

# EFFECTS OF ORCHIECTOMY ON EXPLORATORY BEHAVIOUR OF RATS

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## Abstract

*This study was designed to assess whether the testes influence the exploratory behaviour of rats. The results show that orchietomy parameters of exploratory behaviour, namely the number of head dips, locomotory significantly impaired three activity and number of rears, when evaluated using the hole-board technique. The fourth parameter tested, the time spent head dipping however remained unaltered. These findings suggest that some factor/s secreted by testes influence exploratory behaviour.*

*Key words: orchietomy, exploratory behaviour, rat, hole-board technique.*

## 1. Introduction

There is considerable evidence that the testes by way of its androgens modulate behaviour associated with phenomena such as aggression, defence, offence, dominance, sexuality or emotions (1, 5, 6). In addition, some cognitive functions are also influenced by androgens (2). This study was initiated to investigate whether testes influence exploratory behaviour of rats and report that it does.

## 2. Materials and Methods

Mixed bred male albino rats served as subject. Average body weight and age were respectively  $262 \pm 10$ g and  $130 \pm 8$  days (mean  $\pm$  sem). They were housed in group cages (4/cage) under natural photoperiod 12 h light/24 h at a constant temperature  $(30 \pm 1^\circ\text{C})$  and allowed freely available food and tap water.

The exploratory behaviour was evaluated using rat hole-board technique(3). Eighteen rats were individually placed at the centre of the rat hole-board between 8.00 — 9.00 h and given 7.5 min trial, during which time the

number of head dips made, time spent head dipping, locomotor activity and the number of rears made (parameters of exploratory behaviour) were scored. Also at the end of each trial the number of faecal boluses (as a measure of stress exposure to novelty) were counted, if present and the box was wiped clean. These rats were killed in groups with an overdose of ether and the gross appearance of the coagulatory seminal vesicular complex and ventral prostate (sexual accessory glands) was noted.

Fourteen rats were bilaterally orchietomized under ether anaesthesia using aseptic precautions through a midline incision (2-3 cm) made in the pelvic region. Two weeks following surgery the exploratory behaviour in these rats were evaluated as for the testes intact rats and the appearance of the sexual accessory glands was noted.

### 3. Results

Results of the hole-board experiments are summarized in table. As shown orchietomy had had no significant effect on the time spent head dipping and on the number of faecal boluses expelled (Duncan's Multiple range test,  $p > 0.05$ ). In contrast, orchietomy significantly suppressed ( $p < 0.05$ ) the number of head dips (56%), locomotory activity (60%) and the number of rears (48%). At autopsy testes intact rats displayed healthy looking saccular shape fluid filled apparently normal sized coagulatory gland/seminal vesicular complex and bulbous ventral prostate. On the other hand, these two structures in the castrated rats were markedly atrophied

### 4. Discussion

The primary objective of this study was to assess whether the male gonad exerts a modulatory action on the exploratory behaviour of rats. This was evaluated by studying the exploratory behaviour in both gonad intact and castrated male rats using the hole-board technique. Several factors such as the time of day, sensory stimuli in the test environment, handling, previous exposure, age, species or strain are known to influence exploratory behaviour<sup>(4)</sup>. These variables were accounted for in this study.

The results show that orchietomy significantly impaired three components of the exploratory behaviour; number of head dips, rears and locomotary activity. However, the fourth component, the time spent head dipping remained unaltered. In testes intact rats a powerful correlation between the number of head dips made and time spent head dipping has been shown<sup>(4)</sup>. But such a link is unlikely with gonadectomized male rats since castration did not impair the time spent head dipping.

Since the sexual accessory glands such as seminal vesicle, prostate were strikingly atrophied following castration it is presumed that the level of testosterone was drastically reduced; the structural and functional integrity of sexual accessory glands are androgen dependant<sup>(7)</sup>. It is likely that the impairment in the exploratory behaviour resulted primarily from this drop in testosterone level, as it is the main testicular hormone. Other forms of behavioural phenomena are also known to be influenced by testosterone<sup>(1)</sup>. Confirmation of this suggestion would require further experiments with testosterone replacement, which are in progress. It is now recognized that testes of most, if not all, species also synthesize hormones other than testosterone, notably oxytocin, vasopressin,  $\alpha$ -melanocyte stimulating hormone, oestrogen, LH-RH,  $\beta$  endorphin or inhibin<sup>8, 9</sup>). It is unknown whether these hormones except oestrogen and  $\beta$  endorphin influence behaviour. Testosterone is converted in brain to catechol oestrogens and oestrogen therapy following castration has similar restorative effects on male offence as does the testosterone replacement<sup>(1)</sup>. Therefore, it may be possible that a drop in oestrogen level resulting from testes removal exerts a potentiating effect on the suppression of exploratory behaviour resulting from testosterone withdrawal. A reduction in exploratory behavior may also reflect a sedative action induced by orchietomy, since sedative drugs suppress exploratory behaviour in rats when evaluated by hole-board technique<sup>(4)</sup>. However, orchietomy is unlikely to produce sedative effects. Nevertheless it is possible that the testes may be producing a factor/s which influence the general level of activity/arousal in the rats.

In conclusion, this study demonstrates that castration impairs some parameters of exploratory behaviour in male rats indicating that the testes play a role in the regulation of this type of behaviour. Whether the same is true for a species such as man remains a matter for conjecture.

## 5. Acknowledgements

We are grateful to Messers U. V. D. S. Ananda and G. A. S. Premakumara for technical assistance and Miss. K. P. J. Bandara for typing the manuscript.

The effects of orchietomy in rats, in a 7.5 min trial in the hole-board. Results are expressed as mean  $\pm$  sem.

Parameter	Testes intact	Orchietomized rats
Number of head dips	11.16 $\pm$ 1.30	4.92 $\pm$ 0.26 *
Time/dip(sec)	3.10 $\pm$ 0.53	2.12 $\pm$ 0.47
Locomotor activity	18.38 $\pm$ 2.37	7.50 $\pm$ 1.87 *
Rears	20.94 $\pm$ 3.33	10.85 $\pm$ 2.52 *
Number of faecal boluses	2.72 $\pm$ 0.54	3.28 $\pm$ 0.60

Significantly different from testes intact rats,  $p < 0.05$   
(Duncan's Multiple range test)

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