This is an appendix to the paper by Imamura *et al*. 1999 Restoration of ocular dominance plasticity mediated by adenosine 3',5'-monophosphate in adult visual cortex. *Proc. R. Soc. Lond.* B **266**,1507–1516.

Electronic appendices are refereed with the paper. However, no attempt has been made to impose a uniform editorial style on the electronic appendix.

APPENDIX A

4. DISCUSSION

(e) *Alternative mechanisms*

β-adrenoreceptors are found in both neurons and astrocytes in visual cortex (Hansson, 1988; Stone and Ariano, 1989; Aoki, 1992). Liu et al. (1993) reported that in adult visual cortex more than half the cells immunoreactive with an anti-β-adrenoreceptor antibody were astrocytes. It is, therefore, likely that directly infused agonists activate β-adrenoreceptors to increase the intracellular cAMP pool in both neurons and astrocytes. Indeed, an inhibitor of metabolic activity of glial cells injected in kitten visual cortex reduced ODP significantly (Imamura et al., 1993). It was also reported that supplementing adult visual cortex with astrocytes, cultured from visual cortex of newborn kittens, partly reinstalled ODP in adult cats (Müller and Best, 1989). In short, it is likely that enhanced ODP in the present study was partly mediated by an increase in glial cAMP.

Agonist-induced accumulation of cAMP in neocortex can be detected by *in vivo* microdialysis, suggesting that the extracellular concentration of cAMP may reflect the intracellular one. Type-I adenylate cyclase which is linked to -adrenoreceptors contains 12 transmembrane domains that may constitute a multi-drug transporter (Krupinski et al., 1989). It is hypothesized that through this transporter cAMP accumulated inside cells overflows to the outside (Rosenberg, 1992; Rosenberg and Li, 1995). Therefore, it likely plays some roles in ODP, for example, after its degradation to adenosine or related bioactive substances (Rosenberg et al., 1994). Specifically localized extracellular kinase is indeed known to phosphorylate extracellular proteins in hippocampal long-term potentiation (Chen et al., 1996).

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