Innovative systems for objectively classifying meat products or meat preparations

Summary

The meat sector faces the challenge of objectively distinguishing between meat preparations and meat products. The classification of a meat by-product into one of these two categories determines which additives can be applied to it.

According to current legislation (Regulation 1333/2008 and Regulation 853/2004), the key factor in classification as a meat preparation or a meat product is the degree of processing that the meat by-product has been subjected to, whether this process can alter the internal structure of the muscle fibre, and whether the cutting surface preserves the characteristics of the fresh meat.

The histological study-based methodologies which have been used in recent years are not yet sufficiently robust to make a clear distinction between meat preparations and meat products. Given the above, the project aims to implement an objective methodology based on currently available analytical procedures, combined with a selection of process and product parameters. This will provide the basis for making an unambiguous distinction between meat preparations and meat products, depending on the extent to which the internal structure of the muscle fibre has been processed or altered during the meat by-product's production process.

Objectives

The overall objective of the project was to develop a decision-making tool for classifying meat by-products according to current legislation. The following specific objectives were proposed to achieve this goal:

1. Assess analytical technologies and process/product parameters that enable a meat by-product to be classified as a meat preparation or meat product.
2. Develop a decision supporting tool to facilitate the technological adaptation of meat by-products and their classification in accordance with current legislation.

Description of the actions carried out in the project

The following activities were carried out to achieve the goal of the project:

Activity 1: Assessment of the potential of analytical technologies complementing histological analysis to distinguish between meat preparations and meat products produced under controlled pilot plant conditions.

Activity 2: Comparison of the analytical technologies selected in Activity 1 with the histological methodology used in commercial meat by-products in the European market which experienced difficulties with distinction or which create discrepancies in interpretation.

Activity 3: Design and implementation of a tool (a decision tree) for the classification and technological adaptation of the meat by-products selected in Activity 2.

Activity 4: Industrial validation of the technological adaptation and assessment of meat by-products in the domestic market and in various intra-community markets.

Activity 5: Communication and dissemination of the results.

Final results and practical recommendations

The main results of the study included the proposal for a classification system using an analysis method (simpler and faster than histological methods and protein solubility analysis) based on the evaluation of *Near Infrared*(NIR) spectra in a meat by-product, before (Control) and after high pressure processing (HP), which relates the changes in the spectra to the extent to which the characteristics of the fresh meat have been preserved.

This analytical method enables the meat by-product to be classified as a meat preparation or meat product based on the change in the NIR spectra (Control vs HP). The change in NIR spectra is more extensive when the meat by-product has more characteristics of fresh meat, due to the greater effect of HP on the protein structure. On the other hand, the change in NIR spectra is more limited when the meat by-product has fewer characteristics of fresh meat. This is associated with the fact that the proteins have been denatured and/or gelled in the process used to make the meat by-product (heat treatment, acidification, salting, dehydration or a combination thereof), and the effect of the high pressure on the protein structure is therefore more limited.

A decision tree was designed to unequivocally classify the meat by-products as meat preparations or meat products, using the Meat Derivatives Classification Model obtained based on the measurement of NIR spectra. A second decision tree was also designed to adapt and/or modify the process involved in making the meat by-product so that it becomes a meat product based on the key parameters in the process.

After a clear and unambiguous classification of the meat by-product has been obtained, the company producing it will monitor the key parameters of the meat by-product, and ensure that they remain within the ranges previously defined and used for classification. Based on this proposal, no further classification analysis will be required as long as the key parameters of the meat by-product remain within the range defined in the validation process.

If the meat by-product is classified as a meat preparation when it leaves the company, i.e. at the very beginning of its shelf life, it must be considered as such, regardless of whether it may become a product during its shelf life (e.g. due to acidification). However, if the meat by-product is classified as a meat product when it leaves the company, it cannot become a meat preparation.

Conclusions

When used with the classification model of the meat by-product obtained, the analytical methodology developed for the classification of meat by-products based on measurement of the NIR spectra of the control sample and the sample treated by high pressure, opens up an interesting and promising line of work which, in the near future, may assist in resolving and/or clarifying the classification of meat by-products which are not currently clearly defined as meat preparations or meat products.

However, this analytical methodology, together with the Classification Model obtained, still requires significant additional research and development if it is to be standardised and validated.

It is a non-standardised methodology that must be standardised and validated if it is to be implemented at the laboratory level and be recognised as a reference analytical method for the classification of meat by-products according to current Spanish and European legislation.

The ultimate aim of the implementation and validation of this new analytical methodology is to provide a reference tool for use by the competent authority and companies when classifying commercial meat by-products when there are reasonable doubts about their classification, because they do not clearly present the characteristics of either fresh meat or a meat product (the cut surface shows that the product no longer has the characteristics of fresh meat), and to be able to solve the current problem.

Finally, an interesting aspect or advantage of the NIR analytical method and the Classification Model developed in comparison with other methods is that after the meat by-product for which the classification is open to doubt has been clearly (unequivocally) classified in one of the two categories (meat preparation or meat product), i.e. it has been validated, it is no longer necessary to repeat the analyses for its classification in the future. The company producing the product would only need to monitor and document the characteristic key parameters of the composition of the by-product and the production process of the meat by-product falling within the previously defined range (verification).

Leader of the Operational Group

ORGANISATION: MEAT AND MEAT INDUSTRIES BUSINESS FEDERATION
CONTACT E-MAIL: fecic@fecic.es

Coordinator of the Operational Group

ORGANISATION: INNOVACC
CONTACT E-MAIL: innovacc@olot.cat

Other members of the Operational Group (grant recipients)

ORGANISATION: JOAQUÍM ALBERTÍ, SA
CONTACT E-MAIL: laselva@laselva.es
ORGANISATION: COOPECARN GIRONA, SLU
CONTACT E-MAIL: info@boletsdesoca.com
ORGANISATION: NOEL ALIMENTARIA, SAU
CONTACT E-MAIL: jplanella@noel.es
ORGANISATION: ROLER ESPAÑA, SLU
CONTACT E-MAIL: info@roler.com

Other members of the Operational Group (not recipients of the grant)

ORGANISATION: IRTA
CONTACT E-MAIL: irta@irta.cat

Subject area(s) of application

☒ Food quality/processing and nutrition
☒ Supply chain, marketing and consumption

Geographical area(s) of application

PROVINCE(S): BARCELONA, GIRONA
REGION(S): EL VALLÈS OCCIDENTAL, EL BARCELONÈS, LA GARROTXA

Dissemination of the project: publications, seminars, multimedia, etc. (State links)

INNOVACC annual magazine 2021, where there is an article on the project. Action planned in the Project Dissemination Plan. See page 16 of the following link:
https://www.innovacc.cat/wp-content/uploads/2021/06/disseny-revista-innovacc-2021_ok.pdf

Project website

https://www.innovacc.cat/2021/08/10/sistemes-innovadors-per-a-classificar-de-manera-objectiva-productes-carnis-o-preparats-carnis-3/

More information on the project

PROJECT DATES	TOTAL BUDGET
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Order ARP/133/2017 of 21 June, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ARP/1282/2018, of 8 June, announcing the call for the grant.

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