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EVALUATION OF ANTI-INFLAMMATORY PROPERTY OF VANILLIN IN CARRAGEENAN INDUCED PAW EDEMA MODEL IN RATS

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Abstract: Vanillinis known to have antimutagenic, anti-invasive and metastatic suppression potential. Antinociceptive property in acetic acid induced visceral pain models, antioxidant and hepato-protective properties of in carbon tetrachloride-treated rats have also been demonstrated. Objective of this study is to evaluate the effect of vanillin on acute inflammation induced by carrageenan in rats.
Methods: Rats were assigned to five groups [Control, Asprin and three Vanillin *groups*,] of six animals each. Carrageenan induced paw edema was used to evaluate anti-inflammatory activity. Paw volume was measured using digital plethysmo meter (UgoBasile 7141) various intervals following carrageenan challenge. One way ANOVA was used for statistical analysis of differences in paw volumes.
Results: There was significant decrease in the paw volume at 100mg/kg and 200mg/kg doses of vanillin when compared to control group.
Conclusion: Vanillin at a dose of 100mg/kg and 200 mg/kg demonstrated a significant decrease in paw volume, suggesting a potential anti-inflammatory activity.

Keywords: Vanillin, Paw Oedema, Plethysmometer, Antiinflammatory

INTRODUCTION

Vanillin is a fine, white to slightly yellow crystal, usually needle-like, having a pleasant odor and taste suggestive of vanilla[1]. Vanillin (4-hydroxy-3-methoxy benzaldehyde) is one of the primary chemical components extracted from the seedpods of *Vanilla planifolia*, a monocotyledonous orchid and is widely used in foods, cosmetics, beverages and drugs. It is believed that the high level of vanillin intake from foods and beverages will have beneficial effects on human health[2].

Various previous studies on vanillin have demonstrated that it has antimutagenic[3], anti-invasive and metastatic suppression potential by inhibiting enzymatic activity of matrix metaloproteinase[4, 5]. It has also shown to have antinociceptive property in acetic acid induced visceral pain models, antioxidant, and hepato-protective properties in carbon tetrachloride-treated rats[6, 7]. Objective of this study is to evaluate the effect of vanillin on acute inflammation induced by carrageenan in rats.

MATERIALS AND METHODS

Animals: Healthy adult Wistar albino rats, of either sex, weighing 150-200 grams, inbred in animal house of a medical college were used for the study. Ratswere housed in clean polypropylene cages, with dust free rice husk as a bedding material, three rats per cage, under controlled laboratory conditions (Temperature: 25° ± 2°C, humidity (60% ± 10%) and 12 h light/dark cycle). The experimental animals were fed with standard chow (manufactured by Pranav Agro industries ltd., Sangli) and water *ad libitum.* Experiments were performed during the light phase of the cycle (10:00-17:00).

Drugs and Chemicals:

- Vanillin [IUPAC name 4-hydroxy-3-methoxybenzaldehyde, chemical formula (CH_3O) (OH) C6H3CHO, molecular weight of 152.15] was obtained from Hi Media laboratories.
- Aspirin obtained from Sun Pharmaceuticals was administered at a dose of 400mg/kg by oral route
- Carrageenan was obtained from S.D. Fine Chemicals Limited - 0.1 ml of 1% solution was injected subcutaneously

Ethical issue:

Permission was obtained from the institutional animal ethics committee to carry out the study.

Method [Carrageenan induced paw edema[8]]:

Rats were divided into five groups of six animals each. They were kept fasting for a period of 24 hours prior to the study.

The feeding and treatment schedule was as follows.

Group 1: Two ml of 2% gum acacia in water per oral.
Group 2: Aspirin 400mg/kg suspended in 2 ml of 2% gum acacia per oral.
Group 3: Vanillin (suspended in 2%gum acacia) 10mg/kg per oral.
Group 4: Vanillin (suspended in 2% gum acacia) 100mg/kg per oral.
Group 5: Vanillin (suspended in 2% gum acacia) 200mg/ oral.

One hour after oral administration of drugs, the rats were challenged by sub-cutaneous injection of 0.1 ml of 1% solution of carrageenan into plantar side of the left hind paw. The paw was marked at the level of lateral malleolus and immediately immersed in the digital plethysmo meter (UgoBasile, Italy) up to the mark. The paw volume was measured and average of three readings was taken. Again paw volumes were measured [average of three readings] at 1, 2, 3 and 4 hours after the challenge. The increase in paw volume after each time interval was calculated for each animal and expressed in ml. Differences in paw volumes between various groups were calculated and compared.

Statistical Analysis:

The differences in paw volumes between different groups at various time intervals were compared by one way ANOVA using statistical package-SPSS version 11.5. Post hoc tests were applied. P<0.05 was considered statistically significant.

RESULTS

As depicted in the table 1, Vanillin at doses of 100mg/kg and 200mg/kg of body weight of rats has shown significant anti-inflammatory activity. Vanillin groups have shown less increase [after carrageenan challenge] in paw volume compared to control groups at 1st, 2nd, 3rd and 4th hours at the dose of 200mg/kg but at 100mg/kg dose of vanillin, significant decrease was seen at only 2nd, 3rd and 4th hour. At the dose of 10mg/kg, difference was not statistically significant. There was no significant differences in paw volumes between higher two doses of Vanillin.

DISCUSSION AND CONCLUSION

In carrageenan induced inflammation model two inflammatory phases are seen. First phase is due to the release of inflammatory mediators like histamine and serotonin. This phase is seen upto 2.5 hours after carrageenan injection. Second phase of inflammation occurs due to release of prostaglandins, bradikinins which is usually seen after three hours of carrageenan administration. It has been found that carrageenan induced paw edema model is sensitive to cyclooxygenase inhibitors. Hence this model has been used to evaluate the effect of NSAIDs which act by inhibiting cyclooxygenase pathway of prostaglandins synthesis[9,10]. In this study Vanillin in highest dose has shown anti-inflammatory property on both the phases and at 100 mg/kg only after 2nd hour. At 10 mg/kg vanillin has not demonstrated any significant effect on paw edema induced by carrageenan. So it can be concluded that vanillin may have inhibitory effect on both the phases of inflammation particularly in higher doses. The study has also demonstrated that these effects are dose related.

Table 1: Effect of vanillin and on carrageenan induced paw edema in rats

Drug [mg/kg]	Paw volume in ml at different time intervals [Mean±SD]				
	'o' Hour	1 Hour	2 Hours	3 Hours	4 Hours
Control [Gum acacia]	0.99±0.09	1.34±0.07	1.46±0.07	1.66±0.07	1.81±0.05
Aspirin [400]	1.02±0.07	1.15±0.11*	1.23±0.04*	1.34±0.02*	1.39±0.02*
Vanillin [10]	1.15±0.17	1.41±0.15	1.52±0.14	1.54±0.13	1.61±0.05
Vanillin [100]	1.06±0.05	1.19±0.06	1.30±0.03*	1.47±0.044*	1.62±0.04*
Vanillin [200]	1.07±0.07	1.16±0.04*	1.27±0.06*	1.41±0.09*	1.54±0.10*

*Significant when compared to control group, p<0.05. All drugs administered p.o.

REFERENCES

1. Sweetman SC, Martindale. The Complete Drug Reference. 36th ed. London: pharmaceutical Press; 2009.
2. Tai A, Sawano T, Yazama F, Ito H, Evaluation of antioxidant activity of vanillin by using multiple antioxidant assays. Biochim Biophys Acta. 2011 Feb; 1810 (2):170-7.
3. Kinga AA, Shaughnessy DT, Murea K, Leszczynska J, Ward WO, Umbach DM, Anti mutagenicity of cinnamaldehyde and vanillin in human cells: global gene expression and possible role of DNA damage and repair. Mutat Res 2007; 616 (1-2): 60–9.
4. Lirdprapamongkol K, Sakurai H, Kawasaki N, Choo M, Saitoh Y, Aozuka Y, Vanillin suppresses in vitro invasion and in vivo metastasis of mouse breast cancer cells. Eur J Pharm Sci 2005; 25:57-65.
5. Liang J, Wu S, Lo H, Hsiang C, Ho T. Vanillin Inhibits Matrix Metalloproteinase-9 Expression through Down-Regulation of Nuclear Factor-κB Signaling Pathway in Human Hepatocellular Carcinoma Cells. MolPharmacol 2009; 75:151–7.
6. Park S, Sim Y, Choi S, Seo Y, Kwon M, Lee J et al. Antinociceptive profiles and mechanisms of orally

administered vanillin in the mice. Arch Pharm Res 2009; 32 (11): 1643-9.

7. Makni M, Chtourou Y, Fetoui H, Garoui el M, Boudawara T, Zeghal N. Evaluation of the antioxidant, anti-inflammatory and hepato protective properties of vanillin in carbon tetrachloride-treated rats. Eur J Pharmacol. 2011 Oct 1; 668 (1-2):133-9.

8. Gerhald Vogel H, Wolgard H. Vogel. (Eds). Drug Discovery and Evaluation Pharmacological Essays, New York: Springer (Publishers), 1997; 360-387.

9. Shreedhara CS, Vaidya VP, Vagdevi HM, Latha KP, Muralikrishna KS, Krupnidhi AM. Screening of *Budhinia purpurea* linn. for analgesic and anti-inflammatory activities. Indian J Pharmacol. 2009; 41: 75–9.

10. Thambi PT, Kuzhivelil B, Sabu MC, Jolly CI. Antioxidant and anti inflammatory activities of the flowers of *Tabernaemontana coronaria* (l) R.BR. Indian J Pharm Sci. 2006; 68 (3):352-355.

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