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Germ Cell Differentiation During Spermatogenesis and Reproductive Cycle of the Hanging Cultured Male Scallop *Patinopecten yessoensis* on the East Coast of Korea

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INTRODUCTION

The scallop, Patinopecten yessoensis, is one of the important edible bivalves in East Asian countries including Korea, China and Japan (Kwon et al., 1993). In the east coast of Korea, this species is mainly found in fine sand in the subtidal zone of Jumunjin, Kangwon-do, Korea. For the propagation and management of a living natural resource, it is important to understand the reproductive mechanism with regard to spermatogenesis and testicular development. Previously, there have been many studies on aspects of reproductive ecology including reproductive cycle, and larval distribution and growth, on aspects of aquaculture, including environmental condition of aquaculture (Park et al., 2000) and aquaculture (Wildish et al., 1987). However, there is still disagreement in our knowledge regarding reproductive biology. Especially, little information is available on ultrastructural study of germ cell differentiation (during spermatogenesis) of Patinopecten yessoensis for the study of the reproductive mechanism. Therefore, the main aim of the present study is to describe the male germ cell differentiation during spermatogenesis and the testicular cycle of this scallop.

MATERIALS AND METHODS

Specimens of the scallop, Patinopecten yessoensis were collected monthly from hanging culture at the subtidal zone (shellfish farm) of Jumunjin on the East Sea of Korea, for one year from January to December, 2004.

Ultrastructure of germ cell differentiation during spermatogenesis was studied by electron microscopic observations. For histological observations, a total of 210 individuals were used for histological analysis of the gonads. Preparations of the gonad tissues were made by histological method.

RESULTS AND DISCUSSION

1. Ultrastructure of germ cells during spermatogenesis

Based on the testicular development and morphological characteristics of germ cells, spermatogenesis can be classified into five phases: (1) spermatogonial phase, (2) primary spermatocyte, (3) secondary spematocyte, (4) spermatid, and (5) spermatozoon phases. Spermatogonia differentiate into primary spermatocytes. The synaptonemal complexes in the nucleus of the primary spermatocyte appear in the prophase during the first maturation division. The primary spermatocyte develops into the secondary spermatocyte through the first maturation division. After the secondary meiotic division, the secondary spermatocyte is transformed into the spermatid. Spermiogenesis can be divided into four phases: 1) Golgi, 2) cap, 3) acrosome and 4) maturation phases.

The sperm nucleus and acrosome are 2.90 μm and 0.60 μm, respectively. The sperm nuclear type is vase in shape, and the acrosome type shows cone type. Of the two centrioles lying in the middle piece of the spermatozoon, the distal centriole take up a position behind, the proximal centriole and the distal centriole give rise to the axial filament of the flagellum of the spermatozoon. During the acrosome phase, across sectioned tail flagellum shows that the axoneme of the tail flagellum of the spermatozoon consists of nine pairs of peripheral microtubles at the periphery, and one pair of central microtubles at the center. The satellite body (which is composed of the centriole) and four mitochondria appear in the middle piece. During the maturation phase, the spematozoon differentiation is completed, The head of a spermatozoon is approximately 3.50 μm in length including the acrosome measuring about 0. 60 μm in length.

2. Reproductive cycle with testicular developmental stage

Based on the morphological features and size of the germ cells and the tissue cells around them, the reproductive cycle with gonadal phases can be classified into five successive stages: early active stage (September to November), late active stage (October to March), ripe stage (February to June), spawning stage (April to July) and spent/inactive stage (July to November).

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