6. Symbiodinium as a model organism

6PO.1

IS THE MEHLER REACTION THE MAIN PHOTOPROTECTIVE MECHANISM OCCURRING IN *SYMBIODINIUM* IN HOSPITE?

Stéphane Roberty[1] (sroberty@ulg.ac.be), Eric Béraud[1] (eberaud@centrescientifique.mc), Christine Ferrier-Pagès[1] (ferrier@centrescientifique.mc) and Pierre Cardol[2] (pierre.cardol@ulg.ac.be)

[1]Marine Department, Centre Scientifique de Monaco, Monaco MC-98000, Monaco and [2]Laboratoire de génétique et physiologie des microalgues, University of Liège, Liège 4000, Belgium

The ecological success of reef-building corals throughout tropical oligotrophic waters relies on the symbiosis between cnidarians and photosynthetic dinoflagellates of the genus *Symbiodinium*. This association allows the transfer of highly energetic compounds and an efficient recycling of growth-limiting nutrients. In the natural environment the holobiont have to cope with significant daily variations in light intensities that sometimes exceed *Symbiodinium* photosynthetic capacity. Fortunately, these organisms possess regulatory features that help to ensure that high light intensities can be endured without the accumulation of photodamage. Among them, it has been found recently that photoreduction of oxygen downstream PSI by the so-called Mehler reaction was the main alternative electron sink at the onset and steady state of photosynthesis in different cultured strains of *Symbiodinium*. In this study, we investigated the occurrence and the relative amplitude of this photoprotective mechanism in *Symbiodinium* cells living within the tropical coral *Stylophora pistillata* and the sea anemone *Anemonia viridis*. To this end, joint measurements of oxygen evolution, PSI and PSII activities were conducted. The impacts of CO_2 limitation and CO_2 fixation on the photoreduction of oxygen by PSI was also studied by using several inhibitors targeting the carbon concentrating mechanism and the Calvin-Benson-Bassham cycle. Conversely to cultured cells, these measurements revealed that the *Symbiodinium* located in *S. pistillata*, under control conditions, rely on other photoprotective mechanisms than the Mehler reaction to prevent over-excitation of the photosynthetic apparatus. However, we observed an increased O_2 uptake capacity during photosynthesis when the efficiency of the carbon fixation was reduced in *S. pistillata*.

The ecological success of reef-building corals throughout tropical oligotrophic waters relies on the symbiosis between cnidarians and photosynthetic dinoflagellates of the genus *Symbiodinium*. This association allows the transfer of highly energetic compounds and an efficient recycling of growth-limiting nutrients. In the natural environment the holobiont have to cope with significant daily variations in light intensities that sometimes exceed *Symbiodinium* photosynthetic capacity. Fortunately, these organisms possess regulatory features that help to ensure that high light intensities can be endured without the accumulation of photodamage. Among them, it has been found recently that photoreduction of oxygen downstream PSI by the so-called Mehler reaction was the main alternative electron sink at the onset and steady state of photosynthesis in different cultured strains of *Symbiodinium*. In this study, we investigated the occurrence and the relative amplitude of this photoprotective mechanism in *Symbiodinium* cells living within the tropical coral *Stylophora pistillata* and the sea anemone *Anemonia viridis*. To this end, joint measurements of oxygen evolution, PSI and PSII activities were conducted. The impacts of CO_2 limitation and CO_2 fixation on the photoreduction of oxygen by PSI was also studied by using several inhibitors targeting the carbon concentrating mechanism and the Calvin-Benson-Bassham cycle. Conversely to cultured cells, these measurements revealed that the *Symbiodinium* located in *S. pistillata*, under control conditions, rely on other photoprotective mechanisms than the Mehler reaction to prevent over-excitation of the photosynthetic apparatus. However, we observed an increased O_2 uptake capacity during photosynthesis when the efficiency of the carbon fixation was reduced in *S. pistillata*.

6PO.2

ESTABLISHING A FUNCTIONAL BASIS TO UNRAVEL *SYMBIODINIUM* DIVERSITY

Mark E Warner[1] (mwarner@udel.edu) and David J Suggett[2] (David.Suggett@uts.edu.au)

[1]School of Marine Science and Policy, University of Delaware, Lewes 19958, United States and [2]Climate Change Cluster, University of Technology, Sydney, Sydney 2007, Australia