Effects of Ylang-Ylang Oil on the Relaxation of Rat Bladder Muscles

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Purpose : In cases of overactive bladders, especially hyperreflexic neurogenic bladders, that arise in patients with spine disorder above sacral micturition center, current primary treatment modalities include the administration of anticholinergics and the intermittent catheterization. Because anticholinergics have many side effects including dry mouth, the demand for new agents has been rising. This study was designed to investigate the effects of ylang-ylang (YY) essential oil, which is currently used in aromatherapy, on the relaxation of urinary bladder muscle in vitro. ¹⁾

Materials and Methods : Isometric tension changes of isolated rat bladder muscle strips were recorded in an organ bath using a pressure transducer. Effects of YY oil were assessed on resting tension, electrical field stimulation(EFS)-, bethanechol-, ATP- and KCl-induced contraction. In order to determine the

mechanism of YY oil, effects of YY oil on above all stimulations were assessed in the presence of methylene blue, L-NAME(N-nitro-L-arginine methyl ester) and N-ethylmaleimide.

Results : The contractility of strips pre-treated with YY oil was significantly decreased on all stimulation-induced contractions. There was no statistically significant difference between treated group only with YY oil and pre-treated group with YY oil and methylene blue. Similar findings were obtained when L-NAME(another NOS inhibitor) was used. When N-ethylmaleimide(c-AMP inhibitor) was employed, there was a statistically significant decrease in the rate of contraction induced by EFS, bethanechol, KCl and ATP applications.

Conclusion : From the obtained data, the results of this study indicate that YY essential oil has relaxing effect on the bladder, and such mechanism is thought to be brought about by a pathway mediated by c-AMP.

Key Words : Ylang-Ylang oil, Bladder contractility, Anticholinergics

가

1

가

2,3

가

1.

250-300g Sprague-Dawley

(5mg/kg)

4,5

95% 5%

가

Krebs

1x10mm

20ml

(Force displacement transducer, FT03, Grass, Rhode Island, USA)

6

(Grass Polygraph, Model 79E)

37

, 95% 5%

가

pH 7.4

가

Krebs (mM)

- (Cananga odorata)

NaCl 118.3, KCl 4.7, KH₂PO₄ 1.2, NaHCO₃ 25.0, CaCl₂ 2.5, MgSO₄ 0.6, Dextrose 11.1

7,8

-

1g (passive tension) 가

가

30 Krebs 가,

가

9-11

-

(0.1mM)

Krebs ATP(2mM), KCl
 2 (126mM)
 (0.1mM)
 가 2
 $\pm 10\%$
 (0.01mM), ATP(2mM), KCl(126
 mM)
 가 0.05M -
 100mg g (0.01mM),
 ATP(2mM), KCl(126mM)
 Aroma newtech c-GMP
 L-NAME(N- nitro-L-arginine methyl ester), Krebs 3 30
 bethanechol chloride, ATP KCl, NOS 0.001mM
 N-ethylmaleimide, methylene blue methylene blue 0.05M -
 Sigma(USA)
 2. 0.05M - 10
 가. 가) 1, 2, 4, 8 16Hz
 0.001mM methylene blue 0.05
 M -
 10 1, 2, 4, 8, 16Hz
 (0.7mm)
 (Grass, USA)
 (20msec , 50V, 가 L-NAME(0.001mM)
 5sec) 가 (0.01mM), ATP(2mM),
 KCl(126mM)
 1, 2, 4, 8 16Hz 1, 2, 4, 8 16Hz
 0.05M
 10
 1, 2, 4, 8 16Hz N- ethylmaleimide(0.001mM)
 0.05M -
 C-AMP
 N-ethylmaleimide(0.001mM)
 가 (0.01mM), ATP(2mM), KCl
 (126mM)
 1, 2, 4, 8 16Hz
 30 0.05M -
 10
 (0.01mM)
 -
 N- ethylmaleimide(0.001mM) 0.05
 M -

16.0±3.1
(p<0.05) (Fig. 1).
, ATP, KCl

, ATP, KCl
± SEM 7.2±0.5, 4.4±2.1, 8.6±3.5
(standard error of the mean) 3.5±0.4, 2.1±0.3,
SigmaPlot 2000 (ver 0.8±0.5 가
6.0) Student's t-test (p<0.05) (Fig. 2).
p<0.05 Guanylate cyclase methylene
blue 가 , KCl, ATP
12.9±1.9, 12.9±2.0,
3.48±0.6 -
6.1±0.7, 4.9±1.0, 1.3±0.2

1, 2, 4, 8 16Hz methylene blue
(gm/100mg) 6.8±0.01,
5.3±0.6,
5.8±0.7, 11.2±1.3, 18.7±2.1, 26.5±2.6
3.1±0.5, 3.4±0.7, 7.0±1.3,
12.0±2.5,

Fig. 1. Frequency-contraction curves from bladder muscle strips in male rats. Pretreatment with ylang-ylang oil (0.05 mL) significantly decreased the maximum tension under the control. * p<0.05 indicates significant difference from respective control, n=19 in each group.

Fig. 2. Changes of the contraction induced by bethanechol, ATP, and KCl after pre-treatment with ylang-ylang oil. Bethanechol, ATP, and KCl-induced contractions were decreased by pretreatment with ylang-ylang oil. * $p < 0.05$ indicates significant difference from respective control, (n=11, bethanechol; n=22, ATP; n=21, KCl).

4.8±0.7, 1.2±0.1

-

가

.

1, 2, NOS L-NAME 가

4, 8 16Hz, KCl, ATP

- 4.4±0.6, 8.4±1.5, 4.0±1.2, 3.5±0.8 -

4.3±0.6, 8.7±0.9, 14.1±1.0, 27.2±3.0

- 4.2±0.6, 2.2±0.4, 2.3±0.7

2.0±0.3, 2.2±0.4, 4.3±0.4, - L-NAME

7.2±0.8, 14.3±1.5 13.0 ±3.3,

3.3±1.7, 4.1±0.6

Methylene blue -

2.1±0.3,

2.2±0.3, 4.6±0.6, 7.9±1.0, 17.9±1.41 . 1, 2, 4, 8

- 16Hz

- 9.0±1.7, 8.9±1.7, 4.1±0.8,
 14.7±1.9, 27.1±4.3, 43.9±5.6 - 2.6±0.5, 1.8±0.2 -
 3.8±0.8,
 3.7±0.7, 5.3±1.7, 11.4±2.7, 18.2±3.7 가 (p<0.05) (Fig. 3).
 L-NAME - 1, 2, 4, 8 16Hz
 3.8±0.5, 3.7±0.6, -
 7.0±2.2, 11.8±2.8, 20.4±4.7 - 2.8±0.6, 2.6±0.4, 5.3±0.5, 8.6±1.1,
 11.2±1.3 -
 가 1.0±0.2, 1.0±0.2,
 2.1±0.4, 3.7±0.6, 5.8±1.0
 C-AMP N-ethylmaleimide N-ethylmaleimide -
 가 , KCl, ATP 1.8±0.3,
 7.2±1.7, 5.1±0.8, 1.8±0.3, 4.1±0.8, 6.1±0.8, 8.3±0.1
 2.8±0.4 -
 1.7±0.3, 1.2±0.3, 1.1±0.2
 -
 가
 N-ethylmaleimide (p<0.05) (Fig. 4).

Fig. 3. Changes of the contraction induced by bethanechol, ATP and KCl after pre-treatment with ylang-ylang oil. Bethanechol, ATP and KCl-induced contractions were decreased by pretreatment with ylang-ylang oil. Reduction of contractions were not attenuated by pretreatment with ylang-ylang oil and N-ethylmaleimice.
 *; compared to control, **; compared to ylang-ylang p<0.05 indicate significant difference (n=10, bethanechol; n=10, ATP; n=11, KCl).

Fig. 4. Changes of the contraction induced by electrical field stimulation(EFS) after pretreatment with ylang-ylang oil. Bethanechol, EFS-induced contractions were decreased by pretreatment with ylang-ylang oil. Reduction of contractions were not attenuated by pretreatment with ylang-ylang oil and N-ethylmaleimide.

*; compared to control, **; compared to ylang-ylang p<0.05 indicate significant difference, n=11 in each group.

eugenol¹²⁻¹⁴

가 Elisabethsky

linalool

linalool, linalyl acetate,¹⁵

eugenol, methyleugenol, methyl benzonate

49가

9-11

methyleugenol

가 glutamate

가

linalool⁷

Buchbauer¹⁶

가

N-ethylmaleimide

c-AMP

c-AMP가

Hume¹⁷ [K⁺]_o

L-type Ca²⁺ channel

eugenol Ca²⁺

Eugenol NE, histamine, transmural nerve stimulation

NE histamine

가

가

post-receptor excitation contraction

가

c-AMP

¹⁸

eugenol

eugenoldilol

가

2-

가

17,19-21

가

adenylate cyclase

phosphodiesterase

c-AMP

nitric -oxide stimulated

relaxation c-GMP가 ²²

Norlen ²³

가

Kaplan ²⁴

가

Eglen ²⁵

c-AMP

가 Lis- Balchin

Hart²⁶

c-AMP 가

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