SHORT COMMUNICATION

LATE INFLAMMATORY SWELLING BY CARRAGEENAN IN RAT'S SUBCUTANEOUS NECK TISSUE

T. S. RAO, M. MATHUR AND N. K. BHIDE

Department of Pharmacology,
All-India Institute of Medical Sciences,
New Delhi - 110 029

(Received on May 5, 1988)

Summary : When injected subcutaneously in the dorsum of neck in albino rats, carrageenan produced inflammatory swelling which reached peak after about 16 hr. The occurrence of the peak inflammatory swelling was delayed but not significantly reduced in severity by aspirin or indomethacin which were administered repeatedly. Phenylbutazone significantly reduced and dexamethasone almost completely inhibited it. In rat hind paw model, subplantar carrageenan injection produced peak inflammatory swelling after about 4 hr which was significantly reduced by all anti-inflammatory drugs mentioned above. It is interesting that an inflammagen when injected at different sites in the same species elicits responses which differ in the time course and drug responses.

Key words : Carrageenan neck inflammation paw inflammation anti-inflammatory drugs

INTRODUCTION

In the widely used model of Winter *et al*. (1), inflammatory swelling develops after subplantar injection of carrageenan in rat hind paw. We report here an interesting observation that the same inflammagen injected in the same species, in the dorsum of the neck, produced swelling which had different time course and drug response.

MATERIAL AND METHODS

Wistar strain adult albino rats of either sex (100-240 g) were used. They were injected carrageenan (4.5 or 11.25 *mg* per rat in 0.45 *ml* normal saline, sc) in the dorsum of the neck.

The neck circumference was measured before injection and then at intervals for upto 48 hr., with a 25 *cm* long 1 *cm* broad silk ribbon(2). Inflammation in the hind paw was produced by the subplantar injection of carrageenan (1 or 4 *mg* per rat in 0 1 *ml* normal saline; 1) Paw volume was measured plethysmographically before the injection and then at intervals for upto 33 hr. Increments in the neck circumference or paw volume were expressed as the percentage of the individual pre-injection values. Since different batches of carrageenan are known to vary in their inflammatory potency (2), the same batch of carrageenan was used in all the experiments.

Aspirin (50 *mg/kg*, 8 hourly), indomethacin (3 *mg/kg*, 8 hourly), phenylbutazone (100 *mg/kg*, single dose) or dexamethasone (0.5 *mg/kg*, two doses at 12 hr interval) were mixed in water with 5% gum acacia for oral use and the first dose administered 1 hr before carrageenan injection. Control rats orally received comparable volume of gum acacia in water. The statistical significance was determined using one way analysis of variance followed by Dunnette's multiple range test.

RESULTS

Inflammatory swelling in neck region by carrageenan (both doses) reached maximal after about 16 hr; this clearly exceeded the 4 hr period which is required for the maximal hind paw inflammation.

Aspirin, indomethacin, phenylbutazone and dexamethasone significantly inhibited the inflammatory swelling in the paw; greater efficacy of dexamethasone over other 3 drugs was not significant ($P>0.2$). On the other hand, in the neck inflammation, aspirin and indomethacin did not significantly reduce the swelling but only delayed the occurrence of peak by about 10 hr. Phenylbutazone was effective; dexamethasone significantly ($P<0.001$) more effective than phenylbutazone (Table I).

TABLE I : Effect of drugs on carrageenan-induced inflammation in rats. Carrageenan was injected in hind paw (4 mg/rat) or in the dorsum of neck (11.25 mg/rat). Values (Mean±SEM) were recorded at peak of inflammation in each case

Group	*% Increase in paw volume at 4 hr(n)*	*% Increase in neck circumference at 16 hr(n)*
Control	77.2±3.6(17)	19.9±1.3(22)
Aspirin	59.4±4.3(8)*	17.3±2.4(8)+
Indomethacin	58.9±5.8(10)*	18.1±1.3 16)+
Phenylbutazone	59.8±5.0(9)*	14.3±1.1(12)*
Dexamethasone	53.2±4.9(9)**	4.1±0.9(10)**

n=number of animals in the group

*$P<0.05$ **$P<0.001$ as compared to the controls (one way variance analysis followed by Dunnette's multiple range test).

+Only in these two groups the peak occurred at 26 hr.

DISCUSSION

It is interesting that in the same species, in paw and neck, an inflammagen should produce swellings which differ in their temporal course and drug response. This could be because different humoral-cellular mechanisms are involved at different body sites.

The temporal course and drug response as seen here for neck inflammation agree with those on pleural fluid effusion which is also induced in rats by locally injected carrageenan (3).

Advantages of measuring the circumference of the rat's neck for studying inflammation has been demonstrated by Akhter and others (2).

REFERENCES

1. Winter, C. A., E. A. Risley and G. W. Nuss. Carrageenin-induced edema in hind paw of the rats as an assay for anti-inflammatory drugs. *Proc. Soc. Exp. Biol. Med.*, **111** : 544-547, 1962.
2. Akhter, M. H., M. Sabir and N. K. Bhide. Anti-inflammatory effect of berberine in rats injected locally with cholera toxin. *Ind. J. Med. Res.*, **65** : 133-141, 1977.
3. Vinegar, R., J. F. Truax, J. L. Selph and F. A. Voelker. Pathway of onset, development and decay of carrageenan pleurisy in the rat. *Federation Proc.*, **41** : 2588-2595, 1982.