Vasa: A marker to study larval queen/worker differentiation in the ant Cardiocondyla obscurior

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The development of ovaries in eusocial ants is a crucial point in setting the reproductive division of labor between the queen and worker caste. In the polygynous ant C. obscurior workers lack ovaries and queens are the only reproducing members of the colony. This makes C. obscurior a suitable model to investigate how reproductive division of labor in a higher ant species via differential gonadal development occurs. Vasa is a member of the class of DEAD box proteins and is consecutively expressed throughout the development of germ cells. Vasa is also found in cells that are involved in oogenesis and is therefore considered germline specific. Consistent with this observation queen pupae show expression of Vasa protein in nurse cells and pro-oocytes of their developing ovaries. This makes Vasa a promising marker to follow gonadal development in C. obscurior larvae. To identify active germ cells in developing female larvae, expression levels of vasa were measured using quantitative real-time PCR. Confocal imaging in combination with an antibody against VASA was used to detect and identify VASA expressing cells in C. obscurior queen larvae, showing that worker-destined 3rd instar larvae do not express VASA, while queen-destined 3rd instar larvae show clear VASA expressing cells.