CHAPTER - I

(Prolactin induced tissue gravimetric changes)
INTRODUCTION

Prolactin, hypophysial gonadotrophic hormone exerts a variety of physiological roles in different animals, besides its specific participation in reproduction (Hafiez et al., 1972a, b; Huston et al., 1972; Berle et al., 1974; Byachenko, 1974; Bartke et al., 1975; Mathur et al., 1975; Aragona et al., 1975; Sheth et al., 1975; Louvet and Vatukaitis, 1975; Joseph and Rubak, 1975; Croft and Bartke, 1975; Saito and Brij, 1975; Tyson et al., 1975; Tada et al., 1975; Stoudemire et al., 1975; Derby, 1975; Walvoord et al., 1976; Shah et al., 1976; Rubin et al., 1976; Wuttke et al., 1976; Lone et al., 1976; Brown et al., 1976; Barx and Bartke, 1977; Sheth et al., 1977; Hostetter et al., 1977; Varma et al., 1977; Camper and Burke, 1977; Spanor et al., 1977; Oliverlav et al., 1977; Yamaguchi and Ikuoyasamatsu, 1977). PRL is known to mimic growth hormone, thereby resulting in an induction of overall elevation in tissue weights of all the reproductive tissues of rats and mice (Keenan and Thomas, 1975; Hosteller and Pia-sak, 1977). PRL administration to mice resulted in an accelerated testicular growth, with simultaneously elevated fertility (Cavellero et al., 1963; Bartke, 1966, 1967; Bartke and Lloyd, 1970). However there are conflicting reports on the induction of growth in reproductive tissues by PRL treatment. Seminal vesicles are shown to increase their weights without
any change in testicular weights of adult rats on PRL administration (Sheriff and Govindarajulu, 1975). But a number of reports confirmed the elevated weight of prostatic gland in rats and mice on treatment with PRL (Yamanaka et al, 1975; Bartke et al, 1975; Thomas and Nanandhar, 1975; Walvoord et al, 1975; Walvoord et al, 1976). In some other reports PRL was shown to increase the weight of ventral prostate with no significant change in the weights of testis, dorsolateral prostate and seminal vesicles of rat (Battatreyamurthy, 1975). Hence the reports on the gravimetric changes of reproductive tissues on PRL administration are not only conflicting but also contradictory. Besides the information pertaining to the changes in the non-reproductive tissues on PRL administration is non-existing and scanty. Since increase in testicular weight was correlated with increased fertility (Bartke et al, 1975) in mature rats, it will be interesting to study the possible weight changes in reproductive and nonreproductive tissues of immature rats in response to PRL treatment. Besides, from the growth rate pattern of the normal rat tissues, it will be possible to correlate the PRL induced weight changes towards the advancement of puberty. The work correlating the gravimetric changes of reproductive tissues with the extent of advancement of puberty in immature rats is not available.
Since PRL is known to increase the weight of reproductive tissues, it might be inducing either synthetic activities in the tissues and thereby increasing the mass, and/or accumulating water. PRL is widely reported to take an active part in the osmo-regulatory properties of tissues (Ogawa, 1974; Johnson et al., 1974; Mainoya, 1975; Ogawa, 1975; Holt and Perks, 1975; Chan et al., 1975; Oduleye, 1976; Doseen, 1976). PRL administration induces fluid absorptions across the jejunal walls in rats, along with increased transport of glucose, glycine, proline and other organic nutrients besides ions (Mainoya and James, 1975a, b, c; Mainoya et al., 1975). However, there are contradictory reports where PRL was shown to decrease the permeability of water across the membranes of various tissues in different animals (Ogawa, 1974; Johnson et al., 1974; Foster Roy, 1975; Hiranto, 1975; Ogawa, 1975; Holt et al., 1975). Thus there are conflicting reports on the permeability of water and its accumulation in response to PRL administration. Moreover, the information pertaining the changes in the dry weight of the tissues on PRL administration is not available.

The activity of cholinesterases is shown to be directly influenced by the sex hormones (James and Kanungo, 1978). The AChE activity in nervous and non-nervous tissues of mature and breeding animals was more than the immature and non-breeding
animals (Radha Pant et al., 1978). Hence AchE activity is directly correlated towards the reproductive activity of the animals. Moreover, AchE activity has been widely recognized to indicate tissue responsiveness and alertness, since the enzyme activity was higher in all the active tissues over the inactive tissues (Knowlton and Hines, 1937; Reidig and Williams, 1949; Cannon and Rosenblueth, 1949; Vander Koot, 1955; Nachamson, 1959; Diamond and Miledi, 1959; Miledi, 1960; Thesleff, 1960a, b; Eccles and Liley, 1960; Tyschchenko and Mandelstam, 1965; Venkatachari and Murali Krishna Rass, 1968; Murali Mohan and Murali Krishna Rass, 1969).

In view of the foregoing account, an attempt has been made in the present study to analyse PRL induced tissue gravimetric changes of immature rats towards the extent of advancement of puberty, by taking tissue weights and tissue somatic indices. Since there is no information available on the changes in tissue dry weights and AchE activity and contradictory reports exist on changes in tissue water content on PRL administration, an attempt has been made to analyse these components in reproductive and non-reproductive tissues and to correlate these changes with reproductive activity of the PRL treated animals.
RESULTS

The data presented in tables 1-13 and figures 1-7 indicate the changes in tissue responsiveness in terms of tissue somatic indices (TSI), total weight of individual tissues, percentage water content, dry weight and AcHE activity in immature albino rats on PRL administration.

PRL induced overall increase in TSI of reproductive and non-reproductive tissues in comparison to control (Table 1-3; Fig. 3). The percent increase of TSI over the controls indicated maximum rise in seminal vesicles followed by epididymis, prostate gland and testis respectively (Fig. 3). Among the non-reproductive tissues maximum and minimum percent elevations in TSI were recorded by muscle and kidney in response to PRL treatment.

The total organ weights of reproductive and non-reproductive tissues were shown to be elevated over the control animals on PRL administration. The growth rate pattern of these organs in normal rats were plotted (Fig. 1, 2). The extent of increase in the total weight of these organs in PRL treated animals indicated that they were grown to the sizes of advanced age groups of normal rats. The extent of growth of these organs showed that seminal vesicles have grown maximally while testicular growth was minimum (Fig. 1). From the
growth rate curves of the normal rats, the tissue weights in PRL treated animals showed that seminal vesicles have increased in size which would normally be found in 45 days old rats. Similarly epididymis, prostate gland and testis have shown the weight ranges of 35, 30 and 28 days rats respectively on PRL administration (Fig. 1). Among the non-reproductive tissues both brain and kidney had the growth similar to the weight of these organs in 28 days old rats while liver and muscle showed the growth similar to those of 30 days old rats under the influence of PRL (Fig. 2). In general, reproductive tissues were found to have more advancement in tissue growth than the non-reproductive tissues (Fig. 1, 2) on PRL administration. Thus PRL seems to increase the growth of reproductive and non-reproductive tissues to that of advanced age groups on 26th day of experimentation.

In general, all the tissues studied accumulated water content in response to PRL administration (Table 4-6). Epididymis accumulated maximum water content while testis had minimum water accumulation on PRL treatment among all the tissues studied.

PRL administration in general elevated the dry weights of all the tissues studied. Maximum percent elevation of dry matter was in seminal vesicles while testis has minimum increase among all the tissues studied.
PRL administration elevation elevated AcH activity of all the tissues studied, maximum elevation being in epididymis and minimum being in liver over the controls (Table 10–12; Fig. 6). However the pattern of enzyme activity was entirely different when the values were represented to wet weight of the tissues (Table 13).

**DISCUSSION**

TSI of reproductive and non-reproductive tissues have been taken for study since they were considered as the convenient measures for indicating the proportion of different organs in the body (Gutman, 1962). PRL administration elevated TSI of all the tissues studied over the control animals suggesting higher growth rate of these organs than the body growth in response to PRL.

Since PRL has been widely known to mimic the growth hormone, it will be likely that all the tissues might have been actively involved in growth process in response to PRL, which might have been responsible for the increased TSI of the organs in the experimental animals. PRL administration releases testosterone (Hafiez et al., 1972a, b). Since testosterone exerts anabolic influence on several tissues (Williams-Ashman, 1962; Thomas and Manandhar, 1975; Keenan and Thomas, 1975; Yamanaka et al., 1975; Walvoord et al., 1976; Thomas et al., 1976), it was likely that the combined effect of PRL growth hormone
PRL-like influence and mediation through testosterone might be responsible for the overall growth of the tissues observed in the present study. In general reproductive tissues have shown maximum elevation in percent TSI in comparison to the non-reproductive tissues, indicating higher responsiveness of reproductive tissues to PRL. Since PRL being gonadotropic hormone, its influence on gonads and sex accessories might be more than the non-reproductive tissues which might explain the differential levels of increase in TSI of reproductive and non-reproductive tissues. Even among the reproductive tissues sex accessories showed higher percent elevation TSI than the testis. This observation might suggest the onset of higher rate of functioning by sex accessories than the testis in response to PRL. The higher rate of functioning by sex accessories in immature rats might be a pre-requisite for providing optimal conditions for maturation and maintenance of spermatozoa. At the same time elevated TSI of the testis in PRL treated animals suggest the possibility of the onset of early testicular functioning in the immature rats. The increase in tissue weights observed in the present study in response to PRL treatment is in agreement with the results of earlier workers (Keenan and Thomas, 1975; Yamanaka et al., 1975; Bartke et al., 1975; Hostetter and Piacsek, 1977).

Among the non-reproductive tissues both muscle and brain showed higher levels of percent increase in TSI than
liver and kidney in response to PRL administration. This observation suggests the possibility of higher influence of PRL on excitatory tissues.

When compared to the growth rate pattern of reproductive and non-reproductive tissues in normal rats, the PRL treated animal organs showed the weights which were existing in higher age group rats. The seminal vesicles of the PRL treated animals showed their weight equal to that of the weight of the organ found at 45 days old rat at 26th day. Similarly epididymis, prostate gland and testis have shown their weights equal to the weights of these organs found at 35, 30 and 28 days old rats respectively at the age of 26 days. These observations suggested that PRL could induce higher growth rate of reproductive organs than the normal rats, which might be responsible for initiation of structural and functional activation of these tissues at the earlier periods than the normal course. Hence it can be suggested that PRL was probably responsible for advancing the age of functioning of reproductive system in immature albino rats. Since the sex accessories were advanced to higher ages than the testis, it might be possible that sex accessories are more activated, than the testis, which forms a pre-requisite for the maturation processes. In the light of this information it can be further suggested that the sex accessories are more responsive towards PRL administration.
Similarly non-reproductive tissues also indicated the possibility of advancement of functioning since their growth rates were in advance to that of normal rate. Both brain and kidney had the weights similar to the weights of these organs found at 28 days old rats and liver and muscle had weights similar to the weights of these organs found at 30 days old rats at 26th day.

This advancement of the growth rate of the non-reproductive tissues suggest the operation of growth hormone like effect of PRL and the anabolic effect of testosterone. Thus PRL might be influencing the organs both directly and through the androgen mediation.

The elevated levels of TSI in response to PRL might be due to the setting in of active synthetic activities or due to accumulation of water. PRL has been widely known to be concerned with tissue osmotic and ionic regulations in various animals (Holt and Perks, 1975; Chan et al., 1975; Mainoya and James, 1975a, b, c; Mainoya et al., 1975; Foster Roy, 1975; Hiranto, 1975; Debnam and Snart, 1976; Falconer et al., 1977). All the tissues of the body studied had elevated percentage of water in the experimental animals, hence these tissues might have accumulated in response to altered osmotic properties induced by PRL administration. Thus increase in water content was also partly responsible for the drastic

R$ \text{Rs}

591.16

R 141
increase in the TSI in PRL treated animals. However more accumulations of water might not explain the extent of rise in TSI. Besides the accumulation of water, active synthesis of organic constituents might also be expected in view of anabolic effects of PRL (Keenan and Thomas, 1975; Yamanaka et al., 1975; Bartke et al., 1975; Walvoord et al., 1976; Hostetter and Piacsek, 1977). Hence total dry weights of the tissues have been estimated and found in PRL treated animals that all the tissues had elevated levels of total dry matter. Among the reproductive tissues, the present rise in total dry matter was more in sex accessories than the testis, suggesting the occurrence of more synthetic activities in sex accessories. Among the sex accessories, seminal vesicles recorded maximum percent increase in dry matter, suggesting the onset of net glandular growth which may be a pre-requisite for the onset of its function. Both epididymis and prostate gland had considerable elevation in their dry matter, indicating the possible induction of structural growth and secretory function in them in response to PRL administration. However testicular tissue accumulated least dry matter among all the reproductive tissues suggesting the possibility of initiation of testicular function.

All the non-reproductive tissues studied also recorded increase in dry matter in PRL treated animals, suggesting the overall anabolic effects of the hormone.
AchE activity level was found to be elevated significantly in all the tissues studied in response to PRL administration, when the values were represented to unit dry weight. However when the same was represented per unit wet weight non-significant changes were observed in some tissues while in other, there was inhibition of the enzyme activity. This discrepancy might be due to PRL induced differential water accumulation in the tissues. Hence in order to avoid the interference of water in the tissues the values are expressed to unit dry weight.

AchE activity forms an index of tissue responsiveness and alertness (Hachamson, 1953; Mires, 1955; Koelle, 1965). It was also found to be dependent on physiological state of the tissue, since the enzyme activity was higher in all the active tissues and its inhibition represents inactive condition (Knowlton and Hines, 1937; Reidig and Williams, 1949; Cannon and Rosenblueth, 1949; Diamond and Miledi, 1959; Miledi, 1960a; Thesleff, 1960a, b; Eccles and Liley, 1960; Tyschchenko and Mandel Stamm, 1965). Since all the tissues recorded elevated AchE activity in experimental animals, it can be suggested that they were responsive and alert towards the PRL administration. The elevated tissue AchE activity might also be correlated towards initiation of maturation processes, since it was reported that the increase in this enzyme activity was associated with maturity and reproductively active phase of the animal (Radha Pant et al., 1978).
Sex steroids elevate tissue \(\text{AchE}\) activity (James and Kenungo, 1978). PRL administration increases plasma androgen levels (Hafiez et al., 1972a, b). Hence the observed increase in tissue \(\text{AchE}\) activity in the present study, in response to PRL administration might suggest the androgen mediated influence of PRL on the tissues of immature rats.

Thus PRL administration can be suggested to exert androgen mediated anabolic effects on the reproductive and non-reproductive tissues of rats. These anabolic effects in immature rats might initiate the functional responsiveness which might advance the age of reproductive functioning in immature rats.
Sex steroids elevate tissue AChE activity (James and Kanungo, 1978). PRL administration increases plasma androgen levels (Hafiez et al., 1972a, b). Hence the observed increase in tissue AChE activity in the present study, in response to PRL administration might suggest the androgen mediated influence of PRL on the tissues of immature rats.

Thus PRL administration can be suggested to exert androgen mediated anabolic effects on the reproductive and non-reproductive tissues of rats. These anabolic effects in immature rats might initiate the functional responsiveness which might advance the age of reproductive functioning in immature rats.
Table 1

Table showing tissue somatic indices (TSI) of reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats.

<table>
<thead>
<tr>
<th>Testis</th>
<th>Epididymis</th>
<th>Seminal vesicles</th>
<th>Prostate gland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
</tr>
<tr>
<td>0.469</td>
<td>0.494</td>
<td>0.156</td>
<td>0.238</td>
</tr>
<tr>
<td>0.420</td>
<td>0.487</td>
<td>0.165</td>
<td>0.197</td>
</tr>
<tr>
<td>0.418</td>
<td>0.494</td>
<td>0.117</td>
<td>0.185</td>
</tr>
<tr>
<td>0.351</td>
<td>0.464</td>
<td>0.117</td>
<td>0.173</td>
</tr>
<tr>
<td>0.381</td>
<td>0.473</td>
<td>0.121</td>
<td>0.182</td>
</tr>
<tr>
<td>0.412</td>
<td>0.470</td>
<td>0.148</td>
<td>0.168</td>
</tr>
</tbody>
</table>

* 0.405  * 0.480  * 0.137  * 0.190  * 0.049  * 0.076  * 0.069  * 0.086
± 0.034  ± 0.013  ± 0.021  ± 0.025  ± 0.007  ± 0.009  ± 0.015  ± 0.007

+18.52  +38.68  +55.10  +24.64
p < 0.001  p < 0.001  p < 0.001  p < 0.001

* indicates mean values
+ indicates % increase over control - indicates % decrease
± means standard deviation.
### Table - 1. A.

Table showing total wet weight of the reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats. Values expressed in mg.

<table>
<thead>
<tr>
<th></th>
<th>Testis</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
</tr>
<tr>
<td>101</td>
<td>129</td>
<td>34</td>
<td>51</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>105</td>
<td>132</td>
<td>30</td>
<td>49</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>107</td>
<td>125</td>
<td>37</td>
<td>54</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>96</td>
<td>128</td>
<td>35</td>
<td>49</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>99</td>
<td>130</td>
<td>32</td>
<td>52</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>102</td>
<td>129</td>
<td>34</td>
<td>50</td>
<td>6</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Testis</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>101.66</td>
<td>128.83</td>
<td>33.66</td>
<td>50.66</td>
<td>5.63</td>
<td>19.50</td>
</tr>
<tr>
<td>+3.98</td>
<td>+2.32</td>
<td>+2.42</td>
<td>+2.16</td>
<td>+1.75</td>
<td>+1.52</td>
</tr>
</tbody>
</table>

+ indicates mean values.
+ indicates % increase over control - indicates % decrease.
+ means standard deviation.
Table 2

Table showing tissue somatic indices (TSI) of non-reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats.

<table>
<thead>
<tr>
<th></th>
<th>Brain</th>
<th>Liver</th>
<th>Kidney</th>
<th>Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
</tr>
<tr>
<td></td>
<td>2.529</td>
<td>3.353</td>
<td>3.980</td>
<td>4.466</td>
</tr>
<tr>
<td></td>
<td>2.853</td>
<td>2.987</td>
<td>3.283</td>
<td>3.739</td>
</tr>
<tr>
<td></td>
<td>2.325</td>
<td>2.826</td>
<td>3.285</td>
<td>3.702</td>
</tr>
<tr>
<td></td>
<td>2.845</td>
<td>3.052</td>
<td>3.045</td>
<td>3.884</td>
</tr>
<tr>
<td></td>
<td>2.532</td>
<td>3.346</td>
<td>3.365</td>
<td>3.656</td>
</tr>
<tr>
<td></td>
<td>2.681</td>
<td>2.962</td>
<td>3.462</td>
<td>3.961</td>
</tr>
</tbody>
</table>

* 2.627  * 3.087  * 3.403  * 3.904  * 1.229  * 1.356  * 0.653  * 0.769
+ 0.205  + 0.215  + 0.314  + 0.248  + 0.116  + 0.022  + 0.058  + 0.082

+17.51  +14.72  +9.44  +17.76
P < 0.001  P < 0.001  P < 0.01  P < 0.05

* indicates mean values.
+ indicates % increase over control - indicates % decrease.
± means standard deviation.
### Table 2A

Table showing total wet weight of non-reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats. Values expressed in mg.

<table>
<thead>
<tr>
<th></th>
<th>Brain</th>
<th>Liver</th>
<th>Kidney</th>
<th>Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
</tr>
<tr>
<td>657</td>
<td>833</td>
<td>851</td>
<td>1054</td>
<td>309</td>
</tr>
<tr>
<td>690</td>
<td>825</td>
<td>846</td>
<td>1042</td>
<td>300</td>
</tr>
<tr>
<td>662</td>
<td>832</td>
<td>858</td>
<td>1048</td>
<td>312</td>
</tr>
<tr>
<td>652</td>
<td>829</td>
<td>849</td>
<td>1056</td>
<td>308</td>
</tr>
<tr>
<td>656</td>
<td>830</td>
<td>852</td>
<td>1054</td>
<td>318</td>
</tr>
<tr>
<td>658</td>
<td>821</td>
<td>856</td>
<td>1062</td>
<td>312</td>
</tr>
</tbody>
</table>

|       |        |         |         |         |         |         |         |         |
| 655.83| 829.16 | 851.83  | 1052.67 | 309.83  | 366.82  | 164.0   | 207.00  |
| ±4.31 | ±3.19  | ±4.58   | ±6.59   | ±5.25   | ±5.23   | ±5.69   | ±3.53   |

+26.43  +23.58  +18.39  +26.22
P<0.001  P<0.001  P<0.001  P<0.001

* indicates mean values.

+ indicates % increase over control  - indicates % decrease.

‡ means standard deviation.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tissues</th>
<th>Control</th>
<th>Experimental</th>
<th>% Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Testis</td>
<td>0.405 ± 0.034</td>
<td>0.490 ± 0.013</td>
<td>+18.518</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>2.</td>
<td>Epididymis</td>
<td>0.137 ± 0.021</td>
<td>0.190 ± 0.025</td>
<td>+38.60</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>3.</td>
<td>Seminal vesicles</td>
<td>0.049 ± 0.007</td>
<td>0.076 ± 0.035</td>
<td>+55.10</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>4.</td>
<td>Prostate gland</td>
<td>0.069 ± 0.001</td>
<td>0.086 ± 0.007</td>
<td>+24.64</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>5.</td>
<td>Brain</td>
<td>2.627 ± 0.205</td>
<td>3.087 ± 0.215</td>
<td>+17.51</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>6.</td>
<td>Liver</td>
<td>3.403 ± 0.314</td>
<td>3.904 ± 0.248</td>
<td>+14.72</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>7.</td>
<td>Kidney</td>
<td>1.239 ± 0.116</td>
<td>1.356 ± 0.022</td>
<td>+9.44</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>8.</td>
<td>Muscle</td>
<td>0.653 ± 0.058</td>
<td>0.760 ± 0.082</td>
<td>+17.76</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

+ indicates % increase over control = indicates % decrease
± means standard deviation.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tissue</th>
<th>Control</th>
<th>Experimental</th>
<th>% Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Testis</td>
<td>101.66 ± 3.98</td>
<td>128.83 ± 2.32</td>
<td>+ 25.72</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2.</td>
<td>Epididymis</td>
<td>33.66 ± 2.42</td>
<td>50.88 ± 2.16</td>
<td>+ 50.50</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3.</td>
<td>Seminal vessels</td>
<td>5.83 ± 0.75</td>
<td>19.50 ± 1.52</td>
<td>+ 234.47</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>4.</td>
<td>Prostate gland</td>
<td>16.50 ± 1.52</td>
<td>23.00 ± 1.41</td>
<td>+ 39.00</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>5.</td>
<td>Brain</td>
<td>655.83 ± 4.31</td>
<td>829.16 ± 3.19</td>
<td>+ 26.43</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>6.</td>
<td>Liver</td>
<td>651.83 ± 4.58</td>
<td>1052.67 ± 6.89</td>
<td>+ 23.58</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>7.</td>
<td>Kidney</td>
<td>309.83 ± 5.95</td>
<td>360.83 ± 5.23</td>
<td>+ 18.39</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>8.</td>
<td>Muscle</td>
<td>164.0 ± 5.69</td>
<td>207.0 ± 3.57</td>
<td>+ 26.22</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

+ indicates % increase over control - indicates % decrease
* indicates standard deviation
Table 4

Table showing percentage water content of reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats.

<table>
<thead>
<tr>
<th>Testis</th>
<th>Epididymis</th>
<th>Seminal vesicles</th>
<th>Prostate gland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
</tr>
<tr>
<td>84.00</td>
<td>85.29</td>
<td>65.30</td>
<td>87.80</td>
</tr>
<tr>
<td>81.54</td>
<td>85.14</td>
<td>66.67</td>
<td>85.77</td>
</tr>
<tr>
<td>80.66</td>
<td>81.81</td>
<td>59.52</td>
<td>77.41</td>
</tr>
<tr>
<td>80.00</td>
<td>84.51</td>
<td>68.57</td>
<td>75.86</td>
</tr>
<tr>
<td>85.50</td>
<td>89.10</td>
<td>67.25</td>
<td>70.68</td>
</tr>
<tr>
<td>82.96</td>
<td>89.10</td>
<td>63.13</td>
<td>76.25</td>
</tr>
<tr>
<td>83.28</td>
<td>84.02</td>
<td>65.09</td>
<td>78.96</td>
</tr>
<tr>
<td>+6.00</td>
<td>+1.31</td>
<td>+3.29</td>
<td>+6.51</td>
</tr>
</tbody>
</table>

+2.1          +21.3         +2.56          +6.99

P > 0.05      P < 0.001     P > 0.05       P < 0.01

* indicates mean values.
+ indicates % increase over control = indicates % decrease.
± means standard deviation.
Table 5

Table showing percentage water content of non-reproductive tissues in control (saline administered) and experimental (prolactin administered) immature male albino rats.

<table>
<thead>
<tr>
<th></th>
<th>Brain</th>
<th></th>
<th>Liver</th>
<th></th>
<th>Kidney</th>
<th></th>
<th>Muscle</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td>Control</td>
<td></td>
<td>Control</td>
<td></td>
<td>Control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td></td>
<td>Experimental</td>
<td></td>
<td>Experimental</td>
<td></td>
<td>Experimental</td>
<td></td>
</tr>
<tr>
<td>60.62</td>
<td>63.19</td>
<td>70.70</td>
<td>73.19</td>
<td>73.75</td>
<td>83.29</td>
<td>74.53</td>
<td>78.97</td>
<td></td>
</tr>
<tr>
<td>79.47</td>
<td>82.56</td>
<td>69.46</td>
<td>71.72</td>
<td>74.57</td>
<td>77.37</td>
<td>73.84</td>
<td>75.05</td>
<td></td>
</tr>
<tr>
<td>77.84</td>
<td>81.26</td>
<td>68.47</td>
<td>71.54</td>
<td>70.63</td>
<td>78.49</td>
<td>69.19</td>
<td>77.73</td>
<td></td>
</tr>
<tr>
<td>78.61</td>
<td>80.98</td>
<td>69.15</td>
<td>71.07</td>
<td>72.70</td>
<td>77.70</td>
<td>73.73</td>
<td>79.04</td>
<td></td>
</tr>
<tr>
<td>79.28</td>
<td>80.33</td>
<td>68.25</td>
<td>68.75</td>
<td>71.28</td>
<td>76.05</td>
<td>70.16</td>
<td>77.85</td>
<td></td>
</tr>
<tr>
<td>80.16</td>
<td>82.32</td>
<td>69.16</td>
<td>70.70</td>
<td>73.16</td>
<td>76.26</td>
<td>72.15</td>
<td>79.15</td>
<td></td>
</tr>
</tbody>
</table>

* 79.36 * 81.77 * 69.23 * 71.07 * 72.65 * 76.66 * 72.27 * 78.45
±1.06 ±1.08 ±0.93 ±2.41 ±3.17 ±2.34 ±2.17 ±0.66

+2.52 +2.6 +8.27 +8.55
p > 0.05 p > 0.05 p < 0.001 p < 0.001

* indicates mean values.
+ indicates % increase over control - indicates % decrease
± means standard deviation.
Table - 6

Consolidated table showing percentage water content of reproductive and non-reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tissues</th>
<th>Control</th>
<th>Experimental</th>
<th>% Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Testis</td>
<td>62.28 ± 6.0</td>
<td>64.02 ± 1.31</td>
<td>+ 2.1</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>2.</td>
<td>Epididymis</td>
<td>65.09 ± 3.29</td>
<td>76.96 ± 6.51</td>
<td>+21.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3.</td>
<td>Seminal vesicles</td>
<td>73.06 ± 3.82</td>
<td>75.49 ± 4.02</td>
<td>+2.56</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>4.</td>
<td>Prostate gland</td>
<td>71.60 ± 3.59</td>
<td>76.61 ± 3.64</td>
<td>+6.00</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>5.</td>
<td>Brain</td>
<td>79.36 ± 1.06</td>
<td>81.77 ± 1.02</td>
<td>+2.52</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>6.</td>
<td>Liver</td>
<td>60.23 ± 0.93</td>
<td>71.07 ± 2.41</td>
<td>+2.60</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>7.</td>
<td>Kidney</td>
<td>72.85 ± 3.17</td>
<td>70.66 ± 2.34</td>
<td>+8.27</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>8.</td>
<td>Muscle</td>
<td>72.27 ± 2.17</td>
<td>78.45 ± 0.66</td>
<td>+8.55</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

+ indicates % increase over control - indicates % decrease
\[\pm\] means standard deviation.
<table>
<thead>
<tr>
<th></th>
<th>p &gt; 0.05</th>
<th>p &gt; 0.05</th>
<th>p &gt; 0.05</th>
<th>p &gt; 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
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<tr>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
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<tr>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td>0.70</td>
<td>0.70</td>
<td>0.70</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
</tr>
</tbody>
</table>

Table 2: Showing total dry weight or reproduction tissue in control (saline adenotrope) and experimental (protection adenotrope) groups. Values are expressed in mg.
Table - 8

Table showing total dry weight of non-reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats. Values expressed in mg.

<table>
<thead>
<tr>
<th></th>
<th>Brain</th>
<th>Liver</th>
<th>Kidney</th>
<th>Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
</tr>
<tr>
<td>162.00</td>
<td>178.00</td>
<td>367.00</td>
<td>412.00</td>
<td>92.00</td>
</tr>
<tr>
<td>181.00</td>
<td>188.00</td>
<td>310.00</td>
<td>361.00</td>
<td>102.00</td>
</tr>
<tr>
<td>185.00</td>
<td>187.00</td>
<td>372.00</td>
<td>380.00</td>
<td>107.00</td>
</tr>
<tr>
<td>182.00</td>
<td>194.00</td>
<td>281.00</td>
<td>349.00</td>
<td>87.00</td>
</tr>
<tr>
<td>174.00</td>
<td>210.00</td>
<td>295.00</td>
<td>330.00</td>
<td>100.00</td>
</tr>
<tr>
<td>181.00</td>
<td>187.00</td>
<td>302.00</td>
<td>385.00</td>
<td>105.00</td>
</tr>
</tbody>
</table>

*177.5 190.16 324.15 369.5 98.83 109.00 52.16 56.66
*8.40 12.35 43.27 30.70 77.78 10.48 4.92 3.50

+7.13 +13.66 +11.30 +6.73

p > 0.05 p < 0.05 p < 0.05 p < 0.05

* indicates mean values.
+ indicates % increase over control - indicates % decrease.
± means standard deviation.
Consolidated table showing total dry weight of reproductive and non-reproductive tissues in control (Saline administered) and experimental (Prolactin administered) immature male albino rats. Values expressed in mg.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tissues</th>
<th>Control</th>
<th>Experimental</th>
<th>% Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Testis</td>
<td>24.66 ± 2.65</td>
<td>26.0 ± 2.28</td>
<td>+ 5.43</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>2</td>
<td>Epididymis</td>
<td>13.0 ± 2.708</td>
<td>15.0 ± 2.89</td>
<td>+ 15.38</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>3</td>
<td>Seminal vessels</td>
<td>4.0 ± 0.89</td>
<td>5.67 ± 1.211</td>
<td>+ 41.75</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>4</td>
<td>Prostate gland</td>
<td>6.33 ± 0.51</td>
<td>7.83 ± 0.753</td>
<td>+ 23.69</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>5</td>
<td>Brain</td>
<td>177.5 ± 8.4</td>
<td>190.16 ± 12.35</td>
<td>+ 7.13</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>6</td>
<td>Liver</td>
<td>324.5 ± 43.27</td>
<td>369.5 ± 30.7</td>
<td>+ 13.86</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>7</td>
<td>Kidney</td>
<td>98.83 ± 7.782</td>
<td>109.0 ± 10.48</td>
<td>+ 11.30</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>8</td>
<td>Muscle</td>
<td>52.16 ± 4.916</td>
<td>58.66 ± 3.5</td>
<td>+ 6.73</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

+ indicates % increase over control - indicates % decrease.

± means standard deviation.
Table 10

Table showing levels of acetyl cholinesterase activity (ACHE) in reproductive tissues of control (Saline administered) and experimental (Prolactin administered) immature male albino rats.

Values expressed in u moles Ach Hydrolysed/gm dry wt/hour.

<table>
<thead>
<tr>
<th></th>
<th>Testis</th>
<th>Epididymis</th>
<th>Seminal vesicles</th>
<th>Prostate gland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
</tr>
<tr>
<td>Control</td>
<td>141.00</td>
<td>234.75</td>
<td>71.50</td>
<td>172.18</td>
</tr>
<tr>
<td>Experimental</td>
<td>143.82</td>
<td>233.18</td>
<td>72.93</td>
<td>173.37</td>
</tr>
<tr>
<td>Control</td>
<td>142.41</td>
<td>231.62</td>
<td>68.64</td>
<td>173.47</td>
</tr>
<tr>
<td>Experimental</td>
<td>144.67</td>
<td>236.31</td>
<td>74.36</td>
<td>176.94</td>
</tr>
<tr>
<td>Control</td>
<td>145.23</td>
<td>242.09</td>
<td>75.79</td>
<td>179.64</td>
</tr>
<tr>
<td>Experimental</td>
<td>142.41</td>
<td>139.44</td>
<td>70.78</td>
<td>174.56</td>
</tr>
</tbody>
</table>

* 143.25  236.36  72.33  175.03  157.03  174.14  114.43  175.03
+1.57  +4.18  +2.57  +2.77  +3.66  +5.10  +1.25  +3.14

+65  +140.98  +10.77  +52.06
p < 0.001  p < 0.001  p < 0.001  p < 0.001

* indicates mean values.
+ indicates % increase over control = indicates % decrease
± means standard deviation.
Table - 11

Table showing levels of Acetyl cholinesterase activity (ACHE) in non-reproductive tissues of control (Saline administered) and experimental (Prolactin administered) immature male albino rats. Values expressed in μ moles of Ach hydrolysed/gm dry wt./hr.

<table>
<thead>
<tr>
<th></th>
<th>Brain</th>
<th>Liver</th>
<th>Kidney</th>
<th>Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Experimental</td>
<td>Control</td>
<td>Experimental</td>
</tr>
<tr>
<td>405.35</td>
<td>452.19</td>
<td>134.06</td>
<td>142.72</td>
<td>86.92</td>
</tr>
<tr>
<td>408.20</td>
<td>454.80</td>
<td>136.02</td>
<td>144.05</td>
<td>84.85</td>
</tr>
<tr>
<td>401.72</td>
<td>450.21</td>
<td>130.28</td>
<td>140.21</td>
<td>85.21</td>
</tr>
<tr>
<td>402.93</td>
<td>456.85</td>
<td>135.25</td>
<td>143.16</td>
<td>92.65</td>
</tr>
<tr>
<td>407.82</td>
<td>472.16</td>
<td>136.82</td>
<td>142.72</td>
<td>83.21</td>
</tr>
<tr>
<td>403.21</td>
<td>462.86</td>
<td>133.52</td>
<td>143.18</td>
<td>85.21</td>
</tr>
</tbody>
</table>

\* 404.37 \* 458.16 \* 134.66 \* 142.81 \* 86.34 \* 141.75 \* 114.17 \* 167.20
\+2.19 \+8.14 \+2.72 \+1.49 \+3.31 \+2.64 \+2.97 \+1.77

\+13.35 \+6.05 \+64.17 \+47.13
P < 0.001 P < 0.001 P < 0.001 P < 0.001

* indicates mean values.
+ indicates % increase over control - indicates % decrease.
\= means standard deviation.
Table - 12

Consolidated table showing levels of acetylcholinesterase activity in reproductive and non-reproductive tissues of control (Saline administered) and experimental (Prolactin administered) immature male albino rats. Values expressed as moles Ach hydrolysed per dry wt./hour

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tissues</th>
<th>Control</th>
<th>Experimental</th>
<th>% Difference</th>
<th>P Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Testis</td>
<td>143.25 ± 1.59</td>
<td>236.36 ± 4.18</td>
<td>+ 65.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2.</td>
<td>Epididymis</td>
<td>72.33 ± 2.57</td>
<td>175.03 ± 2.77</td>
<td>+145.98</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3.</td>
<td>Seminal vesicles</td>
<td>157.20 ± 3.66</td>
<td>174.13 ± 5.10</td>
<td>+ 10.77</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>4.</td>
<td>Prostate gland</td>
<td>114.43 ± 1.25</td>
<td>175.03 ± 3.14</td>
<td>+52.96</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>5.</td>
<td>Brain</td>
<td>404.37 ± 2.19</td>
<td>450.16 ± 0.14</td>
<td>+ 13.35</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>6.</td>
<td>Liver</td>
<td>134.66 ± 2.72</td>
<td>142.81 ± 1.49</td>
<td>+ 6.95</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>7.</td>
<td>Kidney</td>
<td>86.34 ± 3.31</td>
<td>141.75 ± 2.64</td>
<td>+ 64.17</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>8.</td>
<td>Muscle</td>
<td>114.17 ± 2.97</td>
<td>167.98 ± 1.77</td>
<td>+ 47.13</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

+ indicates % increase over control - indicates % decrease

± means standard deviation.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Tissue</th>
<th>Control</th>
<th>Experimental</th>
<th>% Difference</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Testis</td>
<td>25.4 ± 0.28</td>
<td>37.62 ± 0.47</td>
<td>+48.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2.</td>
<td>Epididymis</td>
<td>25.29 ± 0.90</td>
<td>36.51 ± 0.48</td>
<td>+44.36</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>3.</td>
<td>Seminal vesicles</td>
<td>41.47 ± 0.97</td>
<td>42.57 ± 1.25</td>
<td>+2.65</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>4.</td>
<td>Prostate gland</td>
<td>32.5 ± 0.35</td>
<td>41.04 ± 0.86</td>
<td>+26.27</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>5.</td>
<td>Brain</td>
<td>83.38 ± 0.3</td>
<td>82.42 ± 0.26</td>
<td>-1.15</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>6.</td>
<td>Liver</td>
<td>41.23 ± 0.66</td>
<td>41.29 ± 0.20</td>
<td>+0.02</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>7.</td>
<td>Kidney</td>
<td>23.73 ± 0.05</td>
<td>30.42 ± 0.12</td>
<td>+28.19</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>8.</td>
<td>Muscle</td>
<td>31.34 ± 0.85</td>
<td>36.34 ± 0.25</td>
<td>+15.95</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

+ indicates % increase over control - indicates % decrease
± means standard deviation.
Fig. 1: Growth rate curves showing the pattern of growth of reproductive tissues in normal rats during pre and post puberal periods. The weights of the PRL treated animal tissues were intercepted to obtain the corresponding age to indicate the advancement in the growth of the tissues.

Fig. 2: Growth rate curves showing the pattern of growth of non-reproductive tissues in normal rats during pre and post puberal periods. The weights of the PRL treated animal tissues were intercepted to obtain the corresponding age to indicate the advancement in the growth of the tissues.
**Fig. 1**

- **T** = 28 days
- **E** = 35 days
- **S** = 45 days
- **P** = 30 days

**Fig. 2**

- **B** = 28 days
- **L** = 30 days
- **K** = 28 days
- **M** = 30 days
Fig. 3: Histograms showing percentage difference of PRL treated rat tissues over the controls in tissue somatic indices.

Fig. 3A: Histograms showing percentage difference of PRL treated rat tissues over the controls in total wet weight.

Fig. 4: Histograms showing percentage difference of PRL treated rat tissues over the controls in water content.

Fig. 5: Histograms showing percentage difference of PRL treated rat tissues over the controls in total dry weight.

Fig. 6: Histograms showing percentage difference of PRL treated rat tissues over the controls in the levels of acetylcholinesterase activity, represented to unit dry weight.

Fig. 7: Histograms showing percentage difference of PRL treated rat tissues over the controls in the levels of acetylcholinesterase activity, represented to unit wet weight.