Effects of Calcium and Cyclopiazonic Acid on the Photoresponse in the *Limulus* Ventral Photoreceptor

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Z. Naturforsch. **54c,** 446–455 (1999); received January 28/March 10, 1999

Phototransduction, Current Components, Light Adaptation, Bumps, CPA

1. Single-photon responses (bumps) and small macroscopic photocurrents were studied in ventral photoreceptors of the horseshoe crab *Limulus*. Lowering the calcium concentration in the bath from 10 mM to 250 μM led to increased bump size. Adaptation of the cells by a moderately bright conditioning flash was not impaired.

2. Pressure-injection of 1.2 mM EGTA into the dark-adapted cells resulted in reduced bump size. EGTA weakened the effect of the conditioning light flash although it did not completely abolish light adaptation.

3. The microsomal calcium-ATPase inhibitor cyclopiazonic acid strongly desensitized the cells, and bumps were suppressed below detection. When the bathing saline contained 10 mM calcium, macroscopic photoresponses after extracellular application of the agent had amplitudes smaller than under control conditions but normal response kinetics: The response to a light step still consisted of a fast transient photocurrent and a much smaller plateau. However, when applied in calcium-free bathing saline, cyclopiazonic acid additionally influenced the waveform of the photoresponse. The clear distinction between transient and plateau was no longer possible, and the photocurrent appeared "square".

4. Our results support the idea that a transient elevation of the cytosolic calcium concentration is obligatory for light adaptation in the ventral photoreceptor. It is also obligatory for the generation of the so-called C_2 component of the photocurrent which is represented by "standard" bumps and the fast transient phase of a prolonged response. However, a rise in cytosolic calcium appears not necessary for the initiation of a slow electrical photoresponse.

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