Cologne Evolution Colloquium

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Evolution of the germ cells: insights from a centipede

Germ cells are a unique cell type - the only cell population that makes a genetic contribution to the next generation. The comparison of germ cell specification and differentiation across the animal kingdom is emerging as a powerful study system to ask questions about how and why developmental mechanisms vary. By studying the centipede Strigamia maritima we provide the first systematic description of germ cell development with molecular markers in a myriapod. Through examining the expression of Strigamia vasa and nanos orthologues, we find that the primordial germ cells are specified from at least the blastoderm stage. This is a much earlier embryonic stage than previously described for centipedes, or any other member of the Myriapoda. Using these genes as markers we track the development of the germ cells throughout embryogenesis. We find that the germ cells accumulate at the blastopore; that the cells do not internalize through the hindgut, but rather through the closing blastopore; and that the cells undergo a long-range migration to the embryonic gonad. This is the first evidence for primordial germ cells displaying these behaviours in any myriapod. Finally, we also find a surprising localization of maternal Vasa protein within the germinal vesicle of developing oocytes, and propose a hypothesis that this could act as mechanism for localizing Vasa protein asymmetrically in early embryos. The myriapods are a phylogenetically important group in the arthropod radiation for which relatively little developmental data is currently available. Our study provides valuable comparative data that complements the growing number of studies in insects, crustaceans and chelicerates, and is important for correct ancestral reconstruction and a fuller understanding of how and why germ cell development has evolved in different arthropod lineages.

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