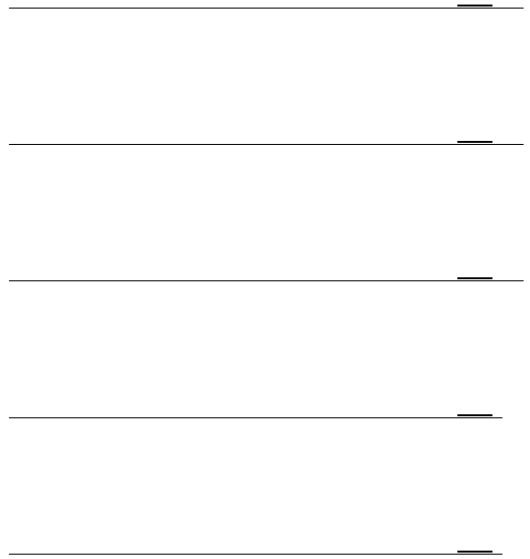


Capsaicin

Capsaicin

2000 6



감사의 글

본 논문이 완성될 수 있도록 각별한 지도와 격려를 베풀어주신 마상열 교수님께 진심으로 감사를 드리며 논문 준비과정 동안 자상한 충고와 가르침으로 이끌어주신 박경아 교수님, 이원택 교수님, 홍성준 교수님, 한상원 교수님께 감사를 드립니다. 그리고 연구 진행과정 중 필요할 때마다 도움을 아끼지 않으신 이종은 교수님, 최영득 교수님, 최영진 강사님, 이성호 선생님, 안수경 선생님, 신영호 선생님과 비뇨기과 의국원에게 감사를 드립니다.

그리고 끝없는 사랑으로 저를 물심양면으로 뒷받침하여 주신 부모님과 항상 곁에서 사랑으로 응원해 준 아내 승혜와 딸 세린이에게 이 논문을 드립니다.

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Capsaicin

: capsaicin
capsaicin
.
: Capsaicin 2 (L2)
calcitonin gene - related peptide(CGRP) neurofilament
. L2 8 (T8)
CGRP substance P(SP)
.
capsaicin
capsaicin c - fos L2, 6
(L6) T8 capsaicin
xylene c - fos L2
L6 . , capsaicin 가
CGRP SP .
: L2 CGRP capsaicin
24
1 가 가 .
neurofilament
. L2 capsaicin CGRP SP .

가 T8 capsaicin CGRP
 SP capsaicin
 . Capsaicin L2 L6
 c - fos 가 가 1
 T8 capsaicin
 c - fos 가 .
 Capsaicin xylene xylene
 L2 L6 c - fos .
 capsaicin 1 capsaicin
 . CGRP, SP
 CGRP, SP 가
 capsaicin CGRP, SP
 capsaicin 1 가
 .
 : capsaicin
 capsaicin
 .
 capsaicin 가 .

: , , , capsaicin, calcitonin gene -
 related peptide, substance P, c - fos

Capsaicin

< >

I.

(prostatodynia)

25%

100

, 가 ,

,

, ,

.¹

, ,

가

.²

3,4

.^{5,6}

.

Capsaicin(8 - methyl - N - vanillyl - 6 - nonenamide)

.⁷ Capsaicin

C (unmyelinated C - fiber) 가
 (thin nociceptive nerve)
 (desensitization) 'capsaicin - desensitization'
 8,9 calcitonin
 gene - related peptide(CGRP) substance P(SP)
 10,11 CGRP
 SP capsaicin
 (immediate early gene) c - fos
 c - fos
 capsaicin 12,13
 Capsaicin Jancso capsaicin
 neurofilament B
 14
 Abelli capsaicin
 xylene xylene
 (visceral pain)
 capsaicin
 (primary afferent nerve) 15 Maggi
 capsaicin capsaicin

16 Capsaicin

17 - 21

capsaicin

²²

. Craft

capsaicin

(deep structure)

²³

capsaicin

1

24

24

가

capsaicin

2 (L2) 6 (L6)

²⁵ capsaicin

capsaicin

capsaicin

II.

1.

200 - 300gm Sprague - Dawley 68
capsaicin 1
, 2 , 24 , 1 , 1 5
xylene xylene , capsaicin 24
7 xylene 5 3
sham operation capsaicin

2.

가. Capsaicin

Capsaicin(Sigma Chemical Co., St. Louis, MO, USA) (10%
ethanol, 10% Tween 80, 80%) stock solution
4mM 0.125M \varnothing capsaicin 0.5 μ
mole ether ,
2cm
26G (ventral lobe)
(10% ethanol, 10% Tween 80,
80%) 0.125M \varnothing
gentamycin 1mg .

. Xylene
 Xylene capsaicin xylene
 capsaicin 24 7
 (10% ethanol, 10% Tween 80, 80% xylene) . Xylene
 0.125M 30%가

3.
 ether ,
 2% sodium nitrate 2% heparin
 , 4% paraformaldehyde
 (laminectomy) L2 8 (T8), L2, L6
 , L2
 24 , 1 , 1

가.
 6 μ m
 , CGRP neurofilament

paraformaldehyde 가 4 24
 vibratome 50 μ m T8, L2, L6 c - fos, T8,
 L2 CGRP, SP

6 μ m

, CGRP, SP , hematoxylin - eosin(H - E)

4.

phosphate buffered saline(PBS)

1% sodium borohydride 1

3%

10 , PBS 10% normal goat serum(Chemicon International Inc., Temecula, CA, USA)

1 , 1:1000

rabbit anti - CGRP (Peninsular Lab., Belmont, CA, USA), 1:200

rabbit anti - SP (Peninsular Lab., Belmont, CA, USA), 1:50

anti - c - fos (Peninsular Lab., Belmont, CA, USA)

. PBS biotinylated goat anti - rabbit IgG (, Chemicon International Inc., Temecula, CA, USA) 1 . PBS

avidin - biotinylated horseradish peroxidase complex 1

0.05% diaminobenzidine - tetrahydro - chloride(DAB, Sigma Chemical Co, St. Louis, MO, USA) 0.01% 가

capsaicin

5.

T8, L2, L6

c - fos

, CGRP SP

Optimas 6.1

(Analytical Measuring System, Seattle,

WA, USA)

L2

CGRP

neurofilament

Windows SPSS

Mann - Whitney U - test

$p < 0.05$

III.

1. L2 CGRP neurofilament
 Capsaicin CGRP . L2
 CGRP capsaicin
 1 가 1 가
 capsaicin 24
 1 가 가
 capsaicin 24 capsaicin
 가 (1A). A
 neurofilament capsaicin
 (1B).

2. L2 T8 CGRP SP
 L2 capsaicin CGRP
 가 2
 24
 (2A). SP CGRP 가 2 가
 CGRP
 1

(2B).

CGRP SP

T8 capsaicin

CGRP SP

가

1

1

가

(3).

3. c - fos

c - fos

. L2

capsaicin

2

c - fos

가 가

가

1

(

4). L6

capsaicin

2

1

c - fos

가 가

가

L2

가

1

. T8

c - fos

가

(5).

4. Capsaicin

xylene

c - fos

xylene

capsaicin

24

,

1

xylene

L2, L6

c - fos

capsaicin

24

L2

c - fos

가 xylene L6
 . Capsaicin 1 xylene
 L2 L6 c - fos 24
 (6).

5. Capsaicin

H - E capsaicin
 (7).
 CGRP SP 가
 . CGRP SP
 capsaicin 2
 24 1
 1 (8).

IV.

1

26

,

C

가

27

C

가

Capsaicin

C

가

capsaicin

가 A

가 B

C

가

B

28

가

CGRP가

capsaicin

29-31

capsaicin

L2

capsaicin 24 CGRP B
 capsaicin 1 .
 가 CGRP 가
 20%
 가 1 . , (touch
 sensory) (proprioception) 가 B
 A neurofilament
 capsaicin

capsaicin CGRP
 B
 capsaicin

Capsaicin CGRP SP
 L2 capsaicin CGRP SP
 T8
 capsaicin CGRP SP 가
 . , Maggi
 capsaicin

16

Capsaicin

capsaicin c - fos

c - fos 2

32

capsaicin c - fos

2 가

L2,

L6 , CGRP SP 가 T8

Capsaicin capsaicin

capsaicin capsaicin

capsaicin 1 xylene xylene

c - fos

capsaicin 가 c - fos

가 가 13

capsaicin

capsaicin

H - E 1

CGRP SP

CGRP, SP 가

capsaicin CGRP, SP

capsaicin 1

capsaicin 1 가 . Malmgren
capsaicin 10 CGRP SP
가 33 capsaicin
CGRP SP
capsaicin
capsaicin
가
capsaicin
capsaicin
가

V.

capsaicin

capsaicin

, ,

.

1. L2

CGRP

capsaicin

.

2. L2

CGRP SP

capsaicin

T8

.

3.

capsaicin

L2, L6

c - fos

가

T8

.

4. Capsaicin

xylene

c - fos

가

.

5. Capsaicin

1

CGRP, SP

.

capsaicin

.

capsaicin

가

.

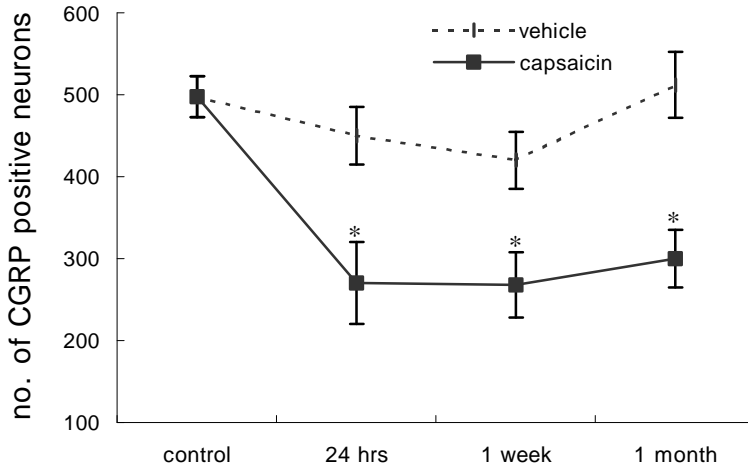
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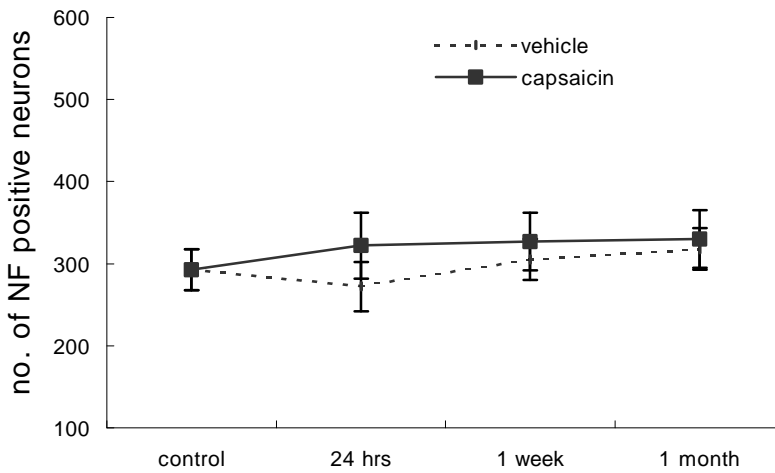
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A



B



1. L2

CGRP neurofilament(NF)

. A. Capsaicin

1

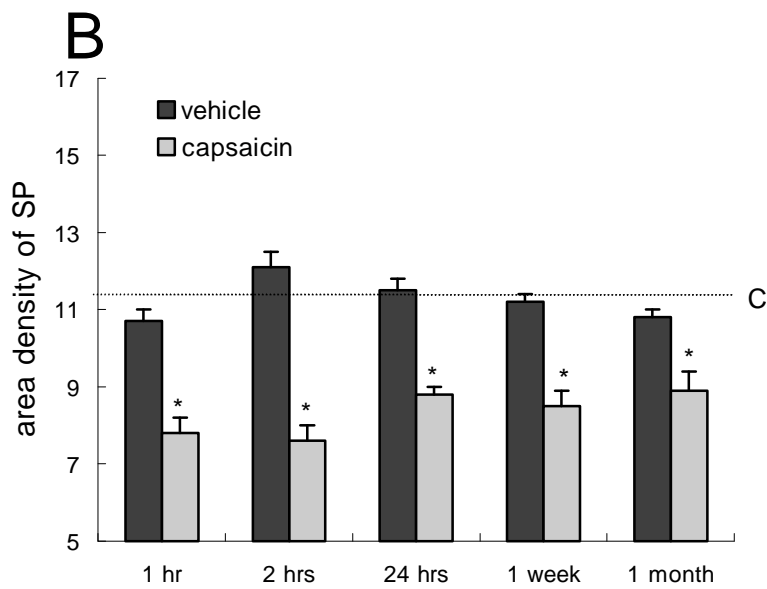
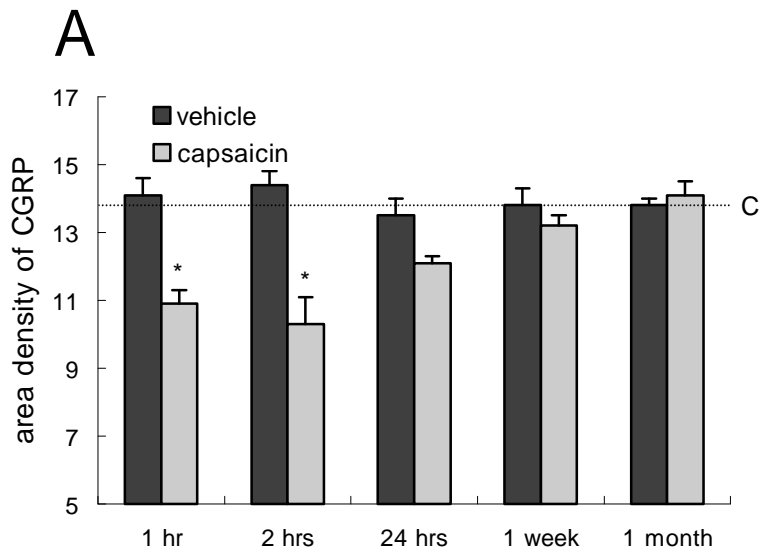
CGRP

. B.

NF

capsaicin

*p<0.05

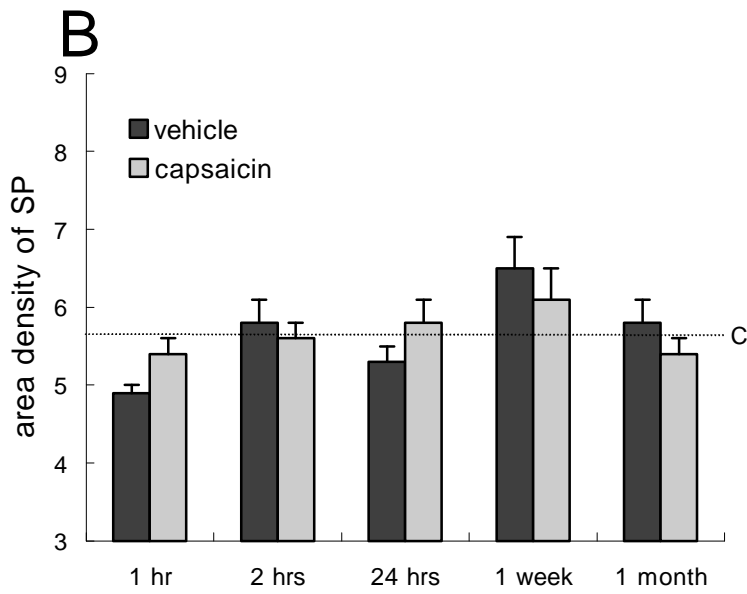
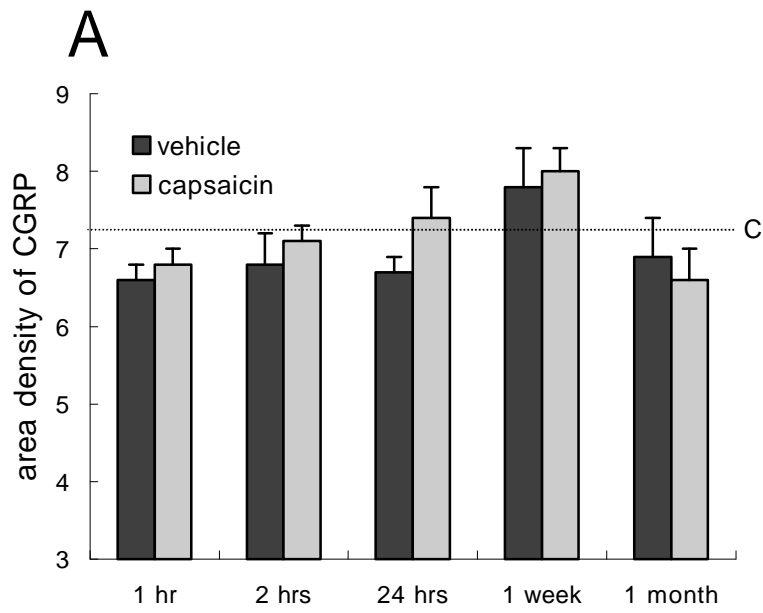


2. L2 CGRP SP
 CGRP (A) SP (B) capsaicin

CGRP SP

*p<0.05

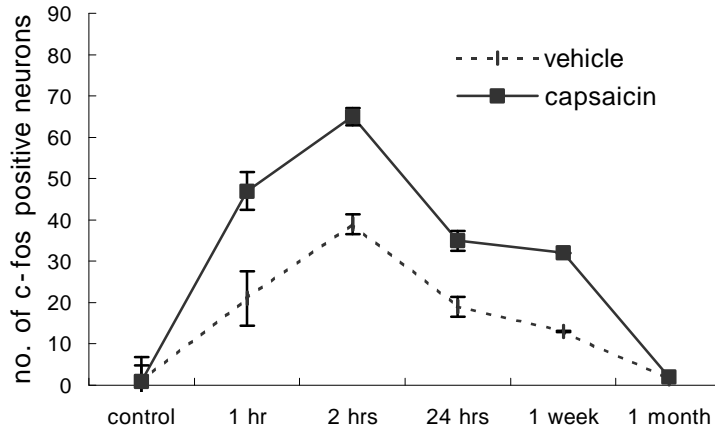
C:



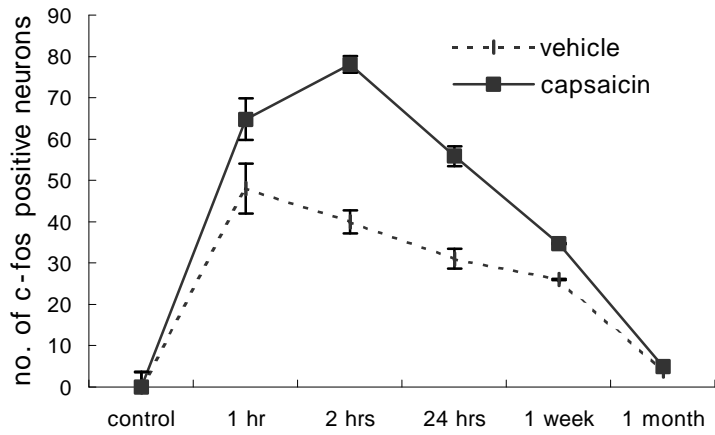
3. T8 CGRP SP
 CGRP (A) SP (B) capsaicin

C:

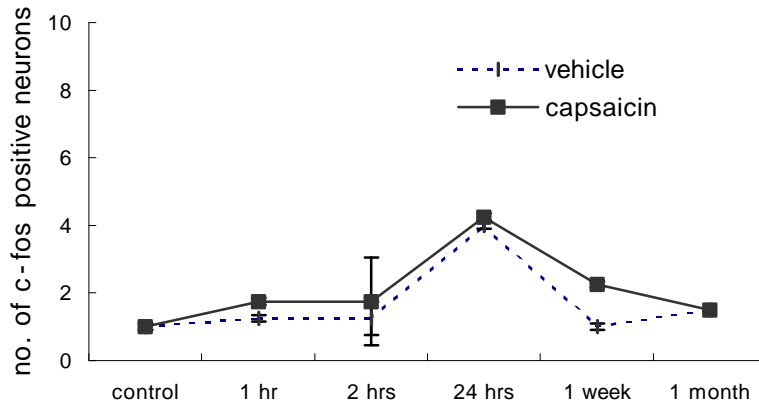
A



B

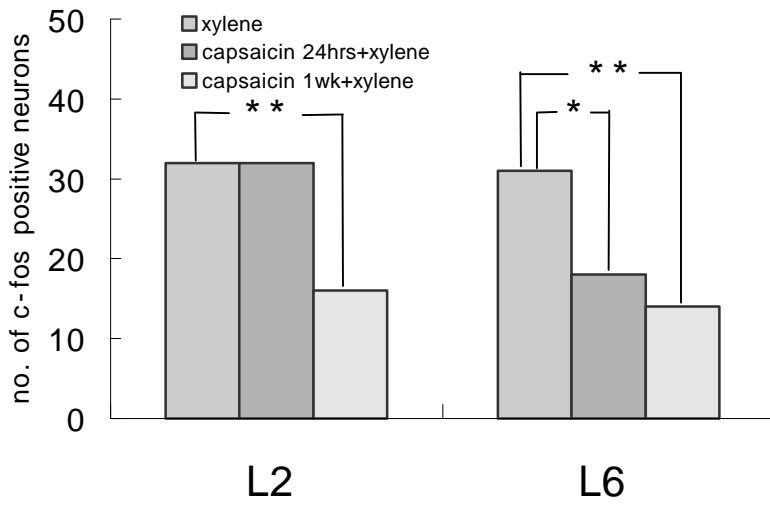


4. L2 L6 c - fos
 . L2(A) L6(B) capsaicin 2 c - fos
 가 1



5. T8 c - fos

. Capsaicin



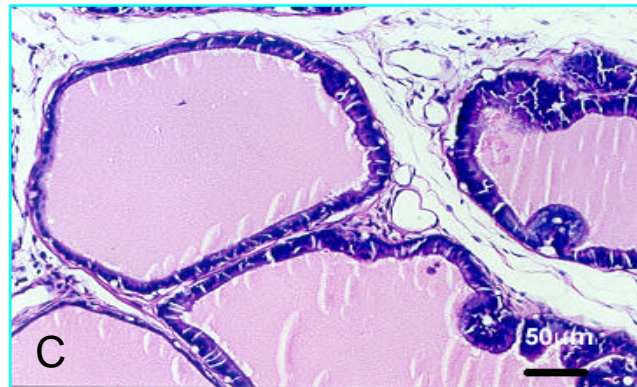
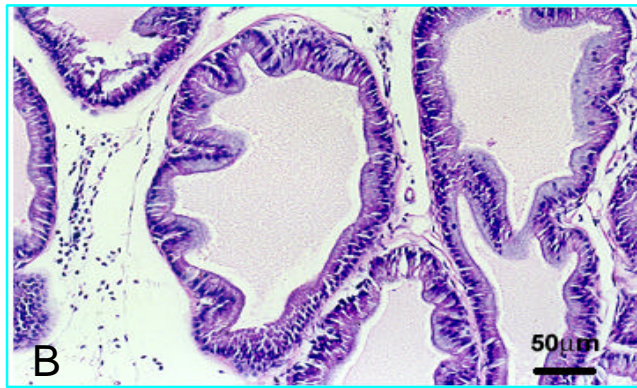
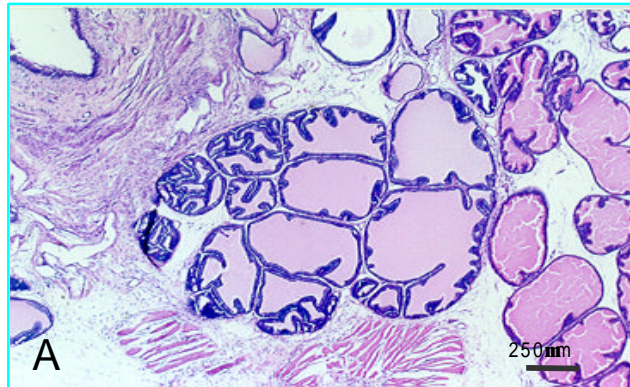
6. Capsaicin xylene c - fos

. L2 L6 capsaicin 1 xylene

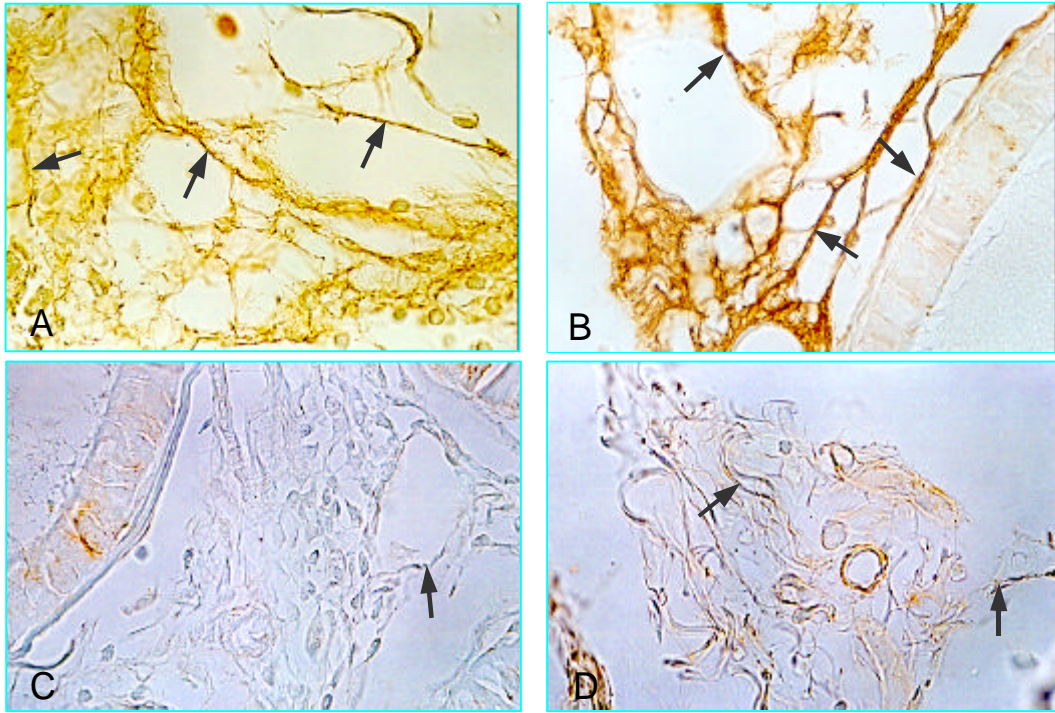
c - fos

가

*,** p<0.05



7. Capsaicin (H - E).
 (A, x200) capsaicin 1 (B, x400), 1 (C, x400)



8. Capsaicin		CGRP	
(A, x800)	capsaicin	24	(B, x800)
		capsaicin	1
1	(D, x800)		(C, x800)
			CGRP

Abstract

The effect of capsaicin on the sensory nerve of the rat prostate

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INTRODUCTION: Prostatodynia is a common and chronic debilitating disease manifested by pain referable to the prostate such as perineal, inguinal, lower back, and suprapubic pain. It has been estimated that more than half of all men suffer from this entity some time in their lives. Although infection, autoimmunity, and intraprostatic reflux are some of the candidates for its cause the etiology and pathogenesis of prostatodynia remains unclear. This study investigated the effect of capsaicin, a selective nociception blocking agent, on the prostatic afferent and determined the presence of capsaicin sensitive nerve at the rat prostate.

MATERIALS AND METHODS: Adult male Sprague-Dawley rats were used for the experiment. Capsaicin(4mM) or vehicle(10% ethanol, 10% Tween 80, 80% normal saline) 0.125M μ l each was injected directly into the right ventral prostate and sacrificed at 1, 2, 24 hours, 1 week and 1 month after injection. Five rats were sacrificed at each time interval. Calcitonin gene related peptide(CGRP) and neurofilament(NF) immunohistochemistry was performed at the L2 dorsal root ganglion(DRG). CGRP and substance P(SP) immunohistochemistry was performed at L2 and T8 dorsal horn, and the prostate. The change in the number of *c-fos* positive cells was determined at L2,

L6, and T8 dorsal horn. Change in *c-fos* positive cells was also compared between those injected with xylene only and those injected with xylene 24 hours and 1 week after capsaicin pretreatment. The prostate was observed under hematoxylin-eosin(H-E) staining for histological change after capsaicin injection.

RESULTS: The number of CGRP positive cells decreased nearly half at the L2 DRG 24 hours after capsaicin injection and remained decreased up until 1 month. However, the number of NF positive cells did not change suggesting the effect of capsaicin only on B-type neurons. Decrease in CGRP and SP at the dorsal horn was observed only at L2 after capsaicin injection. There was no change at T8 and after vehicle injection. The number of *c-fos* positive cells after capsaicin and vehicle injection reached a peak at 2 hours at L2 and at 2 and 1 hour, respectively, at L6. However, *c-fos* positive cell was not observed at T8 even after capsaicin injection. In animals pretreated with capsaicin, injection of xylene induced fewer *c-fos* positive cells at both L2 and L6 compared to animals injected with xylene only. H-E staining of the prostate did not reveal any significant histological change of the prostate after capsaicin injection. However, CGRP and SP positive nerve fibers was not observed 1 week after capsaicin treatment.

CONCLUSION: Direct injection of capsaicin into the rat prostate induced depletion of CGRP and SP, neurotransmitters related to pain conduction, at the DRG, dorsal horn and prostate suggesting that the prostatic afferent is affected by capsaicin. The decreased *c-fos* positive cells observed after capsaicin pretreatment further supports this observation and demonstrates that capsaicin injection can desensitize nociception originating from the rat prostate.

Key Words: prostate, prostatodynia, sensory nerve, capsaicin, calcitonin gene-related peptide, substance P, *c-fos*