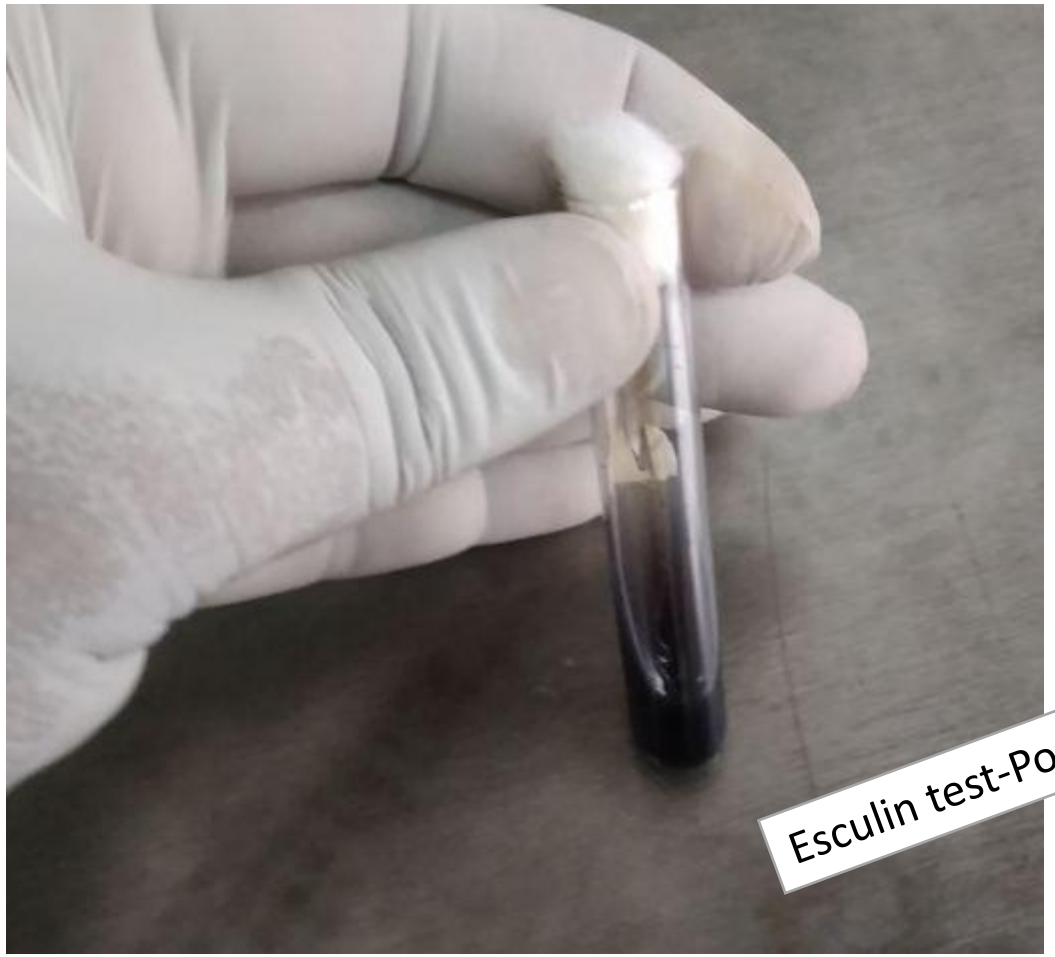
MIU test:
Non motile
Indole-Negative
Urea hydrolyzation
Test-Negative

Citrate Utilization test-Negative

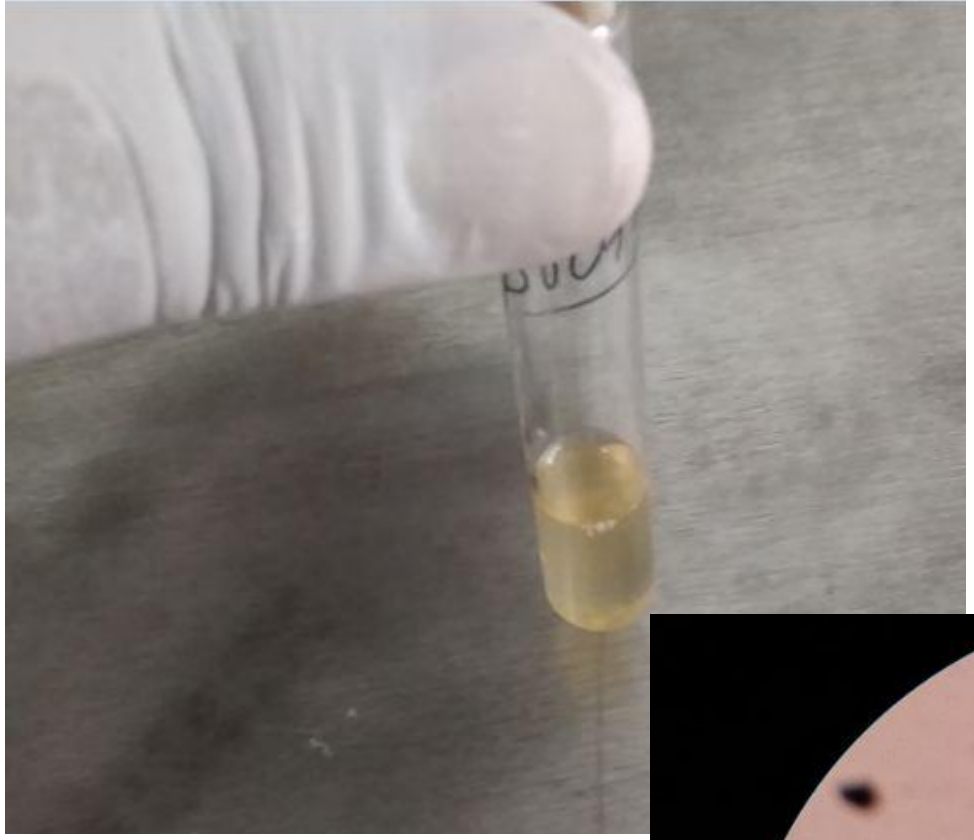
TABLE 24-4 Key Biochemical and Physiologic Characteristics

Organism	Oxidizes Mannitol	Indole	Gelatin	Urea	Nitrate Reduction	Esculin Hydrolysis	Motility
Agrobacterium yellow group[a]	–	–	–	+	–	(+)	p,1-2
CDC group EO–3	(+)	–	–	(+)	–	–	nm
CDC group EO–4	–	–	–	+	–	–	nm
CDC group O–1	–	–	v	–	–	+	p, 1-2
Chryseobacterium spp.[b,d]	–	+	v	v	v	v	nm
Elizabethkingia meningoseptica[b,c]	+	+	+	–	–	+	nm
Empedobacter brevis[b,c]	–	+	+	–	–	–	nm
Myoides spp.	ND	–	+	+	+	ND	nm
Sphingobacterium multivorum	–	–	–	+	–	+	nm
Sphingobacterium spiritivorum	+	–	v	+ or (+)	–	+	nm
Sphingobacterium thalpophilum	–	–	v	+	+	+	nm

ND, No data; *nm*, nonmotile; *p*, polar flagella; *v*, variable; +, >90% of strains are positive; –, >90% of strains are negative; (+), reaction may be delayed.
[a]Only a positive 3-ketolactonate test differentiates this group from *Sphingomonas paucimobilis*.
[b]Colonial pigmentation is critical to separate *Chryseobacterium* spp. and *Empedobacter brevis*.
[c]DNase positive.
[d]Includes *Chryseobacterium gleum*, *C. indologenes*, and CDC group IIb.



Esculin test-Positive



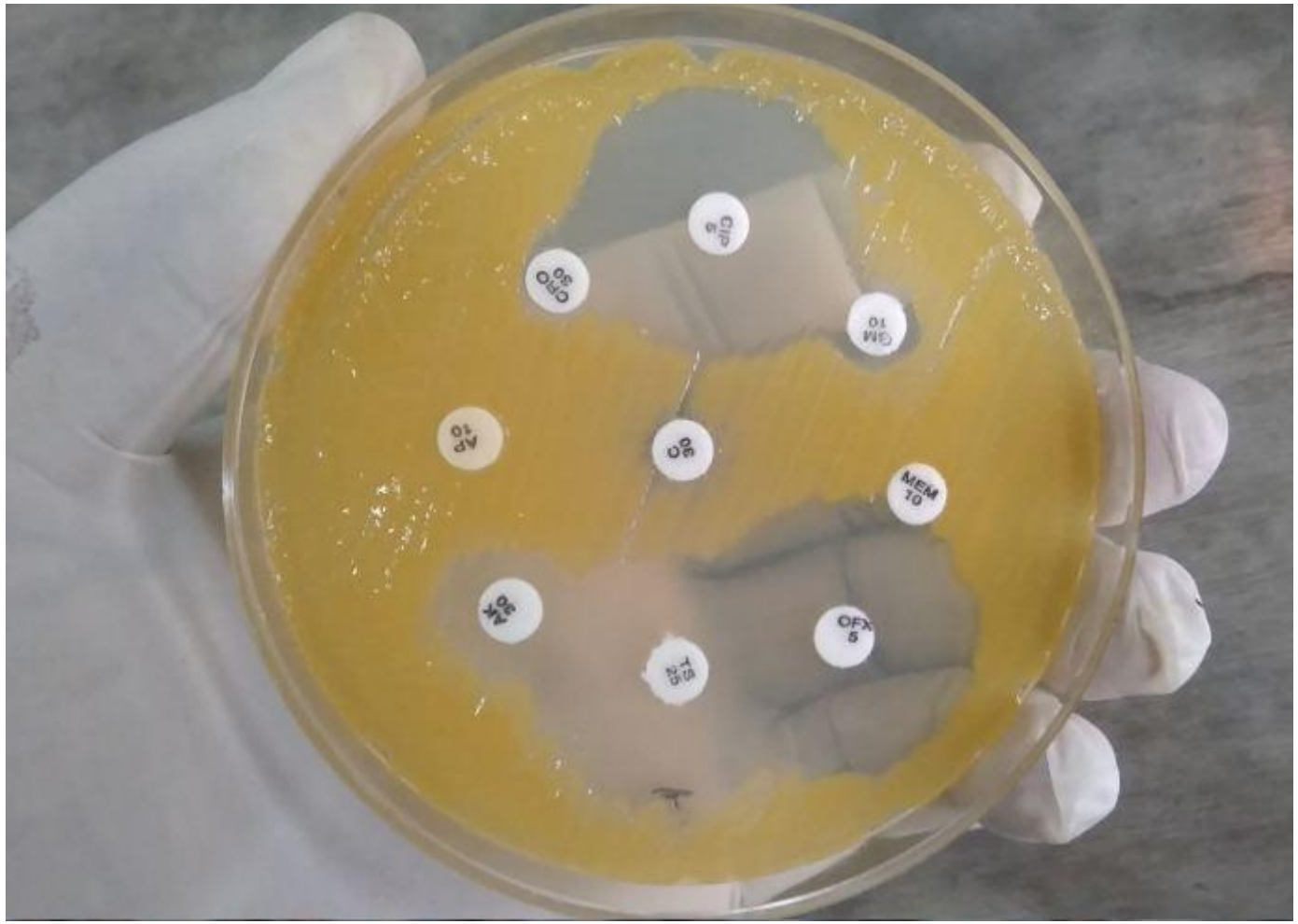
Hanging drop preparation : Negative i.e. Non motile

TABLE 27-5 Specific Biochemical Characteristics for Differentiation of the *Sphingobacterium* spp.

Biochemical Test	*S. multivorum*	*S. spiritivorum*	*S. mizutaii*
Oxidation of ethanol	Negative	Positive	Negative
Oxidation of mannitol	Negative	Positive	Negative
Oxidation of rhamnose	Negative	Positive	Positive
Christensen urease	Positive	Positive	Negative*
DNase	Negative†	Positive	ND‡
Susceptibility to polymyxin B	Resistant	Resistant	Resistant
Indole	Negative	Negative	Negative

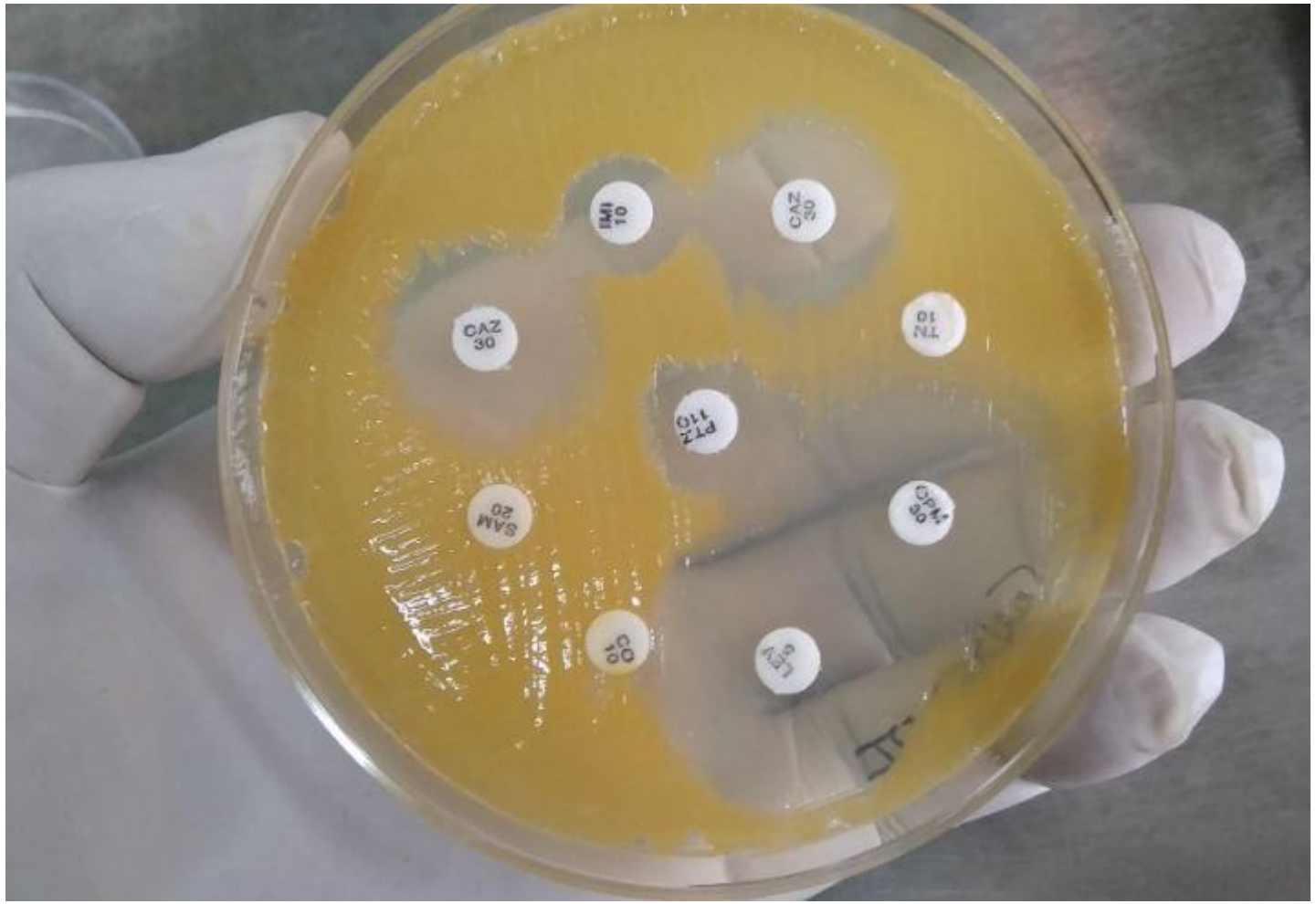
Data compiled from Freney J, Hansen W, Ploton C et al: Septicemia caused by *Sphingobacterium multivorum*. *J Clin Microbiol* 25:1126, 1987.
*Reported positive: 20%.
†Reported positive: 40%.
‡Not determined. Some microbiology texts classify *S. mizutaii* as DNase positive, and some major literature references identify it as DNase negative.

		blood, eyes, and wounds.	
CDC group O-1 CDC group O-2 CDC group O-3	Epidemiology is unknown.	Rarely found in clinical material and rarely implicated as a cause of human infections. CDC group O-3 has been isolated from bone, blood, lung, and lymph node tissue.	No guidelines; one report indicates susceptibility of CDC group O-3 to aminoglycosides, imipenem, trimethoprim-sulfamethoxazole, and chloramphenicol (however, the breakpoints used were based on those for the Enterobacteriaceae family).
Sphingobacterium mizutaii *S. multivorum* *S. spiritivorum*	Sphingobacteria are ubiquitous in nature.	Rarely involved in human infections. *S. mizutaii* has been associated with blood, cerebrospinal fluid, and wound infections; *S. multivorum* with blood and wound infections; and *S. spiritivorum* with blood and urine infections.	Literature references report the following susceptibilities: *S. mizutaii*—erythromycin, trimethoprim-sulfamethoxazole, and pefloxacin. *S. multivorum*—amikacin, gentamicin, aztreonam, cefepime, cefotaxime, ceftazidime, meropenem, piperacillin, piperacillin/tazobactam, and chloramphenicol. *S. spiritivorum*—amikacin, gentamicin, aztreonam, cefepime, cefotaxime, chloramphenicol.
Sphingomonas paucimobilis *S. parapaucimobilis*	*S. paucimobilis* inhabits environmental niches and is known especially as a waterborne organism that can exist in hospital water systems. Not part of human flora. Mode of transmission is uncertain but probably involves patient exposure to contaminated medical devices or solutions.	*S. paucimobilis* virulence factors are unknown. It has been implicated in community- and hospital-acquired infections, specifically in blood and urine infections.	No definitive guidelines; potentially active agents include trimethoprim-sulfamethoxazole, chloramphenicol, ciprofloxacin, and aminoglycosides; resistance to beta-lactams is known, but validated susceptibility testing methods do not exist.



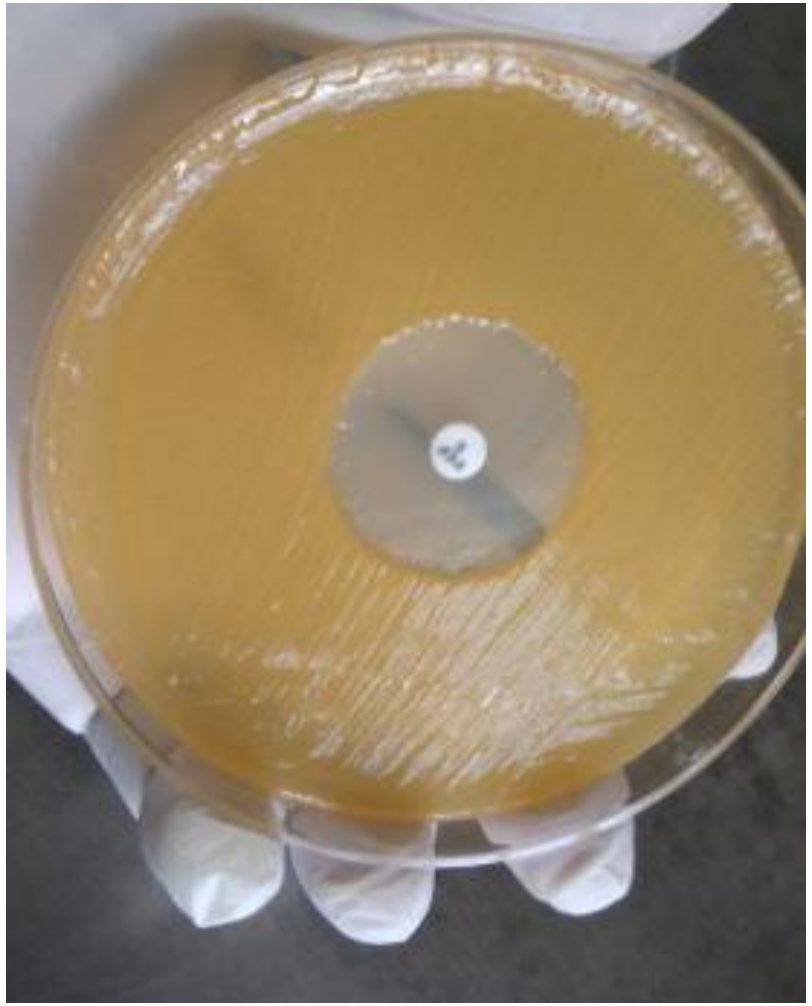
Trimethoprim-Sulfamethoxazole=Sensitive

Antibiotics Sensitivity test



Colistin-Resistant

Extra Drugs



Pefloxacin-Sensitive

TABLE 27-3 Key Biochemical and Physiologic Characteristics

Organism	Insoluble Pigment	Glucose Oxidized	Xylose Oxidized	Sucrose Oxidized	Esculin Hydrolysis	Motility
Acidovorax facilis	–	+	(+)	–	–	+
CDC group IIc	Tan or buff	+	–	+	+	nm
CDC group IIe	–	+	–	–	–	nm
CDC group IIh	–	+	–	–	+	nm
CDC group IIi	Yellow	+	+	+	+	nm
CDC group O-2	Yellow to orange	v	–	+	v	v*
Sphingobacterium mizutaii	v†	+	(+)	+	+	nm
Sphingomonas spp.‡	Yellow	+	+	+	+	+§

Data compiled from Daneshvar MI, Hill B, Hollis DG et al: CDC group O-3: phenotypic characteristics, fatty acid composition, isoprenoid quinone content and in vitro antimicrobic susceptibilities of an unusual gram-negative bacterium isolated from clinical specimens, *J Clin Microbiol* 36:1674, 1998; Hollis DG, Moss CW, Daneshvar MI, Wallace-Shewmaker PL: CDC group IIc phenotypic characteristics, fatty acid composition, and isoprenoid quinone content, *J Clin Microbiol* 34:2322, 1996; and Weyant RS, Moss CW, Weaver RE et al, editors: *Identification of unusual pathogenic gram-negative aerobic and facultatively anaerobic bacteria*, ed 2, Baltimore, 1996, Williams & Wilkins.

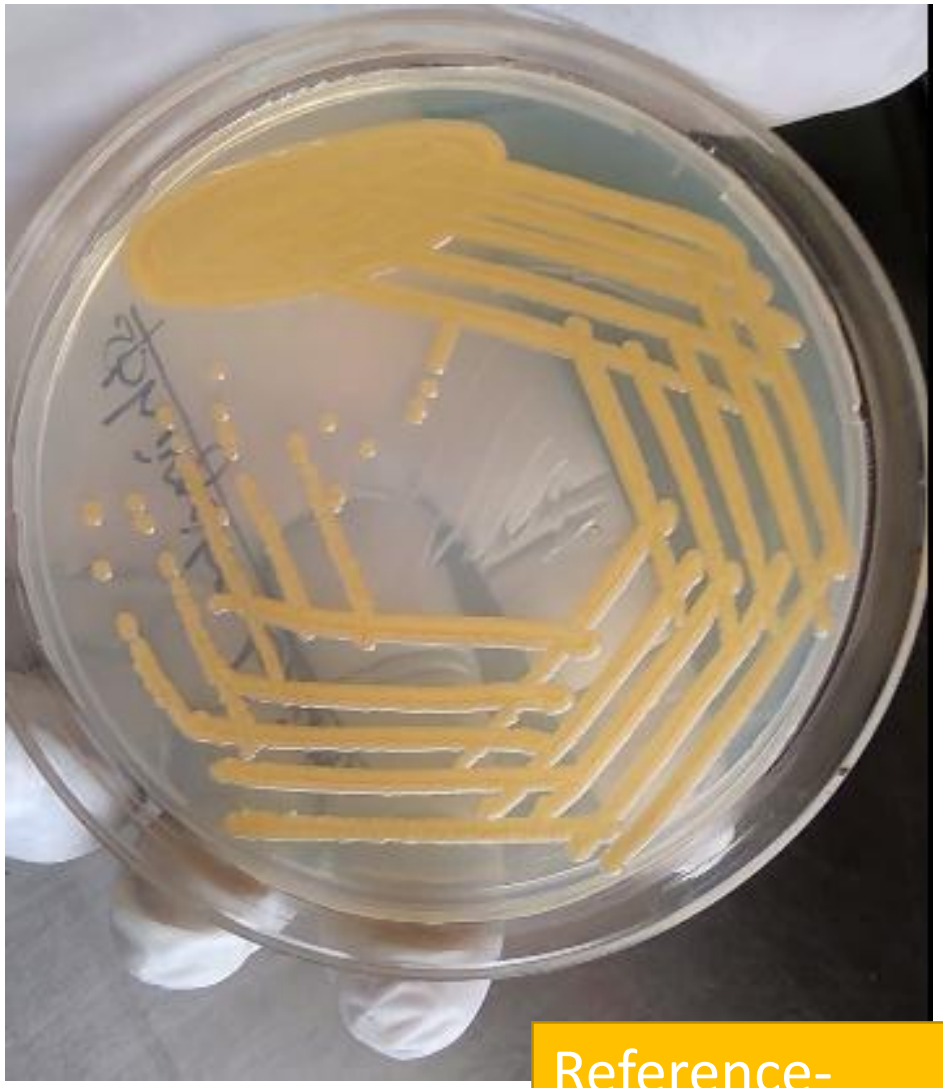
nm, Nonmotile; *v*, variable; +, >90% strains positive; –, >90% strains negative; (+), delayed.

*Only 20% are motile; motility is only apparent upon wet mount or flagellar staining.

†Yellow pigment production may be enhanced by incubation at room temperature.

‡Includes *S. paucimobilis* and *S. parapaucimobilis*.

§Usually nonmotile in motility medium, but motility is present on wet mount.



Enhanced yellow pigmentation after 24 hours incubation at room temperature

On these findings, organism is isolated as *Sphingobacterium mizutaii*.

Reference-
Bailey & Scott's Diagnostic Microbiology
13 Edition