

Modulation of biological responses in polar organism to environmental multiple stressors

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Introduction

Evolutionary adaptation in polar organism has produced distinctive biological pathways, which make them sensitive to quick and fast environmental changes, making them suitable biological models for investigating the synergic effects of physical-chemical stressors in polar regions.

Aims

- Characterization of biological responses in arctic organisms
- Development of non-lethal tissue sampling
- In-vitro ecotoxicology
- Investigation of sea anemone as unconventional sentinel species in arctic regions.

In-vitro approaches

Pedal disk PCTs

Pedal disk → Vibratome → Precision cut tissue sices (PCTs)

Primary cells cultures

Tentacles and pedal disk → Tissue cutting → Primary cells culture

Methods

- Tentacles and marginal pedal tissue were sampled without animal sacrifice
- Tentacles cells were dissociated by enzymatic digestion and cultured
- Pedal disk tissue was cut with vibratome and tissue slices were cultured for a few days

Preliminary results

Pedal disk 7 days culture, Pedal disk 15 days culture, Tentacles 7 days culture, Tentacles 15 days culture

- Tentacles cells culture show three uncharacterized cells.
- Pedal disk show good results both for cell and PCTs culture.

In-vivo approaches

Control (CTRL)

Ibuprophen 0.5 µg/L (CHEM)

Thermal +2 C° (TEMP)

Multiple stressors (CHEM+TEMP, MIX)

Methods

- *Anemonia viridis* were exposed to Ibuprophen 0.5 µg/L, thermal stress (+2 C° temperature) and multiple-stress (Ibuprophen and thermal stress).
- After 25 days of exposure, tentacles and basal body were collected.

Preliminary results

Catalase activity, Glutathione S-transferase activity, Glutathione reductase activity, Glutathione Peroxidase activity

- Limited responses of single antioxidants were observed in response to different environmental stressors dosed alone or in combination.
- The activities of single antioxidants are higher in tentacles than in basal body.

Ongoing activity

In-vivo multiple stressors response in *Actinia equina*

- Due to his abundance and presence in Kongsfjior (Svalbard) and in Adriatic Sea it represents suitable model for investigating biological adaptation to polar environments.
- Animals will be acimatated at 4 C° and then will be exposed to emergent contaminants such as pharmaceutical drugs and microplastics
- antioxidant system in terms of functional activities and transcriptomic profile will be evaluated both in tentacles and basal body
- The modulation of MPs ingestion will be evaluated a confocal microscope



In-vitro multiple stressors responses in Arctic sea anemones

- Three species of sea anemone will be imported alive from Vancouver Aquarium
- In-vitro multiple stressors investigation will be performed in PCTs and primary cell culture obtained from tentacles and pedal disk of these polar species



Arctic crimson anemone



Rugose anemone



White-spotted rose anemone