

EFFECT OF DURATION OF STRESS ON PAIN THRESHOLD IN RATS

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Abstract : Rats were subjected to immobilization stress of varying duration and their pain thresholds were recorded. It was seen that stress of lesser duration did not affect the endogenous opioid analgesic system while stressor of longer duration stimulated this system to its maximum irrespective of further increasing the duration of the stress condition even upto two fold.

Key words : stress immobilization

duration

pain threshold

INTRODUCTION

Stress is known to induce analgesia by activation of endogenous opioid system (1, 2). However, there is paucity of literature regarding the magnitude (intensity and duration) of stressor causing the change in threshold for pain.

The present work is therefore undertaken to study the effect of change in duration of immobilization stress on this analgesic response.

METHODS

The study was carried out on 12 fully grown male albino rats kept separately with food and water *ad lib*. The experimental pattern consisted of restraining the animals for 30 min in a talcum powder tin cut longitudinally so as to accommodate the animal with head and tail being kept out (3). Two short needles were inserted subcutaneously in the middle of the tail. The electrical stimulation consisted of a train of one second duration with pulse width of one millisecond at a frequency of 100/sec (4). The voltage was progressively increased in step by 0.1 volt. An interval of five minutes was kept between two electrical shocks in the same animal.

Three types of pain threshold were determined as below:

1. A low intensity stimulation producing motor responses - tail withdrawal.
2. A higher voltage producing vocalization.
3. A still higher voltage producing vocalization after discharge persisting even after cessation of stimulus.

The above procedure was carried out for six days. The threshold remained nearly constant during the last four days. The mean reading of the last three days was taken as the mean threshold for the three nociceptive responses.

The animals were divided into three groups with four animals in each group. In group A, rats were immobilized for seven hr, group B for 18 hr and group C for 36 hr. At the end of the immobilization period threshold for the three noxious stimuli were determined. All the three groups were subjected alternately to the stress conditions of the three different durations after a week's rest between each study and their pain threshold were recorded.

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RESULTS

Results are depicted in Table I.

TABLE I

Type of stress	Tail withdrawal	Vocalization	Vocalization after discharge
Normal (No stress)	0.47±0.08	0.6±0.17	1.34±0.14
Immobilization for 7 hr	0.54±0.12 NS	0.8±0.14 NS	1.5±0.22 NS
Immobilization for 18 hr	1.15±0.2*	1.94±0.06*	3.22±0.94*
Immobilization for 36 hr	1.02±0.12*	2.1±0.62*	3.34±1.32*

Pain threshold (Mean±standard deviation) in volts in male rats (n=12)

NS - Not significant *P<0.001

There is no significant change in pain threshold between rats immobilized for 18 hr and for 36 hr.

Immobilization of the animal increased the pain threshold irrespective of the duration of this stress. However, no statistical significance for this change in pain threshold was noted when the animals were restricted from any movements only for seven hours. Increasing the duration of this stress for 18 hr and / or 36 hr showed significant increase in pain threshold for all the three responses as P value in all these experiments was less than 0.001. However, there was no difference in statistical significance between the animals exposed

to stress for 18 hr and 36 hr.

DISCUSSION

Immobilization stress of seven hours duration increased the threshold for pain but did not show statistical significance. This type of stress can thus be considered as controllable stress by the animal (5,6,7). Immobilization for 18 hours resulted in significant analgesic response (P<0.001). Here the opioid analgesic system is activated which resulted in increase in pain threshold (8,9,10). Further increase in duration of this stress for 36 hours (two fold) caused analgesia but with no significant change from the analgesic effect with 18 hours immobilization. However, this increase in pain threshold is statistically significant as compared to the pain threshold when the animal was not under any stress condition.

It is thus observed that stress of shorter duration (seven hr immobilization) does not significantly increase the threshold of the nociceptive stimulus for pain response. But if the duration of this stressor is prolonged, there is stimulation of the opioid analgesic system which resulted in significant increase in the strength of the stimulus required to obtain the three responses. It is also observed that this endogenous opioid analgesic system is stimulated to its maximum by stress of 18 hours duration as doubling the duration period of immobilization (from 18 hr to 36 hr) did not show any further change in the statistical significance of increase in pain threshold.

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