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SUMMARY

CHAPTER I

To evaluate the role of corticosterone (CORT) on testicular functions and thyroid activity in intact and pinealectomised (PX) feral pigeons, pigeons were subjected to adrenocortical suppression by dexamethasone (DXM) in the breeding season or were treated with corticosterone in the regression phase and the histomorphological changes in testes, thyroid and adrenal and the serum levels of thyroxine (T_4) and CORT were studied. Treatment with DXM induced testicular regression together with reduced adrenocortical activity and low serum CORT level and increased thyroid activity and elevated serum T_4 level. Pinealectomised pigeons also showed similar set of changes. Corticosterone administration to intact birds in the regression phase reduced thyroid activity and lowered serum T_4 level, was however unable to reverse the involutionary changes of testis. More interestingly, CORT administration to PX pigeons either in the breeding phase or regression phase was without any effect on thyroid or testis. Based on these observations, it was concluded that CORT has an inhibitory influence on the hypothalamo-hypophysial-thyroid (HHT) axis resulting a parallel adrenal-testes and inverse thyroid-testes relationship in the breeding season. Accordingly, decreased

CORT level increase thyroid activity and exerts its inhibitory action on the hypothalamo-hypophysial-Gonad (HHG) axis in the late breeding, leading to testicular regression. Further it is concluded that the inhibitory influence of CORT on the HHT axis requires an intact pineal alluding to a parallel adrenal-pineal interaction.

CHAPTER II

Influence of exogenous CORT on thyroid activity and testicular histomorphology in feral pigeons has been evaluated in the quiescent phase. Apart from increasing the corticomedullary ratio of adrenal, CORT administration resulted in colloid retention and reduced cell height in the thyroid. These changes were parallelled by decrease serum level. Some degree of testicular activation were visible in the form of spermatogonial proliferation, though the tubules did not show any enlargement. The results suggest that the inhibitory influence of CORT on the HHT axis is manifested in the quiescent phase and that though a permissive mileu in the form of increased CORT: T_4 ratio is induced, it is however without any significant influence on initiation of spermatogenesis.

CHAPTER III

Circannual variations in carbohydrate metabolism and the influence of adrenocortical suppression in the breeding phase or of CORT administration in the regression or the quiescent phase in intact and PX feral pigeons have been evaluated. In general, some correlation between carbohydrate metabolism and reproductive phase is discernable. Accordingly, tissue glycogen content, decreased,and blood glucose level increased in the breeding and recrudescent phases, while reverse set of changes occurred in the regression and non-breeding phases. Induced adrenocortical insufficeincy in the breeding season decreased blood glucose level and increased liver, muscle and testis glycogen contents, changes characteristic of the non-breeding phase. Conversely, CORT administration in the regression and non-breeding phases increased blood glucose level and decreased tissue glycogen contents. Corticosterone administration to PX birds potentiated the PX effects of hypoglycemia and decreased tissue glycogen contents. In can be concluded from the present observations that circannual variations in carbohydrate metabolism are related to testicular cyclicity and that, CORT has a modulatory influence on carbohydrate metabolism which is essentially expressed only in the background of a permissive level of melatonin.

CHAPTER IV

Circannual variations in tissue ascorbic acid (AA) content and the influence of adrenocortical suppression in the breeding phase or of CORT administration in the regression or the quiescent phases in intact and pinealectomised feral pigeons have been evaluated. The results reveal that a positive ascorbic acid balance is parallel with adrenocortical activity and testicular functions. Induced hypocorticalism and PX in the breeding season decreased hepatic and adrenal AA contents and increased testicular AA contents, changes parallelled by reduced adrenocortical activity and testicular involution. Conversely, CORT treatment in the regression or the quiescent phase increased hepatic and testis AA contents. Overall, the present study indicates a parallel relationship between adrenocortical activity and hepatic and adrenal AA content and, an inverse relationship between testicular activity and its AA content. It is also inferred that the ability of CORT to induce a positive AA balance requires an intact pineal.

CHAPTER V

The influence of short term administration of FSH or a combination of FSH and LH either alone or in combination

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with corticosterone (CORT) on testicular histomorphology and activity of adrenal and thyroid has been assessed in the quiescent phase of feral pigeons. Treatment with gonadotropins induced active changes in the seminiferous tubules and the interstitium along with adrenocortical activation. This was reflected in the elevated serum testosterone (T) and CORT levels. Treatment with FSH led to retention of colloid in the thyroid follicles and decrease in cell height while treatment with FSH.LH led to depletion of colloid from the follicles. FSH in combination with CORT produced maximum favourable influence as marked by decreased serum T_4 level and more progressive changes in the seminiferous tubules. The observations suggest that the quiescent testis of feral pigeons are sensitive to gonadotropins and that FSH is probably the principle hormone involved in testicular stimulation. It is also inferred that CORT has a potentiating influence on FSH actions and that FSH itself is able to induce adrenocortical activation.

CHAPTER VI

To test whether testicular activation induced by gonadotropins in the quiescent phase are parallelled by changes in carbohydrate metabolism, the influence of gonadotrophic hormones administered either alone or in combination with CORT on tissue glycogen content and blood

glucose level together with the activity levels of hepatic phosphorylase and glucose-6-phosphatase has been studied in feral pigeons. Treatment with CORT or FSH.LH induced hyperglycemia while treatment with FSH or CORT + FSH induced hypoglycemia. Hepatic glycogen depletion was a common feature under all experimental schedules, treatment with CORT or CORT + FSH increased muscle glycogen content. Testis glycogen content was increased under all experimental conditions. Changes in phosphorylase and G-6-P'ase activity were more or less in accordance with the changes in hepatic glycogen content and blood glucose level. From these changes it is inferable that gonadotrophic hormones can modulate systemic carbohydrate metabolism.

CHAPTER VII

The influence of administration of gonadotrophic hormones either alone or in combination in the quiescent phase on tissue AA content of feral pigeons has been assessed. In general all treatment schedules tended to increase hepatic, adrenal and testis AA contents, more prominently under CORT + FSH schedules. Observations suggest an overall positive AA balance by treatment either with CORT or gonadotrophic hormones or even a combination of both. These changes are similar to those occurring normally during the pre-recrudescent and recrudescent phases. Overall, it is

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concluded that CORT or FSH or more potently a combination of the two has a favourable influence in inducing positive AA balance and in promoting mobilization of AA by the adrenals and testes.