Comparison of bioactive properties of cod and chicken protein hydrolysates
Margret Geirsdottir1, Rosa Jonsdottir, Hordur G. Kristinsson1,2,* , Patricia Yuca Hamaguchi1, Annabelle Vrac1
1Matis, Biotechnology and Biomolecules Division, 2University of Florida, Department of Food Science and Human Nutrition

INTRODUCTION

- During processing of cod (Fig. 1) considerable amounts of protein rich byproducts are left over. This material is used for production of lower value products like mince and fish meal.
- The same problem concerns the poultry (Fig. 1) industry due to increasing quantities of chicken waste causing growing disposal costs and possible environmental pollution.
- Worldwide demand of proteins is increasing, and proteins from a variety of sources are growing in popularity in functional foods and nutraceuticals. Animal derived proteins have yet to enter this market successfully.
- Protein hydrolysates have been found to possess certain bioactive properties potentially beneficial to human health. Studies on peptides, mainly from in vitro studied, have recorded potential effects on hypertension, insulin regulation and oxidative stress.
- The properties of the hydrolysates may however be dependent on what type of protein source is used in processing. So far there has been no published comparison between chicken and fish protein hydrolysates so comparative studies on different protein sources are lacking.

METHODS

Materials
- Mince was made from fresh cod fillets and chicken breasts.
- Isolates were made by solubilizing the myofibrillar proteins at pH 11.0, separating them from lipids and connective tissue, and recovering the myofibrillar proteins by precipitation at pH 5.5.
- Hydrolysates were made by treating the proteins with a broad range of muscle protein sources (chicken v.s. cod).
- Scible fractions after centrifugation were collected and freeze dried.

Measurements
- Antioxidant properties of the different fractions were measured by
  - 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging
  - Reducing power
  - Oxygen radical absorbance capacity (ORAC)
  - Metal chelation
  - Angiotensin Converting Enzyme (ACE) inhibitory activity
  - SDS-PAGE Electrophoresis

RESULTS

- Protein source had little impact on the bioactive properties of the hydrolysates (Table 1). SDS-PAGE showed both samples had small peptides with MW < ∼ 10 kDa (Fig. 1).
- Cod protein hydrolysates (CPH) had slightly higher DPPH and reducing power activity while chicken protein hydrolysates (CHPH) had slightly higher metal ion chelating activity and ORAC values (Table 1).
- CPH had a higher ACE inhibition activity with an IC50 value of 0.7 ± 0.3 mg/mL compared to 1.0 ± 0.5 mg/mL for CPH (Table 1).

CONCLUSION

- This study demonstrated that two different muscle sources, cod and chicken, had very comparable bioactivities measured in vitro.
- The bioactivity is therefore largely determined by the processing conditions and not the muscle protein source, which can be very useful information for processors of hydrolysates and users of these products.
- In vivo studies are necessary to investigate if same results are found in living systems.

Table 1. Properties of cod and chicken hydrolysates.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Cod</th>
<th>Chicken</th>
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<tbody>
<tr>
<td>Protein [%]</td>
<td>84.1</td>
<td>84.0</td>
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<tr>
<td>Salt [%]</td>
<td>11.2</td>
<td>10.7</td>
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<tr>
<td>DPPH [%]</td>
<td>60.2 ± 0.6</td>
<td>87.0 ± 0.7</td>
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<tr>
<td>Metal ion chelating [%]</td>
<td>81.5 ± 2.2</td>
<td>83.3 ± 1.2</td>
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<tr>
<td>Reducing power*</td>
<td>17.7 ± 1.9</td>
<td>14.6 ± 2.9</td>
</tr>
<tr>
<td>ORAC value**</td>
<td>94.3 ± 6.0</td>
<td>108.6 ± 7.6</td>
</tr>
<tr>
<td>IC50 (mg/ml)</td>
<td>0.7 ± 0.3</td>
<td>1.0 ± 0.2</td>
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*Ascorbic acid equivalent mg/g protein
**μmol Trolox equivalent/g protein

Acknowledgments
This work was performed within the SAFEOODERA consortium and was funded by the Nordic Innovation Center (NICE) and the Icelandic Centre for Research (ICI). The financing of the work by ICR and NICE is gratefully acknowledged.