



Emulsions versus micelles in the digestion of lipids by benthic invertebrates

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ABSTRACT: Lipids can be valuable sources of energy and nutrition for organisms, but their assimilation into organisms is hampered by the difficulty of transporting these hydrophobic compounds through water. In the digestive tract of metazoans, extracellular digestion of lipids requires transport of insoluble materials from the zone of digestion to the site of absorption, which is facilitated by formation of lipid aggregates in the form of micelles or emulsions. We examined the use of these two transport modes in benthic invertebrate animals via experiments and cross-phyletic characteristics of gut fluids. We examined seven benthic species for emulsions versus micelles. An obligate carnivore used emulsions (most droplet diameters were 1-20 μm), whereas deposit feeders used much smaller micelles, and a suspension feeder used neither. We tested two possible forcing factors for this trend. First, we found emulsions but not micelles to be subject to straining by sediment—a filtration process that reduces permeability to colloidal materials. Second, we varied the ratio of gut fluid to food concentration. High ratios, found with dilute food conditions characteristic of deposit feeding, favored micelles, and low ratios favored emulsions. Both of these findings are consistent with the cross-phyletic results.

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