# ROLE OF CYCLOSIS IN PH PATTERN FORMATION IN *CHARA CORALLINA* CELLS

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Giant internodal cells of *Chara corallina* algae show fast velocity of cytoplasmic streaming (cyclosis). The role of cyclosis in intracellular transport is undeniable, but its role in chloroplast–plasmalemma interactions has been poorly studied.

Illuminated characean cells produce heterogeneous profiles of apoplastic pH: acid zones with $H^+$ pump activity and alkaline zones with high $H^+$ conductance [1]. We used local illumination to reveal the role of cyclosis in pH pattern formation [2]. The effect of local illumination turned out to be asymmetric depending on mutual location of measurement region and illuminated area and on direction of cyclosis. When the area of measurement was located downstream from the illuminated spot (configuration 1) pH increased and alkaline zone was formed there. In this case the cytoplasm flowed from the illuminated area with active photosynthesis to the measurement region. In the opposite case, when the area of measurement was located downstream from the illuminated spot (configuration 2) pH decreased to the bulk pH level (the same pH kinetic can be observed when the light is turned off after overall illumination). In this case the cytoplasm came to the measurement region from the darkened area. All measurements were performed in areas capable of producing alkaline zone upon overall illumination.

Asymmetric changes in nonphotochemical fluorescence quenching (NPQ) were found for configuration 1 and 2. For configuration 1, when the alkaline zone was formed in the measurement region, NPQ noticeably increased. For configuration 2 there was no increase in NPQ.

When the cytoplasmic streaming was stopped by means of action potential generation or by treatment with cytochalasin B, pH kinetics in response to local illumination became similar for cases 1 and 2.

We assume that some functionally active intermediate moving with the flowing cytoplasm can have an effect on the $H^+$ transporting systems of plasmalemma, the functional activity of chloroplasts, and pattern formation in the plant cell.

**References**

1. *Lucas W.J., Smith F.A.* The formation of alkaline and acid regions at the surface of *Chara corallina* cells // *J. Exp. Bot.* **24**, **1**, 1973, 1-14.

2. *Dodonova S.O., Bulychev A.A.* Cyclosis-related asymmetry of chloroplast–plasma membrane interactions at the margins of illuminated area in *Chara corallina* cells // *Protoplasma*, DOI: 10.1007/s00709-010-0241-6