# SUMMARY

The results presented in this investigation elucidate the pre- and postnatal development of the thyroid gland of New Zealand white rabbit using 28 embryos and fetuses at different ages ranging from 10 – 30 days of prenatal life and 28 rabbits ranging between 3 days up till 5 years old. The collected specimens were serially and step-serially sectioned at 4-6 micrometers thick, and then stained with different histological stains for light and an electron microscopic examination.

The bilateral thyroid primordium was recognized at 12 days old rabbit embryos, it appeared as bilateral masses of endodermal cells lying on either side of the tracheal anlage. The endodermal cells were arranged in the form of clumps or branching and anastomosing cords. By the development of the embryo, the cell cords grow due to active proliferation of the endodermal cells, during the growth, the cords were fragmented into shorter portions or clumps. From these clumps, the primitive follicles were developed at 14 days old rabbit embryo. These follicles appeared as small vesicle with narrow empty lumina. As the development proceeded the size of the lobe increased and the gland assumed a bilobed form connected by a narrow cellular isthmus at the $18^{th}$ day of gestation.

The connective tissue stroma begins as undifferentiated mesenchymal cells surrounding the thyroid primordium at 12 days old rabbit embryo. Then it differentiated into newly formed fibroblasts and reticular fibers as well as collagenic fibers at 14 days of pregnancy. The capsule increased in thickness with increasing of age of the fetus and was

mainly formed of collagen, reticular fibers and connective tissue cells with some blood vessels and sinsoids.

True follicles were seen at 20-22 days, while colloid material was seen in their lumina at 24 days old fetuses. Some new follicles were originated from the parent follicles by budding as well as from the ultimobranchial cyst. The follicles increased in size with aging and took a characteristic distribution within the thyroid lobule; the small follicles were centrally located which were more active than the large follicles which located peripherally. In very active follicles, the colloid was uptaken and re-entered the follicular cells by the process of micropinocytosis and appeared in the follicular cytoplasm as colloid droplets. Degenerative changes appeared in the follicular cells of some thyroid follicles especially in senile ages.

The first appearance of the colloid material in the lumen of some follicles specially the central ones at the $24^{th}$ day of gestation but the majority of the follicles still devoid of colloid till the late stage of pregnancy and increased gradually as well as with vacuolations after birth (at the postnatal life) and reached the peak in the adult rabbits but the colloid and the vacuolations decreased gradually with proceeding age till all the follicular lumens lose their colloid and appeared empty in case of highly senile rabbits. The follicular colloid was PAS positive and fuchsinophilic or light green (+ve) or showed double staining reaction as well as giving positive reaction with touilidine blue stain but negative reaction with Alcian blue stain.

The primordia of the ultimobranchial body was observed beside the thyroid lobe at 20 days of gestation as a compact cell mass and then

became embedded into it at 22 day of gestation and then transformed into cystic structures which shared in the formation of the thyroid follicles by budding at the late stage of pregnancy and after birth. They were lined by simple cuboidal or columnar epithelium and sometimes appeared stratified. Some large cells with light staining cytoplasm were observed in the cyst wall. The lumina of some cysts contained colloid-like material. The ultimobranchial cysts persisted in the postnatal life up to senile age but some of them showed degenerative changes and cell debris as well as macrophages appear in their colloid like material.

Few light cells or parafollicular cells were observed firstly at 12 days old embryos scattered between the cell cords and clumps. They were easily observed at 25 days old fetus either singly within the follicular epithelium or in small clusters in the interfollicular spaces as well as between the undifferentiated cell cords and clumps. They were large spherical, oval or polyhedral with lightly stained cytoplasm and large nuclei. Mitotic cell divisions were seen in light cells especially in prenatal life. Some of C-cells migrated as a collection of light cells and directed towards the follicles through the interfollicular connective tissue. The number of C-cell will be decreased in senile ages and some of them showed degenerative changes.

With electron microscopical examination in the prenatal stages the follicular cells appeared in hypoactive state which indicated by the ill-developed cytoplasmic organelles except scattered numbers of RER with dilated cisternae as well as rounded mitochondria. But, with increasing the fetal age till the late stage of pregnancy, some of follicular cells were somewhat active due to presence of euchromatic nucleus as well as most

of cytoplasmic organelles were well developed and distinct. The maximum rate of activity of the follicular cells appeared after birth especially in adult rabbits because of all cytoplasmic organelles which responsible for glycoprotein synthesis and secretion were numerous and well-developed as RER, Mitochondria and Golgi apparatus as well as free ribosomes and lysosomes which were seen fused with the secretory vesicles. The apical parts of the adjacent follicular cells sealed by tight junction, while the lateral borders showed desmosomes The apical plasma membrane bordering the follicular lumen exhibited numerous short finger-like projections or microvilli which extending into light-electron dense colloid. In senile rabbits, the follicular cells appeared in hypoactive state and most of cytoplasmic organelles and the nucleus showed degenerative changes.

In addition, the parafollicular cells were examined ultrastructurally which appeared in hypoactive state in the early prenatal stages, but their activity began at the late stage of pregnancy and increased after birth which showed well-developed RER, numerous free ribosomes as well as considerable amount of electron-dense bodies. In senile rabbits many degenerative changes were observed in the nucleus and the cytoplasmic organelles of the parafollicular cells.

No clear sex difference was observed.