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CO_2-dependent relocation of carbonic anhydrase in the algal chloroplast

緑藻葉緑体における CO_2 に応答した炭酸脱水酵素の局在変化

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Aquatic photosynthetic organisms induce a CO_2-concentrating mechanism (CCM) to overcome the difficulty of acquiring inorganic carbon (Ci) under CO_2-limiting conditions. During induction of CCM, the CO_2-fixing enzyme Rubisco is enriched in the pyrenoid, a prominent structure in the chloroplast surrounded by several thick starch plates to form a ring-like starch sheath. In *Chlamydomonas reinhardtii*, the starch sheath is required for the migration of the low-CO_2 inducible carbonic anhydrase (LCIB) around the pyrenoid starch sheath to maintain an increased photosynthetic Ci-affinity. Although the importance of LCIB has been shown, environmental factors essential for the relocation of LCIB in the chloroplast remain uncertain. Here, we traced the LCIB-Venus localization under different CO_2 concentrations, pH of the medium under light or dark conditions, and revealed that a decrease of absolute CO_2 level in the culture medium is sufficient for relocating LCIB to around the starch sheath. Moreover, LCIC, which is a homolog of LCIB, was necessary to form speckle structures consisting of the LCIB/LCIC complex around the starch sheath.