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Meat4Vitality: Novel meat products target promotion of healthy ageing

Key external stakeholders:

Primary and secondary meat processors, consumers, dieticians, ingredients companies, food retailers, regulatory agencies, charities

Practical implications for stakeholders:

- Red meat is an ideal foodstuff to support healthy ageing, containing the essential amino acids in the right proportions to promote muscle maintenance, as well as key micronutrients, and it also provides an excellent food vehicle for fortification with health-promoting ingredients.
- The Meat4Vitality project developed targeted meat products for the growing cohort of over-65s.

Main results:

- Aiming to promote healthy ageing, the researchers developed novel steaks with softer texture from economical cuts, highly flavoured comminuted products to address chemosensory decline, and protein-enriched beef patties and restructured steaks to deliver approximately 30g protein in a small portion size (75g), as favoured by older people.
- Acceptability of many novel products to the target market was demonstrated using consumer panels of over-65s in UCC and AFBI and these panels also showed that within the over-65 cohort, sensory acuity was stratified with age.

Opportunity / Benefit:

Healthy ageing, through maintaining vitality and quality of life is a grand challenge of growing international importance. Availability of flavoursome and wholesome fortified meat products will provide greater choice to older adults enhancing nutritional status, vitality and quality of life.

Enhanced knowledge of the structure-function relationship in meat products using microscopy, in vitro gut models and nutritional profiling will be of benefit to dietitians, industry and the international scientific community.

The improved texture, sensory properties and functional benefits of novel meat products developed in case studies in this project will improve consumer appeal in a growing consumer segment (older adults) and could increase in European market share for meat processing companies.

Collaborating Institutions:

UCC
AFBI

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1. Project background:

Nutrition has an important role to play in supporting healthy ageing, but by the age of 80, caloric intake decreases to 800-1200 kcal/day, due to factors such as decreased appetite, poor dentition, reduced chemosensory perception and cognitive impairment. This leads to unintended weight loss in older adults, muscle wasting, reduced immunity and cognitive function. Protein, in particular is a highly significant nutrient in the context of this challenge. Older people need to consume more high quality protein than younger cohorts to help counteract the steep decline in muscle mass that occurs as we age. Red meat is a rich source of certain nutrients particularly important for healthy ageing e.g. protein (growth and repair), beneficial fatty acids (cognitive function), vitamins and micronutrients. . As staple foods, meat products also offer potential as vehicles for fortification with added nutrients such as fibre, vitamins and minerals. However, meat is a challenging food matrix, in terms of texture which partly explains why intakes decrease in older adults. This project aimed to explore the opportunities for meat processors in supporting healthy ageing.

2. Questions addressed by the project:

- How does meat texture perception change as we age?
- Can we increase our understanding of the chemosensory response of consumers at different ages to meat and meat products?
- Can we develop improved texture whole muscle products, with excellent sensory characteristics that will be acceptable to older consumers?
- Can we develop comminuted beef and pork products with improved health profile, i.e. reduced salt, with acceptable flavor characteristics to those aged over-65
- Can we develop a fortified meat product to deliver high protein content in a small portion size?
- Does the PiVac system of elasticated packaging have relevance to the development of restructured beef products?
- How do the plant proteins affect the digestive profile of the meat products?
- What are the consumer responses to meat products developed in the studies?

- **The experimental studies:**
- Steaks of variable texture classification were sensorially assessed by consumers ranging from 20 to 85 years of age
- Fresh and marinated meat products were developed and assessed for texture profiles and rheological characteristics appropriate for older consumers while preserving their intrinsic nutritional value
- To develop novel versions of traditional comminuted meat products with enhanced sensory characteristics specifically tailored to older adults
- To develop novel versions of traditional meat products with enhanced nutritional profiles, specifically tailored for the elderly.
- To assess the technological and sensory performance of prototype restructured meat products developed using the Pivac wrapping technology
- To test relevant packaging systems in meat product for their acceptance among older consumers
- To apply realistic digestive models to observe the digestibility of meat products including added plant protein
- To conduct a consumer study of the most promising developed products to fully understand the consumer acceptance and commercial possibilities.

3. Main results:

- The sensory capability of young, middle-aged and elderly Irish assessors to identify beef steaks of

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varying texture varied significantly and poor identification of tenderness classification was found in the 71–85 age cohort groupings
- The Meat4Vitality project developed targeted meat products for the growing cohort of over-65s.
- A variety of proteinaceous plant-based ingredients increased the protein content of beef patty formulations.
- Rice protein addition enhanced protein content in beef patties, while lentil flour did not increase protein but it imparted a softer texture.
- Optimisation of patty composition was possible and allowed protein-enriched beef patties deliver approximately 30g protein in small portion size (75g), as favoured by older people
- Optimised patties were analysed with a trained sensory panel and demonstrated satisfactory sensory characteristics with a stronger beef aroma and increased tenderness profile
- Restructured steaks were successfully developed using the PiVac wrapping technology
- Restructured products with plant proteins were less susceptible to digestion than controls
- Fruit-derived proteolytic enzymes were successful in tenderizing tougher cuts of beef
- Cuts marinated in fruit acids, such as malic acid had a more favourable shear force and sensory tenderness profile
- The texture of optimised marinated products was more acceptable to older adults than controls
- Sous vide was a promising technique to add value to lower value cuts and is highly relevant to older consumers
- Acceptability of novel products to the target market was demonstrated using consumer panels of over-65s in UCC and AFBI
- For corned beef and sausage products, assessors of varying age groups had differing preferences for certain NaCl levels and salt replacers
- Sausage formulation choice was found to be driven by texture for the younger age cohort, flavour for the middle age cohort and visual aspects from the oldest age cohort
- Consumer panels also showed that within the over-65 cohort, sensory acuity was stratified with age

4. Opportunity/Benefit:

Enhanced consumption of meat with its intrinsic nutritional benefits will contribute towards improved nutritional status indicators in older adults.

Availability of flavoursome and wholesome fortified meat products will provide greater choice to older adults enhancing nutritional status, vitality and quality of life.

Enhanced knowledge of the structure-function relationship in meat products using microscopy, in vitro gut models and nutritional profiling will be of benefit to dietitians, industry and the international scientific community.

The improved texture, sensory properties and functional benefits of novel meat products developed in case studies in this project will improve consumer appeal in a growing consumer segment (older adults) and could increase in European market share for meat processing companies.

Irish meat processors will benefit from the available extensive analysis of the impact of formulation alteration on technological performance and sensory response in older adults

5. Dissemination:

This project was showcased at several Teagasc Gateways events and a specific focused workshop entitled “Healthy Ageing: Opportunities for NPD” held at Teagasc Ashtown on Nov 29 2017. More than ten peer-reviewed publications have emerged to date and aspects of the work were highlighted in poster and oral presentations at international conferences such as invited speaker at the International Congress of Meat Science and the World Congress of Food Science and Technology. The project outputs were featured as part of the Teagasc Impacts 2017 publication. Two PhD theses were submitted as a result of the work done in this project.

Main publications:

1. Baugreet, S, Kerry, J.P., Allen, P., Gallagher, E, Hamill, R. M. (2018). Physicochemical Characteristics of Protein-Enriched Restructured Beef Steaks with Phosphates, Transglutaminase, and Elasticised Package Forming. Journal of Food Quality, 2018,2, 1-11.
2. Baugreet, Sephora; Kerry, Joseph P.; Brodkorb, André; Gomez, Carolina; Auty, Mark; Allen, Paul; Hamill, Ruth M (2018). Optimisation of plant protein and transglutaminase content in novel beef restructured steaks for older adults by central composite design. Meat Science, 137, p. 265-274 https://doi.org/10.1016/j.meatsci.2018.03.024
3. Conroy, P, O’Sullivan, MG, Hamill, RM, Kerry JP (2018). Impact on the physical and sensory properties of salt-and fat-reduced traditional Irish breakfast sausages on various age cohorts

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acceptance. Meat Science, https://doi.org/10.1016/j.meatsci.2018.04.037
4. Botinestean, C, Gomez, C, Nian, YQ, Auty, MA, Kerry, JP, Hamill, RM (2017). Possibilities for developing texture-modified beef steaks suitable for older consumers using fruit-derived proteolytic enzymes. Journal of Texture Studies, DOI: 10.1111/jtxs.12305
5. Baugreet, S, Hamill, RM, Allen, P, Kerry, JP (2017). Application of novel PiVac technology for the development of fortified restructured beef steaks targeted at older consumers. Journal of Food Processing and Preservation, 2017*, e13498.* https://doi.org/10.1111/jfpp.13498
6. Baugreet, S., Kerry, J. P., Botinestean, C., Allen, P., & Hamill, R. M. (2017). Optimisation of protein-fortified beef patties targeted to the needs of older adults: a mixture design approach. Meat Science, Volume 134, December 2017, Pages 111-118
7. Conroy, P, O'Sullivan, MG, Hamill, RM, Kerry, JP (2017). Sensory capability of young, middle-aged and elderly Irish assessors to identify beef steaks of varying texture. Meat Science, Volume 132, October 2017, Pages 125-130, doi:10.1016/j.meatsci.2017.05.020
8. Baugreet, S, Hamill, R.M., Kerry, J.P., McCarthy, S.N. (2017). Mitigating nutrition and health deficiencies in older adults - a role for food innovation? Journal of Food Science, 2017 Apr;82(4):848-855. doi: 10.1111/1750-3841.13674.
9. Baugreet, S., Kerry, J. P., Botinestean, C., Allen, P., & Hamill, R. M.(2016). Development of novel fortified beef patties with added functional protein ingredients for the elderly. Meat Science, 122, 40-47.
10. Botinestean, C., Keenan, D. F., Kerry, J. P., & Hamill, R. M. (2016). The effect of thermal treatments including sous-vide, blast freezing and their combinations on beef tenderness of M. semitendinosus steaks targeted at elderly consumers. Lwt-Food Science and Technology, 74, 154-159.

Popular publications: Teagasc Impacts 2017

6. Compiled by: Dr. Ruth Hamill

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