



How accepting are Irish consumers of novel food technologies?

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The Irish Agriculture and Food Development Authority

Presentation overview

Novel Food Technologies

Research objectives

Qualitative component

- *Methodology*
- *Functional foods*
- *In-vitro meat*
- *Conclusions*



Quantitative component

- *Nanotechnology*
- *Questionnaire design*
- *Conjoint analysis*
- *Future work*



Novel Food Technologies (NFTs)

Scientific and technological developments that may be adopted by industry to enhance the way food is produced or processed. They may or may not result in differentiated products for consumers.

Food Harvest 2020

underlines their importance in delivering a sustainable agri-food economy.

Consumer acceptance – a key priority for the food industry.

Consumer and industry acceptance of 8 NFTs
examined within the context of this research project.



Selection Criteria	Technologies Selected
Nearness to market	Functional Foods
Need for regulation	In-Vitro Meat
Moral / Ethical concerns	Nanotechnology
Consumer familiarity	Genetic Modification
Degree of novelty	Thermal Technologies (RF, OH)
Expected consumer reaction	Non-Thermal Technologies (PEF, US)
Risks (assessed by food scientist)	Food Irradiation
Perceived consumer benefits	Nutrigenomics & Personalised Nutrition
Perceived distribution of benefits	



Research Objectives

Investigate consumer awareness, perceived risks and benefits of novel food technologies.

Determine the extent to which personal (e.g. health, price benefits) vs. societal (e.g. environmental benefits) perspectives influence acceptability.

Investigate the attributes of technologies which are more/less acceptable.

Investigate the influence of new knowledge and information (and transmission mechanisms) on acceptability and thus evolution of acceptability.

Qualitative component



Methodology

Deliberative discourse methodology involved a one-to-one dialogue between a food scientist and consumers.

Two-way communication process enabled an understanding of:

- evolving perspectives of the individual;
- flexibility and framing of attitudes.

Pre-defined hypothetical scenarios illustrated benefits and risks from a consumer, societal and industry perspective.

- to gauge 'tipping points' in acceptance.

Consumers also participated in pre and post-discourse interviews.

Each consumer participated in three interactions.

Each scientist met with five consumers.



Functional Foods



Functional foods are developed to provide additional nutritional and health benefits beyond basic needs.

Examples include foods containing specific minerals, vitamins, fatty acids or dietary fibre, foods with added biologically active substances such as phytochemicals or other antioxidants, and probiotics with live beneficial cultures added (EUFIC, 2006).



Global functional food and drinks market valued at over US\$80bn in 2009 (Leatherhead, 2010).

Market opportunities for novel functional foods exist in Europe.

Successful market expansion dependent on consumer acceptance

– a snapshot from the discourses...

Hypothetical Functional Food Scenarios

*A number of **benefits and risks** of each functional food application presented to participants within the scenarios.*

Live probiotic cultures added to cheese to improve digestive health.



Plant sterols and stanol esters added to a fruit shot to help lower cholesterol - addition of a cholesterol lowering drug also discussed.



Antioxidants with 'beautifying' benefits added to bread.



Beef with anti-arthritic properties produced by supplementing cattle feed with sunflower oil to increase the conjugated linoleic acid (CLA) content.

- addition of (immune boosting) chitin (extracted from shellfish) to cattle feed also discussed.



Functional Food Discourses

Consumer acceptance of functional foods not homogenous.



Continuum of acceptance:

- participants more positive towards products with health benefits;
- sceptical of purported beauty enhancing benefits of 'nutricosmetics'.

Individual health status a key factor determining acceptance.

Price premium acceptable if benefits perceived.

Functional Food Discourses



A high degree of trust in regulation positively influenced acceptance

- generally conditional on clear labelling of the production process and any associated negative effects.

Mixed response to the addition of medication to foods.

- some perceived this to be a positive development for the elderly, others perceived it to be a step too far and voiced concerns regarding the monitoring of such products.

As the lines blur between food and medicine perhaps the boundaries can only be pushed so far?

In-Vitro Meat Discourses



‘In Vitro’ meat involves culturing muscle tissue in a liquid medium on a large scale.

Utilisation of *in vitro* meat in ground, processed goods most feasible in short term.

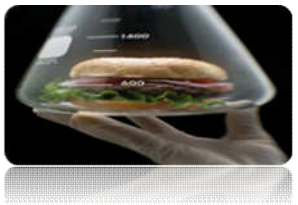
Hypothetical In-Vitro Meat Scenarios



A number of benefits and risks of each functional food application presented to participants within the scenarios.



Production of *In-Vitro* meat as an alternative to conventionally produced minced meat e.g. minced beef for cooking at home and for use in ready meals.



Production of *In-Vitro* meat as an alternative to conventionally produced cuts of meat e.g. steak, chicken fillets, fish.



In Vitro Meat Discourses

Following initial adverse reaction consumers were positive towards the use of the technology resulting in:

- improved animal welfare,
- improved nutritional value of meat products,
- reduced environmental impacts.



Main barriers to acceptance were issues with regard to taste, texture, quality and perceived unnaturalness of the process.

Consumers displayed a 'hierarchy of approval' (Hallman, 2000) with regard to acceptance of different types of *in vitro* meat products.

- more favourable towards *in vitro* chicken than beef, on welfare grounds.



In Vitro Meat Discourses

Receipt of information positively influenced consumers' attitudes.

- general acceptance conditional on safety assurances guaranteed.

Much research still needed to establish *in vitro* meat technology at a sustainable industrial scale.

- technical challenges around creating an *in vitro* 3D muscle with acceptable texture.
- consumer acceptance – the 'yuck factor' (Hopkins, 2008).



Outcomes from the Discourses

Common themes with regard to acceptance across technologies.

- insights for quantitative component of the research.



Individual perspectives and values framed overall attitudes towards NFTs.

- acceptance positively of technologies influenced by perceived benefits and receipt of information from a credible, trustworthy source.

As more innovative technologies emerge additional issues with regard to acceptance arise.

- important to gain insights into acceptance of evolving and potentially controversial technologies at an early stage.
- inherent benefits of more novel products and their effective communication will influence overall acceptance or rejection, underlining the importance of continued dialogue with consumers.



Quantitative component



**Examining consumer acceptance of Nanotechnology
- applications in food and food packaging.**

Nanotechnology explained...

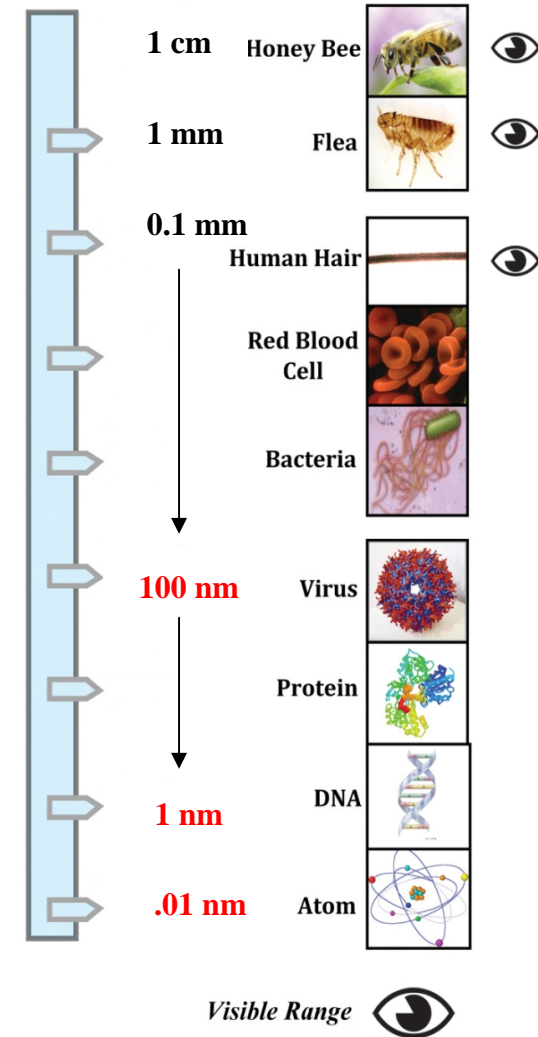
Nanotechnology deals with nano particles (particles less than 100 nanometres).

Nanotechnology can be used to produce food e.g. the nutritional value of food can be improved without altering taste, appearance or texture.

Nanotechnology can also be used to develop food packaging to improve food safety and extend shelf life.

Nanotechnology in food and food packaging could also carry potential risks which we know little about. Possible risks for human health and for the environment are still unknown.

However, if nanotechnology were to be used in food production in the future, it would have to meet the European Food Safety Authority (EFSA) standards.



Nanomaterial definition adopted by EU Commission 18th Oct. 2011

“a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50% or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm – 100 nm.”

Nanotechnology is the purposeful manipulation or engineering of atoms and molecules at the nanoscale so that familiar materials have new and often unique properties and behavioural traits that can be used in new applications (Buzby, 2010).

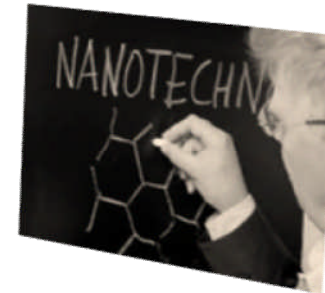
Nanotechnology applications in food offer many potential benefits to food manufacturers & consumers.



Why Nanotechnology?

A relatively new area of science

- benefits and risks not fully understood.
- ongoing legislative debate in EU.



Consumer acceptance

- citizens as stakeholders
– need for dialogue.
- lessons from GM - limited knowledge and pre-existing values combine to cause affective or emotional responses to the idea of particular technologies.

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Nanotechnology risks going same way as GM, FSA study
By Freddie Dawson, 21-Apr-2011 1 comment
Related topics: Legislation

Manufacturers risk new nanotechnology-based food products being rejected in a similar way to genetically modified (GM) foods, unless they start engaging with consumers over their perceptions of the risks involved, a new Food Standards Agency (FSA) commissioned study has warned.

At a briefing in London yesterday, the FSA released the results of a study into consumer perceptions about nanotechnology, which found that ignorance of the issues had led to consumer confusion about the risks and benefits involved.

The study was conducted by research agency TNS-BMRB and was commissioned following publication of the House of Lords Science and Technology Committee report into nanotechnology last year, chaired by Sir John Krebs.

Attitude Formation

General attitudes – most important driver of acceptance including attitudes towards:

- nature & natural content
- technology
- food neophobia

Acceptance is also influenced by perception of:

- personal knowledge
- alienation from the market place
- moral and ethical concerns including ecological, environmental etc.
- health, familiarity, price

Perceived risk and benefit trade offs:

- personal, societal, environmental, industry
- benefits need to be tangible and identifiable.



Sources: FSA, 2009; Scholderer & Frewer, 2003; Siegrist 2008; Bredahl, 2001; Evans & Cox, 2006

Questionnaire Design



- Nationally representative survey ($n = 1000$)
- Attitudinal questions.
- Closed questions on food science knowledge.
- Trust in information sources and stakeholders.
- Acceptance or Rejection of Nanotechnology (conjoint analysis).
- Socio-demographic characteristics.

Consumer oriented methodology which seeks to quantify and predict consumers' overall judgement of a product on the basis of the underlying product attributes (Steenkamp, 1987).

Attributes - general attribute categories of the product such as price and taste.

Levels - specific values of the product attributes such as reduced fat, salt etc.

Two basic assumptions of conjoint analysis:

- a product can be described as a combination of levels of a set of attributes;
- these levels determine consumers' overall judgement of a product.



Aim of conjoint analysis - to identify attribute combinations that confer the highest utility to the consumer, and to establish the relative importance of attributes in terms of their contribution to total utility.



Full profile conjoint analysis

Complete products presented to consumers who score each alternative product profile based on their preferences.

- similar to a real life purchase situation
- consumers “trade off” attribute level combinations (choose between alternative products).

Based on scores, the conjoint analysis procedure calculates the contribution of each product attribute to the respondent's preference - its ‘part-worth utility’.



Sample product prototype – nanotechnology food application

Attributes and Levels

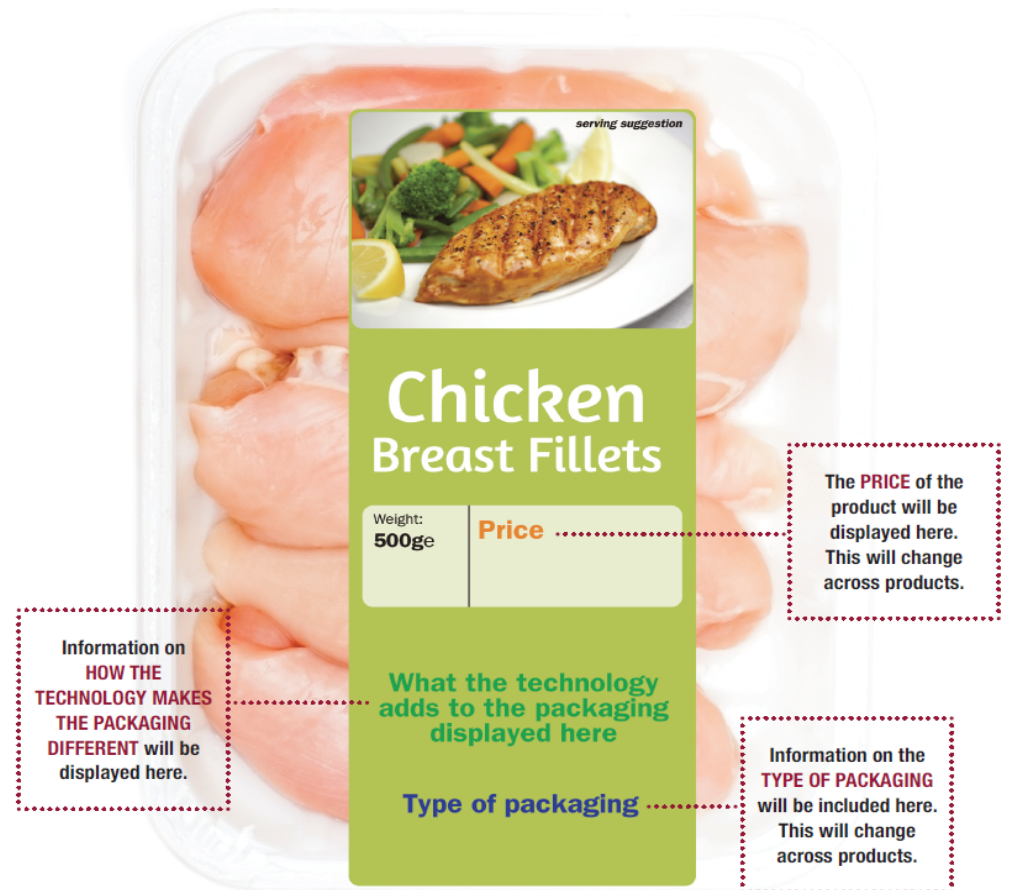


	How happy would you be for this product to be made available for sale?										Would you eat this product?	
	Not at all happy				Neither					Very happy	Yes	No
Product 1	1	2	3	4	5	6	7	8	9	10	1	2

Consumers evaluate 11 food prototypes

Sample product prototype – nanotechnology food packaging application

Attributes and Levels



	How happy would you be for this product to be made available for sale?										Would you eat this product?	
	Not at all happy				Neither					Very happy	Yes	No
Product 1	1	2	3	4	5	6	7	8	9	10	1	2

Consumers evaluate 11 packaging prototypes

Future Work



Data analysis (To start - January 2012)

Elicit determinants of nanotechnology acceptance

- factors driving ultimate acceptance/rejection.

Examine differences in determinants of nanotechnology acceptance across foods and food packaging applications.

- explore risk-benefit trade-offs.

Link to consumer acceptance of other NFTs

- given the scale of investment by public agencies and others in technological R&D this research should be particularly useful in influencing the trajectory of such technologies.

Acknowledgements

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