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Effect of a Single Tetanus Toxoid in Korean Adults with Low Tetanus Antibody Titers

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Purpose: The determination of tetanus prophylaxis according to patients' memories of past immunization is inaccurate. However, by using the Tetanus Quick Stick test, it is possible to select Korean adults with low tetanus antibody titers and to perform tetanus prophylaxis in the emergency department. In 1996, Ha reported that tetanus toxoid injection into healthy Korean adults revealed significant differences between the tetanus antibody titers at the beginning and the tetanus antibody titers after 1 week. Our purpose is to determine the effect of a single tetanus toxoid in Korean adults with low tetanus antibody titers.

Methods: Blood samples were taken from 44 volunteers for a period of 6 weeks. All samples were analyzed using the Tetanus IgG ELISA (enzyme-linked immunosorbent assay) method.

Results: The results for tetanus antibody titers at the beginning and after 1 week, 2 weeks, 4 weeks, and 6 weeks were 0.04 ± 0.05 IU/mL, 1.22 ± 3.63 IU/mL, 4.99 ± 7.36 IU/mL, 8.36 ± 11.10 IU/mL and 6.59 ± 9.21 IU/mL respectively. There was a statistically significant difference between the tetanus antibody titers at the beginning and the tetanus antibody titers after 2 weeks. There was no statistically significant difference between the tetanus antibody

titers after 2 weeks and 6 weeks. After 4 weeks, all subjects' tetanus antibody titers were at the protective level.

Conclusions: A single tetanus toxoid injection is effective in Korean adults with low tetanus antibody titers.

Key Words: Tetanus, Tetanus toxoid, Immunization

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가 1).
1958 DPT , 1981
DTaP .
DTaP 2, 4, 6
3 18 4 , 4~6 5
10 가
2).
3,4). 2000
가 10
50 가
4). 2001 Kang 3) 가
가가
, 2004 5 가
가

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: 2005 7 21 , 1 : 2005 9 7

: 2005 9 28

5).

4,6).

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가가
가 가
7,8) 2004
Yoon 9) Tetanos Quick Stick (가)
TQS 가
TQS 가
가
가가
6) 1996 Ha 4) 20
1 가 가
가가
가가
1

(antigen-dye conjugate)
dilution buffer(detergent 0.1% and sodium azide 0.05%) 가 - - (antibody-antigen- dye complex)가 (test window)
가 0.2 IU/mL
0.2 IU/mL
20
(control window) 가
가
(Fig. 1).

2)

(,) 0.5 mL
1 1 ,
2 , 4 , 6

3) Tetanus IgG ELISA

Tetanus IgG ELISA (Immuno-Biological Laboratories, Hamburg, Germany)

	Gel & Clot Activator	3,000
rpm	10	ELISA
	wash buffer	
1:10	working buffer	60
	working buffer	
enzyme conjugate	가	30
	working buffer	
(tetramethylbenzidine) substrate	가	TMB work-

1.

2004 12 1 2005 3 31 20
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TQS 가
1
1 , 2 , 4 , 6 1 5
(ELISA: Enzyme-Linked Immunosorbent Assay)
가

2.

1) TQS

TQS (GAMMA, Angleur, Belgium) (immunochromatographic assay)
가가
TQS (dilution buffer) (30 µL)
20 가

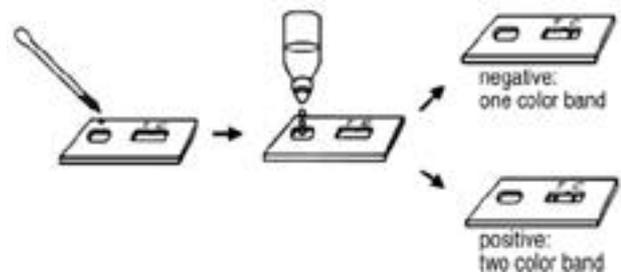


Fig. 1. Procedure of Tetanos Quick Stick assay.

ing substrate solution 20
 (stop solution)
 450 nm
 가 0.1 IU/mL¹⁰⁻¹²⁾
 3.
 SPSS for Windows 11.5
 way ANOVA
 가 65
 가
 p 0.05

가 2
 (p<0.05). 2~6
 4 44
 IU/mL)
 (Table 2).
 6
 65 8
 가 가 (p<0.05). 4
 8 가(0.1 IU/mL)
 (Table 3). 4
 6 가가
 (Fig. 4).
 20 5
 가 가 (p<0.05)(Fig. 5). 2
 5 가 (Table 4).

20 53 TQS
 7 , 46
 6 5 ELISA
 . ELISA
 가가 0.2 IU/mL 2
 가가 0.2 IU/mL 44
 24 , 20 , 46.9±
 16.6(24 ~ 78) 20 ~ 29 5
 , 30 ~ 39 18 , 40 ~ 49 1 , 50 ~ 59 1 ,
 60 ~ 64 11 , 65 8 .
 44
 가 2
 (p<0.05)(Fig. 2). 2~6 가
 . 4 44 가(0.1
 IU/mL) (Table 1). 4
 6 가가
 (Fig. 2).
 65 36

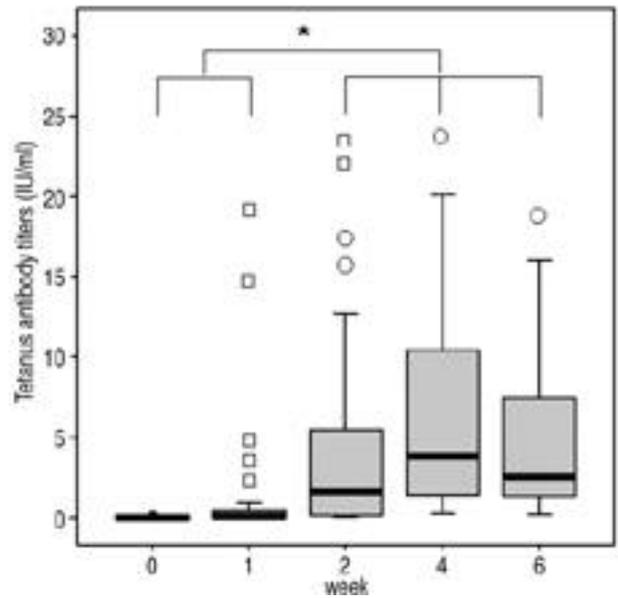


Fig. 2. Tetanus antibody titers in all subjects (N=44).

*p<0.05
 outliers
 extreme point

Table 1. Tetanus antibody titers in all subjects (N=44)

	Mean ± SD	Minimum	Maximum
Beginning (IU/mL)	0.04 ± 0.05	0.00	0.17
1 week (IU/mL)	1.22 ± 3.63	0.00	19.16
2 weeks (IU/mL)	4.99 ± 7.36*	0.04	32.05
4 weeks (IU/mL)	8.36 ± 11.10*	0.25	53.41
6 weeks (IU/mL)	6.59 ± 9.21*	0.18	38.33

N: number, SD: standard deviation
 *p<0.05

30 18
 가 2
 (p<0.05). 2~6
 가 (Fig. 6). 2 18
 가(0.1 IU/mL) (Table 5).

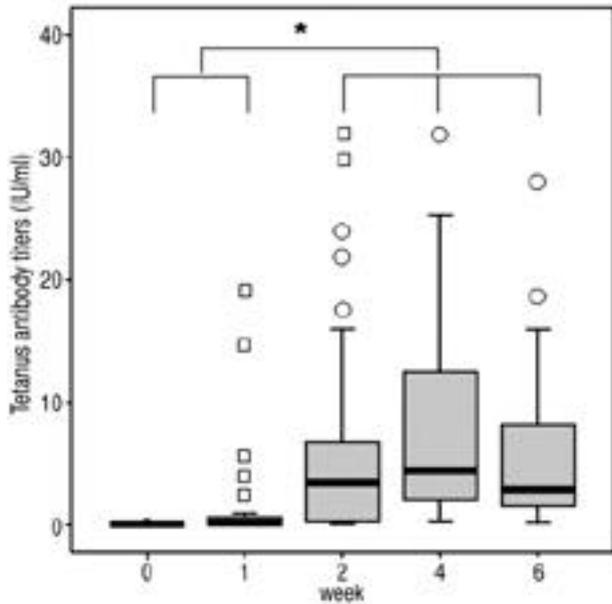


Fig. 3. Tetanus antibody titers in less than 65 years old subjects (N=36).
 *p<0.05
 outliers
 extreme point

Clostridium tetani
 tetanoplasmin

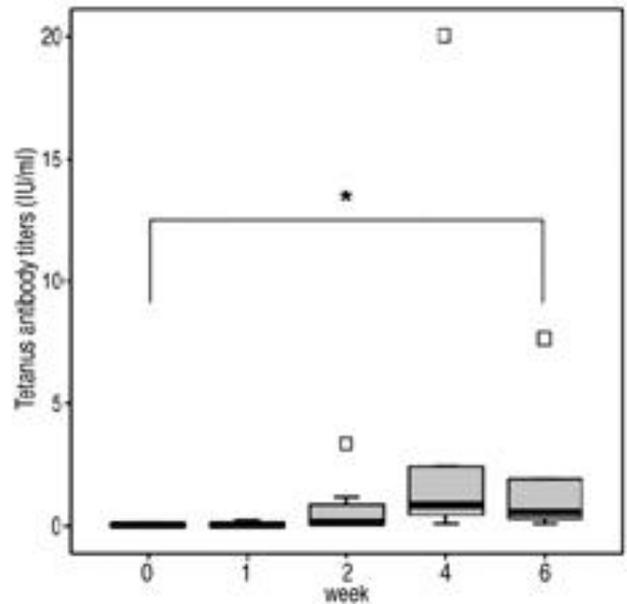


Fig. 4. Tetanus antibody titers in more than 65 years old subjects (N=8).
 *p<0.05
 extreme point

Table 2. Tetanus antibody titers in less than 65 years old subjects (N=36)

	Mean ± SD	Minimum	Maximum
Beginning (IU/mL)	0.04 ± 0.05	0.00	0.17
1 week (IU/mL)	1.48 ± 3.98	0.00	19.16
2 weeks (IU/mL)	5.94 ± 7.82*	0.04	32.05
4 weeks (IU/mL)	8.87 ± 11.42*	0.25	53.41
6 weeks (IU/mL)	7.23 ± 9.65*	0.18	38.33

N: number, SD: standard deviation

*p<0.05

Table 3. Tetanus antibody titers in more than 65 years old subjects (N=8)

	Mean ± SD	Minimum	Maximum
Beginning (IU/mL)	0.05 ± 0.05	0.00	0.13
1 week (IU/mL)	0.06 ± 0.08	0.00	0.22
2 weeks (IU/mL)	0.70 ± 1.11	0.09	3.29
4 weeks (IU/mL)	4.95 ± 8.51	0.45	20.10
6 weeks (IU/mL)	2.19 ± 3.09	0.29	7.59

N: number, SD: standard deviation

glycin 가 GABA 가

13,14)

14

15)

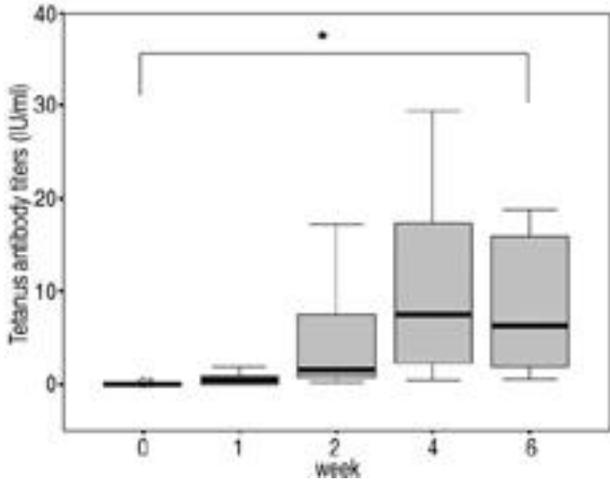


Fig. 5. Tetanus antibody titers between 20 and 29 years old (N=5).
*p<0.05

1940

1988 10

65

1947 10

0.02

가

16), 1927

0.39

4)

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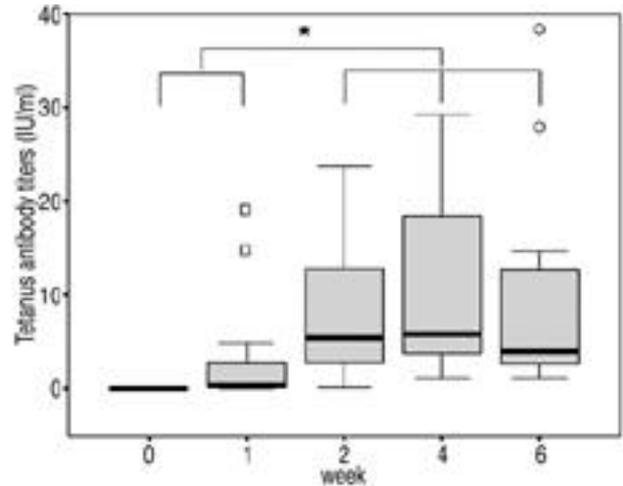


Fig. 6. Tetanus antibody titers between 30 and 39 years old (N=18).
*p<0.05
outliers
extreme point

Table 4. Tetanus antibody titers between 20 and 29 years old (N=5)

	Mean ± SD	Minimum	Maximum
Beginning (IU/mL)	0.04 ± 0.06	0.00	0.15
1 week (IU/mL)	0.66 ± 0.74	0.02	1.80
2 weeks (IU/mL)	5.45 ± 7.21	0.24	17.26
4 weeks (IU/mL)	11.39 ± 12.04	0.43	29.39
6 weeks (IU/mL)	8.67 ± 8.28	0.53	18.79

N: number, SD: standard deviation

Table 5. Tetanus antibody titers between 30 and 39 years old (N=18)

	Mean ± SD	Minimum	Maximum
Beginning (IU/mL)	0.05 ± 0.06	0.00	0.17
1 week (IU/mL)	2.72 ± 5.40	0.01	19.16
2 weeks (IU/mL)	8.90 ± 8.90*	0.13	32.05
4 weeks (IU/mL)	11.80 ± 13.38*	1.09	53.41
6 weeks (IU/mL)	10.01 ± 11.67*	1.10	38.33

N: number, SD: standard deviation

*p<0.05

가
 가 3,4) 15
 30~40% 65
 17-19) 2001 3)
 0.1 IU/mL 20 42%, 30
 75% ELISA
 가 0.1 IU/mL
 0.15 IU/mL 0.17 IU/mL
 16,20,21)
 가
 가 4
 가 4
 1996 Ha 4) 28 20
 IU/mL , 1 가 10.18
 가 8.32 IU/mL , 2 가
 가 Ha 4) 가
 가
 1997 Kumar 16) 65
 가가
 65 4 , 6
 8.87 IU/mL, 7.23 IU/mL ,
 65 4 , 6 4.95
 IU/mL, 2.19 IU/mL
 (Table 2,3). 65
 가
 가 가
 , 65 1
 가 Lee 22)
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 Fig. 2 Fig. 3
 6
 1 6
 가 가 가

가 44
 , , 20 65
 가 가
 가가
 1 가가
 44
 1. 2 가가
 2. 2, 4, 6 가
 3. 가 가
 4 가
 가가
 1 가

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