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Research Article

THE ROLE OF FOLLICULAR CELLS DURING VITELLOGENESIS OF OOCYTES IN THE DRAGONFLY *PANTALA FLAVESCENS* (FABRICIUS) (LIBELLULIDAE: ANISOPTERA)

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ABSTRACT

The last two larval instars and adults of *Pantala flavescens* were selected. The ovaries from these instars and adults were dissected out to process for histological preparations. At the beginning of vitellogenesis, the basal oocyte in the ovary increased in size and the epithelial cells become columnar with intercellular spaces. The follicular cells became secretory and the oocyte developed inner vitelline membrane and outer chorion. The present study clearly evidenced for intercellular pathway of vitelline precursors inside the oocytes.

Keywords: Follicular cells, Oocytes, Vitellogenesis, *Pantala flavescens.*

INTRODUCTION

In insects, the process of vitellogenesis includes the production of yolk precursors and their transport to the developing oocytes. In most insects, the yolk is not synthesized in the oocytes but derived from the precursors namely vitellogenin which is synthesized in the fat body. It is established that the protein yolk in insects is derived from the haemolymph, the lipid yolk from the fat body and the carbohydrate yolk from the follicular cells of oocytes (Martin, 1969). Investigators like Sareen and kuldeepkhar (1990), Devapaul *et al.* (2001), Telfer (2009), Kubrakiewicz (2012) and Mark *et al.* (2012) have made studies on the role of follicular cells during vitellogenesis in various insects. But knowledge regarding the role of follicular cells in the oocytes of dragonflies is not yet known. Therefore the present investigation has been carried out to study the role of follicular cells during vitellogenesis of oocytes in the dragonfly *Pantala flavescens.*

MATERIALS AND METHODS

The larval and adult instars of *P. flavescens* were manually collected from their natural habitat and maintained in the laboratory. The last two larval instars and adults of various stages (previtellogenic, early vitellogenic, vitellogenic and post vitellogenic) were selected for the present investigation. The female larvae were identified by observing nonbifurcated genital lobe on the second sternum of the abdomen and the adult females by external genitalia.

The ovaries from last two instars at various stages of development were selected. From each test individual, the ovary was dissected out in insect Ringer and processed by the method given by Smith (1940) with slight modifications. Sections of 8μ thickness were cut, stained and microphotographed.

RESULTS AND DISCUSSION

In insects, the ovary synthesizes glycogen and the follicle cells, glycoaminoglycons during vitellognesis. These two compounds react with the haemolymph vitellogenin to form a complex which is absorbed by oocytes (Rockstein, 1978; Waclaw Tworzydlo and Elzbirtakisiel, 2010). Thus the protein and lipid yolks were exogenous whereas the carbohydrate yolk is endogenous in insects as observed by Tembhare and Thakare (1975).

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In the present experimental animals, the basal oocyte increases in size and become spherical at the beginning of vitellogenesis. The epithelial cells become columnar, resulting in intercellular spaces in the follicular epithelium and separate from the ooplasm forming spaces (Plate I: Figure 1) all along the epithelial lining (vitellogenic stage). Elliot and Gillot (1976) have also observed the appearance of clear spaces between the apical regions of the follicular cells and ooplasm in *Melanopus*. At postvitelloginc phase, the follicular cells become secretary and the oocyte develops an inner vitelline membrane and an outer chorion (Plate I: Figure 2).

In normal course of development, considerable changes have been observed in the follicular epithelial cells of the ovary in the dragonflies. In *P. flavescens* the follicular cells of the basal oocytes are tall and columnar with intercelluar spaces at the time of vitellogenesis. This finding corroborates with Zhao *et al.* (2012). The presence of yolk granules at the apex of follicular cells in the present species evidences for intercellular pathway for protein accumulation inside the oocytes. Investigators like Stay (1965) and Patchin and Davey (1968) have also reported that the proteins from the haemolymph are transported through the intercellular spaces of the follicular epithelium into the developing oocytes during vitellogenesis of insects. It is opined that the enlargement of the interfollicular channels is one of the vitellogenic events in the follicular cells at the onset of vitellogenesis. According to Oliveira *et al.* (1986), the potency of the interfollicular channels is directly correlated with the increasing in the vitellogenin uptake. It is shown that the removal of follicular cells in *Hyalophora* results in the failure of vitellogenic proteins to pick up from the surrounding medium (Anderson, 1971). The same can also hold well in the present study where the follicular cells play a decisive role in vitellogenisis by transporting yolk precursors from the haemolymph into the oocytes.

PLATE –I

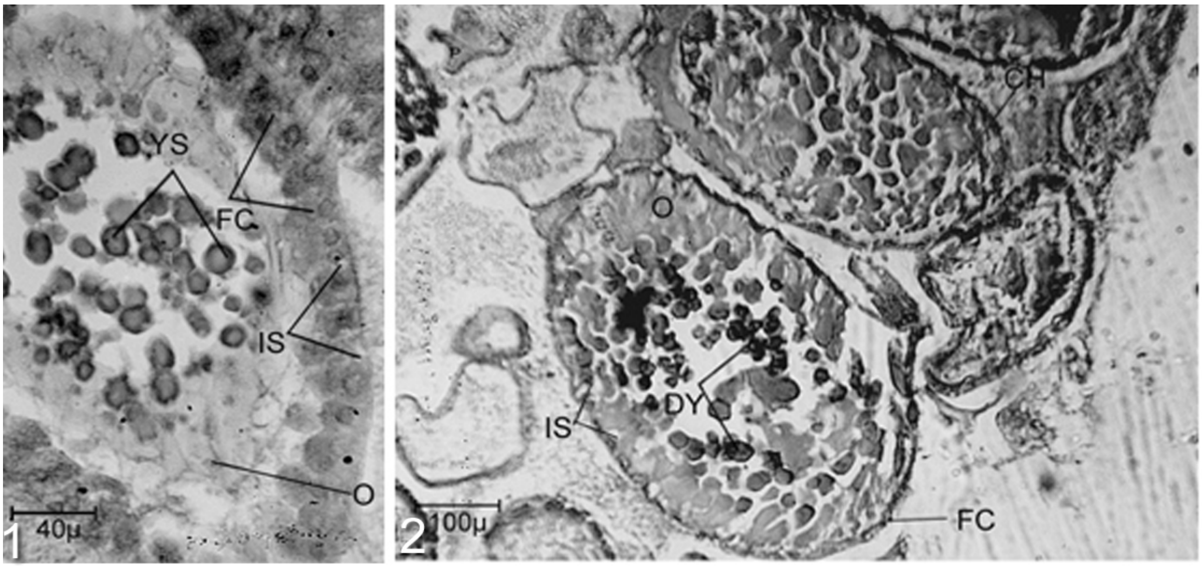

Figure 1. L.S. of a vitellogenic basal oocyte in adult stage III (control) of female *P. flavescens* (with yoke bodies at the periphery) (400x). (FC – Follicular cell ; IS – Intercellular space ; O – Ooplasm; YS- Yolk spheres).

Figure 2. L.S. of a post vitellogenic oocyte in adult stage IV (control) of female *P. flavescens* (with fully packed yolk bodies covered by vacuolated and reduced follicular epithelium). (100x) (CH –Chorion; DY – Dense yolk; FC – Follicular cell; IS – Intercellular space; O-Ooplasm).

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest associated with this article.

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