

# Bioactivity properties of fractionated capelin (*Mallotus villosus*) protein hydrolysates

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## INTRODUCTION

- ❖ Capelin is a small pelagic fish harvested in very large volumes the North Atlantic ocean
- ❖ Capelin has traditionally been used to produce fishmeal but there is a great potential to use this material for higher value products
- ❖ Producing functional and bioactive protein hydrolysates is one way to add more value and use capelin more responsively
- ❖ Research in the past few years has increasingly show the great potential for FPH as ingredients to potentially combat common ailments and illnesses facing humans
- ❖ In this study the bioactivity of different fractions of capelin protein hydrolysates were studied:
  - for their potential cardiovascular benefits
  - for their ability to potentially reduce oxidative stress
  - for their ability to scavenge biologically relevant free radicals

## OBJECTIVES

- ❖ Enzymatically hydrolyze heat-extracted capelin soluble protein using Cryotin® and Protamex®
- ❖ Fractionate hydrolysates using ultrafiltration into different fractions
- ❖ Evaluate bioactivity of hydrolyzed capelin protein fractions

## METHODS

### Hydrolysis

- ❖ Cryotin® and Protamex® were used to hydrolyze heat extracted soluble capelin protein to 8% degree of hydrolysis (DH)

### Ultra-filtration

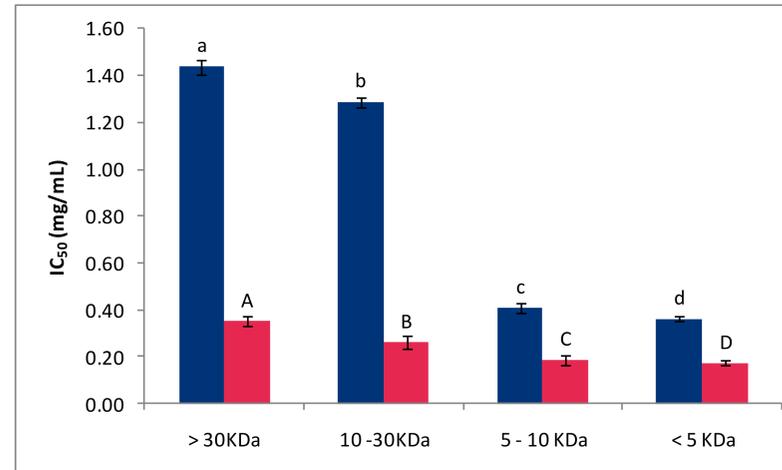
- ❖ The FPH was ultra-filtrated using membranes of different molecular weight cut-offs (30 KDa, 10 KDa, and 5 KDa)

### Bioactivity

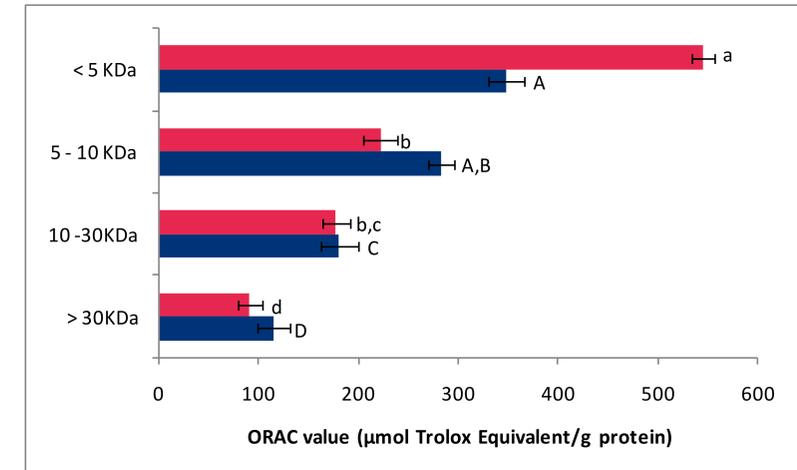
- ❖ Antihypertensive activity measured as ability of hydrolysates to inhibit the action of Angiotensin Converting Enzyme (ACE)
- ❖ Antioxidant activity was measured using:
  - oxygen radical absorbance capacity (ORAC)
  - 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging
  - metal ion chelating activity

## Acknowledgements

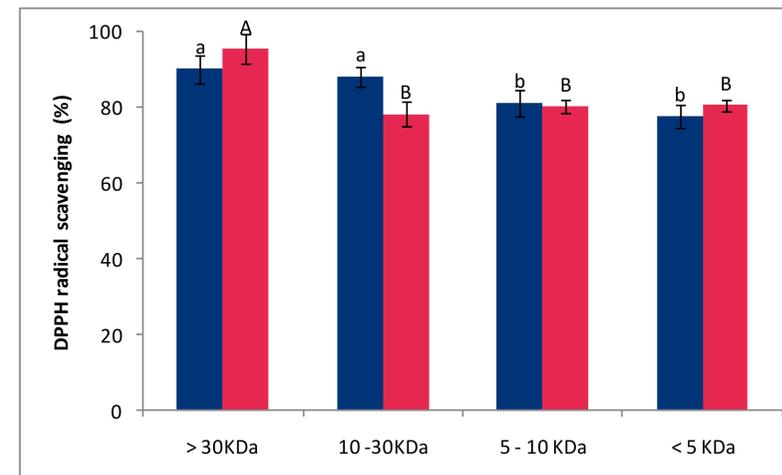
This study was funded by the AVS Funds of the Icelandic Ministry of Fisheries and Agriculture



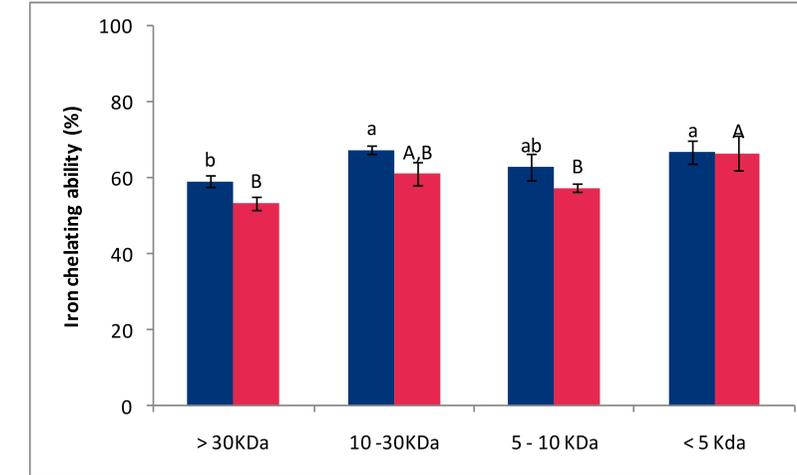
**Figure 1.** ACE inhibitory activity of fractionated capelin protein using Cryotin (blue) and Protamex (red) was expressed as IC<sub>50</sub> value, the concentration of inhibitor required to inhibit 50% of the ACE activity. The molecular weight of fractions tested was: > 30 KDa, 10 - 30 KDa, 5 - 10 KDa and < 5 KDa. Any two means followed by the same letters are not significantly different (p>0.05)



**Figure 2.** Oxygen radical absorbance capacity (ORAC values) of fractionated capelin protein using Cryotin (blue) and Protamex (red) was expressed as Trolox equivalent per gram of protein. The molecular weight of fractions tested was: > 30 KDa, 10 - 30 KDa, 5 - 10 KDa and < 5 KDa. Any two means followed by the same letters are not significantly different (p>0.05)



**Figure 3.** DPPH radical scavenging ability of fractionated capelin protein using Cryotin (blue) and Protamex (red) was expressed as Trolox equivalent per gram of protein. The molecular weight of fractions tested was: > 30 KDa, 10 - 30 KDa, 5 - 10 KDa and < 5 KDa. Any two means followed by the same letters are not significantly different (p>0.05)



**Figure 4.** Iron (Fe<sup>2+</sup>) chelating ability of fractionated capelin protein using Cryotin (blue) and Protamex (red). The molecular weight of fractions tested was: > 30 KDa, 10 - 30 KDa, 5 - 10 KDa and < 5 KDa. Any two means followed by the same letters are not significantly different (p>0.05)

## RESULTS

- ❖ The concentration of fractionates required to inhibit 50% of the ACE activity significantly (p>0.05) decreased with a decrease in molecular weight of the fractions and the concentration of hydrolysates required to inhibit 50% of the ACE activity decreased in the order: Cryotin > Protamex
- ❖ Radical scavenging ability (measured as ORAC) increased with decrease in molecular weight of all the fractions tested. Hydrolysates using Protamex showed higher radical scavenging ability than Cryotin
- ❖ DPPH radical scavenging ability slightly decreased (p>0.05) with a decrease in fraction molecular weight. Cryotin and Protamex fractions had similar ability to scavenge DPPH radicals
- ❖ Metal (Fe<sup>2+</sup>) chelating ability significantly increased (p>0.05) with a decrease in molecular weight. Cryotin had slightly better chelating ability than Protamex

## CONCLUSION

- ❖ This study suggest the potential to regulate blood pressure might be better for smaller peptides. In this study FPH made using Protamex showed better results than hydrolysates using Cryotin regarding ability to inhibit ACE
- ❖ All fractionated capelin hydrolysates demonstrated good ability to scavenge DPPH radicals and to chelate iron, however the capability to absorb oxygen radicals were better for smaller fractions, suggesting that capelin FPH may have the potential to help reduce oxidation