



UCD Institute of Food & Health

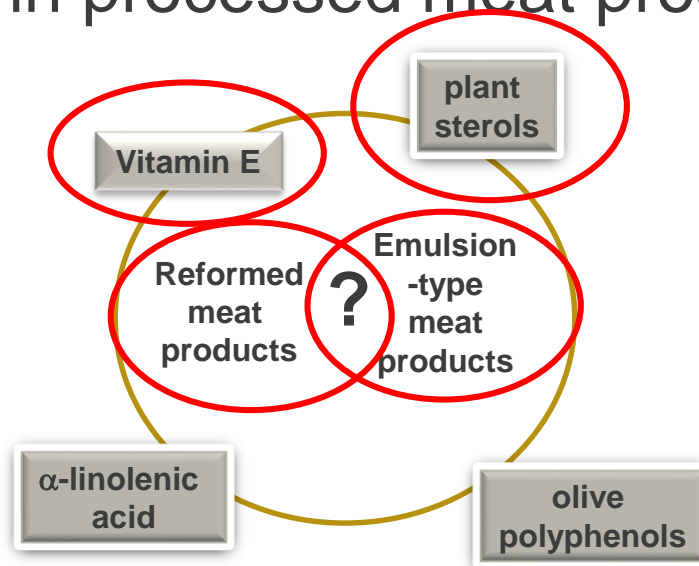
# Delivering processed meat products with health benefits

**Nigel Brunton, Frank Monahan, Fiona Lalor, Christine Shan, Simona Grasso, James Lyng**

UCD Institute of Food and Health

# “NutriMeat” - Delivering processed meat products with health benefits

- to reduce “unhealthy” constituents in processed meat products
- increase the level of desirable bioactive constituents in processed meat products

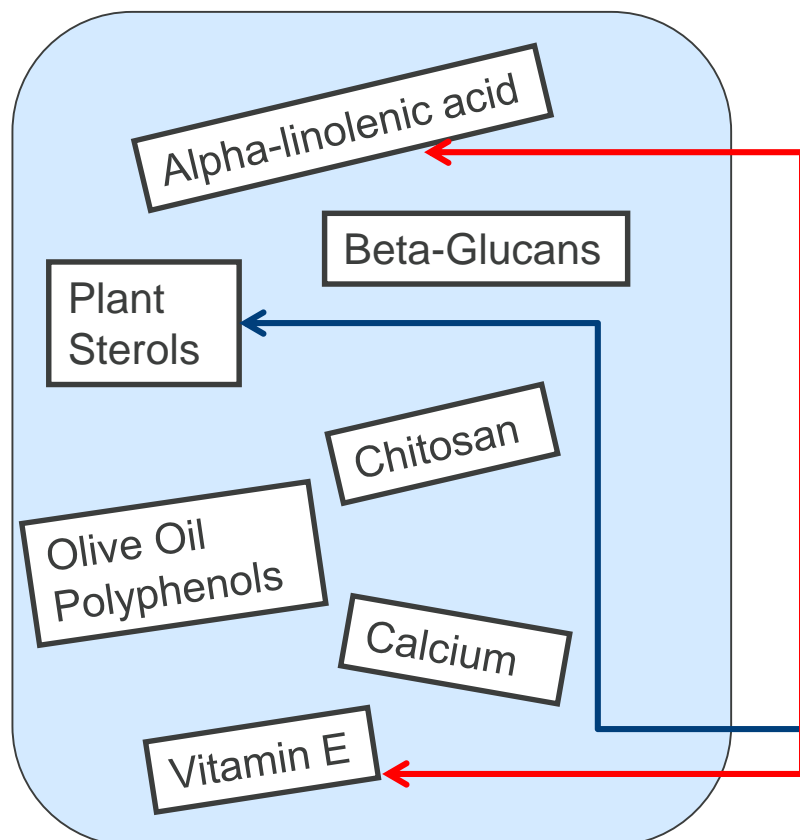


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**Agriculture,  
Food and the Marine**  
An Roinn  
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# Specific Objectives

- Develop healthy processed meat formulations containing ingredients with which there is an associated nutrition or health claim
- Perform sensory evaluation of the products to establish their suitability from a sensory perspective
- Obtain consumer insights into reformulated meat products

# Ingredients



# Meat matrix

## Sausage/“Emulsion” Type Products



Frankfurter



Black/White Pudding



Sausage

## Whole/“Re-structured” Type Products



Turkey/Chicken Roll

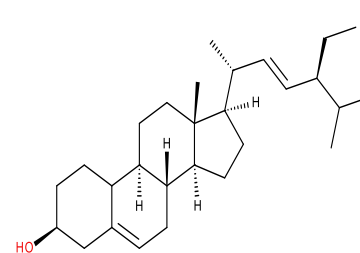


Ham

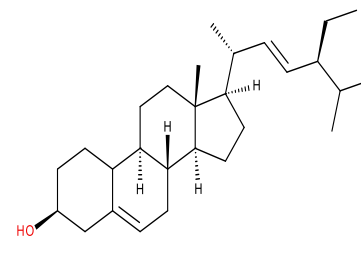


Bacon

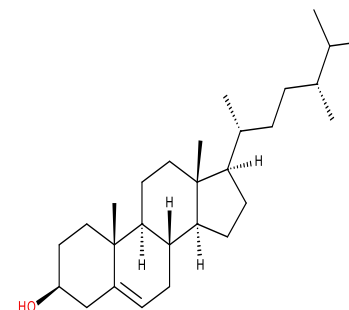
# Turkey meat with added plant sterols



$\beta$ -Sitosterol



Stigmasterol



Campesterol



# Cholesterol health claims – rules?

- Article 13.1 – “*Plant sterols/stanols contribute to the **maintenance** of normal blood cholesterol levels*” (2012)

Reference to the magnitude of the effect can only be mentioned in dairy products, yellow fat spreads, mayonnaise & salad dressings

(EU Regulation 686/2014)

*shown to **lower/reduce** blood cholesterol. High cholesterol is a risk factor in the development of CHD.” (2010)*

- Info must be given that this effect has been shown with a daily intake of **1.5 – 3g of ingredient**

# Sterol Enriched Turkey Roll Production



Nutrient	Per 100g	Per serving (60g)
Energy (kJ/kcal)	438 / 104	263 / 62
Protein (g)	<b>21.1</b>	12.7
Carbohydrate	0.1	0.06
Fat (g)	<b>2.1</b>	1.3
- of which saturates	0.7	0.4
- of which plant sterols (g)	<b>4.3</b>	<b>2.6</b>
Sodium (mg)	400	240
Equivalent as salt (g)	1	0.6



**Meat products that are good for you!?**

**At the UCD Institute of Food & Health we have developed a healthy turkey meat product.**

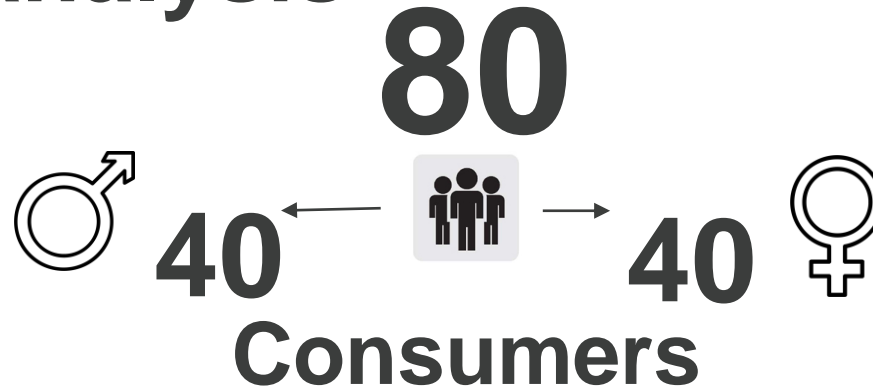
**Could you help us by tasting it and telling us what you think?**

**One Session - Flexible times & dates before & after Christmas—  
Healthy Food Goody Bags provided!**

**For more info get in touch! [simona.grasso@ucdconnect.ie](mailto:simona.grasso@ucdconnect.ie)**



# Sensory analysis



**Blind Test**

- Liking
- WTB/P

**Info**

- Plant sterol health claim

**Info Test**

- Liking
- WTB/P



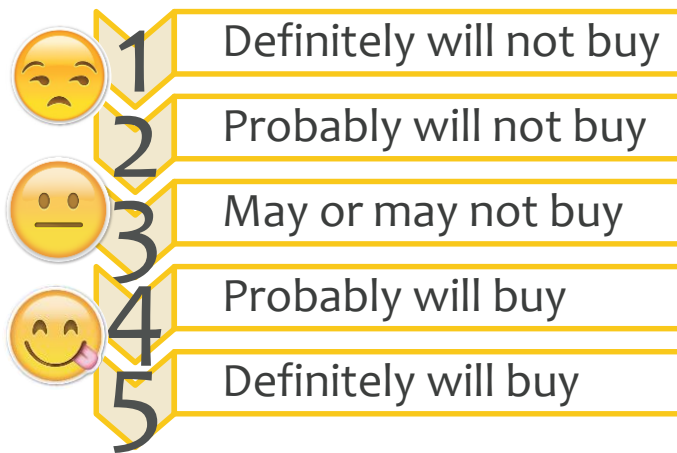
**Control**      **+ Plant Sterols**



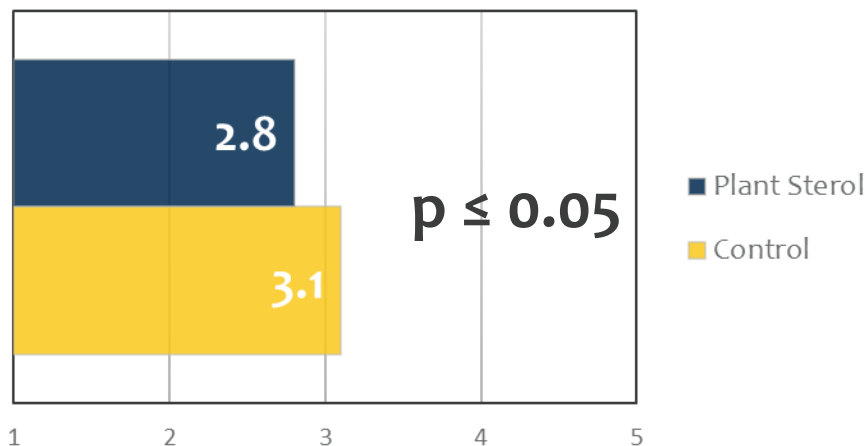
**Control**      **+ Plant Sterols**

# Willingness to buy (WTB)

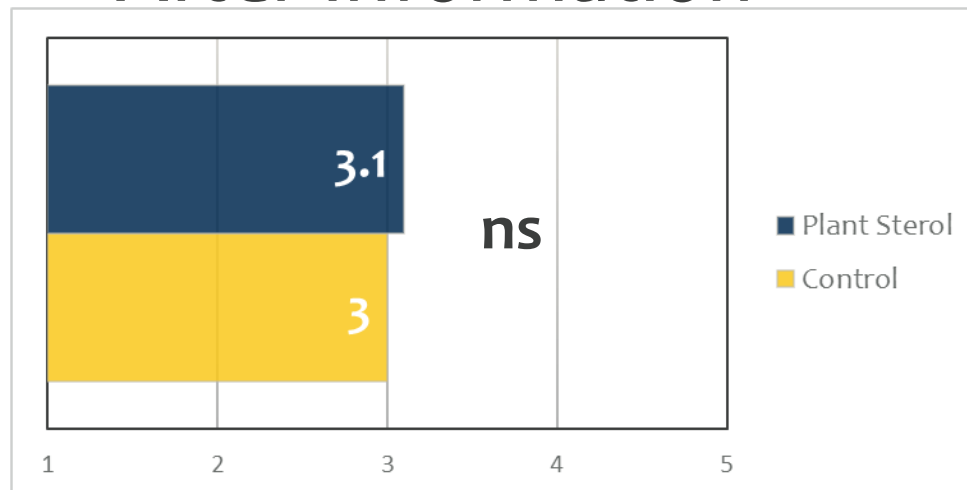
How likely would you be to buy the product you just tasted?



## Before Information



## After Information

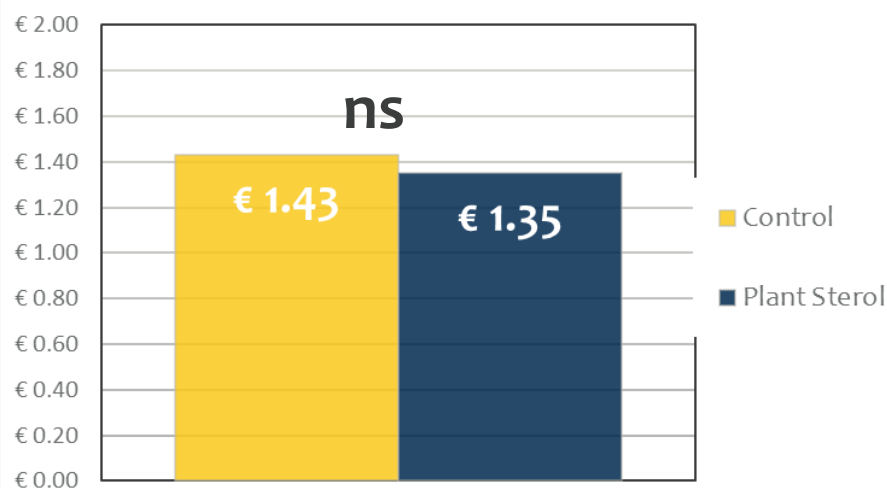


# Willingness to pay (WTP)

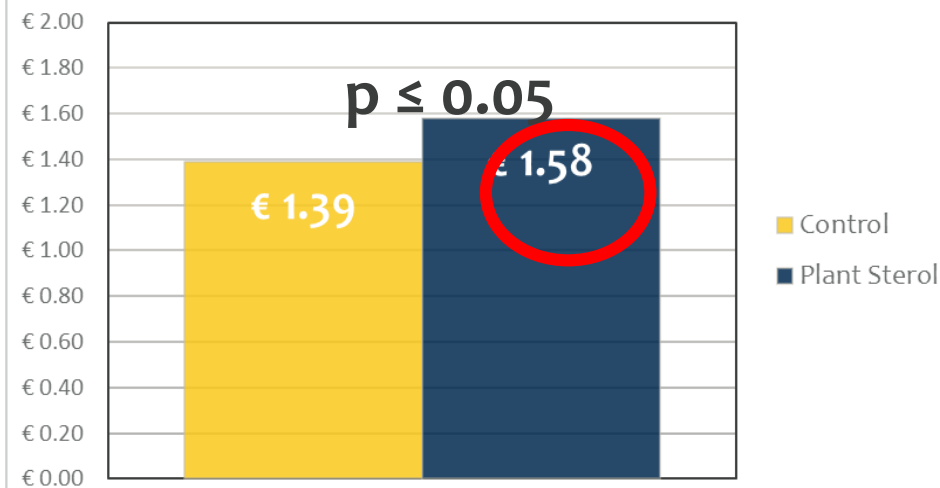
How much would you pay for the product you just tasted?

The average price for sliced turkey is € 1.60 per 130 g (average 5 slice tray)

## Before Information



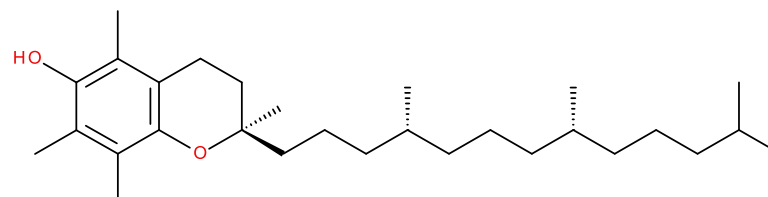
## After Information



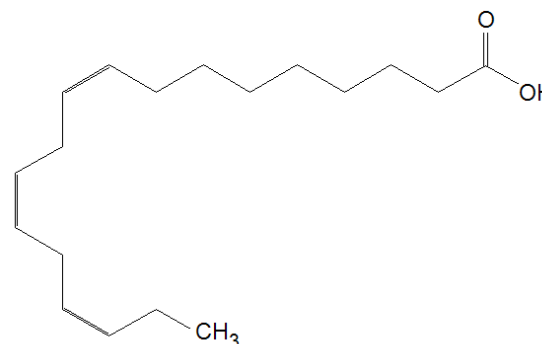
# Turkey meat: What can you say?

Nutrient	Amount in Product	Conditions of use	Claim
Protein	21.1g / 100g (81% of Total Energy)	At least 20% of the energy value required	High protein
Fat	2.1 g /100g	No more than 3g fat per 100g solids	Low fat
Plant Sterols	4.3g / 100g BUT 2.58g per serving	LOTS of conditions	Plant sterols have been shown to lower/reduce blood cholesterol. High cholesterol is a risk factor in the development of CHD

# Chicken sausage with added omega-3 and vitamin E



Vitamin E

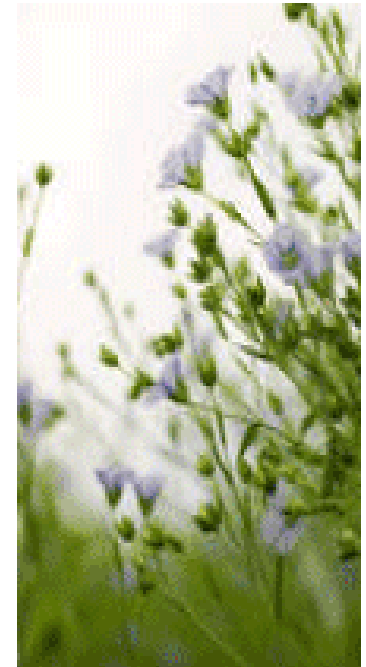


alpha-linolenic acid

# alpha-linolenic acid (ALA)

- EU approved health claim:
  - “ALA contributes to the maintenance of normal blood cholesterol levels”\*
- Amount for health claim
  - “Source omega-3 fatty acids” – **0.3 g alpha-linolenic acid** per 100 g and per 100 kcal
  - “High omega-3 fatty acids” – 0.6 g alpha-linolenic acid per 100 g and per 100 kcal

\* Commission Regulation (EU) No 432/2012



# Vitamin E

- EU approved health claim:
  - “Vitamin E contributes to the protection of cells from oxidative stress”\*
- Amount for health claim
  - “Source vitamin E” - 1.8mg/100g
  - “High vitamin E” - 3.6mg/100g



\* Commission Regulation (EU) No 432/2012

# Chicken sausage with added omega-3 and vitamin E



Nutrient	Per 100g	Per serving (60g)
Energy (kJ/kcal)	438 /104	364/ 104
Protein (g)	11.1	6.6
Carbohydrate (g)	11.4	6.9
Fat (g)	9.4	5.6
- of which saturates (g)	2.6	1.6
- of which alpha-linolenic acid (g)	1.2	0.72
Vitamin E (mg)	8.5	5.1
Sodium (mg)	400	240
Salt (g)	0.61	0.36



# Chicken Sausage:- What **Nutrition** Claims can you make?

Nutrient	Amount in Product	Conditions of use	Claim
Protein	11.1g / 100g	At least 20% of the energy value required	High protein
Fat	9.4 g / 100g	No more than 3g fat per 100g	No Low Fat Claim
Alpha-linolenic acid	1.2g / 100	At least 0.6g alpha – linolenic acid per 100g	High in Omega-3
Vitamin E	8.5mg / 100g	At least 3.6 mg Vitamin E per 100g	High in Vitamin E

# Chicken Sausage:- What **Health Claims** can you make?

Nutrient	Amount in product	Conditions of use	Claim
Alpha-linolenic acid	1.2g / 100 g	At least a “source of ALA”	<p>Alpha Linolenic Acid (ALA) contributes to the maintenance of normal blood cholesterol levels.</p> <p>The beneficial effect is obtained with a daily intake of 2g</p>
Vitamin E	8.5mg /100g	At least a “source of Vitamin E”	Vitamin E contributes to the protection of cells from oxidative stress

# Consumer research methods

## Focus groups

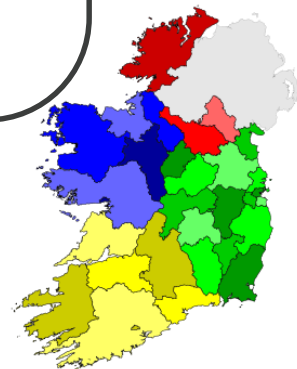


**7 focus groups** with food shoppers and processed meat consumers

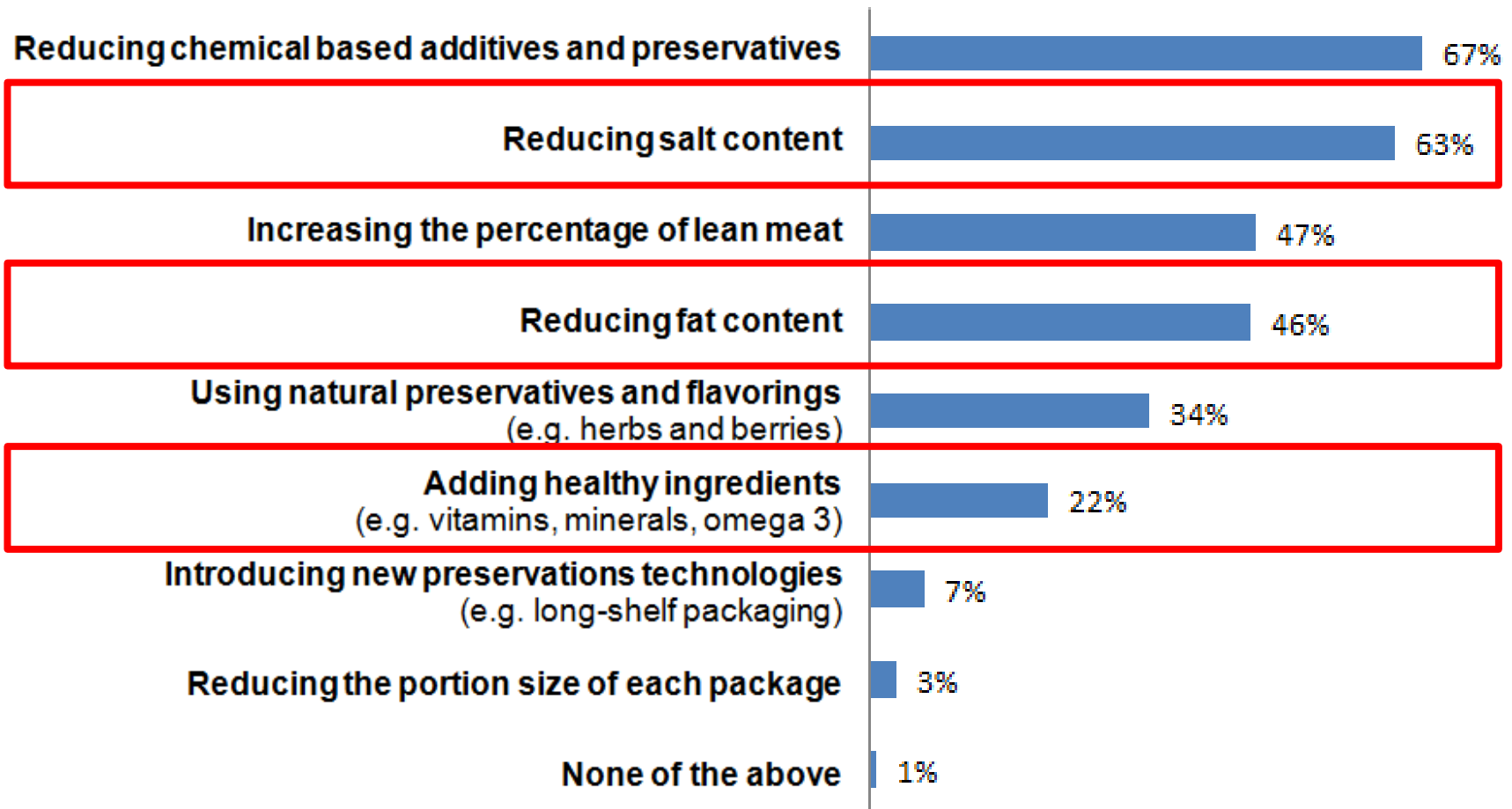
## Consumer surveys



2 online surveys with a total of **967** processed meat **consumers** (a representative sample)



# What strategies would consumers like to see developed further for processed meat?



# What are consumers' opinions on enriched processed meat?

In general **uncertain**, but many consumers are **open to the product if taste and price are not influenced much**

## Major concerns:

- Unfamiliarity
- Expectation of 'natural' meat product
- Eating purpose (convenience, taste, vs. health)
- Overall health characteristics of final product
- Trust and unforeseen risks

## Knowledge gaps

- Low awareness of strict regulations on the use of nutrition and health claims → marketing scam

*Yoghurt or juice, yes. I don't think I would say it for processed meat*

*It is not going to change the fact that they are bad for you*

# Summary

## Consumers

- Not likely to compromise on taste and price for additional health benefits
- Enrichment of healthy ingredients should be combined with salt/fat reduction, to increase chance of success,
- Target meat product and healthy ingredients on the basis of consumer preferences
- Consumer education required to increase their confidence in health/nutrition claims

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# Summary

The turkey with plant sterols

- Plant sterol information disclosure increased consumer WTB and WTP for the sterol enriched turkey product
- Health claim has heretofore not been made for meat products

The chicken sausage with omega-3 and vitamin E

- Health and Nutrition claims possible



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Smart science, good food

## Acknowledgements



Department of  
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Bia agus Mara**

NutriMeat Project 11/F/035







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# Effect of mode of addition of flaxseed oil on the quality characteristics of chicken sausage containing vitamin E and omega 3 fatty acids at levels to support a health claim

Zara Bolger, Nigel P. Brunton and Frank J. Monahan\*

Journal of Food Engineering 230 (2018) 39–48



Contents lists available at ScienceDirect

Journal of Food Engineering

journal homepage: [www.elsevier.com/locate/jfoodeng](http://www.elsevier.com/locate/jfoodeng)

## Impact of inclusion of flaxseed oil (pre-emulsified or encapsulated) on the physical characteristics of chicken sausages

Zara Bolger, Nigel P. Brunton, Frank J. Monahan\*

UCD School of Agriculture and Food Science, University College Dublin, Dublin 4, Belfield, Ireland

Meat Science 133 (2017) 185–193



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Meat Science

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## Factors that predict consumer acceptance of enriched processed meats

Liran C. Shan<sup>a</sup>, Maeve Henchion<sup>b</sup>, Aoife De Brún<sup>a</sup>, Celine Murrin<sup>a</sup>, Patrick G. Wall<sup>a</sup>, Frank J. Monahan<sup>a,c,\*</sup>

emeraldinsight



## British Food Journal

Consumer preferences towards healthier reformulation of a range of processed meat products: A qualitative exploratory study

Liran Christine Shan, Aine Regan, Frank J. Monahan, Chenguang Li, Fiona Lalor, Celine Murrin, Patrick G. Wall, Aine McConnon,



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Food Quality and Preference 57 (2017) 69–78



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Food Quality and Preference

journal homepage: [www.elsevier.com/locate/foodqual](http://www.elsevier.com/locate/foodqual)

## The effect of health claim information disclosure on the sensory characteristics of plant sterol-enriched turkey as assessed using the Check-All-That-Apply (CATA) methodology

S. Grasso<sup>a</sup>, F.J. Monahan<sup>a</sup>, S.C. Hutchings<sup>b</sup>, N.P. Brunton<sup>a,\*</sup>

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International Journal of Food Sciences and Nutrition

ISSN: 0963-7486 (Print) 1465-3478 (Online) journal homepage: <http://www.tandfonline.com/loi/ijfz20>

## The effect of plant sterol-enriched turkey meat on cholesterol bio-accessibility during in vitro digestion and Caco-2 cell uptake

S. Grasso, S. M. Harrison, F. J. Monahan, D. Brayden & N. P. Brunton

Meat Science 131 (2017) 82–89



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Meat Science

journal homepage: [www.elsevier.com/locate/meatsci](http://www.elsevier.com/locate/meatsci)

## Consumer evaluations of processed meat products reformulated to be healthier – A conjoint analysis study

Liran C. Shan<sup>a</sup>, Aoife De Brún<sup>b</sup>, Maeve Henchion<sup>c</sup>, Chenguang Li<sup>d</sup>, Celine Murrin<sup>a</sup>, Patrick G. Wall<sup>a</sup>, Frank J. Monahan<sup>a,d,\*</sup>



## British Food Journal

Consumer views on “healthier” processed meat

Liran Christine Shan, Aine Regan, Frank J Monahan, Chenguang Li, Celine Murrin, Fiona Lalor, Patrick G. Wall, Aine McConnon,



Food Reviews International



ISSN: 8755-9129 (Print) 1525-6103 (Online) journal homepage: <http://www.tandfonline.com/ol/ffri20>



FOOD SCIENCE AND TECHNOLOGY INTERNATIONAL

Article

## Quality of deli-style turkey enriched with plant sterols

S Grasso, NP Brunton, JG Lyng, SM Harrison and FJ Monahan

J Food Sci Technol (November 2016) 53(11):3948–3959  
DOI 10.1007/s13197-016-2385-7



ORIGINAL ARTICLE

## Quality attributes and retention of vitamin E in reduced salt chicken sausages fortified with vitamin E

Zara Bolger<sup>1</sup> · Nigel P. Brunton<sup>1</sup> · James G. Lyng<sup>1</sup> · Frank J. Monahan<sup>1</sup>



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Trends in Food Science & Technology 39 (2014) 4–17



Review



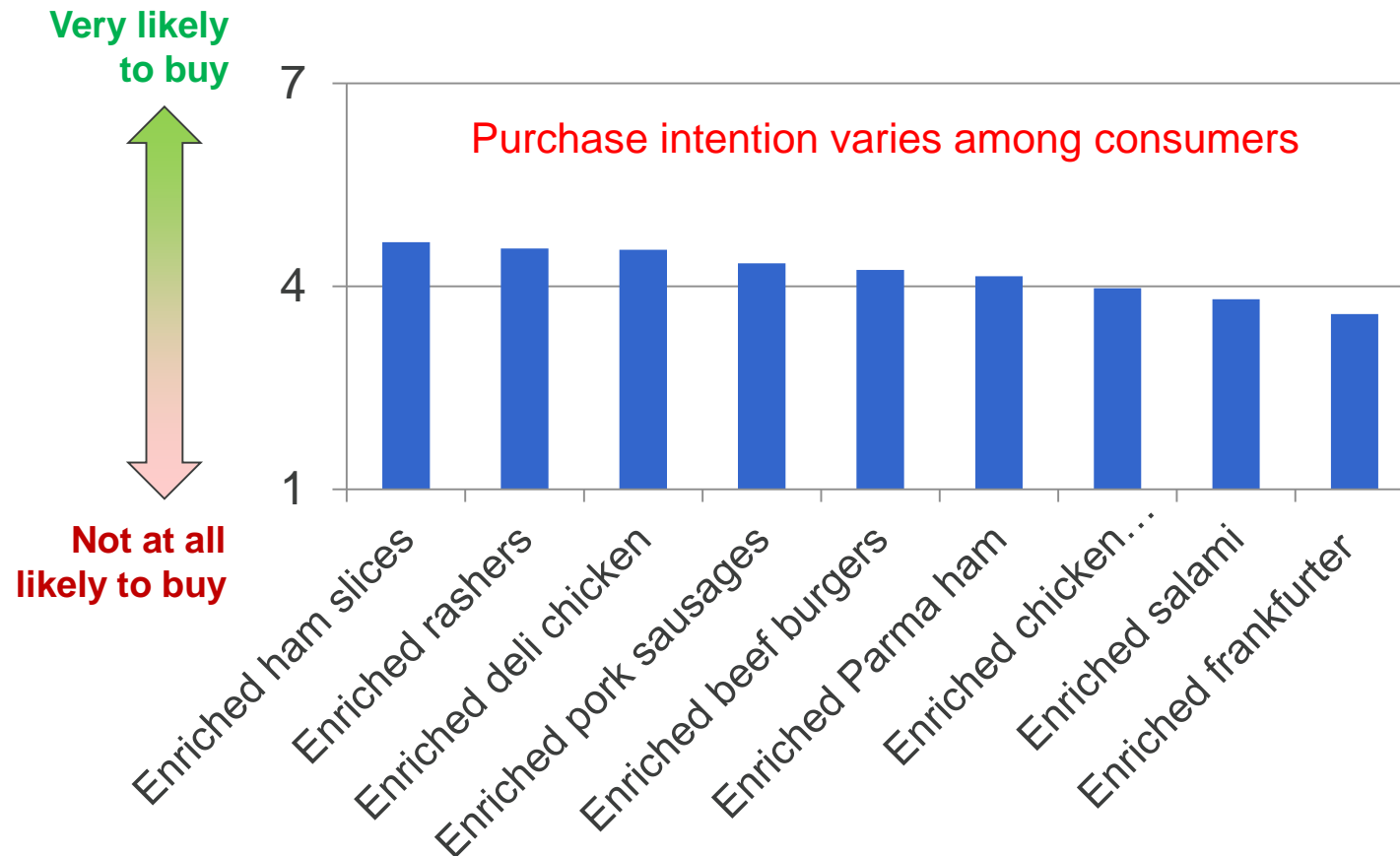
## Healthy processed meat products – Regulatory, reformulation and consumer challenges

S. Grasso, N.P. Brunton, J.G. Lyng, F. Lalor and F.J. Monahan\*

interest in foods that are not only healthy and nutritious but that also confer additional benefits for the consumer. Functional foods have been developed to satisfy this need. The EC Concerted Action on Functional Food Science in Europe (FUFOSE) (European Commission, 2010) proposed a working definition of functional food as follows: “A food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease. It is consumed as part of a normal food pattern. It is not a pill, a capsule or any form of dietary supplement”.

The advantage of functional foods is that they can deliver health benefits to the consumer without greatly affecting the diet, as well as looking and tasting like regular foods. Meat products could be excellent matrices for functional foods: they appeal to a wide range of consumers; they are versatile (e.g. minimally processed to comminuted

# Purchase intention of enriched processed meat



# Which type of products should be given priority?

Improving products commonly eaten by children



Improving products consumers eat regularly as a source of protein



Perceived unhealthy products for salt and fat reduction



Don't alter speciality-type products

