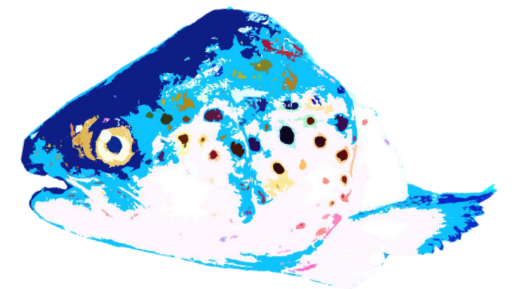




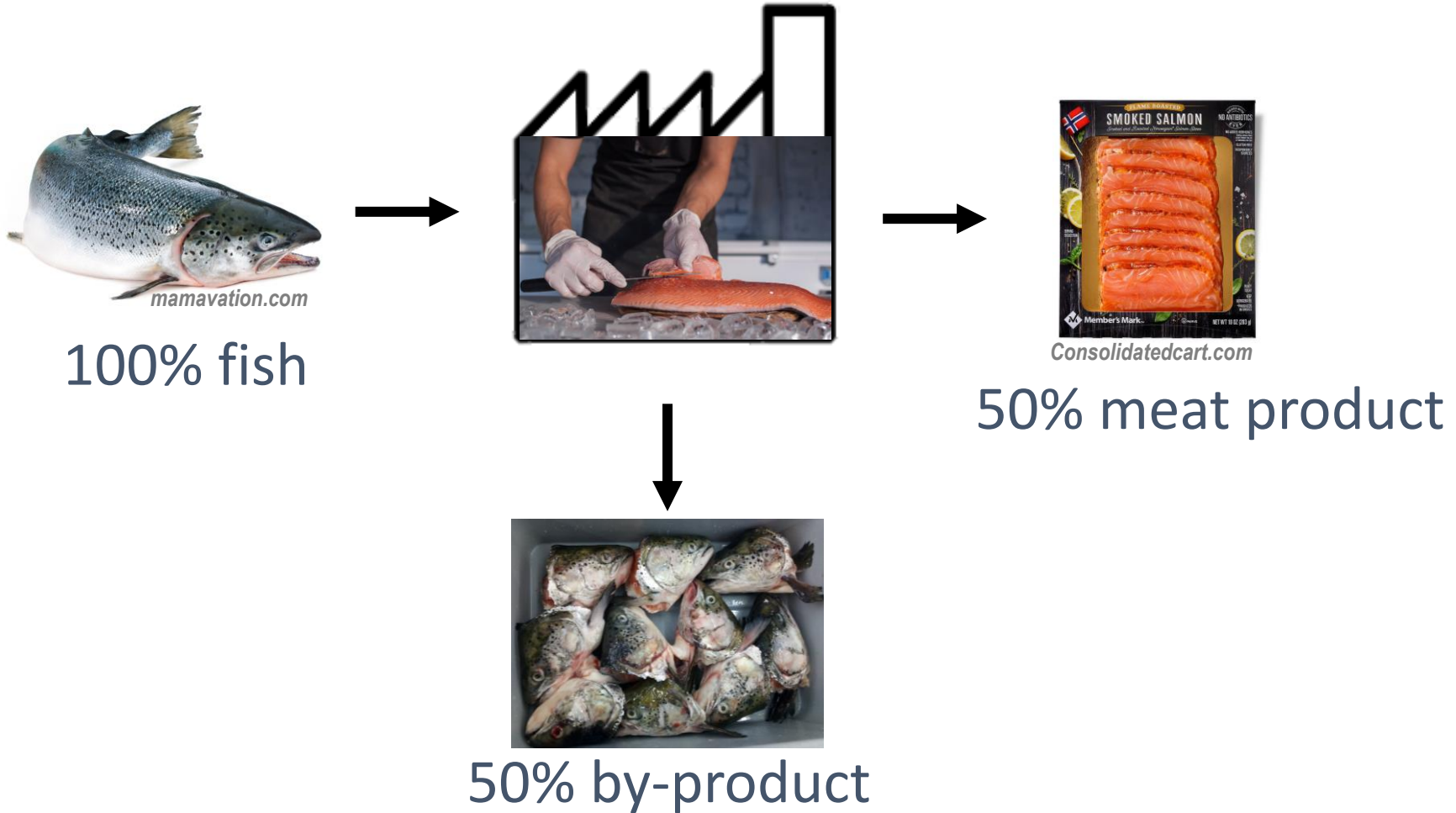
## Sustainable approach toward salmon by-products bioeconomic potential

**Isabel Cuenca**

Marine Institute, Memorial University of Newfoundland  
Reykjavik, June 10, 2022



# Salmon by-product generation



# Salmon by-product utilization



## Traditional use

## Potential use



[www.alibaba.com/product-detail/Low-Moisture-and-Impurities-high-protein\\_60221462751.html](http://www.alibaba.com/product-detail/Low-Moisture-and-Impurities-high-protein_60221462751.html)



[www.biomarinus.co.nz](http://www.biomarinus.co.nz)



[www.ca.iherb.com](http://www.ca.iherb.com)

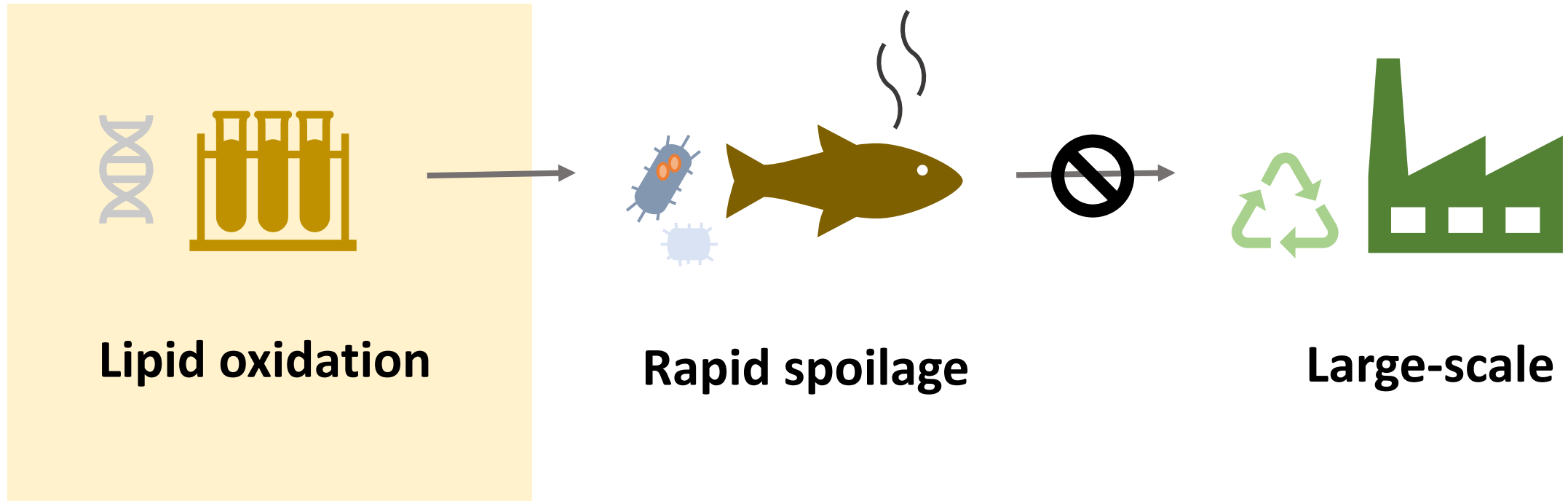


[www.momjunction.com/articles](http://www.momjunction.com/articles)



<https://naturecollagen.com>

# The challenge



# Lipid oxidation

A dynamic reaction between oxygen and lipids



Internal factors

External factors

**Fe<sup>2+</sup>**



*Medicalnewstoday.com*



*news.unl.edu*

**O<sub>2</sub>**



*Superawsomevectors.com*



**Heat and  
Temperature**

*slideshare.net*

# Salmon processing discards



Salmon heads



Salmon viscera



Salmon frames

# Alternatives for storage

Lipids + Hemoglobin

Separate hemoglobin

Impede contact

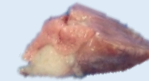
# By-products organs



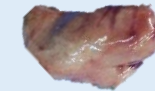
Esophagus



Intestine



Heart



Liver



Bile sac



Stomach and pyloric caeca



Spleen



Swim bladder



Gonads



Gills



Eyes



Brain



Fatty tissue and  
cartilage



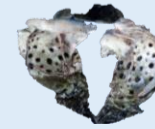
Cheeks



Tongue



Skin



External facial skeleton



Jaw



Pectoral fins



Skin and dorsal, adipose,  
caudal, and anal fin



Meat and spines



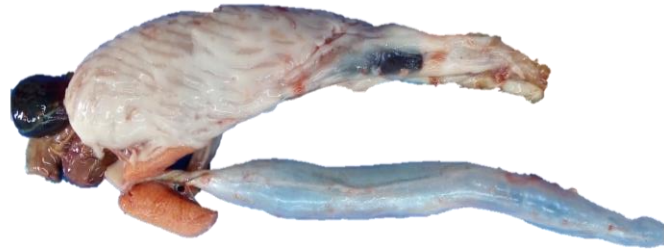
Bones



Parts of the kidney



# Reactive organs



Liver and bile sac



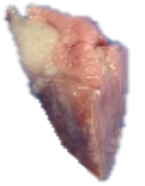
Gonads



Spleen



Air bladder



Heart



Gills



# Viscera with/without reactive organs



Viscera **with** reactive organs



Viscera **without** reactive organs

# Heads with/without reactive organs



Head **with** gills



Ground head **with** gills

Ground head **without** gills



Heads **without** gills

# Study: reactive organs

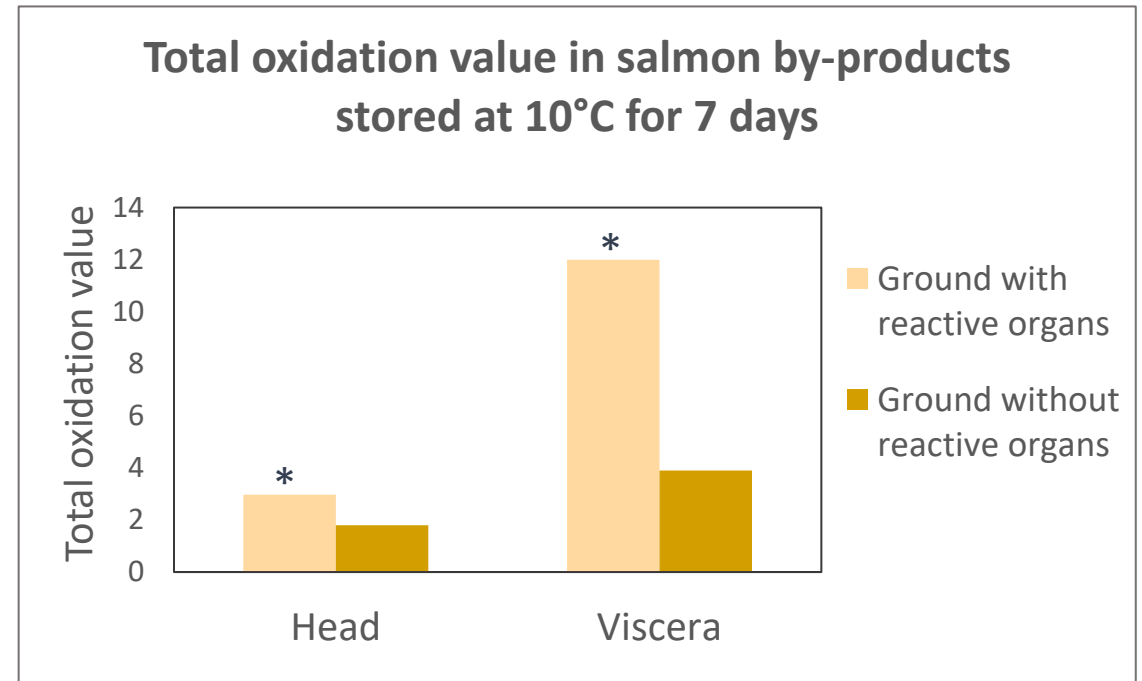
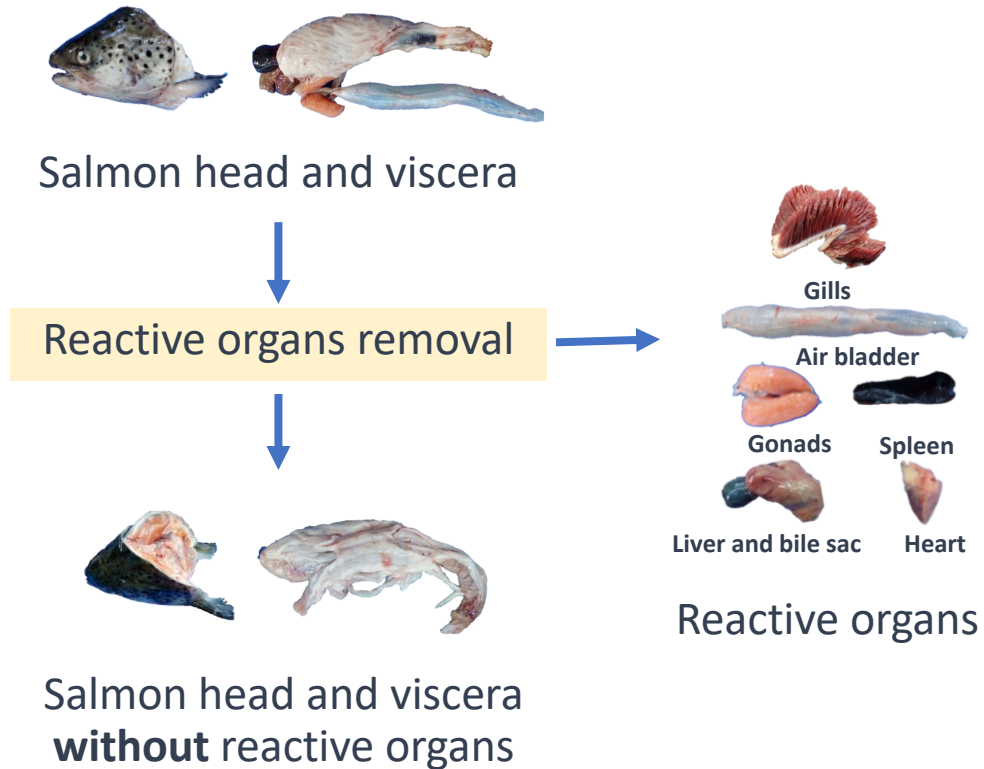


Figure 2. Total oxidation value in by-product lipids during the storage at 10°C for 7 days.  
\* Denotes statistical difference (p<0.05)

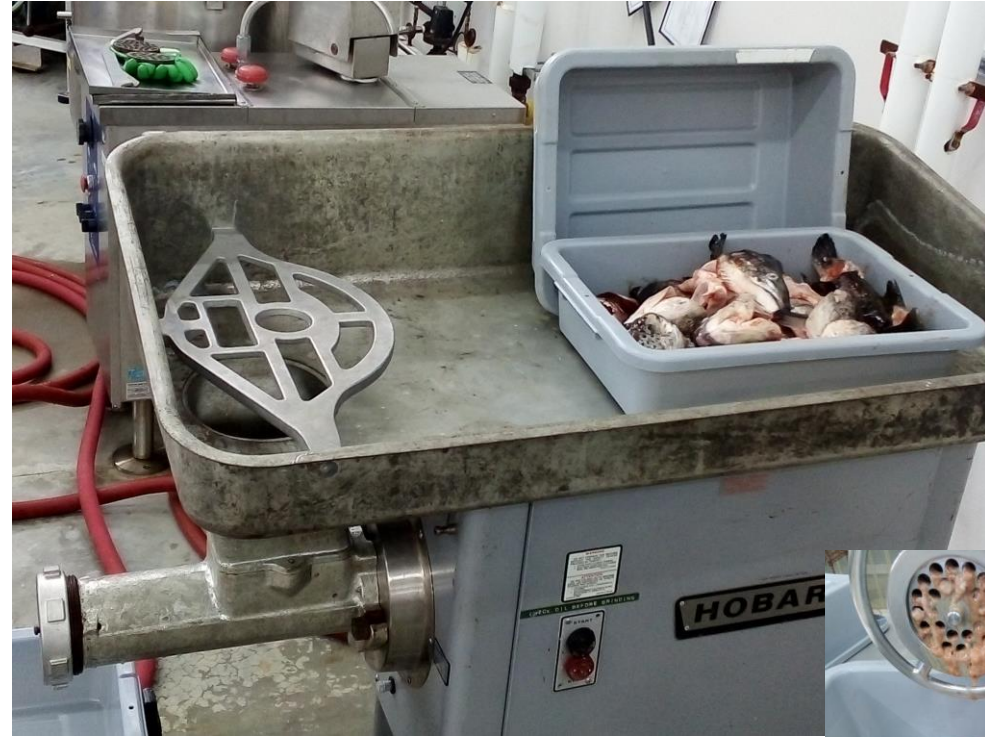
# Processing intensity

Processing intensity	Description	Examples
High-intensity processing	Reduction of size with high tissue damage	<b>Mincing</b> <b>Grinding</b> <b>Homogenizing</b>
Low-intensity processing	Remaining size with low tissue damage	<b>Tumbling</b> <b>Dipping</b> <b>Immersing</b>

# Tissue damage due to processing



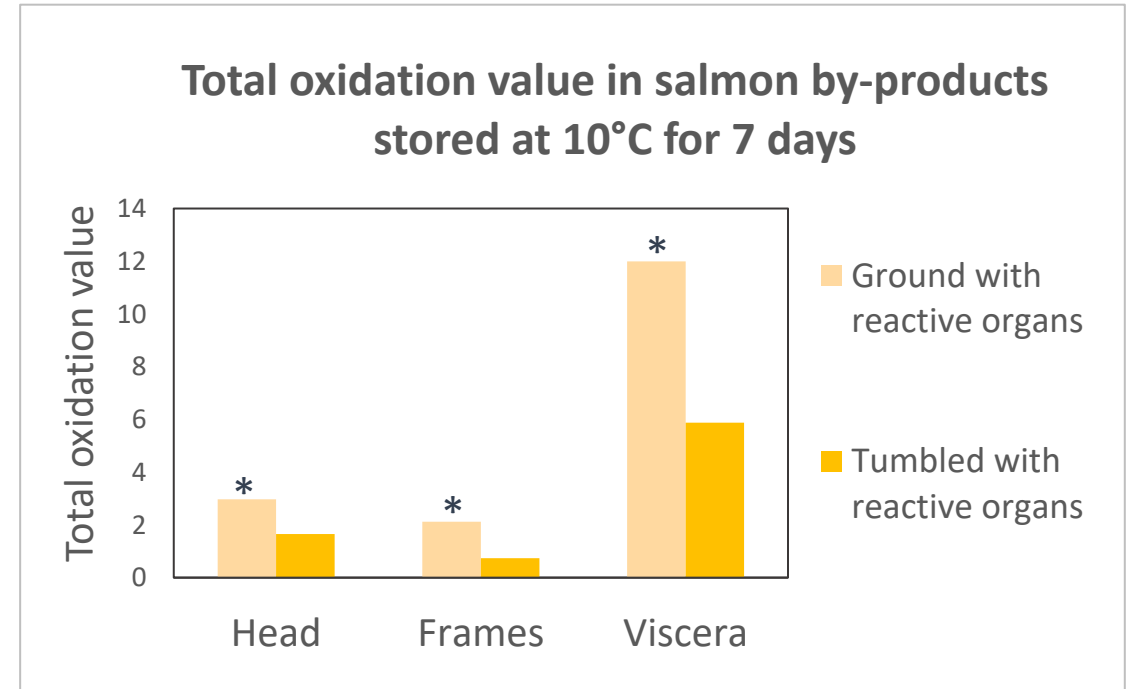
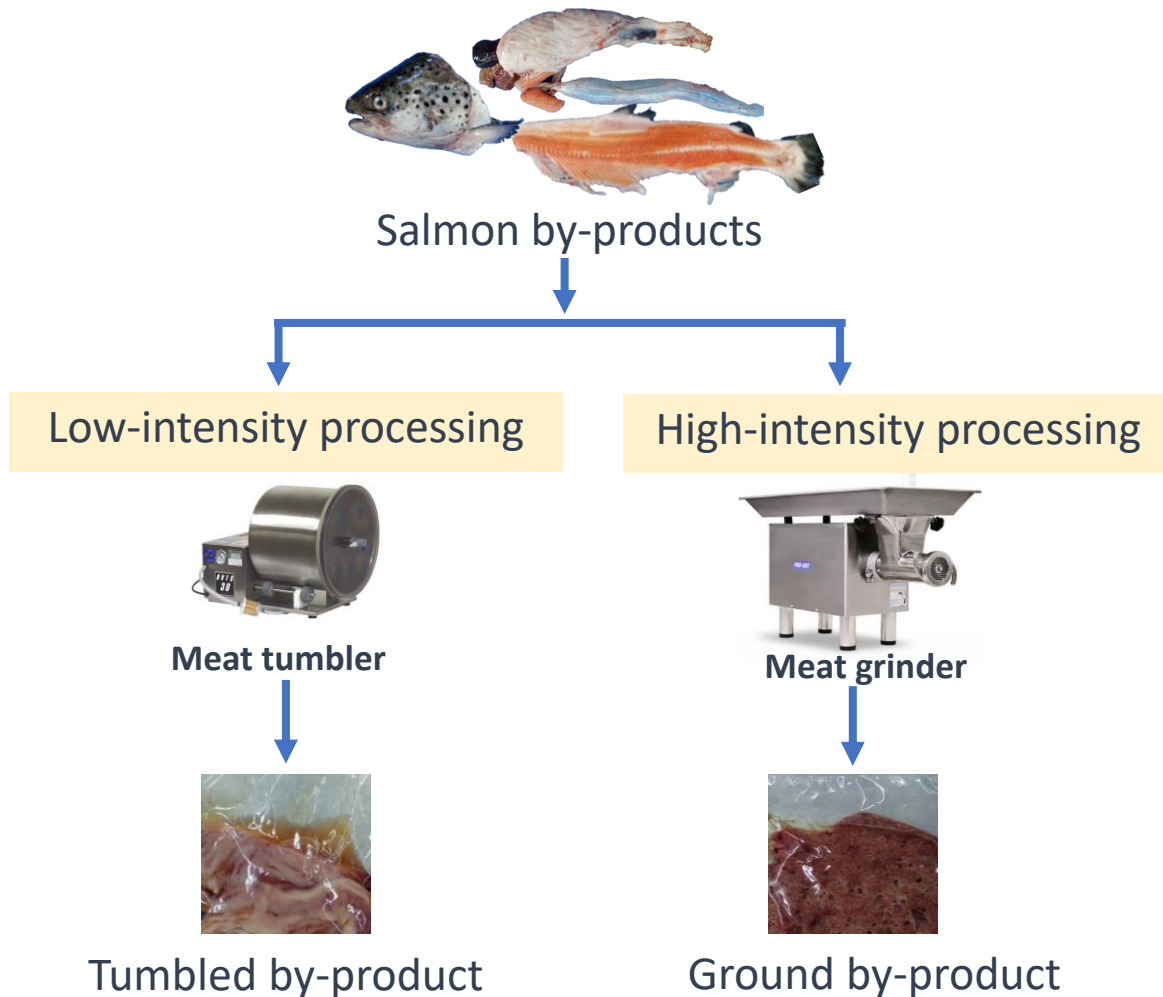
Meat **tumbler**  
**Low** tissue damage



Meat **grinder**  
**High** tissue damage



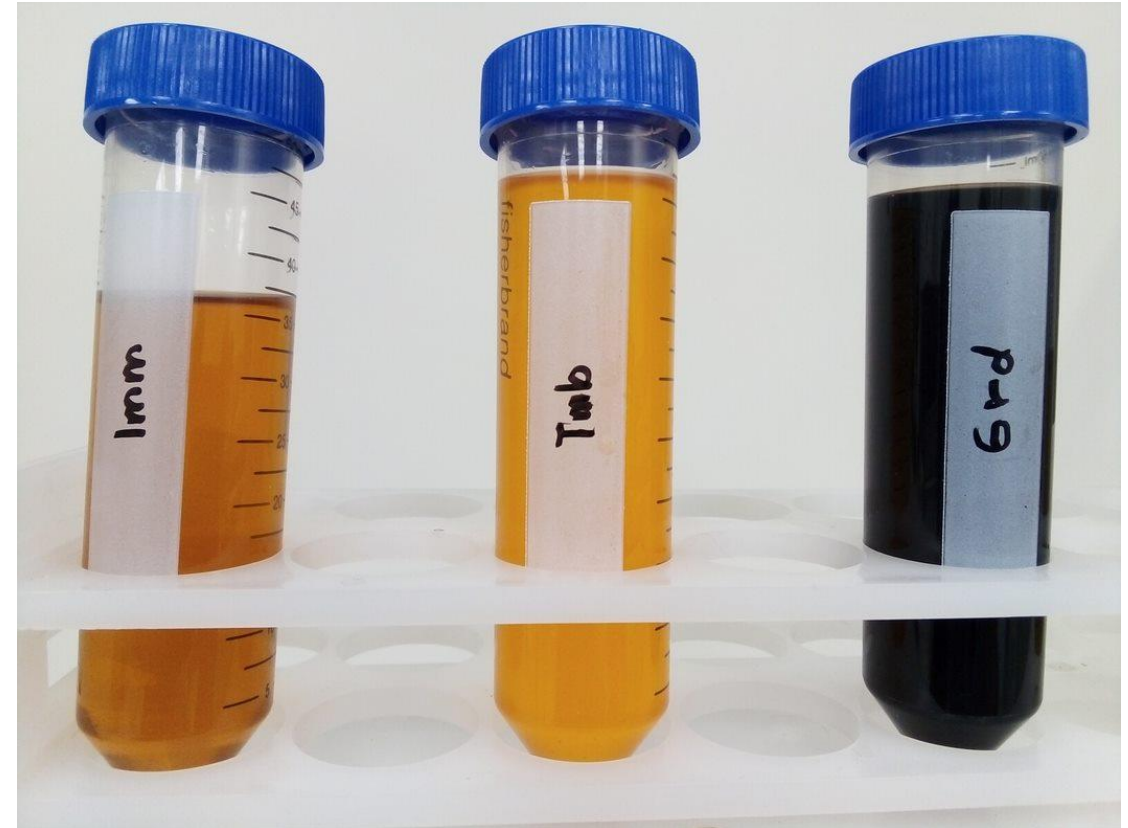
# Study: processing methods



**Figure 2. Total oxidation value in by-product lipids during the storage studies at 10°C for 7 days.**  
\* Denotes statistical difference (p<0.05)

# Study of processing methods

The proper processing method can maintain the quality of by-products during storage by impeding contact between lipids and prooxidants



Oil extracted from salmon viscera stored 4 days after **immersion** process

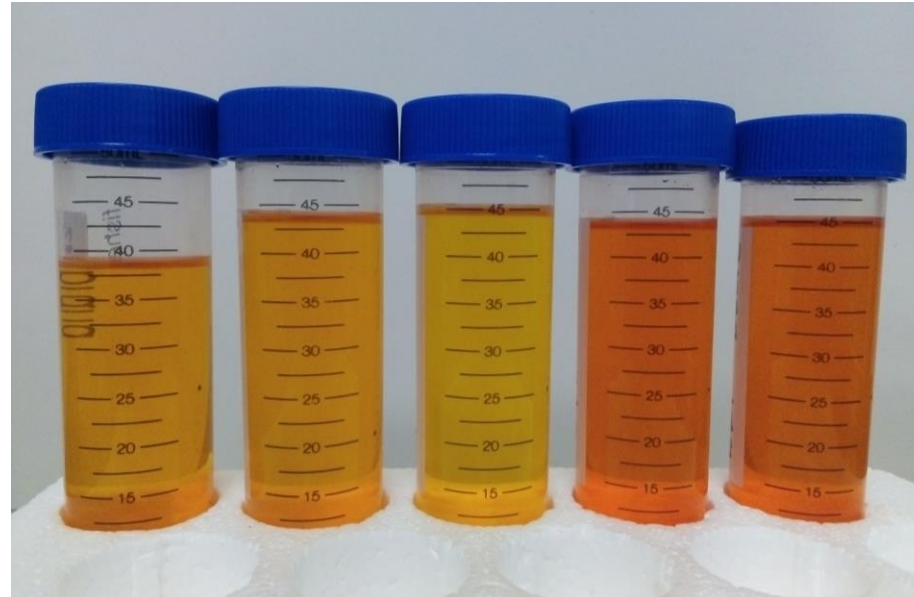
Oil extracted from salmon viscera stored 4 days after **tumbling** process

Oil extracted from salmon viscera stored 4 days after **grinding** process






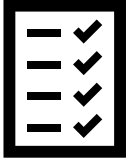
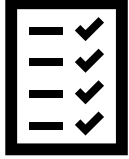



# Study of individual organs

The sorting of organs can maintain the quality of by-products during storage by reducing the load of prooxidants

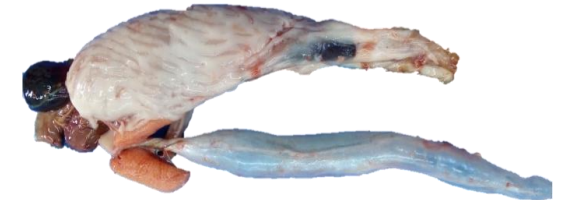


# Analysis of processing viability

Targeted compound	Omega-3	Proteins	Enzymes	Calcium
More viable material				
Material enhancing degradation				

# Main takeaways

- Sorting organs and selecting the appropriate processing is relevant for maintaining quality during storage
- The proper handling of by-products can hit the blue economy by increasing the technology at a large-scale
- **To maximize their value, the proper handling of fish by-products is critical**





**Gracias!**

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4<sup>th</sup> Fish Waste 2022  
**FOR PROFIT**  
Icelandic Fisheries Conference 

