# Effects of photosymbiosis establishment on cnidarian redox homeostasis

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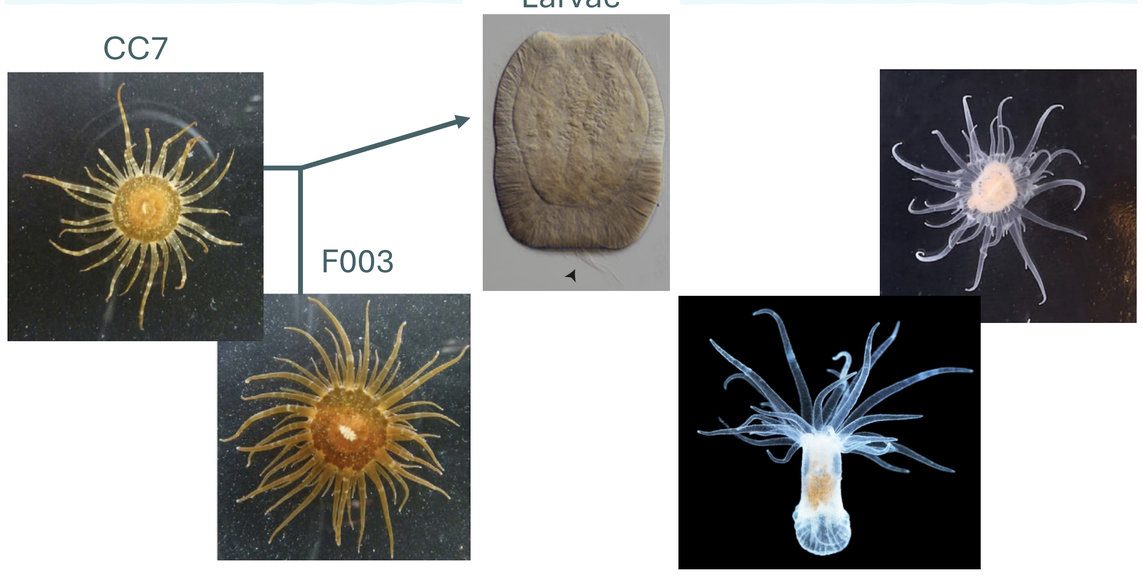
## Introduction

Symbiotic relationships are widespread in nature. One of the most iconic examples is the partnership between corals and dinoflagellates from the *Symbiodiniaceae* family. In this mutualistic relationship, the algae provide the coral with photosynthetic products, but they can also generate high amounts of reactive oxygen species (ROS). These molecules are neutralized by enzymatic (such as superoxide dismutase, catalase, and peroxidases) or non-enzymatic antioxidants (like glutathione and ascorbate). Under stress, ROS production can overwhelm the capacity of antioxidant defences, leading to significant cellular damage and oxidative stress, that can ultimately result in coral bleaching. However, our understanding of the redox homeostasis on this symbiosis remains incomplete.

My PhD project **aims** to understand how ROS produced by the symbionts affect host redox homeostasis

## Biological materials

*Exaiptasia diaphana* : model species for coral symbiosis




## Project

### 1 Development of a biosensor encoding genetically to visualize in vivo $H_2O_2$

a. Construction of a ratiometric biosensor sensitive to $H_2O_2$ (HyPer7)


b. Integration in DNA of larvae and pedal lacerates of *Exaiptasia diaphana*

c. Experiments 2 and 3 and monitoring of $H_2O_2$

### 2 How is the host's antioxidant network modulated during the establishment of symbiosis?

With or without symbionts

a. Comparison of anemones with symbionts and without symbionts

b. Measurement of antioxidant capacity

With different species of symbionts

a. Comparison of anemones without symbionts with different species of symbionts

b. The anemones will be kept under control light and high light

c. Measurement of the rate of infection and of antioxidant capacity

### 3 How do disturbances in redox homeostasis affect the establishment of symbiosis?

a. **Modification of the host antioxidant capacity** (aposymbiotic ; + or – catalase)

b. Infection of anemones with native symbionts

c. Measurement of the rate of infection

d. Measurement of the antioxidant capacity when the rate of infection is maximal

a. **Modification of the redox environment** (aposymbiotic ; +ROS)

b. Infection of anemones with native symbionts

c. Measurement of the rate of infection

d. Measurement of the antioxidant capacity when the rate of infection is maximal

a. **Modification of the redox environment of native symbionts**

b. **Modification of the antioxidant capacity of the anemones** without symbionts

c. Infection of anemones with symbionts

d. The anemones will be kept under low , control and high light

e. Measurement of the rate of infection

f. Measurement of the antioxidant capacity when the rate of infection is maximal

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