

Fine structure of the spermatogenic cells during the spermiogenesis of *Paradoxornis webbiana*

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The morphological characteristics of spermatogenic cells during the spermiogenesis of *Paradoxornis webbiana* were examined with transmission electron microscope. According to the Morphological features of seminiferous epithelium, spermiogenesis of *P. webbiana* was divided into four phases: Golgi, cap, acrosome and maturation phases. The Golgi and cap phases were further divided into two steps of early and late phase respectively, and acrosomal and maturation phases into three steps of early, mid and late phase respectively. Hence, the spermiogenesis of *P. webbiana* was divided into ten phases. The chromatin became fibrous granules at the Golgi phase, gradually condensed at the cap phase, condensed as a stick at the acrosome phase, and finally, a perfect nucleus was formed at the maturation phase. The formation of sperm tail began at the early Golgi phase, and completed at the late maturation phase. In particular, the dense materials which were existed below the segmented columns in the neck region surrounded the outer dense fibers. The axonema in spermatozoon contains a 9 + 2 arrangement of microtubules: 9 doublets, and 2 central single microtubules. Mitochondrial bundles of middle piece were composed of a pair of arms, which surrounded the axone of middle piece by 15° angled-helical structure. The outer membrane of mitochondria were surrounded by microfilaments in plasma membrane of the sperm. The undulating membrane had a helical structure, and the sperm plasma membrane was surrounded by undulating membrane.

Key words: Dense materials, Microfilament, Undulating membrane, *Pradoxornis webbiana*

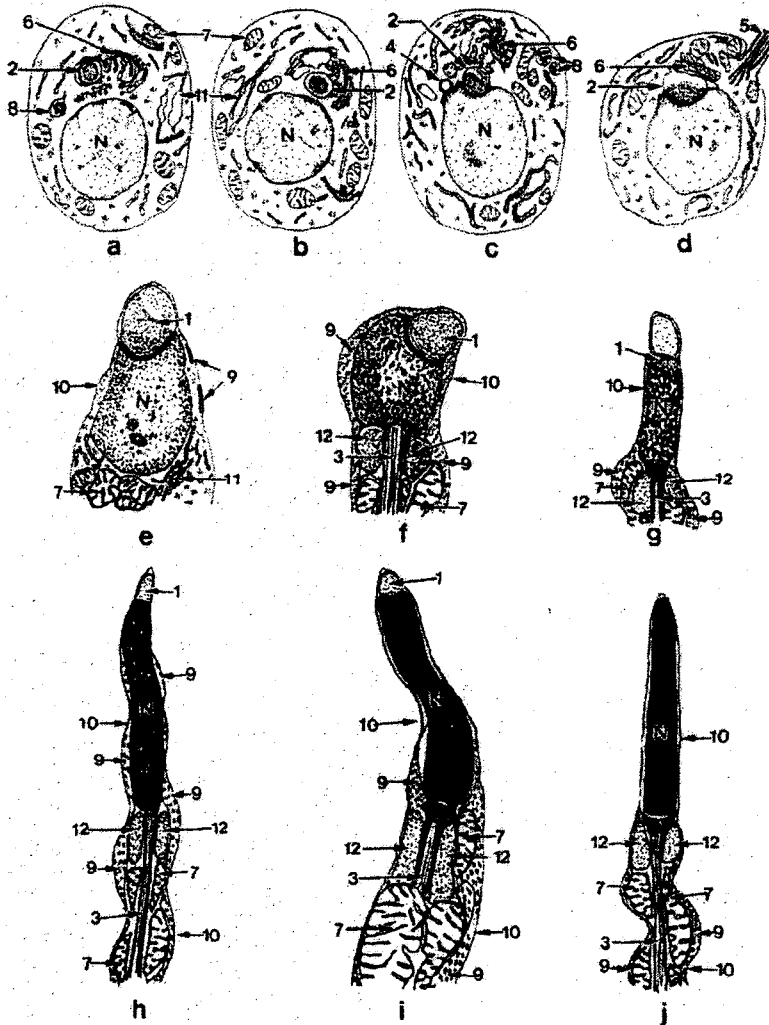


Fig. 1a-j. Schematic representation of the development of acrosome, chromatin, Golgi, mitochondria, microfilament and sperm tail during spermiogenesis of *Pradoxornis webbiana*. a-b: Golgi phases (a, early; b, late), c-d: cap phases (c, early; d, late), e-g: acrosomal phases (e, early; f, mid; g, late), h-j: maturation phases (h, early; I, mid; j, late). Note the microtubules appeared in plasma membrane of sperm. The neck region with two expansions of dense material which extend under the nucleus. The shape of undulating membrane had a helical structure, and the sperm plasma membrane was surrounded by the undulating membrane. 1, acrosome; 2, acrosomal vesicle; 3, axoneme; 4, cenriole; 5, flagellum; 6, Glogi complex; 7, mitochondria; 8, multivescle body; 9, microfilament; 10, palsa membrane; 11, smooth endoplasmic reticulum; 12, dense materials.