

# Influence of Melatonin and L – thyroxine to thymic cellular structure in a seasonally breeding rodent *Funambulus pennanti*

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## Abstract:

The pineal gland and its principal neurohormone melatonin have been explored as a gland of physiological importance. However, another significant thyroid gland has proved its importance. Looking such view, we have focused our study on immunologically important thymic gland's cellularity in a seasonally breeding rodent *Funambulus pennanti*. Pinealectomized squirrel revealed no clear-cut demarcation between thymic cortex and medulla region. Severe depletion of thymocytes in cortical region were observed. Melatonin treatment to the pinealectomized squirrels showed restoration of the thymic cellular structure. However, surgical of thyroid gland caused depletion of thymocytes in thymic lobules when compared to the sham control squirrels. L-thyroxine to the thyroidectomized squirrels showed almost same cellular architecture to that of sham control squirrels. Moreover, melatonin treatment along with L-thyroxine showed dense population of thymocytes in the cortex region. Study suggest synergistic action of both hormones on thymic cellularity.

**Key words:** Melatonin, L- Thyroxine, thymocytes, synergistic action, thymic cellularity

## Introduction:

The role of pineal gland and its principal neurohormone melatonin in the immune modulation have recently attracted most researchers. During the last twenty years the experimental evidences describing bidirectional interrelationships (Conti and Maestroni 1994). The lymphoid organs such as spleen, lymph nodes and thymus are found to have its involvement in immune function. The pineal gland and its hormone melatonin can affect lymphatic tissue sizes. Exposure of male and female hamster to short days or daily afternoon melatonin injections elevated splenic mass (Vaughan et al 1987). The development of thymolymphatic tissue is dependent on the integrity of the endocrine system in avian species studied (Bachman and Mashaly 1987). The thyroid gland and its hormone have been reported to influence reproduction and metabolism (Lewinski 1990). The Pineal and its hormone melatonin have been shown to affect thyroid function (Shavali and Halder 1998).

There is no report available to date explaining the role melatonin and L-thyroxine and their respective gland in immunologically important organ thymus and its cellularity in seasonally breeding rodent Indian palm squirrel *Funambulus pennanti*. Therefore, the present study has been undertaken to elucidate the hormonal influence on thymic cellularity.

## Material and Methods:

Adult male Indian palm squirrels approximately of same age one year (weighing 110±10 g) were taken for the study. The animals were maintained on food and water *ad libitum* in wire

net cages (25''X25''X30'' in size) exposed to natural day length (11L:13D) and temperature 13-22°C. Melatonin and L-thyroxine was purchased from Sigma Chem. Co. USA. Melatonin solution was made by dissolving it in few drops of 10% ethanol and diluted in normal saline (0.9% NaCl) up to desired concentration. The solution was stored at 4°C in the amber coloured bottle. L- thyroxine was simply dissolved in alkaline saline (0.01N NaOH). Thyroxine was injected at the dose of 35 µg/squirrel/day and melatonin 25µg/squirrel/day, subcutaneously during the evening hrs. (4.30-5.00PM). Histological study was performed following the Hematoxylin and Eosin staining Procedures.

## Results:

### Thymic Cellular architecture:

The thymus of the thyroidectomized squirrels revealed no clear-cut demarcation between thymic cortex and medulla region. Depletion of thymocytes in cortical region were observed following thyroidectomy. A disproportional increase of epithelial cells and connective tissue elements were observed. Hassall's corpuscles were cystic with pycknotic cells. The cortex and medulla having more hollow space. The L-thyroxine treatment to the thyroidectomized squirrels showed restoration of the thymic cellular architecture. Further, melatonin treatment along with L-thyroxine to the thyroidectomized squirrels showed dense population of thymocytes in the thymic cortex region and restoration of thymic cellularity (Fig.01.).

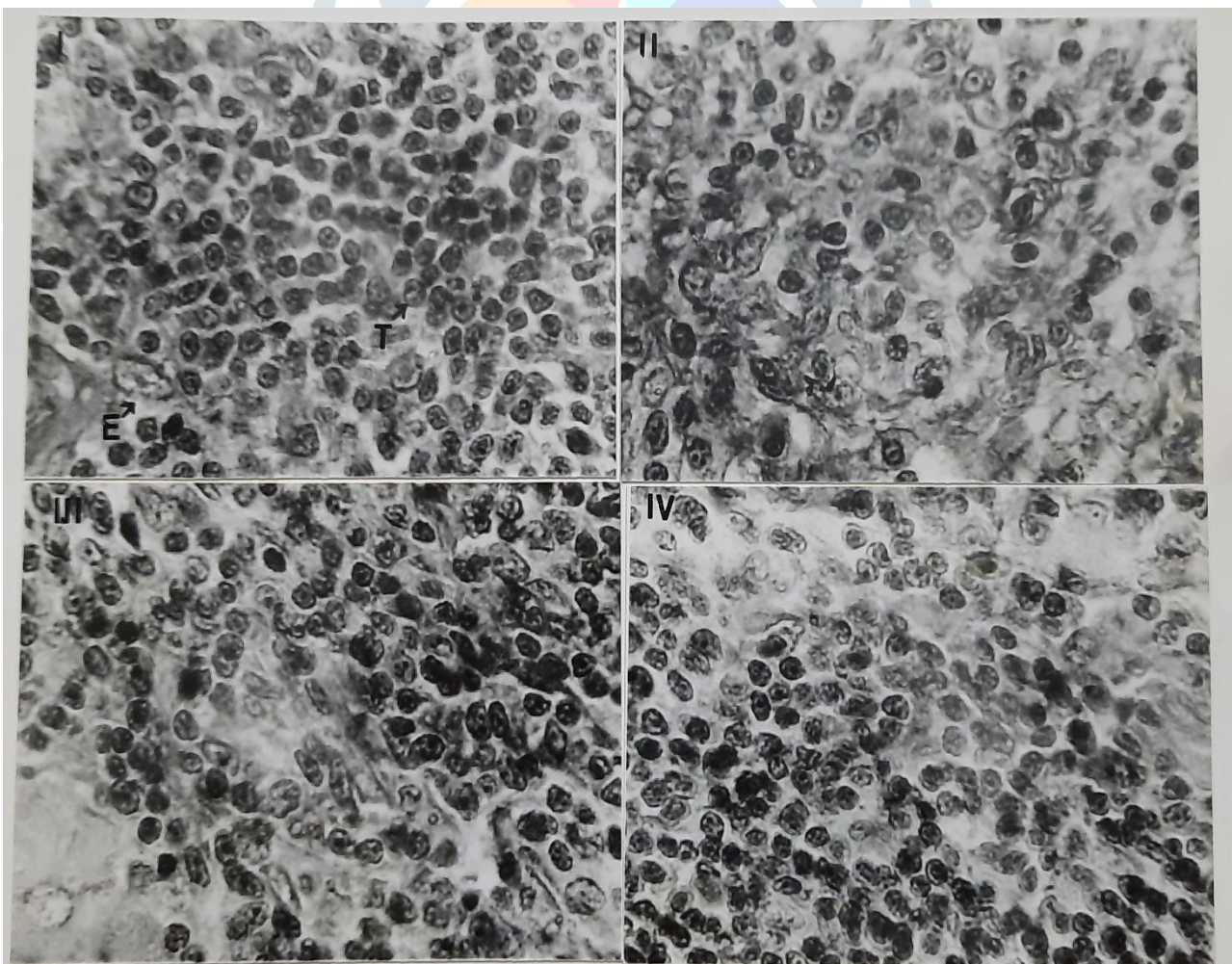


Fig.01. Histology of the thymus gland of I- Sham - control squirrel II- Thyroidectomized squirrel, III – L-thyroxine treated thyroidectomized squirrels, IV- Melatonin and L-thyroxine treated thyroidectomized squirrels X365

### Discussion:

It has been demonstrated that thymus growth is negatively influenced by removal of thyroid (Fabris and Piantanelli 1982). However, Thyroxine has been shown to influence sex steroid and reproductive function (Vidhu 1992, Shavali and Haldar 1998). Further thyroid and its hormones have been reported to modulate mitogen responsiveness, skin graft rejection time and antibody response to T-dependent antigen (Ong et al.1986). In the present experiment our observation in change of thymic cellularity supports the earlier reports that thyroidectomy caused lymphoid organs weight loss and throxine treatment restored the same. Scheift et al. (1997) have reported that thyroid hormones modulate the endocrine function by causing epithelial cell proliferation, which is known to synthesize thymic hormones. Melatonin treatment has shown synergistic action in restoring the thymic cellularity of L- thyroxine hormone. Our study on thymic cellularity indirectly support the melatonin and L-thyroxine modulated immune function in seasonally breeding rodent *Funambulus pennanti*.

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