

STUDIES ON THE PITUITARY GLAND  
OF THE INDIAN PALM SQUIRREL,  
*FUNAMBULUS PENNANTI*  
(WROUGHTON)

THE cytology of the pituitary gland has been reviewed by Purves.<sup>1</sup> Dawson<sup>2</sup> described two tinctorially distinct acidophil cell types in the pituitary glands of 34 mammalian species. In these exhaustive reviews no mention is made of studies on the pituitary of any member of the family Sciuridae. Hoffman and Zarrow<sup>3</sup> have briefly described the changes in periodic acid-Schiff positive cells of the pituitary gland of the ground squirrel *Citellus tridecemlineatus*. The present report includes an account of the cytology of the pituitary gland of the Indian palm squirrel *Funambulus pennanti*.

Pituitaries from sexually mature male and female squirrels collected from the vicinity of the campus of the University of Delhi were fixed in Formol saline and Dawson's fixative. Serial sections cut at 5  $\mu$  were stained in Mallory Triple stain (MTS), Crossmon's modification of the MTS<sup>4</sup> and periodic acid-Schiff-Orange G (PAS/OG) of Purves and Griesbach<sup>5</sup> for the tinctorial differentiation of the various cell types.

The pituitary gland of the palm squirrel is divisible into three distinct parts namely, pars anterior, pars intermedia and pars nervosa. The hypophyseal cleft is distinct and separates the pars anterior from the pars intermedia. The basophil cells are distributed throughout the pars anterior with greater concentrations in the antero-median zone and along the lateral margins. The acidophils are localised mostly in the central portions of the lateral regions and along their inner margin facing the pars intermedia.

Consecutive sections stained in MTS or Crossmon's stain and PAS/OG reveal four chromophil cell types. Two of these belong to the basophil cell class and the other two to the acidophil cell class. This classification is based on stainability, shape, size, granulation and disposition of the cells in the pars anterior. One of the basophil cell types which is coarsely granulated is stained dark-blue with MTS and magenta with PAS. These cells occupy the lateral portions of the pituitary gland and predominantly but not exclusively border the sinusoidal walls. They are round or ovoid with an eccentrically placed nucleus and a prominent nucleolus. Some cells exhibit a well-developed juxtannuclear Golgi apparatus which is composed of a dark staining inner zone surrounded by a clear space. These cells exhibit marked

differences in number between the two sexes, being lesser in the females than in the male squirrels. They increase in number and granulation following gonadectomy and are therefore considered to be responsible for the secretion of gonadotrophic hormones. They are similar to the  $\delta$ -cells of Halmi<sup>6</sup> and the gonadotrophs of Purves and Griesbach.<sup>5</sup> The gonadotrophs represent both the follicle stimulating hormone (FSH) secreting and luteinizing hormone (LH) secreting cells. A tinctorial differentiation between the FSH and LH secreting cells so characteristically seen in the rat pituitaries following PAS-methyl blue staining (Rennels<sup>7</sup>) was not possible in the pituitary of the palm squirrel. Interspersed between the gonadotrophs are some light staining basophils which resemble the gonadotrophs in all respects except in staining intensity. Whether these cells constitute a separate cell type or denote a different stage in the secretory cycle of the gonadotrophs is not clear. The latter is more probable.

The second basophil cell type is large, round or polyhedral and is confined to the antero-median zone of the pars anterior. These cells are light blue after MTS, pink after PAS and purple after the aldehyde fuchsin stain (Gomori<sup>8</sup>). The cytoplasm is finely granulated and shows a large Golgi zone in some cells. These basophils neither show differences in number, distribution and granulation between the two sexes nor do they show any change after gonadectomy or during pregnancy and lactation. They are, however, affected by thyroidectomy. On the basis of these criteria it is inferred that these large, light staining cells secrete thyrotrophin. They are termed thyrotrophs and correspond to  $\beta$ -cells of Halmi<sup>6</sup> and thyrotrophs of Purves and Griesbach.<sup>5</sup>

A tinctorial differentiation is made between the gonadotrophs and thyrotrophs with the performic acid-Alcian blue/PAS/OG technique of Adams and Sloper<sup>9</sup> where the gonadotrophs are stained purple and the thyrotrophs are stained pink.

Two types of acidophils are recognised in the pituitary of the palm squirrel. In the pituitary glands of male and non-pregnant, non-lactating female squirrels one type of acidophil cell is stained red with MTS, and orange in Crossmon's stain and PAS/OG. These are termed orangeophils as suggested by Lacour.<sup>10</sup> They are seen in clusters of 3-8 cells and generally occupy the interior of the inter-sinusoidal spaces. These cells are small, rounded and possess a dense coarsely granulated cytoplasm. They do not fluctuate either in number or in granulation in



mature squirrels of both sexes and in females during pregnancy and lactation. They are considered to be responsible for the production of somatotrophic hormone (STH).

In pregnant females another tinctorially distinct cell type appears which is brown in MTS and purple after Crossmon's stain. These cells are large, coarsely granulated and possess a hypertrophied Golgi apparatus. These are termed carminophils as suggested by Friedgood and Dawson.<sup>11</sup> Their number which is small in early pregnancy increases as pregnancy advances. In late pregnancy and lactation the carminophils dominate the acidophil cell population and are possibly associated with the secretion of luteotrophic hormone (LTH).

The two types of acidophils are stained bright blue selectively with mercury bromophenol blue (Mazia *et al.*<sup>12</sup>) which provides a useful counterstain after PAS for the differentiation of the acidophils. A detailed account of the cytology and histochemistry of the pituitary gland will be published elsewhere.

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