

In vitro에서 titanium이 구강미생물에 미치는 영향

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=Abstract=

In vitro effects of titanium on oral microorganism

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Titanium(Ti) alloys has been mostly concerned with biocompatibility, corrosion resistance, and biofunctionality. However, very little is known, about the biological effects of titanium on microorganism and in particular on the oral flora. So, the effect of titanium on the in vitro growth of oral microorganism forming dental caries was studied under either aerobic or anaerobic condition.

In this study, the mostly bacterial species commonly found in dental plaque or gingival sulcus grew well in an aqueous medium containing 100 μ g/ml of titanium standard solution.

1. 서론

Titanium(Ti)

(展延性)
400

가 (4.50),

, 가 ,

(/)

2 , 6

500

가

(赤熱) 가

(酸)

가
 가 TiO₂가 (强酸) 가
 가
 가 (復水管),
 가
 가
 가
 가 (inhalation exposure) 가
 가 (corrosive), (forced vital capacity)가 Elo 4
 가
 가 23,700cell/mm³ 가
 가 x-ray (energy dispersive x-ray analysis) (lower righth lobe) 1.39 × 10⁹ exogenous particulate/cm³ 61%
 가 35% 2% silica

가

4

4

titanium

II. 재료 및 방법

1. 재료

1)
 Ti Aldrich (U.S.A.) dml titanium atomic absorption (1015μg/Mℓ),

2)
 Miller가 Streptococcus mutans,

Lactobacillus sp. 가 가 (normal flora)
 Candida albicans

2. 방법

1)
 250ml Table 2
 100ml 가
 5 120rpm
 (Adventec Co.)
 Lactobacillus sp.

Table. Characteristics of bacterial strains.

Species	Gram stain	Morphology	Respiratory type
<i>Streptococcus mutans</i>	+	Cocci	Facultative anaerobic
<i>Streptococcus mutans</i>	+	Cocci	Facultative anaerobic
<i>Lactobacillus parabuchneri</i>	+	Bacilli	Facultative anaerobic
<i>Lactobacillus lactis</i>	+	Bacilli	Facultative anaerobic
<i>Lactobacillus oris</i>	+	Bacilli	Facultative anaerobic
<i>Lactobacillus brevis</i>	+	Bacilli	Facultative anaerobic
<i>Actinomyces naeslundii</i>	+	Bacilli	Strictly anaerobic
<i>Candida albicans</i>	*	Cocci	Facultative anaerobic

*. Eukaryotic cell

Table 2. Composition of media.

A. MRS broth		B. TH broth	
Proteose peptone No. 3	10.0 g	Beef heart, infusion from	500.0 g
Beef extract	10.0 g	Neopeptone	200.0 g
Yeast extract	5.0 g	Dextrose	2.0 g
Dextrose	20.0 g	NaCl	2.0 g
Sorbitan monooleate complex	1.0 g	K ₂ HPO ₄	0.4 g
Ammonium citrate	2.0 g	NaCO ₃	2.5 g
Sodium acetate	5.0 g	C. YPD broth	
MgSO ₄	0.1 g	yeast extract	0.1 g
MnSO ₄	0.05 g	peptone	0.2 g
K ₂ HPO ₄	2.0 g	dextrose	0.2 g

MRS broth , *Streptococcus mutans* LB 50mg/Mℓ, 80mg/Mℓ 100mg/Mℓ 가
 Todd Hewith broth , *Candida albicans* YPD plate colony
 broth 1% C.
albicans 28 , *S. mutans* *Lactobacillus*
 sp.(anaeobic incubation) 37 2)
 Titanium 가 20% glycerol
 가 deep freezer(-80)

III. 결 과

1. 치아우식원인균이 S. mutans에 미치는 영향

glycoprotein
(acquired pellicle)
S. mutans가
glycosyltransferase(GTase)
-1, 3
(dental plaque)
(autochthonous)
S. mutans

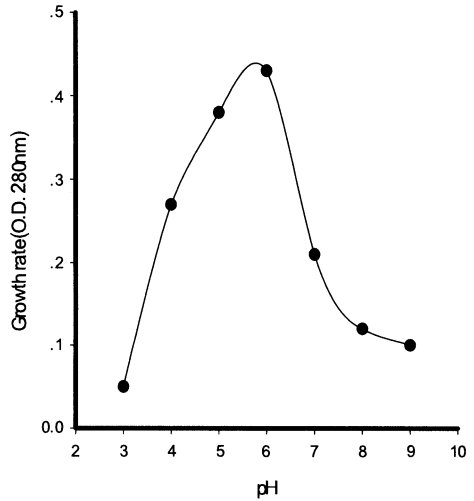
mutans

demineralization
가
dentin

mutans titanium
Table 3
가 50mg/Mℓ, 60mg/Mℓ, 80mg/Mℓ

Table 3. Maximum concentration for the inhibition of the growth of oral microorganism by titanium.

Species	Ti Conc.(μg/ml)			
	50	60	80	100
<i>Streptococcus mutans</i> KCTC 3001	+	+	+	-
<i>Streptococcus mutans</i> KCTC 3303	+	+	+	-
<i>Lactobacillus parabuchneri</i>	+	-	-	-
<i>Lactobacillus lactis</i>	+	-	-	-
<i>Lactobacillus oris</i>	+	-	-	-
<i>Lactobacillus brevis</i>	+	-	-	-
<i>Actinomyces naeslundii</i>	+	+	+	-
<i>Candida albicans</i>	+	+	+	-



S. Fig 1. Effect of initial pH on the growth of S. mutans in LB broth containing titanium(80mg/Mℓ).

S. LB Todd Hewitt broth 가
80mg/Mℓ pH S.
mutans pH가
가

2. Lactobacillus sp.에 미치는 영향

Lactobacillus
Clark
sp.가
S. mutans가
가
(Lactobacillus index)가
-type(Bifidum pathway) -
type(PK pathway) 가 가

Lactobacillus sp. titanium
, Table
Lactobacillus acidophilus, Lactobacillus lactis,

Lactobacillus oris, Lactobacillus salivarius 가
50ppm

IV. 고찰

3. Candida albicans에 미치는 영향

(denture stomatitis) Candida sp. 가
(Eukaryotic cell) 가
Malcila 가 , Bergendahl 가
가
가
C. albicans titanium
50 μ g/M ℓ , 60 μ g/M ℓ , 80 μ g/M ℓ

Table
proteolysis theory
Staplylococcus aureus 100 μ g/M ℓ 가
() 가

4. Actinomyces naeslundii에 미치는 영향

Actinomyces
sp.
(actinomycosis)
가 Titanium
Titanium
trismus Titanium
Actinomyces naeslundii 가
titanium , 100 μ g/M ℓ Ti, TiO₂, TiCl₄

rat

가

V. 결론

Titanium

1.

pH가 6.0 가 S. mutans Ti
80µg/Mℓ

2.

Ti 50µg/Mℓ Lactobacillus sp.

3.

naeslundii Ti Candida albicans
Mℓ, 80µg/Mℓ Actinomyces
50µg/Mℓ, 60µg/
100µg/Mℓ

index)

Ti Ti (Lactobacillus

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