Publication:

**Contribution of cathepsins B, L and D to muscle protein profiles correlated with texture in rainbow trout (Oncorhynchus mykiss)**

Post-mortem softening of fish tissue often results in low yield and decreased product quality. In this study, proteolytic profiles of trout stored 5 days on ice were obtained by SDS-PAGE. The link between protein hand intensities and firmness of trout fillets was examined through a correlation study. In parallel, trout extracts were incubated with cathepsin B, cathepsin L and cathepsin D, alone or in combination, in order to evaluate the effect of each cathepsin on the texture-related proteins. Proteins from both myofibrillar (alpha-actinin, actin, MLC1, MLC2, and N-terminal 70 kDa MHC fragment) and sarcoplasmic (glycogen phosphorylase, creatine kinase, and TPI) fractions correlated closely with firmness. Cathepsins D, B and L affected, respectively, 10, 9 and 4 out of the 17 protein bands correlating with firmness, and most changes induced by cathepsin D were unfavourable to firmness. This implies that cathepsin D is likely to be involved in textural change of trout, due to breakdown of the muscle structure.
Stress induced alteration in the proteome of farmed trout: investigation of the mechanism behind changes in sensory properties

General information
State: Published
New method to discriminate between cathepsin B and cathepsin L in crude extracts from fish muscle based on a simple acidification procedure

A new and simple method to distinguish between cathepsin B and cathepsin L in crude extracts of herring (Clupea harengus) muscle has been established. An acid treatment of crude extracts (exposed to pH 3 for 5 min) activated a latent form of cathepsin L and inactivated cathepsin B. Furthermore, in neutral crude extract, the hydrolysis of benzyloxycarbonyl-L-phenylalanyl-L-arginyl-4-methylcoumarine (Z-Phe-Arg-MCA) (cathepsin B and cathepsin L substrates) was between 0% and 15% of the hydrolysis of benzyloxycarbonyl-L-arginyl-L-arginyl-7-amino-4-methylcoumarine (Z-Arg-Arg-MCA; cathepsin B substrate). Cathepsin B activity is measured in neutral extract using the specific cathepsin B substrate Z-Arg-Arg-MCA and cathepsin L activity is measured in acid-treated extract with Z-Phe-Arg-MCA as substrate. The specific cathepsin B inhibitor, CA-074, did not inhibit the Z-Arg-Arg-MCA significantly without affecting the Z-Phe-Arg-MCA activity. An acid treatment of the crude extract is therefore a more advantageous approach to discriminate between cathepsin B and cathepsin L activities.

General information

State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Protein Biochemistry
Authors: Godiksen, H. (Intern), Nielsen, H. H. (Intern)
Pages: 102-106
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information

Journal: International Journal of Food Science and Technology
Volume: 42
Issue number: 1
ISSN (Print): 0950-5423
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.89
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.67
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.65
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.65
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.47
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.51
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Kvalitetsforskelle i opdrætsørrød - kan de forudsiges?

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Process and Product Technology, Section for Aquatic Protein Biochemistry
Authors: Godiksen, H. (Intern), Hyldig, G. (Intern), Kjærgård, I. V. H. (Intern), Jessen, F. (Intern)
Publication date: 2006
Main Research Area: Technical/natural sciences

Bibliographical note
Poster
Source: orbit
Source-ID: 225526
Publication: Research › Poster – Annual report year: 2006

Stress induced changes in sensory properties and proteome of farmed trout

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Process and Product Technology, Section for Aquatic Protein Biochemistry
Authors: Godiksen, H. (Intern), Hyldig, G. (Intern), Jessen, F. (Intern)
Publication date: 2006
Main Research Area: Technical/natural sciences

Bibliographical note
Poster
Source: orbit
Source-ID: 225531
Publication: Research › Poster – Annual report year: 2006

Cathepsin activity in herring (Clupea harengus L.) caught at different locations and different seasons

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Protein Biochemistry
Authors: Godiksen, H. (Intern), Nielsen, H. H. (Intern)
Number of pages: 400
Publication date: 2003

Host publication information
Title of host publication: TAFT 2003: First joint trans Atlantic Fisheries Technology conference, 10-14 June 2003 Reykjavik, Iceland: 33rd WEFTA meeting
Sarcoplasmic reticulum Ca²⁺-ATPase and cytochrome oxidase as indicators of frozen storage in cod (Gadus morhua)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Process and Product Technology, Section for Aquatic Protein Biochemistry
Authors: Godiksen, H. (Intern), Hyldig, G. (Intern), Jessen, F. (Intern)
Pages: 2579-2585
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Food Science
Volume: 68
Issue number: 8
ISSN (Print): 0022-1147
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.77 SNIP 1.013 CiteScore 1.92
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.83 SNIP 0.985 CiteScore 1.97
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.937 SNIP 1.11 CiteScore 2.07
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.011 SNIP 1.079 CiteScore 2.24
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.978 SNIP 1.086 CiteScore 1.98
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.934 SNIP 1.058 CiteScore 1.9
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.047 SNIP 1.101
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.969 SNIP 1.001
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.886 SNIP 0.924
Scopus rating (2007): SJR 0.695 SNIP 0.966
Temperature and Ca2+-dependence of the sarcoplasmic reticulum Ca2(+)-ATPase in haddock, salmon, rainbow trout and zebra cichlid

Temperature dependence of Ca2+-ATPase from the sarcoplasmic reticulum (SR) in rabbit muscle has been widely studied, and it is generally accepted that a break point in Arrhenius plot exist at approximately 20 degreesC. Whether the break point arises as a result of temperature dependent changes in the enzyme or its membrane lipid environment is still a matter of discussion. In this study we compared the temperature dependence and Ca2+-dependence of SR Ca2+-ATPase in haddock (Melanogrammus aeglefinus), salmon (Salmo salar), rainbow trout (Oncorhynchus mykiss) and zebra cichlid (Cichlasoma nigrofasciatum). The Arrhenius plot of zebra cichlid showed a break point at 20 degreesC, and the haddock Arrhenius plot was non-linear with pronounced changes in slope in the temperature area, 6-14 degreesC. In Arrhenius plot from both salmon and rainbow trout a plateau exists with an almost constant SR Ca2+- ATPase activity. The temperature range of the plateau was 14-21 and 18-25 degreesC in salmon and rainbow trout, respectively. Ca2+-dependence in the four different fish species investigated was very similar with half maximal activation (K-0.5) between 0.2 and 0.6 muM and half maximal inhibition (I-0.5) between 60 and 250 muM. Results indicated that interaction between SR Ca2+-ATPase and its lipid environment may play an important role for the different Arrhenius plot of the different types of fish species investigated. (C) 2002 Elsevier Science Inc. All rights reserved.
Cytochrome oxidase as an indicator of ice storage and frozen storage

The potential of cytochrome oxidase as an indicator of ice storage and frozen storage of fish was investigated. Optimal assay conditions for cytochrome oxidase in a crude homogenate from cod muscle were studied. Maximal cytochrome oxidase activity was found at pH 6.5-7.5 and an assay temperature of 30 degreesC. Maximal activation by Triton X-100 was obtained in a range of 0.62-1.25 mM Triton X-100. The specificity of the assay was high, as cytochrome oxidase was inhibited 98% by 33 μM of the specific inhibitor sodium azide. The coefficient of variation of cytochrome oxidase activity in different cods was 21%, and the coefficient of variation of different analyses on the same homogenate was 5%. It was shown that ice storage of muscle samples before they were frozen and thawed resulted in a major freezing-induced activation of cytochrome oxidase activity. The enzyme may therefore be used as an indicator of frozen fish to determine if the fish has been stored on ice before freezing. Cytochrome oxidase activity showed also potential as an indicator of frozen storage, as it was possible to distinguish between the frozen storage temperatures -9, -20, and -40 degreesC.
Membrane bound enzymes ad indicators of frozen storage of fish. Sarcoplasmic reticulum Ca$^{2+}$-ATPase and cytochrome oxidase activity in cod muscle during frozen storage

General information
State: Published
Organisations: National Institute of Aquatic Resources
Authors: Godiksen, H. (Intern)
Number of pages: 169
Publication date: 2001

Publication information
Publisher: Danish Institute for Fisheries Research, Department of Seafood Research
Original language: English
Main Research Area: Technical/natural sciences

Bibliographical note
URA 01/61
Source: orbit
Source-ID: 225527
Publication: Research › Ph.D. thesis – Annual report year: 2001

Sarcoplasmic reticulum CA$^{2+}$ ATPase activity in cod (Gadus morhua) muscle measured in crude homogenates

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Protein Biochemistry
Authors: Godiksen, H. (Intern), Jessen, F. (Intern)
Pages: 343-358
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Food Biochemistry
Volume: 25
Issue number: 4
ISSN (Print): 0145-8884
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.394 SNIP 0.602 CiteScore 1.09
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.421 SNIP 0.585 CiteScore 1.13
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.409 SNIP 0.555 CiteScore 0.9
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.426 SNIP 0.613 CiteScore 1.03
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Sarcoplasmic Reticulum Ca2+-ATPase Activity in Cod (Gadus morhua) Muscle Measured in Crude Homogenates

General information
State: Published
Organisations: National Institute of Aquatic Resources
Authors: Godiksen, H. (Intern), Jessen, F. (Intern)
Pages: 343-359
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Food Biochemistry
Volume: 25
Issue number: 4
ISSN (Print): 0145-8884
Ratings:
BFI (2018): BFI-level 1
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.394 SNIP 0.602 CiteScore 1.09
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.421 SNIP 0.585 CiteScore 1.13
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.409 SNIP 0.555 CiteScore 0.9
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.426 SNIP 0.613 CiteScore 1.03
ISI indexed (2013): ISI indexed yes
The effect of ice storage and freeze/thaw cycles on CA 2+ -ATPase and Cytochrome oxidase activity in salmon (Salmo salar)

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Aquatic Protein Biochemistry
Authors: Godiksen, H. (Intern), Jessen, F. (Intern)
Pages: 151-159
Publication date: 2001
Conference: 30th West European Fish Technologist's Association Plenary Meeting, Torshavn, Faroe Islands, 19/06/2000 - 19/06/2000
Main Research Area: Technical/natural sciences

Publication information
Journal: Annales Societatis Scientiarum Færoensis Supplementum
Volume: XXVIII
ISSN (Print): 0356-6772
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
BFI (2015): BFI-level 1
BFI (2014): BFI-level 1
BFI (2013): BFI-level 1
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
ISI indexed (2012): ISI indexed no
Sarcoplasmic reticulum CA 2+ -ATPASE activity changes during frozen storage depend on pre-freezing time

General information
State: Published
Organisations: Section for Aquatic Protein Biochemistry, National Institute of Aquatic Resources
Authors: Jessen, F. (Intern), Jensen, U. (Ekstern), Godiksen, H. (Intern), Georgakis, S. (ed.) (Ekstern)
Pages: 412
Publication date: 2000
Conference: 29th West European Fish Technologists Association Meeting, Leptocarya, Greece, 10/10/1999 - 10/10/1999
Main Research Area: Technical/natural sciences

Publication information
Journal: Proceedings of 29th WEFTA Meeting, 10 - 14 October, 1999 - Leptocarya - Pieria, Greece
Original language: English
Source: orbit
Source-ID: 226043
Publication: Research › Conference article – Annual report year: 2000

Projects:

Prediction of technological and sensory quality of trout
Manufacturing food of high and uniform quality requires good knowledge of the characteristics of the raw material, and knowledge of how these characteristics vary between different raw materials. It is also necessary to know how suitable a given raw material is for different types of product, and how the interaction between raw materials and production technology affects the sensory quality of the final product.

The most important differences between fish raw materials will be reflected in the pheno type of the fish, irrespective of whether the cause of this is genetic or environmental. Characterization of pheno type will thus be appropriate to identifying the characteristics of the raw material (protein markers) that will be included in a model to predict the technological and sensory quality of the final product.

The project will produce a number of frozen and smoked products from different raw materials. Characterisation of pheno types will take place through proteom analyses, where image analysis of 2DE gels will reveal protein markers that can potentially relate the quality of the final product to the characteristics of the original raw material. These proteins will be identified using mass spectroscopy and antibodies against them will be raised. The antibodies will be used to develop rapid immune chemical methods. The quality of both the different varieties of raw materials and the

National Food Institute
Division of Industrial Food Research
Department of Systems Biology
Enzyme and Protein Chemistry
Period: 01/08/2003 → 30/04/2009
Number of participants: 6
Project participant:
Kjærgård, Inger Vibeke Holst (Intern)
Godiksen, Helene (Intern)
Hyldig, Grethe (Intern)
Barkholt, Vibeke (Intern)
Membranbundne enzymer som fryselagringsindikerer

Department of Systems Biology
Period: 01/03/1997 → 10/09/2001
Number of participants: 5
Phd Student:
Godiksen, Helene (Intern)
Main Supervisor:
Jessen, Flemming (Intern)
Examiner:
Jørgensen, Bo Munk (Intern)
Nielsen, Robert (Ekstern)
Rehbein, Hartmut (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Program Stipendium-SU, Eksp
Project: PhD

Quality indicators for frozen fish
An important factor for efficient utilisation of the resources of fish is quality assurance in the chain from catch to consumer. Freezing is an effective method for preserving fat and lean fish. In order to reduce the quality loss during processing, storing and distribution it is necessary to obtain better knowledge of the biochemical shelf life indicators of the different species. It is important to create a system of traceability of the fish through the chain for the benefit of the consumer. On the background of the obtained knowledge in the project the objective is to construct a model for labelling of quality, prediction of shelf life and utilisation and to obtain a better freezing stability. The aim is to give guidelines for the optimum handling of fish prior to freezing, the optimum freezing-, storage- and thawing conditions and to collect data necessary for prediction of a production of thawed fish packed in MAP based on raw material frozen-at-sea. The effect of season, catch handling, cold/chilled storage period and temperature is examined.

National Institute of Aquatic Resources
Hoejmarklaboratory
Period: 01/01/1997 → 01/03/2002
Number of participants: 6
Project participant:
Jensen, Helle Skov (Intern)
Jørgensen, Bo Munk (Intern)
Jessen, Flemming (Intern)
Jensen, Kristina Nedenskov (Intern)
Godiksen, Helene (Intern)
Project Manager, organisational:
Nielsen, Jette (Intern)

Financing sources
Source: Unknown
Name of research programme: Ukendt
Amount: 9,994,630.00 Danish Kroner
Project