

Pseudomonas aeruginosa

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(*P. aeruginosa*) *Pseudomonas aeruginosa*

% 1

Twitching motility

(LB) Luria-burtani

Swarming

motility

.% 0.7

Swimming motility

LB

. % 0.3

P.aeruginosa:

Motility Types for *Pseudomonas aeruginosa* Isolated from Respiratory Tract Infections

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ABSTRACT

Motility types of *Pseudomonas aeruginosa* (*P.aeruginosa*) have been studied and the detection on twitching motility was done by using stabbing with 1% agar to Luria-burtani (LB) broth medium. *P. aeruginosa* isolates revealed the ability to twitching motility which was characterized by extension of growth between agar and Petri dish, In addition to various degrees of swarming after induction by using different amino acids and different agar concentrations lower than 0.7%. Cell morphology was examined from the center and margins of swarmed cells, cells from center seemed normal in morphology while the marginal cells appear elongated. Also swimming motility was observed by the wet mount preparation. The elongated cells were showed from LB broth by using transmission electron microscope. The bacterium succeeded in swimming motility in minimal media with 3% agar.

Type IV pili

P. aeruginosa

.(Tang, 1995)

. (Ottemann and Miller, 1997)

(1972) Henrichsen

Type IVpili

Pilus

(Köhler *et al.*, 2000)

filament

.....*Pseudomonas aeruginosa*

Swimming

P. aeruginosa

.(Köhler *et al.*, 2000)

(Semmler *et al.*, 1999)

.(O'Toole, and Kolter,1998)

% 1 0.4)

Swarming motility

(

Hyperflagellated

Swarmer cells

% 0.7 0.5

P. aeruginosa

.(Köhler *et al.*, 2000 ; Harshey, 1994)

P.aeruginosa

(Semmler *et al.*, 1999)

P.aeruginosa

: /

P.aeruginosa

6

:

•

:

•

% 0.5

% 1

) (LB) Luria-Bertani

.1

.(% 0.5

Minimal media (M9) medium

M8

.2

0.5 NaCl

3.0KH₂PO₄

6.0 Na₂HPO₄ :

NH₄Cl

7.4

Trace MgSo₄ 2 % 0.2
% 0.7 2 [CaCl₂] element

Twitching Motility

(LB) Luria-Bertani % 1 Twtich plates
% 1.5 LB *P.aeruginosa*
24 37 tooth pick
(Rashid and Kornberg, 2000)

:Swarming Motility

M8
-1
% 0.05

24 ° 37 LB
(Köhler *et al.* , 2000 ; Miller, 1972)

-2

. % 0.6 0.5
(/) %0.05 % 0.2

LB

(Köhler *et al.*, 2000)

37

P. aeruginosa

24

20 – 15 Formvar (0.5 %)-coated 75-mesh grids

.....*Pseudomonas aeruginosa*

30-20 Grids

10 7.0

/ /

Potassium phosphtungstate %1
(Köhler *et al.*, 2000) Grids

Swimming motility :

:

P. aeruginosa

(Koneman *et al.*, 1997)

:

(LB)

Negative staining

: % 0.3

% 0.2

M8

% 0.3

% 0.05

24 ° 37

LB

(Köhler *et al.*, 2000)

Expansion

(Tang *et al.*, 1995)

P. aeruginosa

Interstitial

(1)

33 32 30

(Rashid and Kornberg, 2000)

(Beatson *et al.*, 2002)

P.aeruginosa

(Semmler *et al.*, 1999)

(Semmler *et al.*, 1999)

(O'Toole and Kolter, 1998)

:

(1)

(2)

(1)

(3)

(1)

(4)

P.aeruginosa

: 1

+	
++	
+++	
++	
+++	
-	
-	

: +++

: ++

: +

: -

(Köhler *et al.*, 2000)

P. aeruginosa

(Köhler *et al.*, 2000)

1

5

48

Succinate

:

P.aeruginosa

(6) (5)

% 0.6 % 0.5

% 0.6

(Köhler *et al.*, 2000)

% 0.5

% 0.9 0.7 0.5

.% 0.7

P.aeruginosa

Serratia Vibrio

P.aeruginosa

.(Alberti and Harshey, 1990) Clostridium Bacillus

Surfactants

Biosurfactants

Serratia(Gygi *et al.*, 1995) *Proteus mirabilis*Rhamnolipid .(Lindum *et al.*, 1988) *liquefacies*. *P.aeruginosa**P.aeruginosa*.(Köhler *et al.*, 2000) *in vivo*

:

P.aeruginosa

(8)

7

Negative sitaining

.(Köhler *et al.*, 2000 ; Rashid and Kornberg, 2000)(Köhler *et al.*, 2000)*P.aeruginosa*

.peritichously flagellated

*P.aeruginosa**P.aeruginosa*.(Dasgupta *et al.*, 2000).(Köhler *et al.*, 2000)

:

-1*P.aeruginosa**P.aeruginosa*

.....*Pseudomonas aeruginosa*

(Rashid and Kornberg, 2000)

.(Forbes *et al.*, 2007; Willey *et al.*, 2008)

P.aeruginosa

: -2

Negative staining

LB

P.aeruginosa

.(9)

.(Willey *et al.*, 2008 ; Burton and Engelkirk 2000)

: % 0.3 -3

P.aeruginosa

(Köhler *et al.*, 2000)

% 0.05

% 0.2

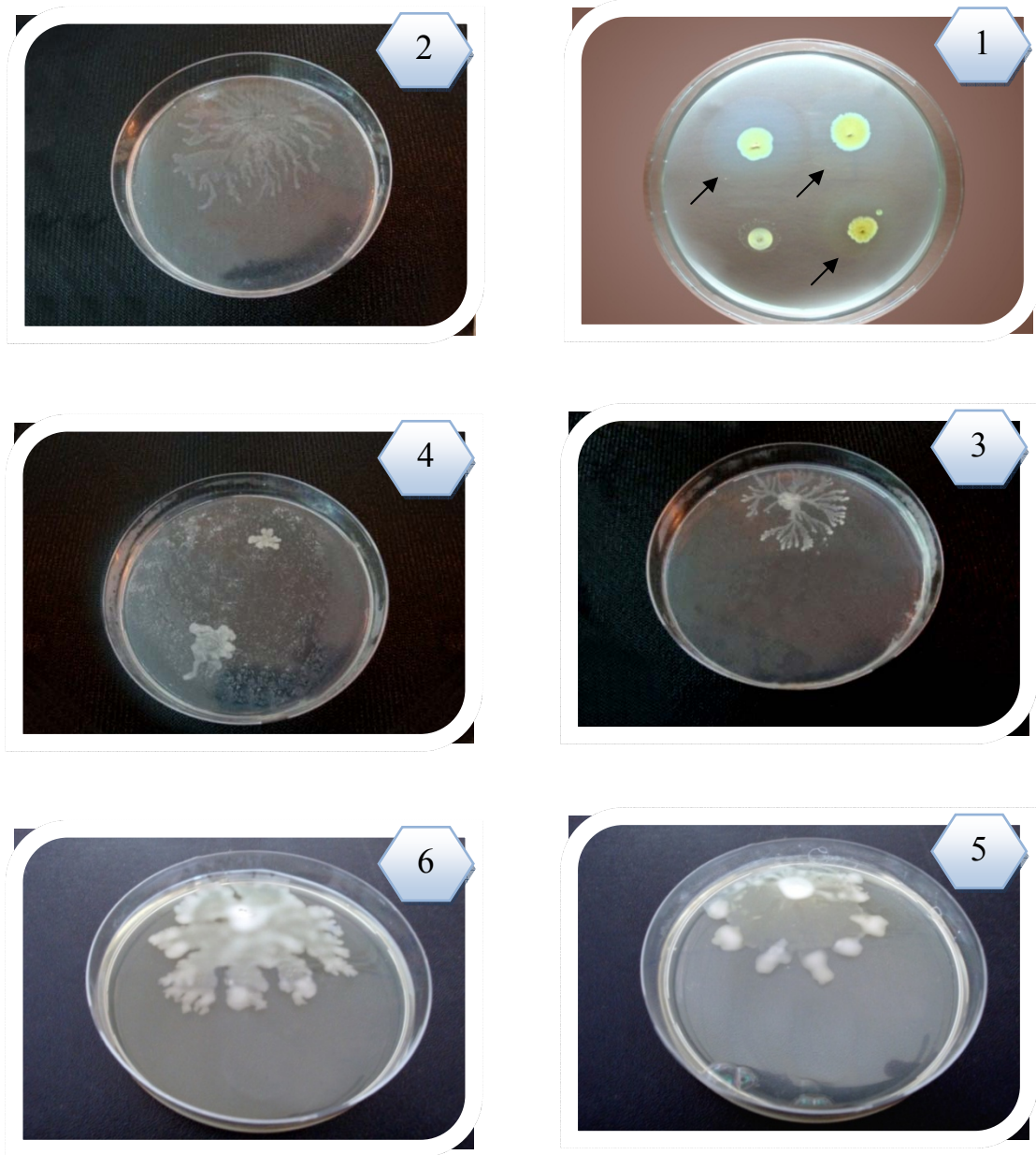
. % 0.3

(10)

Quantitative data (2)

70 45

()



P.aeruginosa : 1

P.aeruginosa : 2

P.aeruginosa : 3

P.aeruginosa : 4

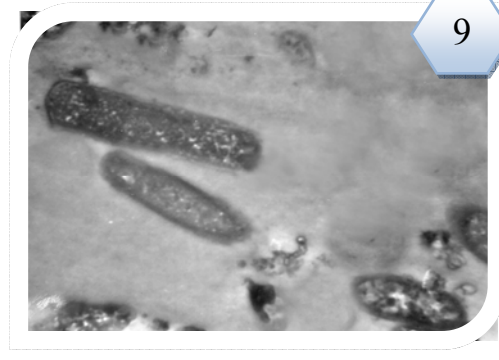
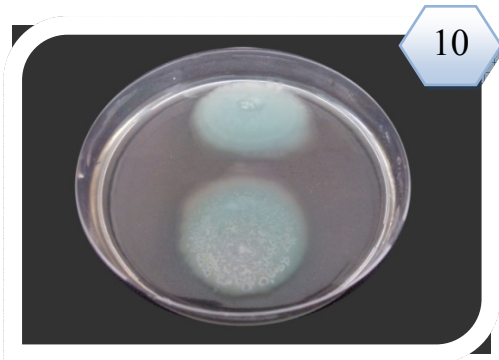
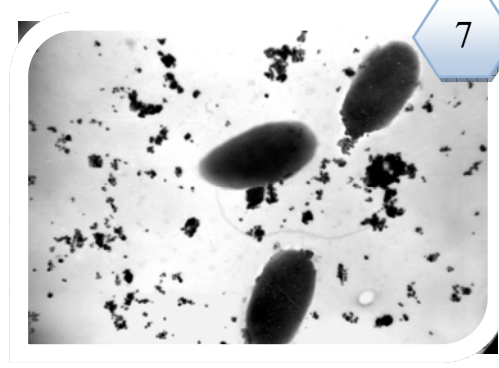
% 0.5 *P.aeruginosa* : 5

% 0.6 *P.aeruginosa* : 6

P.aeruginosa

: 2

()	
45	14
45	15
47	19
48	29
70	117
45	155



P.aeruginosa : 7

24500X

P.aeruginosa : 8

24500X

LB

P.aeruginosa : 9

24500X

%0.3

P.aeruginosa :10

- Alberti, L. ; Harshey, R.M. (1990). Differentiation of *Serratia marcescens* 274 into swimmer and swarmer cells. *J. Bacteriol.*, **(172)**, 4322-4328.
- Beatson, S.A.; Whitechurch, C.B.; Sargant, J.L.; Levesque, R. C.; Mattick, J.S. (2002). Differential regulation of twitching motility and elastase production by *vfr* in *Pseudomonas aeruginosa*. *J. Bacteriol.* **(184)**,3605-3613.1
- Burton, G.R.W. ; Engelkirk, P.G. (2000). "Microbiology for the Health Sciences". Lippincott Williams and Willsins.
- Dasgupta, N.; Arora, S. K.; ; Ramphal, R. (2000). *fleN*, a gene that regulates flagellar number in *Pseudomonas aeruginosa*. *J. Bacteriol.* **(182)**, 357–364.
- Forbes, B.A.; Sahm, D.F.; Weissfeld, A.S. (2007). "Bailey and Scott's Diagnostic Microbiology". 12th edn. Mosby, Inc., St. Louis.
- Gygi, D.; Rahman, M. M.; Lai, H.C., Carlson, R.; Guard-Petter, J. ; Hughes, C. (1995). A cell-surface polysaccharide that facilitate rapid population miugration by differentiated swarm cells of *Proteus mirabilis*. *J. Mol. Microbiol.*, **(17)**, 1167-1175.
- Harshey, R. M. (1994). Bees aren't the only ones: swarming in gram-negative bacteria. *J. Mol. Microbiol.* **(13)**, 389–394.
- Henrichsen, J. (1972). Bacterial surface translocation: a survey and a classification. *J. Bacteriol Rev.* **(36)**, 478-503.
- Köhler, T.; Curty, L. K.; Barja, F.; Delen, C. ; Pechere, J. (2000). Swarming of *Pseudomonas aeruginosa*s dependent on cell-to-cell signaling and require flagella and pili. *J. Bacteriol.* **(182)**, 5990-5996.
- Koneman, E.W.; Allen S.D.; Janda, W.M.; Schreckenberger, P.C.; Winn, W.C. (1997) "Color Atlas and Textbook of Diagnostic Microbiology". 5th edn. Lippincott-Raven Publishers, Philadelphia, USA.
- Lindum, P.W.; Anthoni, U.; Christophersen, C.; Eberl, L.; Molin, S.; Givskov, M. (1988). N-Aceyl-homoserine lactone autoinducers control production of an extraceullarlipopeptidebiosurfactant required for swarming motility of *Serratialiquefaciens* MG1. *J. Bacteriol.*, **(180)**, 6384-6388.
- Miller, J.H. (1972). "Experiments in Molecular Genetics". Cold Spring Harpor Laboratory, Cold Spring Harper, New York, pp.150-153.
- O'Toole, G. A.; Kolter, R. (1998). Flagellar and twitching motility are necessary for *Pseudomonas aeruginosa*biofilm development. *J. Mol. Microbiol.* **(30)**, 295–304.
- Ottemann, K.M. ; Miller, J.F. (1997). Roles for motility in bacterial–host interactions. *J. Mol. Microbiol.* **(24)**, 1109-1117.
- Rashid, M. H.; Kornberg, A. (2000). Inorganic polyphosphate is needed for swimming, swarming, and twitching motilities of *Pseudomonas aeruginosa*. *Proc. Natl. Acad. Sci. USA.* **(97)**, 4885–4890.
- Semmler, A. B. T.; Whitchurch, C.B. ; Mattick, J.S. (1999). A re-examination of twitching motility in *Pseudomonas aeruginosa*. *J. Microbiol.* **(145)**, 2863-2873.
- Tang, H.; Kays, M. ; Prince, A. (1995). Role of *Pseudomonas aeruginosa*pili in acute pulmonary infection. *J. Infect. Immun.* **(63)**, 1278–1285.
- Willey, J.M.; Sherwood, L.M. ; Woolverton, C.J. (2008). "Prescott, Harley and Klein's Microbiology", 7th edn., McGraw-Hill Company, Inc., USA.