

MRSA

50%

(methicillin-resistant *Staphylococcus aureus* MRSA)

MRSA

(Burow's solution) 19
pH 3
20

Karl August Burow (1809 1874)
1)

3)

2003 4

(Table 1) Table 2 (BP)

BP

10

(

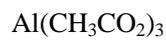
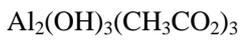
USP

Martindale BP
Aluminum Subacetate Topical Solution

USP Aluminum Acetate Topical Solution

1)

(aluminum acetate)



(

)

MRSA

4 5

)

BP

(/

Xylenol Orange

5 50 mg/100 mL

100

0.05 M EDTA

1 M NaOH

30

2 M

EDTA 0.05 M

(Al)

EDTA

A mL B

mL

$$\text{Al mg/100 mL} = A B \times 0.05 \times 26.98$$

10 mL

4

5

pH

a

b

10 mL

4

a

b

pH

0.1 M

pH 3.3, 4.6, 6.2

(1.7%

)

BP

1.7%

$\text{Al}_2\text{O}(\text{CH}_3\text{CO}_2)_4 \cdot n\text{H}_2\text{O}$

10.24 g,

$\text{Al}(\text{OH})(\text{CH}_3\text{CO}_2)_2$

10.33 g

4.5 g

30-32

25 ml

70 ml

100 mL

In-vitro

Mueller-Hinton

Staphylococcus aureus FDA 209P

MRSA

(8 mm)

-

pH 3.4, 4.8, 6.1

150 μ L

4

24

37

20

(

bactericidal effect)

(

bacteriostatic effect)

10 mL

4

5

10 20

A.

%	pH				w/v%		(Table 3)
200 mL		300 mL				73%	USP
		pH 3.6 4.4		USP		Thorp	pH 3.1 3.2
²⁾ BP	pH			BP			
	2		pH 3.2 3.4				pH 3.1± 0.4
				pH			
			BP 1.7 1.9%				3.09%
			BP				

Table 3. Physicochemical properties of Burow's solution and effect of 5-month storage

	Fresh	Stored ¹⁾	Reported
Recovered volume %	73.2 ± 4.0		
pH of solution	2.8 ± 0.1	2.7 ± 0.1	3.1 3.4
Osmolarity ratio ²⁾	4.4 ± 0.1	4.5 ± 0.1	
Aluminum concn. w/v%	3.1 ± 0.1	3.2 ± 0.1	1.7 1.9

Each value represents the mean ± SE of 3 trials.

¹⁾ Burow's solution was stored at 4 C for 5 months.

²⁾ Osmolarity ratio = ratio of osmolarity between the solution and saline

()	BP	USP	
				25
				1 3
4	1	5	Table 3	5

pH

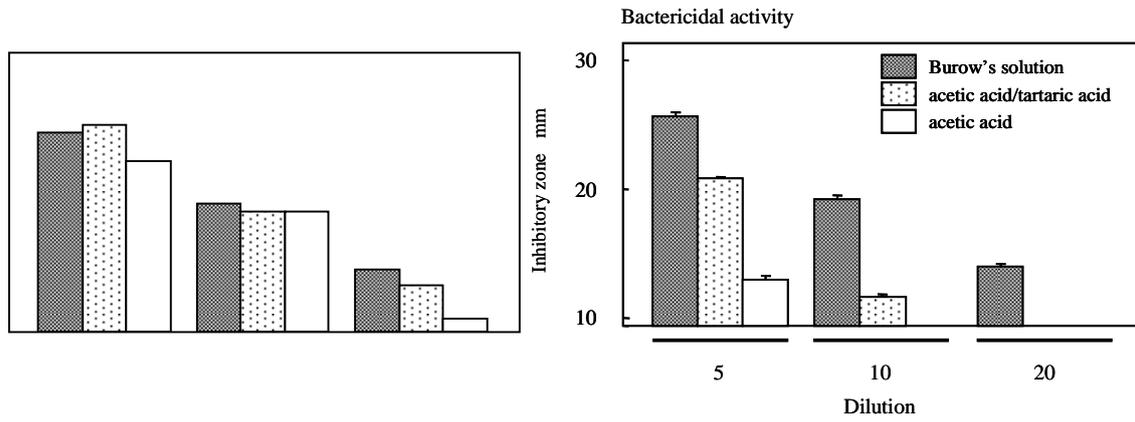


Fig. 1. Comparison of antibacterial activity of Burow-related solutions against *S. aureus* FDA 209

Each value represents the mean \pm SE of 3 trials.

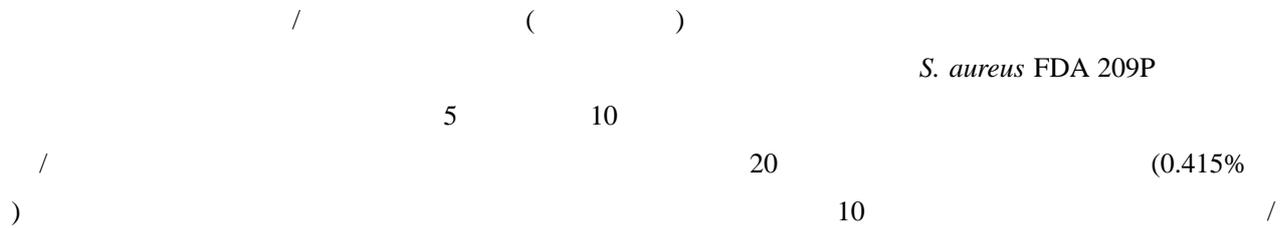


Fig. 1

MRSAs

4 MRSA

()

Fig. 2

4

MRSA

20

MRSA

/

10

5

/

12 mm

20 mm

Fig. 2. Antibacterial activity of Burow-related solutions against MRSA

■ Bactericidal effect; □ Bacteriostatic effect

Each value represents the mean \pm S.E. of 3 trials.

4 5

MRSA 3

5

D. (1.7%)) BP
 (1.7%)
 $\text{Al(OH)(CH}_3\text{CO}_2)_2$ $\text{(Al}_2\text{O(CH}_3\text{CO}_2)_4 \cdot n\text{H}_2\text{O)}$
 pH 3
 0.1 0.4 M pH pH 3 6 100
 (0.2 or 0.4 M)
 pH (pH 3)
 (80 100)

Table 5

2

3 1.7% BP
 pH (Table 6)
 $\text{Al}_2\text{O(CH}_3\text{CO}_2)_4$ 4 4
 pH

Table 5 Development of rapid preparation method of aluminum acetate (1.7% aluminum) solution

Prescription			Procedure
Aluminum acetate ¹⁾	102 or 103	g	Mix aluminum acetate, acetic acid, tartaric acid in purified water (800 mL) Boil in hot water until dissolved (about 2 hr) Add purified water to 1000 mL
Acetic acid (33%)	250	mL	
Tartaric acid	45	g	
Purified water	appropriate	vol.	
Total	1000	mL	
1) $\text{Al}_2\text{O(CH}_3\text{CO}_2)_4 \cdot n\text{H}_2\text{O}$:	102 g	
$\text{Al(OH)(CH}_3\text{CO}_2)_2$:	103 g	

Table 6 Pharmaceutical evaluation of rapidly prepared aluminum acetate (1.7% aluminum) solution

	$\text{Al}_2\text{O}(\text{CH}_3\text{CO}_2)_4 \cdot n\text{H}_2\text{O}$	$\text{Al}(\text{OH})(\text{CH}_3\text{CO}_2)_2$
pH of solution	3.1 ± 0.1	3.1 ± 0.1
Osmolarity ratio	5.9 ± 0.1	6.0 ± 0.1
Aluminum concn. w/v%	1.7 ± 0.1	1.6 ± 0.1

Each value represents the mean \pm SE of 3 trials. Heating was carried out in boiling water. Osmolarity ratio = ratio of osmolarity between the solution and saline. A 1.7 % aluminum concn. is based on BP Burow's solution.

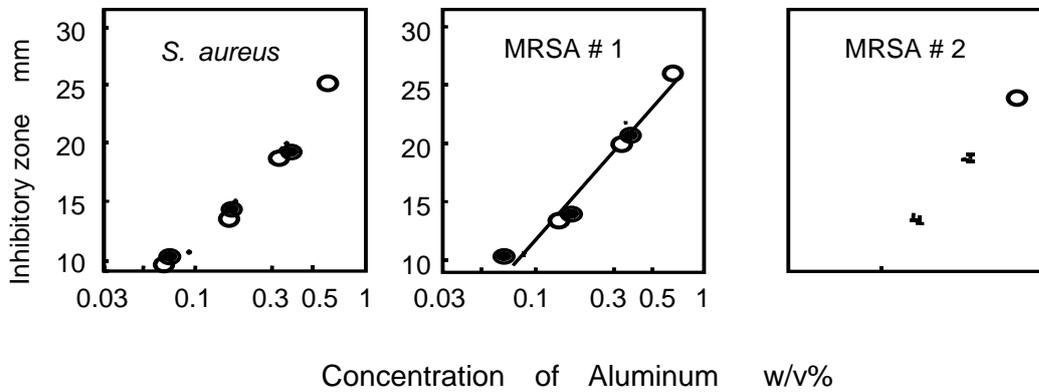


Fig. 3. Comparison of bactericidal activity as a function of aluminum concentration
 O, Burow's soln.; ●, $\text{Al}_2\text{O}(\text{CH}_3\text{CO}_2)_4 \cdot n\text{H}_2\text{O}$; ■, $\text{Al}(\text{OH})(\text{CH}_3\text{CO}_2)_2$
 Each value represents the mean of 3 trials.

E.

5 20

MRSA

Fig. 3

S. aureus FDA 209P

1.7w/v%

3.1w/v%

4

4

MRSA

(1)

(2)	<i>S. aureus</i>			
	MRSA	<i>S. aureus</i>		
(3)		4	5	
(4)				(Al ₂ O(CH ₃ CO ₂) ₄ nH ₂ O Al(OH)(CH ₃ CO ₂) ₂)
	1.7%	2	3	
(5)		1.7%		MRSAs
(6)		1.7%	4	4

1.7%

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- 1) "The Extra Pharmacopoeia" Martindale W., London. Pharmaceutical Press. 1996.
- 2) Thorp M. A., Gardiner I. B., Prescott C. A., *J. Laryngol. Otol.* **114**, 432-436 (2000).
- 3) Kashiwamura M., Chiba E., Matsumura M., Nakamaru Y., Suda N., Terayama Y., Fukuda S., *Otol. Neurotol.* **25**, 9-13 (2004).
- 4) Lee Y. L., Cesario T., Owens J., Shambrom E., Thrupp L. D., *Nutrition* **18**, 665-666 (2002).