

Intact, unfertilized sand dollar eggs were chosen for this investigation. Although these eggs were found to be impermeable to many solutes including several amino acids, acetamide and propionamide penetrated freely. Some preliminary evidence was obtained for interaction between these two solutes in experiments where one solute was allowed to equilibrate between the eggs and external medium before the second solute was added. Theoretical equations were derived which indicate the reciprocal effects to be expected in the interaction of the solutes on each other. Further experimental work is planned on both fertilized and unfertilized eggs, as well as on individual cells from embryos dissociated in calcium-free media at the two and four cell stages.

Interacting Flows in Diffusion Across the Cell Membrane of Sand Dollar Eggs

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Additional data were obtained on the interactions between flows of solvent and one or more permeable solutes across the cell membrane of unfertilized sand dollar eggs. Measurements with an ocular micrometer were supplemented by photographic studies which permit more complete measurement of individual eggs and allow direct comparisons to be made among different eggs.

Definite solute-solvent interactions were demonstrated. Thus in one type of experiment, eggs equilibrated in sea water solutions were transferred to other solutions having the same freezing point, but having the impermeable salts replaced in part by a permeable solute, acetamide. The rate of water penetration accompanying the solute penetration was much greater than would be predicted from the osmotic imbalance resulting secondarily from the solute penetration. Some preliminary evidence for solute-solute interaction between different permeable solutes was also obtained.

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Studies on interacting flows in diffusion across the cell membrane of unfertilized sand dollar eggs were extended to mixtures of sea water, ethylene glycol, and propylene glycol. These solutes are superior to acetamide and propionamide in their apparent lower toxicity to the eggs.

Experiments with ethylene glycol and propylene glycol separately showed marked solute-solvent interaction. The magnitude of this inter-