INTRODUCTION

Avian integument is characterised by its unique epidermal derivative - the feathers. A veriety of functions are attributed to feathers depending on their disposition and structure. Of the various functions, protection, insulation, thermoregulation, indicator of sexual dimorphism and inducer of certain behavioural activities are the major ones. It has been suggested that feathers are derived through modifications from reptilian scales. Coiter (1573) is believed to be the first one to describe the development of feather in chick. However, the foundation for our present knowledge of feather morphogenesis was laid by Malpighi (1697) whose work has been brought to light through translation and review by Adelmann (1966).

Detailed descriptions of the histological feature of embryonic and post-natal development of feathers have been well documented in the works of Hosker (1936), Waterson (1942), Wessells (1965) and Lucas and Stettenheim (1972). Adult avian skin also depicts development of feathers in association with the phenomenon of moulting. Such conditions offer a good opportunity for studying dermal-epidermal interactions involved in organogenesis in adult forms. Studies on chemical regulation of feather development and regeneration are

relatively restricted. However, data on general embryological studies (done in fairly good detail) is well presented by Brotman (1976), Sawyer (1972a&b) and Carcini et al.,(1976). Hamilton (1965) studied histochemical aspects of feather development in chick, while Shah and Menon (1971, 1972, 1973, 1974a,b, 1976) and Menon and Shah (1975) have studied feather development in pigeon from the histochemical and histophysiological points of view. The investigations of the latter workers involved normal development, induced development and regeneration of definitive feathers. Endocrine dependence of plumage development, their morphological characters and other aspects are investigated by Juhn (1937, 1938, 1947, 1963), Juhn and Frap (1934), Juhn and Harris (1955), Witschi (1936), Kobayashi (1952, 1953, 1954). Voitkevich (1966) and Mueller (1970, 1976, 1977).

A common feature of some birds is the suppression of feather development either of a temporary nature or of a permanent kind. Besides, it is also realised that hormonal deficiencies can cause retardation of feather development. Studies on these aspects as applied to avian integument have received relatively less attention and data available as such is inadequate. Examples of permanent suppression of feather development can be had from some of the species of Stork, where the nestlings and juveniles have their head and neck

well covered with definitive feathers as in other body parts. However, on subsequent moultings, either the head or both the head and neck become featherless and bare. Thus, the skin of the head and neck regions of such storks during their postnatal development lose the usual function of feather production. The histological and histophysiological changes that accompany such a transformation of integumentary function remains to be elucidated.

Of the various endocrine glands, that influence development of feathers, thyroid is known to play a significant role (Voitkevich, 1966). Assenmacher (1958) and Juhn (1963) have shown the mode of action of thyroxine on feather forming tissues. It is well established that hypothyrodism retards feather development which can interfere with the normal mode of plumage replacement during moulting. However, no attempt has been made to evaluate the histoenzymologic profile of the feather forming tissues under hypothyrodic conditions. With these facts in view it was deemed fit to investigate certain aspects of histophysiology of feather development under an induced state of athyreosis in the Blue Rock Pigeon, Columba livia.

In diverse groups of birds including passarines the ventral skin of the body becomes bare (featherless), during breeding season. So formed naked skin patch becomes highly

vascularised and edematous. This is the incubation patch which provides necessary heat to eggs under incubation and the nestlings. Studies on the incubation patch (Brood patch) have clearly shown that its formation and maintainance are dependent on hormonal factors (Jones, 1971). It is believed that the process of defeathering occuring during the formation of incubation patch is associated with loss of feather papillae. If this be true, then it becomes interesting from the point of view of the process of feather development. Does the feather forming tissues in the incubation patch where feather papillae along with feathers have been lost, form de novo? If so, what is the process where fully differentiated skin becomes embryonic to give rise to new feathers at the time of refeathering of the incubation patch towards the end of breeding. This, though interesting, however appears highly improbable. Nevertheless, the bare skin of the incubation patch does get refeathered when the breeding phase is over. In this case the suppression of feather development after moulting is of a temporary type as against the parmanent suppression that occurs in the crown skin of Storks and Ibises which leave the skin bare and featherless permanently. Much is not known about the histophysiological state of incubation patch where temporary suppression of feather development occurs. Besides, what becomes of feather papillae in the defeathered area of incubation patch is needed to be investigated. With these facts in view, histological and histochemical studies have been

conducted on the ventral skin of the female house sparrows. It was also considered worthwhile to evaluate the effect of thyroxine administration in birds where incubation patch is in the fully functional state.

Lucas and Stettenheim (1972) have shown that the entire avian epidermis (in the non-feathering areas) actively secretes lipoidal substances which are considered to be akin to sebum in mammals. In the light of this fact, the relationship between the two main functions of the avian skin viz., production of feathers and scales and secretion of lipoidal substances is examined in a few birds with special reference to the suppression of feather development. Based on these studies a hypothesis about the relationship between these two functions of the avian skin has been proposed.