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The physiological stress response to amputation in the eleven-armed sea star (*Coscinasterias muricata*)

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ABSTRACT

The eleven-armed sea star, *Coscinasterias muricata*, is subject to human-induced stressors, such as invasive fishing activities, that can cause limb loss (amputation), and heavy metal discharge into their habitat. The well-being and survival of a keystone predator such as *C. muricata* has important ecological implications as their presence influences community structure in the marine environment.

Understanding the stress physiology of an animal can provide insight into their overall health and survival. While the stress physiology of northern asteroid species (such as *Asterias rubens*) has been well documented, this has not been well studied with *C. muricata*. In this thesis, I was able to identify time-dependent changes in two physiological parameters (total coelomocyte count and dopamine levels in the coelomic fluid) in *C. muricata* subjected to amputation. There was a synchronous increase in both of these parameters 24 hours post amputation.

Dopamine in the coelomic fluid was measured by using high performance liquid chromatography (HPLC). I adapted a pre-existing method involving pre-column derivatisation and fluorescent detection, which was initially developed for the detection of dopamine in porcine muscle. However, this method requires further development as it could not detect dopamine to the same sensitivity as previously reported HPLC methods using electrochemical detection.

Lastly, the initial attempts at developing an *in vitro* cytotoxicity bioassay using *C. muricata* coelomocytes is described in detail. The initial aim of this experiment was to understand the effect of heavy metals on cellular parameters. However the experiment was hampered by unusually low cell counts in this species, which has not been previously reported. The knowledge gleaned from this study may provide the groundwork for future studies that use *C. muricata* coelomocytes for cytotoxicity testing or as a biomarker.

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TABLE OF CONTENTS

| | |
|---------------------------------------------------------------------------------------|-----------|
| Abstract | 3 |
| Chapter 1 – General introduction..... | 11 |
| 1.1 Stressors | 12 |
| 1.1.1 Amputation..... | 13 |
| 1.1.2 Heavy metals | 14 |
| 1.1.2.1 Cadmium..... | 15 |
| 1.1.2.2 Zinc | 16 |
| 1.2 Biology of <i>C. muricata</i> | 16 |
| 1.2.1 Coelomic fluid | 18 |
| 1.2.2 Coelomocytes | 19 |
| 1.3 Objectives and outlines | 20 |
| 1.3.1 Chapter outline | 21 |
| 1.4 References..... | 23 |
| Chapter 2 – Changes in total coelomocyte count in response to amputation | 29 |
| 2.1 Abstract..... | 30 |
| 2.2 Introduction | 30 |
| 2.3 Methods and materials..... | 32 |
| 2.3.1 Collection and field sampling..... | 34 |
| 2.3.2 Transport and housing..... | 33 |
| 2.3.3 Experimental design | 33 |
| 2.3.4 Sample treatment | 34 |
| 2.3.5 Total coelomocyte count..... | 34 |
| 2.3.6 Statistical analysis | 34 |
| 2.4 Results | 34 |
| 2.5 Discussion..... | 36 |
| 2.5.1 Differential coelomocyte count..... | 39 |

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 2.5.1.1 Phagocytes | 39 |
| 2.5.1.2 Spherule cells..... | 41 |
| 2.6 References..... | 43 |
| Chapter 3 – Quantification of dopamine in coelomic fluid of sea stars using high-performance liquid chromatography (HPLC) | 47 |
| 3.1 Abstract | 48 |
| 3.2 Introduction | 48 |
| 3.3 Methods and materials..... | 51 |
| 3.3.1 HPLC system configuration | 51 |
| 3.3.2 Reagents | 52 |
| 3.3.3 Sample treatment | 52 |
| 3.3.4 Method validation..... | 52 |
| 3.3.5 Statistical analysis | 53 |
| 3.4 Results | 54 |
| 3.4.1 HPLC method development..... | 54 |
| 3.4.1.1 Intra- and inter- day variation | 55 |
| 3.4.1.2 Recovery rate..... | 56 |
| 3.4.2 Dopamine levels following amputation | 56 |
| 3.5 Discussion..... | 57 |
| 3.6 References..... | 61 |
| Chapter 4 – Initial steps made in the development of an <i>in vitro</i> cytotoxicity bioassay using coelomocytes harvested from sea stars | 63 |
| 4.1 Abstract..... | 64 |
| 4.2 Introduction | 64 |
| 4.2.1 Cellular heavy metal tolerance | 66 |
| 4.2.2 <i>In vitro</i> cytotoxicity testing..... | 67 |
| 4.2.2.1 Cellular metabolic activity..... | 69 |
| 4.2.2.2 Cellular membrane integrity | 70 |
| 4.2.2.3 Phagocytosis activity..... | 70 |

| | |
|---------------------------------------------------------------------------------------------------------|-----------|
| 4.2.3 Chapter aims | 71 |
| 4.3 Method development..... | 71 |
| 4.3.1 First trial | 71 |
| 4.3.1.1 Protein determination | 73 |
| 4.3.2 Second trial..... | 74 |
| 4.3.2.1 Heavy metal exposure | 75 |
| 4.3.2.2 Cellular metabolic activity..... | 75 |
| 4.3.2.3 Cellular membrane integrity | 76 |
| 4.3.2.4 Phagocytosis activity..... | 76 |
| 4.3.2.4.1 Staining of zymosan particles..... | 76 |
| 4.3.2.4.2 Quantification of zymosan uptake | 77 |
| 4.3.2.5 Protein determination | 77 |
| 4.4 Discussion..... | 77 |
| 4.4.1 Heavy metal exposure on coelomocyte physiology..... | 79 |
| 4.4.2 Amputation and heavy metal challenge..... | 80 |
| 4.5 Conclusion | 81 |
| 4.6 Reference..... | 82 |
| Chapter 5 – General discussion..... | 87 |
| 5.1 Synthesis and future directions for assessing the stress response of amputated sea stars..... | 88 |
| 5.2 Synthesis and future directions for <i>in vitro</i> experiments with sea star coelomocytes | 90 |
| 5.3 References..... | 93 |