Application of a micro-respirometric volumetric method to respiratory measurements of larvae of the Pacific oyster

The application of a simple, fast and reliable volumetric microrespirometric method to assess respiration of bivalve larvae is discussed. As a model, C. gigas larvae of various sizes were used. Metabolic activity of veliger larvae was assessed by measuring respiratory rate for use in ecophysiological modelling. As an example of the application of this approach, additional measurements of veliger respiratory rates were carried out to assess the effect on larval metabolism of different concentrations of leachate from wood treated with chromated copper-arsenate (CCA). Veligers of Crassostrea gigas (length from 95 to 331 µm) were fed with a mixture of Isochrysis galbana and Chaetoceros pumilum cells. Experiments were performed in a 20 °C constant seawater temperature. The wet and dry weight of four length (L, in µm) classes of larvae were obtained from which the relationship between total dry weight and veliger length was derived {DW = e(3.27+L×0.0154)} (R2 = 99%). Moreover, tissue dry weight (TDW; in ng) was calculated according to Gerdes (1983). Since the mathematical model between larval length and respiratory rate explained 88% of the total variability, a more conservative approach using oyster larval dry meat weight (in ng) and respiratory rate (in µl O2 h–1) was developed to establish a linear model explaining 94.5% of the variability: Resp. = -3.849 × 10-4 + 5.211 × 10-6 × TDW. These experiments provided updated figures of C. gigas larval respiratory rates for use in ecophysiological models. The relationship between tissue dry weight and respiratory rate was close to previous estimates obtained by Gerdes (1983) and Hoegh-Guldberg and Manahan (1995) at 25 °C and 20 °C respectively. Our experiments demonstrate that volumetric microrespirometry is suitable for assessing larval respiratory rate and therefore can be used to assess impacts of pollutants on an early larval stage. Oysters exposed to leachates from chromated copper arsenate (CCA) treated timber at 5 kg m–3 showed initially highly variable respiratory rates while those rates decreased drastically for a 15 kg m–3 CCA treatment exposure. Among bioindicators using physiological response to assess pollutant effects, swimming activity and respiratory rates can be compared, the later showing a significant response at a lower pollutant concentration.

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