

## C17

**Human cone photoreceptor circulating current assessed *in vivo* using the electroretinogram *a*-wave during and after intense illumination**

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It has been shown that, following a 30 s exposure to intense illumination that bleached around half the photopigment, the cone photoreceptor circulating current recovered to its dark-adapted level within several seconds (Paupoo *et al.* 2000). We now investigate recovery on a faster time scale, following longer, more intense exposures. We recorded the corneal ERG from human subjects using a conductive fibre electrode.

Approval was obtained from the local Research Ethics Committee, and subjects gave informed written consent. We delivered all stimuli in a ganzfeld apparatus after dilating the subject's pupil (Paupoo *et al.* 2000). The eye was exposed to white light of ~37 000 photopic Td from 12 LEDs (Luxeon LXHL-BW01) until a steady-state bleach was achieved (estimated as ~85 % pigment bleached). The LEDs were then extinguished for a short period, and a bright flash was delivered. The flash intensity (~9800 Td s) and the duration in darkness (250 ms) were chosen so that the total light flux barely changed. Cycles of LED extinction and flash delivery were repeated at 4 s intervals.

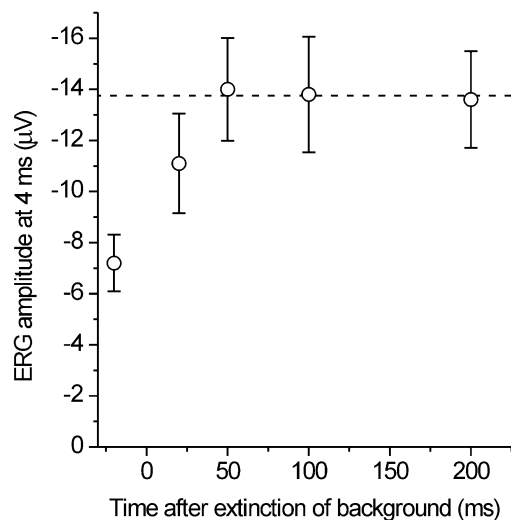


Figure 1. Bright-flash response amplitudes following extinction of intense background. Amplitudes were measured very early (4 ms) after flash delivery, after first subtracting the ERG response to extinction of the background. Points plot means  $\pm$  S.E.M. ( $n \approx 105$ ). The dashed line shows the mean response amplitude in dark-adapted conditions, to a flash adjusted to deliver the same number of photoisomerizations (i.e.  $0.15 \times$  as bright).

Figure 1 plots the response amplitude, for flashes presented at a range of times relative to extinction of the background. For comparison, the dashed line shows the amplitude obtained under dark-adapted conditions, with an equivalent flash (i.e. delivering the same number of photoisomerizations). For flashes presented during the background (–20 ms), the amplitude was around half the dark-adapted level, but following extinction of the LEDs, the amplitude recovered within 50 ms. In rod photoreceptors, the circulating current is completely suppressed

during, and for ~5 min after, illumination that produces a bleach of this level (Thomas & Lamb, 1999).

Our results indicate that, in contrast, cones are able to preserve around half their circulating current during steady-state exposure to a large bleach (~85 %), and that, at extinction of the light, they are able to recover their full circulating current within 50 ms, several thousand times faster than rods.

Paupoo AAV *et al.* (2000). *J Physiol* **529**, 469–482.

Thomas MM & Lamb TD (1999). *J Physiol* **518**, 479–496.

All procedures accord with current local guidelines and the Declaration of Helsinki.