

## 기니픽에서 흡연에 의한 혈관 내피 의존성 이완반응의 양상에 관한 연구

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### Endothelium-Dependent Relaxation Is Impaired by Environmental Tobacco Smoke Exposure in Guinea Pig Aorta

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#### ABSTRACT

**Background & Objectives :** Smoking is a risk factor for the development of atherosclerosis. However, the exact mechanism of smoking-related damage to the arterial wall and its relation to the atherosclerotic process are not known. The endothelium plays an important role for the regulation of vascular tone and its function is impaired in the presence of risk factors early in the process of atherosclerosis. To assess the effect of smoking on endothelium-dependent relaxation, we examined vascular reactivity in vitro in an animal model of environmental tobacco smoke exposure. **Materials & Methods :** Guinea pigs were randomized to control group or environmental tobacco smoke exposure group. The source of environmental tobacco smoke exposure was sidestream smoke during 6 hours per day and 5 days per week over 6 weeks or 12 weeks in a smoking chamber. Fresh aortic rings were suspended in organ baths (37 °C, 95%O<sub>2</sub> -5%CO<sub>2</sub>). Rings were precontracted with phenylephrine (10<sup>-7</sup> M) and exposed to acetylcholine (10<sup>-7</sup> -10<sup>-4</sup> M) and sodium nitroprusside (10<sup>-7</sup> -10<sup>-5</sup> M) in increasing doses and isometric tension was recorded to evaluate the endothelium-dependent and -independent relaxation. **Results :** Acetylcholine-induced maximal relaxation (mean ±SD) was 18 ±9% in the rings from the 6-week smoked guinea pigs and 4 ±3% in the rings from the 12-week smoked guinea pigs in comparison with 49 ±6% of the controls (p <0.05). The endothelium-dependent relaxation of the rings from 12 week-exposure was significantly less than that of 6 week-exposure. In contrast endothelium-independent relaxation to sodium nitroprusside was not different among three groups. **Conclusion :** Environmental tobacco smoke exposure impairs endothelial function in guinea pig aorta. (Korean Circulation J 2000;30(9):1149-1155)

**KEY WORDS :** Smoking · Endothelium-dependent relaxation · Atherosclerosis · Organ chamber · Guinea pig.

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11)12)

## 대상 및 방법

가

가 대 상

500 gm 가

15

5 , 6

5 , 12

5

(smoking apparatus)

(Fig. 1).

1) 10

15

5 6

20

5

6

12

가

가

2-7)

8-10)

가

1989

4)

75.4%,

7.6%, 1992

73.2%,

6.1%,

1995

73%,

6.0%, 1997

68.2%,

6.7%

### Organ Chamber Study

NaCl 118 mmol/L, KCl 5.9 mmol/L,  $\text{NaH}_2\text{PO}_4$  1.2 mmol/L,  $\text{MgSO}_4$  1.2 mmol/L,  $\text{CaCl}_2$  2.0 mmol/L,  $\text{NaHCO}_3$  25 mmol/L, Glucose 10 mmol/L

가 Kreb

. 30 ml organ chamber

Kreb

chamber 95%

5%

가

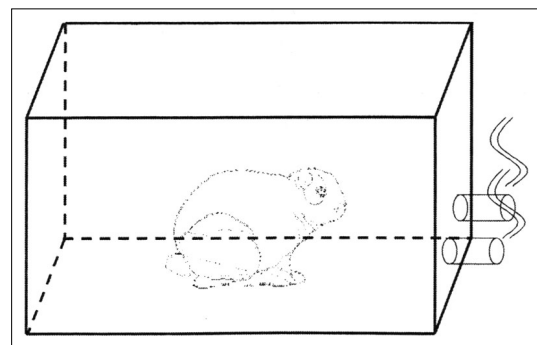
37

4

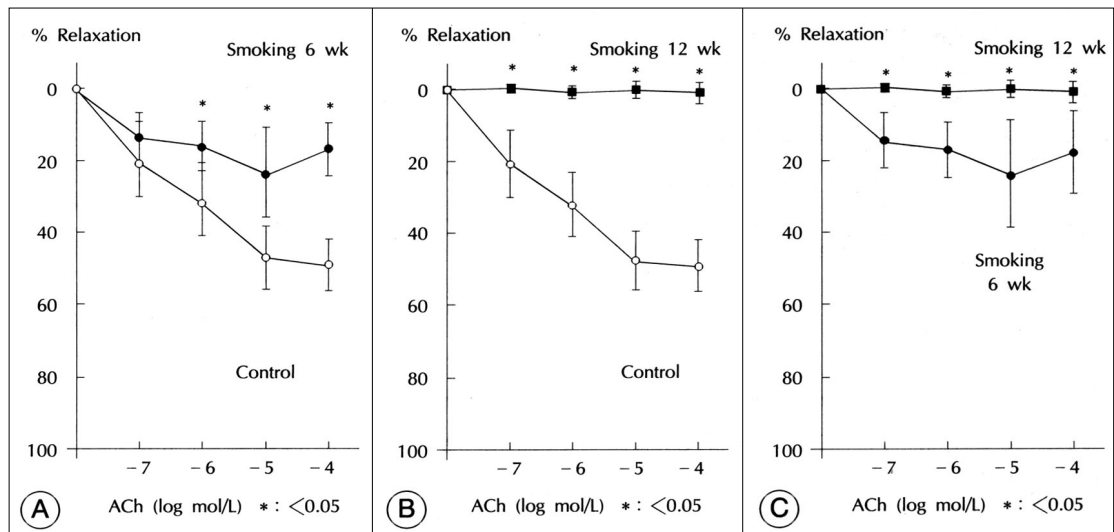
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**Fig. 1.** The source of environmental tobacco smoke exposure was sidestream smoke during 6 hours per day and 5 days per week over 6 weeks or 12 weeks in a smoking chamber.



**Fig. 2.** Relaxation to acetylcholine in control group, 6-week and 12-week environmental tobacco smoke exposure group. Acetylcholine induced relaxation was significantly reduced in the rings from the smoked guinea pigs in comparison with the controls (A, B). Acetylcholine induced relaxation was significantly reduced in the rings from the 12-week smoked guinea pigs in comparison with the 6-week smoked group (C). Points are means and vertical lines standard deviation of five experiments.

5 mm chamber t -  
transducer 2 g test p 0.05  
30  
phenylephrine( $10^{-7}$  M)  
Kreb  
baseline - 6%  
Acetylcholine 9%  
sodium nitr -  
oprusside  
30 가 (Fig. 2A, B). 6 12  
phenylephrine  $10^{-7}$  M 6 12  
chamber acetylcholine  $10^{-7}$  M  $10^{-4}$  M (Fig. 2C,  $p < 0.05$ ).  
ansducer physiograph Grass (Mo - sodium nitroprusside  $10^{-5}$  M  
del 7H polygraph) organ chamber 6 , 12 100%  
Model Radnotti Glass 6 12 (Fig. 3).  
통계방법 고 안  
phenylephrine  
100% ±



(adhesion molecule) free radical  
 NO 8 free radical C  
 P-selectin C  
 NO NO  
 NO NO  
 LDL NO  
 NO 가 LDL 가  
 LDL 가  
 L-arginine LDL(cigarette  
 PET L-arginine LDL  
 L-arginine  
 eNOS eNOS mRNA  
 eNOS , mRNA  
 eNOS  
 NO가  
 free radical aromatic compound가 NO  
 NO  
 shear force rheology 9 17 5 15  
 29 21 15  
 adhesion molecule LDL intimamedia  
 LDL media 가  
 fi- 12  
 brinogen 12  
 cigarette smoke extract or-  
 (cigarette smoke extract) agan chamber  
 free radical scavenger  
 6 12

가 가 6 12

요 약

연구배경 :

가 가

가 가

가

가

방 법 :

chamber

500 gm 가 15

5 , 6 5 , 12

5 (smoking ap -

paratus) 10 15

5 6

20

5 6 12

organ chamber

acetylcholine

sodium nitroprusside

가

결 과 :

6 12

6 12

12

결 론 :

organ chamber

6

12

가 가

중심 단어 :

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