

Possible ATP trafficking by ATP-shuttles in the olfactory cilia and glucose transfer across the olfactory mucosa

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Odor transduction in the cilia of olfactory sensory neurons involves several ATP-requiring enzymes. ATP is generated by glycolysis in the ciliary lumen, using glucose incorporated from surrounding mucus, and by oxidative phosphorylation in the dendrite. During prolonged stimulation, the cilia maintain ATP levels along their length, by unknown means. We used immunochemistry, RT-PCR, and immunoblotting to explore possible underlying mechanisms. We found the ATP-shuttles, adenylate and creatine kinases, capable of equilibrating ATP. We also investigated how glucose delivered by blood vessels in the olfactory mucosa reaches the mucus. We detected, in sustentacular and Bowman's gland cells, the crucial enzyme in glucose secretion glucose-6-phosphatase, implicating both cell types as putative glucose pathways. We propose a model accounting for both processes.