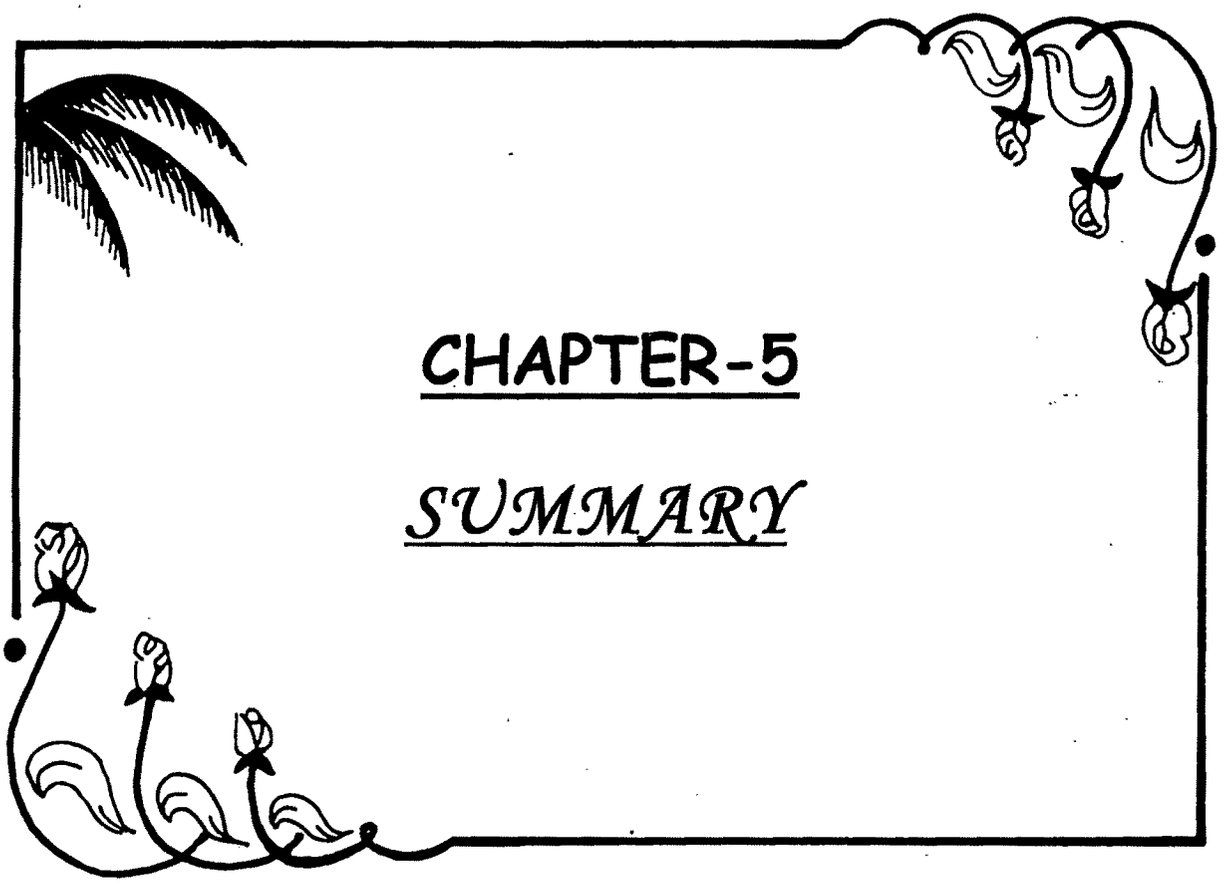

CHAPTER-5

SUMMARY

SUMMARY

Toxic effect of lethal and sub-lethal exposures of heavy metal salt cadmium chloride on the various cells types of gill and the epidermis of a cat fish *Ompok bimaculatus* and an air breathing fish *Lepidocephalichthys guntea* has been described in the present investigation. Toxic impact of cadmium chloride has also been observed on carbohydrate and protein moieties of different cellular components of gill epithelian and epidermis of the fish species under investigation.

96h LC_{50} value using spearman Karber method (Bryon and Brown 1970) for *Ompok bimaculatus* is 292.5 mg/L and for *Lepidocephalichthys guntea* is 388.7mg/L.

GILLS

Two types of toxic effects-lesions and reactions are observed in gills in present investigation. Lesions are characterized by degenerative changes in epithelial cells at different regions of the gill and reaction includes epithelial lifting, fusion of gill lamellae, hypertrophy, hyperplasia, mucous cell proliferation, mucous secretion and acidophil proliferation.

Degeration in epithelial cells in gill arch, gill filament and gill lamellae of *Ompok bimaculatus* and*Lepidocephalichthys guntea* at different duration of cadmium treatment is charactierised by nuclear pyknosis, breaking of cell membrane, cytoplasmic disintegration and exfoliation of epithelial cells.

Upliftment of epithelial cells in gill lamellae from basement membrane of pillar cells leaving sub-epithelial space between pillar cell and epithelial lining at different duration of lethal and sub-lethal exposure has been correlated to diminish effective osmoregulatory surface in addition to the possibilities of normal gas exchanges since the water flow though the above region is reduced.

Fusion of gill lamellae at different exposure periods in the gill of both the fish species of present investigation has been correlated to reduce pollutant intake.

The gill filament epithelium between the gill lamellae show hyperplasia which contribute to the reduction of interlamellar speces minimizing passage between two adjacent lamellae for entering water containing toxicant.

Swelling of lamellae has been correlated to increase diffusion distance between water and blood and thus being responsible for respiratory impairment and delay the arrival of heavy metal dissolved in water to blood channels of the pillar cell system.

Increase in density and dimension of mucous cells are related to enhance mucous secretion which is an inbuilt defence mechanism of fish against a distributed aquatic environment.

Appearance of telangiectasia in *Ompok bimaculatus* and *Lepidocephalichthys guntea* is due to the dilation of the capillaries and it adversety affects the oxygen uptake efficiency of the gills. Fatal haemonhage due to repture of telangiectasia also occurs.

Presence of glycoporteins in taste buds indicates a secretory functions of the taste buds and has been postulated to maintain and regulate the chemical micro environment, to protect mucous or other glycoproteins in the taste bud cells and inside taste pore premature enzymatic degradation and to inside taste pore or premature enzxymatic degration and to have hormore like paraneuronal functions. Closing of taste pore, disintergration of taste hairs and cellular components of taste buds and decline in glycoprotein moieties during different exposures of cadmium chloride has been associated with great reduction in the ability of the fish to sense the chemical nature of surrounding water and food available in a particular feeding zone.

EPIDERMIS

Laying down of a barrier layer of slime by the mucous cells following exposure to lethal and sub-lethal concentration of cadmium chloride solution might delay the pernetration of toxic heavy metal salt at least in the initial stages of exposure.

The present investigation reveals that most of the mucous cells contain acidic

or mixture of neutral and acidic glycoprotein. The ability of these glycoproteins to trap heavy metal ions is well documented.

The SH groups of mucous seems to bind with the toxicant and play a fundamental role in their reduction mechanism specially for occasional and short term exposure.

Increase in size and number of acidophil cells may be correlated to cope with influx of cadmium. Further these cells at 3d and 4d treatments could not sustain the toxic environment and thus due to heavy lysis of other cellular constituents acidophil cells also degenerate. However, they again appear at 5d treatment and their number also increases at 6d and onward treatments as per according to the need of the animal kept in the toxic solution.

Appearance of degenerative superficial layer epithelial cells leading to their exfoliation has been correctated with the disorganization of their permeability barrier as an impact of cadmium chloride treatment. Disruption of the osmotic barrier at the suface is also responsible for the appearance of necrotic epithelial cells in the middle layer of the epidermis. Vaccuolization in these cells is related with accumulation of extra cellular fluids, as a result of increased influx from the surrounding medium. The functional significance of the enlargement of the intercellular spaces between the epithelial cells, observed in treated fish, is however, not immediately apparent.

There is cyclic increase and decrease in the dimension of mucous cells in the epidermis of *Ompok bimaculatus* and *Lepidocephalichthys guntea* at different exposures of cadmium chloride. Enlargement in mucous cells has been associated with intensive rate of synthesis of secretory content in these cells. Decrease in the dimension of mucous cells may be corretated with the loss of secretory contents.

Thick slimy coat over the damaged epithelial surface at different duration of cadmium chloride treatment has been correlated to prevent entry of pathogens through damaged sites of the surface which provide invasion sites for microorganisms.

Presence of sulphated glycoproteins in most of the mucous cells and in the slimy coat elaborated by these cells on the surface *Ompok bimaculatus* and *Lepidocephalichthys guntea* may confer high resistane against pathogens and protect the fish.

The club cells show cytological changes which suggest that these cells as a reaction to cadmium chloride treatment release their contents in the intercellular spaces between the epithelial cells. This has been corretated to plug the intercellutar channels preventing the discriminate entry of external fluid, in the body of fish, that might be initiated due to the disruption of superficial layer epithelial cells.

The presence of ampullary organs in the epidermis of *Ompok bimaculatus* suggest that they play a significant role in complementing the taste buds in location of prey in this predatory cat fish.