SUMMARY

CHAPTER - 2

Titres of estrogen are known to rise from diestrous to proestrous stage of the estrous cycle (Hori *et al.*, 1968; Butcher *et al.*, 1974). Such a rising level of estrogen was noted to be responsible for rise in glandular glycogen and total lipid concentrations. The estrogen primed tissue, shifting from proestrous to estrous stage and coming under increasing influence of progesterone accompanied by preovulatory LH surge has been suggested to respond to such hormonal conditions by exhibiting maximum level of c.AMP-specific phosphodiesterase activity. Logically, this would lower intracellular c.AMP availablity. These circumstances were attributed to accelerate the rate of glycogen synthesis, despite the fact that there was slight increase in phosphorylase activity. Further, it has been surmized that the overall character of the hormonal *milieu* in the submandibular gland was more in favour of protein synthesis

An abrupt but significant drop in cAMP-PDE activity during metestrous stage was found to facilitate glycogen phosphorylase activation leading to reduction in glycogen. Additionally, glandular protein and lipid conentration were also seen to be reduced. However, reduction in glandular lipids was accompanied, as would be expected, by rise in cholesterol percentage. It was, therefore, noted that catabolic trends are predominent during metestrous stage. During the diestrous stage circulating gonadal hormones are known to be minimal, hence the enzyme activities under investigation registered minimal levels Total lipid and glycogen concentration were seen at their lowest levels. The only obvious exception was that of glandular total protein concentration. This was in consonance with known anabolic influence of low level of estrogenic compounds

Metabolic alterations and their significance through the four stages of the estrous cycle have been discussed in the light of available literature.

CHAPTER-3

Short term effects of ovariectomy (24,48 and 72 H) on glycogen concentration and enzymic activity levels of glycogen phosphorylase, total ATPase, Na^+-K^+ ATPase, c.AMP-PDE , succinate dehydrogenase of the submandibular gland of female rats were studied. Ovariectomy was found to enhance glandular glycogen concentration and the c.AMP-PDE activity at 24 and 48 H post-ovariectomy intervals. However, phosphorylase activity virtually did not respond to absence of gonads. It was suggested that there is enhanced glucose uptake from blood and its incorporation into glandular glycogen. By 72 H of ovariectomy these three parameters were found to get restored to normal condition.

The overall inference that could be drawn from the recorded data upto 72 H interval is that initially there was indication of general acceleration of cellular metabolic activities leading to recovery by 72 H of protein concentration, which was reduced at first two intervals. Similarly, of the fluctuations during first two intervals with respect to other parameters only those of plasma glucose, glycogen and c.AMP-PDE were found to be normalized. This is tentamount to saying that ovariectomy does affect the metabolic patterns of submandibular glands to varying degrees.

CHAPTER-4

The present chapter dealt with the short term (1, 2 and 4 H) influence of replacement with 17β-estradiol (5, 10 and 15 μg / rat) to 48 H ovariectomized rats on same aspects of glycogen metabolism (as in Chapter-3) of the submandibular gland. From the results obtained it became apparent that maximum influence of different doses of 17β–estradiol was noticeable by 2 H post injection interval. 15

μg dose of 17β-estradiol was more effective in bringing about better reparative influence but at 4 H interval. It was apparent that 17β–estradiol administration generally favours glandular catabolic tendency. Further, this influences more of Ca^{++} and Mg^{++} activated ATPase than the Na^{+}-K^{+} ATPase activity.

CHAPTER-5

This chapter dealt with the influence of replacement with 5, 10 and 15 μg of 17β-estradiol alongwith a constant dose of 2 mg of progesterone to 48 H ovariectomized rats on same aspect of glycogen metabolism of the submandibular gland as were considered in preceding two chapters The plasma glucose levels were also assayed From the results obtained it could be seen that an overall catabolic pattern of metabolism induced by administration of estradiol alone in submandibular gland of 48 H ovariectomized rats was reversed to a considerable extent by combination doses . Further, it was noted that 10 μg estradiol plus 2 mg progesterone combination brought about restoration of functional state of submandibular gland of ovariectomized rats more effectively particularly at the 2 H interval. Variation of glycemic levels did not depend on the status of either glandular glycogen concentration or phosphorylase activity

CHAPTER-6

Influence of estrous cyclicity and short-term effects of ovariectomy and replacement with 17β-estradiol and 17β-estradiol plus progesterone on sialic acid concentration of submandibular gland was studied Sialic acid (SA) concentration in the submandibular gland showed cyclic variation, showing highest SA concentration at metestrous stage and lowest at estrous The SA concentration was seen to rise slightly after 24, 48 and 72 H due to ovariectomy as compared to the level at estrous stage.

48H spayed animals, administered with 5 μg E_2 and assayed after 2 H for SA concentration, mimicked fairly well the estrous stage. The other two higher doses were apparently non-physiological. Strangely enough, replacement with combined 15 μg E_2 plus 2 mg dose of P revealed a very high increase in SA concentration of the submandibular gland at 2 H. This unexpected observation remains enigmatic. The only tentative explanation that could be put forward is that, experimentally induced lack of ovarian hormones exerts an adverse influence on the sensitivity of submandibular gland to subsequent administration of combination of E_2 plus P probably by affecting glandular receptors in a qualitative or quantitative manner. It may probably be explained in a better way only with more work.

CHAPTER-7

Influence of estrous cyclicity on some key enzymes of steroid metabolism (3α-, 3β- and 17β- Hydroxysteroid dehydrogenase) in submandibular salivary gland of rat was histochemically studied. Results obtained showed that during the estrous cycle the submandibular gland exhibited general positive reaction as far as 3β- and 17β-HSDH activities are concerned. 3α-HSDH enzyme activity appeared during diestrous stage and remained active through proestrous stage indicating a sort of time-bound sensitivity of submandibular gland. Generally these enzymes activities are commonly localized intensely in granular ducts, whenever present, than in acinar region. It can be seen that the granular duct portions of submandibular glands are capable of effecting metabolic conversions of steroid hormones in general, and the 3α-HSDH activity is brought into play only during diestrous and proestrous stage. Significance of these observation are discussed in relation to estrous cyclicity.