

## UPGRADING OF SIDE STREAMS – POTENTIAL IN LAMB AND BEEF HYDROLYSATES

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### PROJECT DESCRIPTION

The upgrading of side stream products (by-products, offal, blood) is an area of focus. There seems to be two main reasons for this focus:

- 1) The global increase in protein demands
- 2) The increasing pressure on meat producers to reduce CO<sub>2</sub> emissions

This optimization of by-products/side stream products/biomasses from slaughterhouses is directed towards an economic add-on as well as improvement of environmentally related factors. By moving raw material from feed to food, the CO<sub>2</sub> emissions are reduced, as the calculation of CO<sub>2</sub> emission is based on the amount of meat (proteins) that may be replaced. From a nutritional perspective, proteins from side stream products like offal and blood may have a high nutritional value due to the content of essential amino acids according to WHO directions for human health. Nowadays, there is little tradition for using offal and blood in the family dinners. Producing ingredients (e.g. proteins and fat) from side stream products seems to be a feasible solution.

The aim of this project was to present an overview of state of the art for utilization of proteins from side stream raw materials with focus on hydrolysed proteins. The goal was to gather knowledge related to quality, application, consumers, business potential, health and functionality related to the upgrading of slaughterhouse side stream proteins.

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## PROJECT CONTENT

The project was carried out in two main activities:

- 1) Consumer survey on the use of protein supplements and/or protein enriched food products
- 2) State of the art on the use of side stream products (literature review)

The project deliverables related to the main activities were:

- Report on the consumer survey results
- State of the art literature report
- Catalogue, which contains main findings from the consumer survey and the literature search. Furthermore, the catalogue also contains the main findings from interviews with personnel associated with the Australian meat industry.

## PROJECT OUTCOME

This section presents the main findings from the consumer survey, literature search on the use of side stream products and interviews.

### Consumer survey

In total, 622 consumers participated in the survey (on-line questionnaire), of which 225 used protein supplements. The overall aim of the survey was to study the attitudes towards protein of slaughterhouse origin. In general, the consumers had strong reservations against proteins from e.g. offal and blood. The reservation was not readily changed by the inclusion of nutrient information. The most preferred protein enriched food products are within the “snack category” (bars and shakes), which may be the products to start with, when developing products enriched with side stream proteins.

### Literature search

#### Methods for protein production

The main methods for protein production include hydrolysis by heat and by enzymes. These two methods are the corner stones in the production of proteins from side stream raw materials. Heat hydrolysis has been used for years in the production of soup stock based on bones as raw material. Roasting can be applied prior to the hydrolysis for the generation of roasted meat flavour. Enzymatic hydrolysis is also a well-known process. Even so, there are

challenges in the process due to the generation of bitter taste and off-flavours. In some cases, the off-flavours can be linked to the raw material used in the hydrolysis. Previous studies reveal that fermentation of the hydrolysed proteins is a feasible solution to minimise the off-flavours.

It is not known to which extent extraction of proteins are used industrially. However, extraction may be an interesting approach due to the preservation of protein functionality, though few reports on the method have been published.

### **Application of proteins**

Regarding application of hydrolysed proteins to foods, it all comes down to the purpose of the protein addition (functionality, health) and then finding the perfect match between the protein and the food carrier. When adding enzymatic hydrolysed proteins, the potential off-flavour can be a challenge, and a masking strategy may have to be included.

### **Nutrition**

WHO has given directions for the composition of a complete protein, based on a minimum content of essential amino acids. Plasma, beef tongue, beef liver and lamb sweetbread are examples of complete protein sources.

In general, if a nutrition claim is made about a food, a nutrition information panel must be included on the label (Food Standards). In schedule 4, Nutrition, health and related claims related to proteins are stated (Food standards, as of 1 March 2016).

### **Bioactivity**

Much interest has been given to the potential bioactivity properties of peptides, and researchers have investigated activities such as “antimicrobial”, “antioxidant”, inhibition of hypertension, prevention of diabetes etc. However, so far, none of the peptides have been approved by authorities including the European Food Safety Authority (EFSA). This means that no claim can be used for these peptides. To the best of our knowledge, only the peptide from the Japanese Bonito fish has been commercialised, which presumably has an inhibiting effect on hypertension.

### **Interview**

#### **Potentials and obstacles in short**

Cattle blood was pointed out as one of the side stream products that has an upgrading potential. At the same time, the potential is highly dependent on marked prices and the investment necessary to perform the upgrading.

Among the obstacles for upgrading are logistics, cost of set-up, food labelling directions and consumer reservations.

## **BENEFIT FOR INDUSTRY**

Within the production flow in and around the slaughterhouses there are plenty of proteins to be utilised more effectively. Looking at the MLA price statistics, the most obvious offal products for processing protein hydrolysates could be blood cells (plasma proteins could be used without processing) and the low-priced parts of beef and lamb. So, in theory, there is a clear potential for using blood and offal, but there is a need to create the right story for marketing purposes.

## **USEFUL RESOURCES**

MLA statistics database: <http://statistics.mla.com.au/Report/List>

Food Standards Australia: <http://www.foodstandards.gov.au>

USDA National Food Database: <https://ndb.nal.usda.gov/ndb/>

Danish National Food Database: <http://frida.fooddata.dk/>

WHO directions on protein:

[http://www.who.int/nutrition/publications/nutrientrequirements/WHO\\_TRS\\_935/en/](http://www.who.int/nutrition/publications/nutrientrequirements/WHO_TRS_935/en/)

MLA info sheet on bone stock preparation:

<http://www.meatupdate.csiro.au/infosheets/Preparation%20of%20Bone%20Stock.pdf>