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Variation in alanine transport among sibling lecithotrophic larvae of holothuroid and asteroid echinoderms

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Variation in development rate (e.g., time to metamorphic competence) among sibling larvae has been reported, but inter-individual differences in physiological processes has received comparatively little attention. All echinoderm larvae tested have a physiological capacity to assimilate dissolved organic materials (DOM) from seawater. Lecithotrophic larvae of holothuroid and asteroid echinoderms are sufficiently large to allow measurement of DOM transport in individuals and to determine variation among sibling larvae. Larvae of Cuctunaria miniata, Psolus chitonoides, and Solaster stimpsoni (30-45 individuals) were added to 15 ml of seawater (9-9.5°C) and 14C-alanine was added to produce a concentration of 50-70 nM. At regular time intervals, 3-5 larvae were transferred to 200 ml of seawater, each was removed and placed in a separate tube, the residual seawater removed, and the radioactivity measured. All larvae tested assimilated alanine from solution, but the transport rates varied among and within species. For C. ininiata doliolaria and pentactula larvae, transport rates averaged 0.0195 ± 0.00129 pmol ala/ larva-min (± standard deviation, n= 4 experiments). Transport rates of individual larvae varied and the r2 of the regression line for each experiment was < 0.70. When individual values were averaged per sampling time, the r2 of the regression equations increased to > 0.90. For both Psolus and Solaster there was less variation in transport rate among individuals, The transport rate of Psolus pentactulae was 0.021 pmol ala/ larva-min (r2 = 0.86) and rates of alanine transport by Solaster brachiolariae were 0.054 and 0.049 pmol ala/ larva-min (r2 of the regression lines were 0.82 and 0.92 respectively). Observed differences among larvae are not a consequence of sample contamination or label adsorption and represents true variation among individuals. The functional consequences of variation in the ability to remove DOM from seawater remain unknown, but these results indicate that there can be significant variation among individuals.