EFFECT OF PROLACTIN AND BROMOCRIPTINE ADMINISTRATION ON EPIDIDYMAL FUNCTION - A BIOCHEMICAL STUDY IN RATS

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(Received on June 1, 1985)

Summary : The pattern of androgen dependent enzyme activities of epididymis was studied after the administration of prolactin and bromocriptine in albino rats. Prolactin activated the glycogenolysis and hexose mono and diphosphate pathways, which would be essential for sperm maturation. But bromocriptine inhibited these activities of epididymis. Hence role of bromocriptine in decreasing epididymal function has been suggested.

Key words : albino rats, bromocriptine, glycogen, epididymis, prolactin

INTRODUCTION

Polactin (PRL) enhances the fertility in male rats and mice (1,2). PRL administration resulted in an increased growth and maintenance of activity of testis and accessory sex organs (3-11). It exerts gowth hormone-like influence on the testis and accessory sex organs (3,5). Bromocriptine, an ergot alkaloid, inhibits the release of prolactin from the hypophysis (12). Administration of bormocriptine decreases circulating prolactin levels of male rats (13). Since PRL enhances the male fertility (1-11), its blocking might possibly decrease the male fertility. PRL receptor sites have been detected on testis and accessory sex organs of rat (14, 15). Epididymis is an important accessoy duct system and the administration of prolactin enhances its growth and activities (8). However, there has been no report on the epididymal activities under hypoprolactinemic condition. Hence, an attempt has been made to study the metabolic profiles of epididymis during higher and lower concentration of prolactin.

MATERIAL AND METHODS

Adult male Wistar strain albino rats (70±2 days old and 160±5 *g* body weight) were administered with bromocriptine (Sandoz Pharmaceuticals Ltd., Switzerland) 20 *µg*

per rat daily for 15 datys (16). The other group of six rats received subcutaneous injections of ovine prolaction (OPRL-15, AFP-4585 NIH, Bethesda, USA) at a concentration of 1 $\mu g/g$ body weight dissolved in physiological saline, 0.9% NaCl, for 5 days (5,6). The two groups of control rats received similar volume of the vehicle (Physiological saline). The rats were maintained at laboratory conditions (12:12 hours light : dark intervals) and fed on standard rat pellet diet obtained from Hindustan Lever Ltd., Bombay, India, and water was supplied *ad libitum*. All the animals were sacrificed by cervical dislocation 24 hours after the last injection and the epididymis was isolated carefully with minimum mechanical stress or injury. The adhering blood stain and damp was blotted out and used for furthr biochemical study.

The tissue somatic index (TSI) was determined gravimetrically by using the formula :

$$TSI = \frac{\text{Weight of organ}}{\text{Weight of the body}} \times 100$$

Glucose and glycogen (17), lactic acid (18) and the activity levels of sorbitol dehydrogenase, glucose-6-phosphate dehydrogenase (19), acid phosphatese and alkaline phosphatase (20), phosphorylase (21), aldolase (22), ATPase (23), alanine aminotransferase (AlAT), aspartate aminotransferase (AAT) (24) were estimated by the methods referred to. All the enzyme assays were made under the conditions following zero order kinetics after preliminary standardization regarding linearity with respect to time of incubation and enzyme concentration. The method of Gupta (25) was employed for statistical processing of the data.

RESULTS AND DISCUSSION

The data presented in the Table I reveal the extent of changes in the epididymal metabolic events after the administration of PRL and bromocriptine independently. ATPase activity was significantly elevated in the presence of PRL and inhibited in the presence of bromocriptine, indicating the accelerating and inhibitory roles of PRL and bromocriptine respectively on epididymal energy metabolism. Glycogen contet was markedly elevated with depletion of glucose on PRL administration. Since epithelial cells of epididymis store glycogen as carbohydrate reserve for sperm maturation (8), the elevated glycogen content might be suggestive of energy substances in the cells. This observation indicates maturation events in the presense of PRL. In view of inhibited activity of phosphorylase 'a' decreasee glycogenolysis and consequent decrease in glucose content can be expected in the presence of PRL. The decline in the free glucose content in the presence of PRL might also be due to its mobilization towards the formation of fructose In contrast, the activity of phosphorylase 'a' was increased with elevation in glucose level in the presence

TABLE I : Effect of PRL and bromocriptine on the metabolic profiles of rat epididymis. Values are mean±S. D. of 6 individual observations.

Component	*Control*	*PRL*	*Bromocriptine*
Tissue Somatic Indices (TSI)	0.16±0.01	0.21±0.01*	0.15±0.001 NS
ATPase (*μmol* of Pi/*mg* protein/h)	9.89±0.92	14.53±1.25*	6.39±0.52*
G-6-PDH (*μmol* of formazan/*mg* protein/h)	1.40±0.11	1.82±0.09*	1.08±0.01*
Glycogen (*mg/g* dry wt)	0.44±0.02	1.01±0.10*	0.23±0.002*
Phosphorylase 'a' (*μmol* of Pi/*mg* protein/h)	1.26±0.09	0.84±0.001*	1.79±0.01*
Phosphorylase 'b (*μmol* of Pi/*mg* protein/h)	0.57±0.09	1.54±0.08*	0.29±0.001*
Glucose (*mg/g* dry wt)	2.45±0.94	0.98±0.003*	3.49±0.09*
Sorbitol dehydrogenase (*μmol* of formazan/*mg* protein/h)	1.40±0.11	2.81±0.09*	0.08±0.001*
ACP (*μmol* of Pi/*mg* protein/jh)	15.54±1.24	20.97±1.97*	9.72±0.92*
ALP (*μmol* of Pi/*mg* protein/h)	17.51±1.09	22.29±2.13*	11.23±1.04*
Aldolase (*μmol* of FDP cleaved/*mg* protein/h)	1.20±0.07	2.89±0.14*	0.94±0.004*
Lactate (*mg/g* dry wt)	23.46±1.02	28.02±2.05*	14.95±1.45*
AlAT (*μmol* of pyruvate/*mg* protein/h)	1.01±0.09	1.96±0.009*	0.70±0.00*
AAT (*μmol* of pyruvate/*mg* protein/h)	0.95±0.08	1.73±0.01*	0.41±0.02*

*=Statistically significant ($P<0.001$) over control values. NS = Not significant.

of bromocriptine. The activity of sorbitol dehydrogenase was elevated by PRL, suggesting the enhanced fructogenic activity of epididymis. Activity of acid and alkaline phosphatases were elevated in PRL administered rat epididymis. Since these enzymes are androgen dependent (26), the present pattern indicates the role of PRL in androgen mediated activation of the epididymal metabolic events. However, in the presence of bromocriptine these activities were inhibited.

The activity of aldolase, which marks the tissue glycolysis was elevated by the administration of PRL and hence epididymal glycolysis seems to be activated by the hormone. In contrast, bromocriptine inhibited aldolase activity with decrease in lactic acid content. Since lactic acid can stimulate spermatozoa (11), PRL seems to provide congennial conditions for the sperm stimulation in the epididymis, while bromocriptine seems to be inhibiting the same.

G-6-PDH which marks the HMP shunt was elevated in the presence of PRL, indicating the operation of hexose monophosphate shunt in the tissue in the presence of this hormone. This enzyme activity was also assoiated with the formation of steroid hormones (27), enhanced steroidogenesis in the presence of PRL and inhibition in the presence of bromocriptine can be envisaged. The activities of amino transferases, namely, AIAT and AAT were activated in the presence of PRL and inhibited in the presence of bromocriptine. Since these enzymes are directly associated with sperm motility and sperm density (9). PRL mediated activation of sperm maturation and male fertility and bromocriptine mediated inhibition of sperm maturation can be envisaged.

In general it can be concluded that the PRL was enhancing the activities of androgen dependent enzymes of epididymis and thereby seems to have direct role on epididymal function. In contrast bromocriptine seems to inhibit epididymal function possibly through blocking of PRL release from the pituitary.

ACKNOWLEDGEMENTS

The authors (YDR and KVR) are grateful to ICMR and CSIR, New Delhi for the award of research fellowships and NIH, Bethesda, U.S.A. for generous supply of OPRL.

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