CHAPTER - II

SEASONAL ALTERATIONS IN THE WEIGHTS OF PANCREAS, SPLEEN AND UROPYGIUM IN NORMAL AND PINEALECTOMISED DOMESTIC PIGEONS, *COLUMBA LIVIA*

Since the recognition of pineal as an active structure involved with many bodily activities like reproduction, thermoregulation and circadian activity, it is being studied for its possible inter-relationship with many other organs of the body. Though the major brunt of such investigations has been directed towards gonads, adrenal and throid have also received attention. As its influence over gonads are characterised as either pro or antigonadal, similar clearcut characterisation of its influence over adrenal and thyroid have not come about due to the variable results obtained in terms of species, season etc. Both positive and negative relationship have been observed between pineal and the two endocrine glands (Ishibashi *et al.*, 1966; Houssay *et al.*, 1966 b; Kinsen and Singer, 1967; Kinsen *et al.*, 1967; Houssay and Pazo, 1968; Ogle and Kitay, 1976; Haldar and Thapliyal, 1979; Cogburn and Harrison, 1980).

A previous study on wild pigeons had demonstrated season specific alterations of adrenals and thyroid post-pinealectomy (Patel, 1982). In the same study alterations in weight of pancreas, spleen and uropygium too were noted in response to pinealectomy. In the previous chapter, the adrenal and thyroid of

domestic pigeons have been shown to undergo parallel changes with the gonads in response to pinealectomy conducted during breeding and non-breeding seasons. Since weight changes had been noted with respect to pancreas, spleen and uropygium in wild pigeons and as certain definite alterations in carbohydrate metabolism is induced due to pinealectomy (Patel, 1982 & Chapter 3) and uropygium is known to be a target organ for gonadal steroids, morphometric studies of these organs have been attempted herein on a seasonal basis in normal and pinealectomised domestic pigeons.

MATERIAL AND METHODS

Adult domestic pigeons were procured from the local animal dealer and were maintained in the aviary for a fortnight under natural photoperiod regimen for acclimation before using them for experimental work. The birds were brought from the aviary and their body weight noted. They were then divided into three groups of eighteen each; Group-I - intact control (C), group-II - sham pinealectomised (PN) and group-III - pinealectomised (PX). All the three groups of birds with proper markings were maintained under similar conditions on a diet of grains and water ad libitum. At the end of 30, 45 and 60 days post-pinealectomy/sham operation, six birds from each group were sacrificed under mild anæsthesia and their pancreas, spleen and uropygium excised blotted free of tissue fluids and weighed. Similar studies

were carried out during the breeding and non-breeding seasons.

RESULTS

The results are represented in table 1 and figures 1 to 3. Of the three organs, spleen showed maximum weight during the breeding season, while uropygium and pancreas had maximum weight during the non-breeding period in the intact birds. The decrease in weight of spleen from the breeding to the non-breeding season was about 26 %. Uropygium and pancreas which showed increase in weights during the non-breeding period was about 30 % and 11 % respectively.

Pinealectomy in the breeding season brought about reduction in weights of the spleen while the uropygial gland showed an increase in its weight. Both these organs recorded increase and decrease in weight respectively during the non-breeding season. In contrast to these two organs, the pancreas depicted increase in weight in pinealectomised birds during both the seasons. Noticeably, the decrease in weight of uropygium and the increase in weight of spleen which occurred post-pinealectomy in the non-breeding season was evident from the late breeding phase itself. The average increase in weight of uropygium during the breeding period was about 27 % while that of the pancreas was 18 % . The reduction in weight of the spleen at the same time was 35 % . During the non-breeding season the uropygial weight fell by 29 %

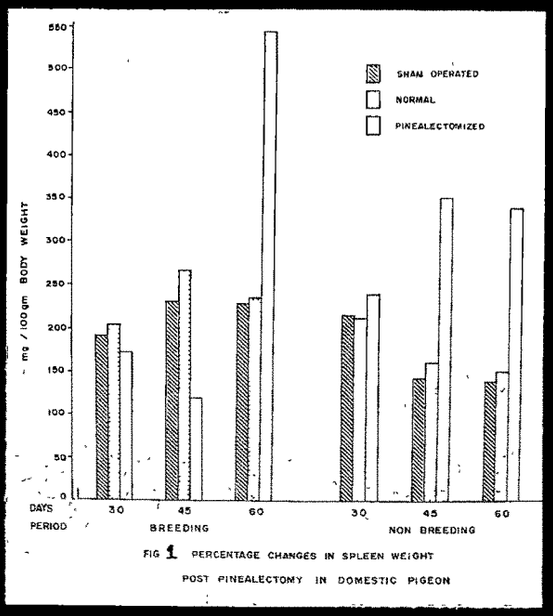

FIG 1 PERCENTAGE CHANGES IN SPLEEN WEIGHT POST PINEALECTOMY IN DOMESTIC PIGEON

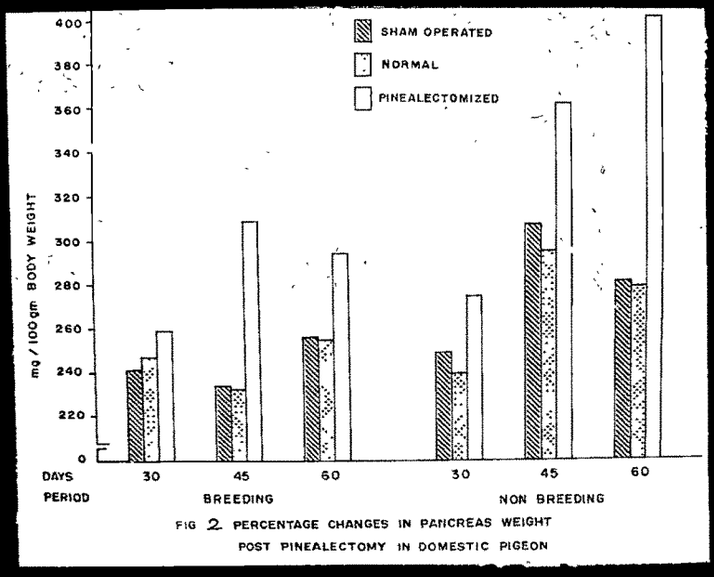

FIG 2. PERCENTAGE CHANGES IN PANCREAS WEIGHT POST PINEALECTOMY IN DOMESTIC PIGEON

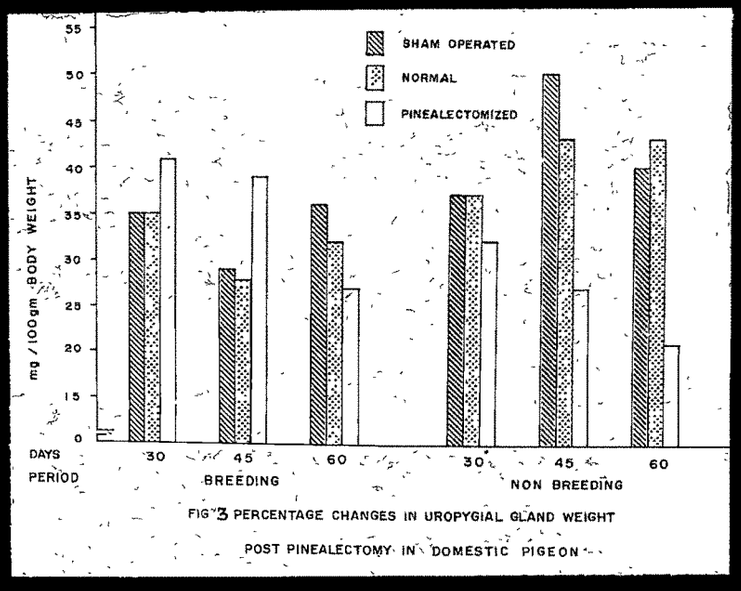

FIG 3 PERCENTAGE CHANGES IN UROPYGIAL GLAND WEIGHT POST PINEALECTOMY IN DOMESTIC PIGEON

and that of spleen and pancreas increased by about 96 % and 27 % respectively.

DISCUSSION

The results obtained in the present study are suggestive of breeding associated seasonal alterations influencing even organs such as spleen, pancreas and uropygium. Pancreas being involved in both digestion of food in the alimentary canal and regulation of carbohydrate metabolism, could be expected to undergo some histosomatic alteration in response to the changing needs of the animal from the breeding phase to the non-breeding phase. The comparatively lesser weight of this organ during the breeding season may be due to the increased secretory activity of both its components (i.e. exocrine and endocrine). The 25 % increase in spleen weight noted during the breeding period may suggest the increased haemopoietic demands of the physiological changes associated with breeding. Interestingly, higher spleen weight during the recrudescent period in wild pigeons has also been noted (Patel, 1982). Just as the pancreas, the uropygium also showed increased weight during the non-breeding phase than the breeding. Being a target organ for steroid hormones, the possible accumulation of lipoidal secretory material during the non-breeding whence the titre of gonadal steroid is also low may have some relevance on the observed increase in weight during non-breeding.

In the previous chapter (Chapter 1), pinealectomy has been shown to bring about histomorphological alterations of the gonads, adrenals and thyroid during breeding as well as non-breeding. The present morphometric studies also indicate alterations in pancreas, spleen and uropygium due to pinealectomy. The changes in spleen weight tend to provide further evidence to a parallel relationship between gonadal activity and spleen, an observation which is identical to that reported for in wild pigeons in the recrudescent period (Patel, 1982). However, maximal spleen weight was recorded in the breeding period of pinealectomised wild pigeons while it was so recorded only in the non-breeding period of domestic pigeons. The observation of increased thyroid activity induced by pinealectomy occuring in the case of wild pigeons during the breeding period (Patel, 1982) and in the case of domestic pigeons during the non-breeding period may be relevant in the present context and could suggest a positive thyroid-spleen relationship. Pinealectomised birds in the present study have shown increased uropygial weight during breeding and significantly more pronounced decreased weights during non-breeding, obviously an inverse relationship with gonadal activity which was also found to be true for wild pigeons. It is interesting that while the spleen and uropygium have both depicted a differential seasonal alteration in response to pinealectomy the pancreas tended to show a common response in the form of increase in weight. This is in contrast to the observation of decrease in weight in wild pigeons (Patel,1982).

Apparently, the pineal-pancreas axis has a differential relationship in the two species, a fact which is corroborated by the variations in modulations of carbohydrate metabolism noted to occur in relation to breeding and non-breeding in the pinealectomised members of the two species.