

Analysis of cell aggregation in *Dictyostelium discoideum* expressing beta subunit of photo-activated adenylyl cyclase (PAC β)

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SUMMARY

Dictyostelium discoideum amoebae aggregate and form multicellular structures when starved. The aggregation process is mediated by extracellular cAMP secreted from the amoebae. As aggregation of amoebae requires cAMP synthesis by adenylyl cyclase ACA (*acaA*), an *acaA*-null mutant does not aggregate. We transformed the *acaA*-null mutant with a plasmid carrying the beta subunit of photoactivated adenylyl cyclase (PAC β). Photoactivated adenylyl cyclase (PAC) was purified from a photosensing organelle (paraflagellar body) of the unicellular flagellate *Euglena gracilis*. PAC consists of alpha and beta subunits that both have two flavin-binding domains, F1 and F2, each followed by a catalytic domain of adenylyl cyclase C1 and C2, respectively. PAC shows adenylyl cyclase activity that is elevated upon light irradiation. Aggregation of the transformants was analyzed in both dark and light-irradiated conditions. The transformants formed multicellular structures when they were irradiated by light but did not form such structures in the dark, suggesting that PAC β in *D. discoideum* was activated by light irradiation and synthesized cAMP.