

DEVELOPING FOODS FOR AN OLDER POPULATION



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Our Menu for this afternoon....

- What are the issues of food choice & diet in later life ?
- How can our sensory perception influence food choice, and how does that alter with age and frailty ?
- How can we design foods for an older population ?



Food Choice impacts Health & Quality of Later Life

- **The Under & Over Debate !**
 - Problems can result from “Under” or “Over” Nutrition
 - **Diet related diseases** may result from “over” or unbalanced intake
 - Diabetes, CHD, Cancer
 - However, many older adults suffer **Malnutrition**
 - total under-nutrition or nutrient deficiencies
- **Diet can have a positive role in :**
 - Preventing Cognitive decline
 - Bone Health, Muscle Strength
 - Immune function
 - Gut Health

Food components we may want to promote in diets of older people



Foods for Cognition:

- n-3 PUFA
- Flavonoids



Foods to help prevent CHD, Cancer & T2D:

- 5 a day
- High Fibre
- Low Sat Fat
- Limit Free Sugar



Food for Bone Health:

- Calcium
- Vitamin D
- Protein



Foods to help prevent Sarcopenia:

- Protein

Malnutrition in Older Adults in Developed Countries:

25-34%

Admitted to elderly care
wards are
undernourished



42 %

of those entering care
homes



70%

weigh less on hospital
discharge



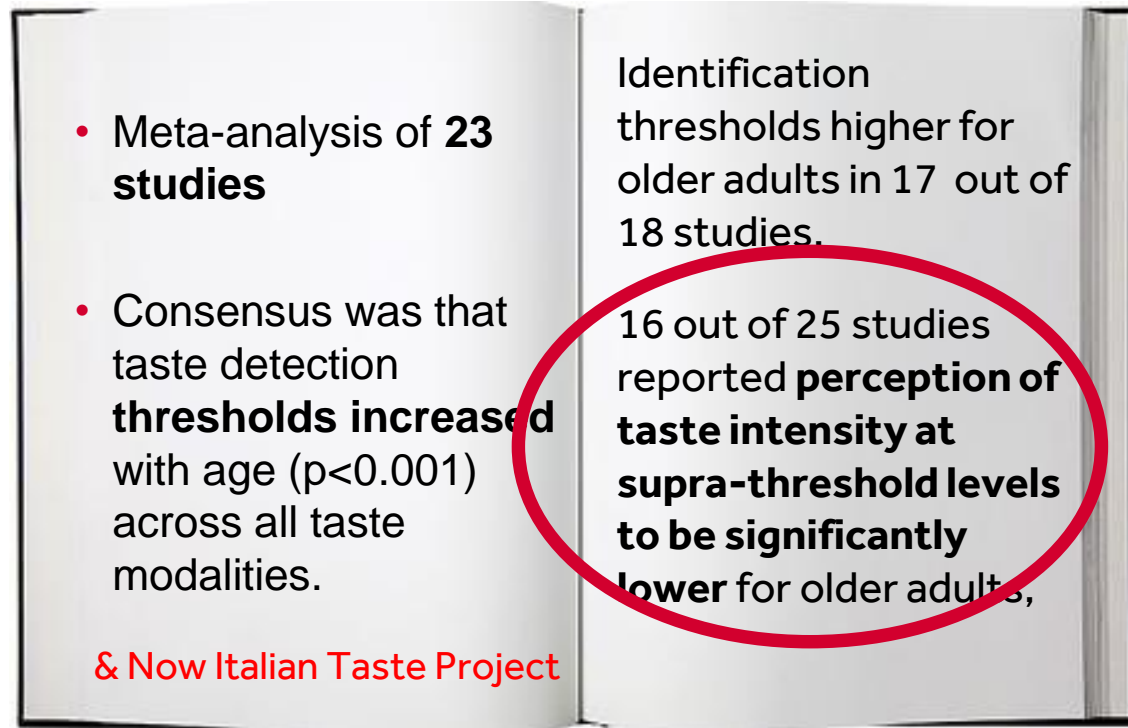
Risk factors for Malnutrition (BDA, 2017):

Social Factors	Physical	Medical
<ul style="list-style-type: none">• Living in isolation• Limited knowledge of nutrition• Limited cooking skills• Alcohol or drug dependency• Poverty• Limited mobility or lack of transport resulting in difficulty to get food	<ul style="list-style-type: none">• Poor dentition• Loss of appetite due to loss of smell or taste• Physical disabilities which reduce an individual's ability to cook or shop for themselves	<ul style="list-style-type: none">• Conditions causing a lack of appetite (such as cancer or liver disease)• Mental health conditions• A condition that reduces the body's ability to absorb or utilise nutrients• Dementia• Dysphagia• Vomiting or diarrhoea• Eating disorders

How does **taste** change with age & health ?

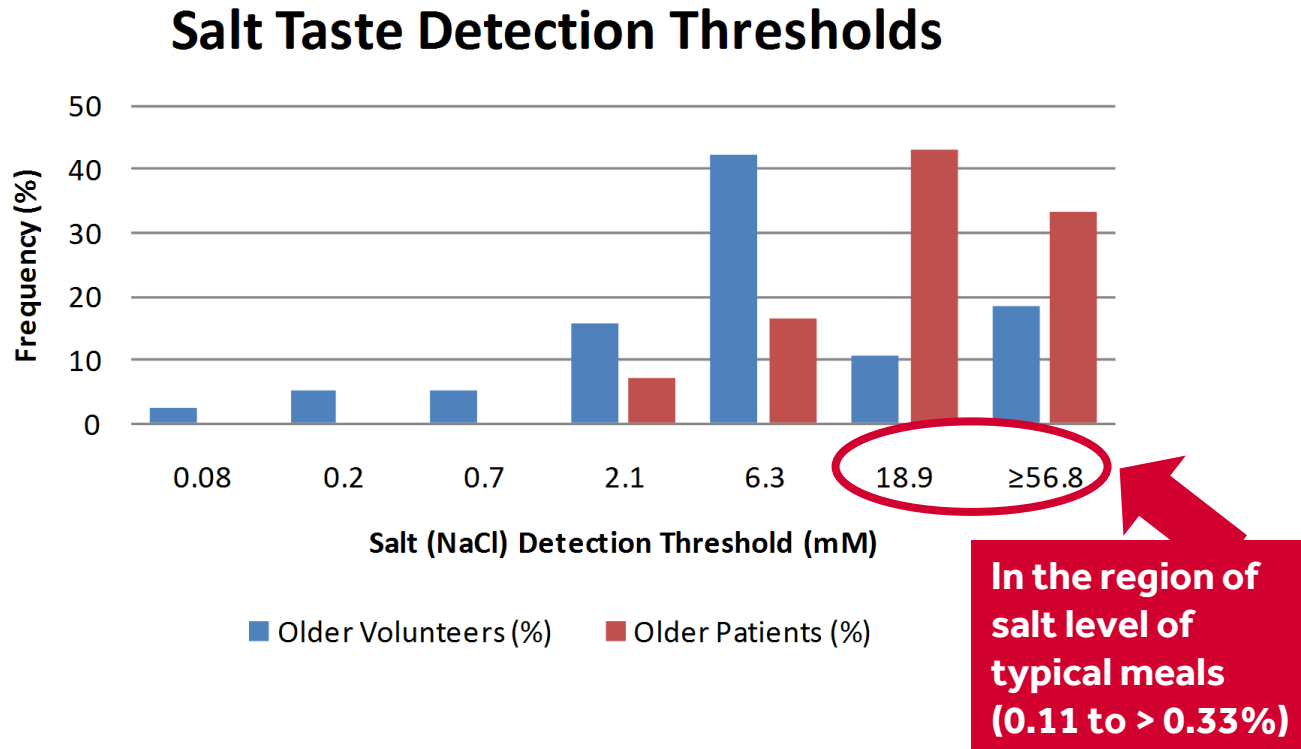


Literature evidence...



Methven, Allen, Withers & Gosney (2012) Ageing and Taste. *Proceeding of the Nutrition Society*, 71 (4): 556-65

Our Evidence on Salt Taste:



Chemosensory loss is connected with Frailty not just Age

Orosensory decline correlates with dependency

(poor health, medication, cognitive dysfunction):

- n=559 France (65-99 yr)
- Independent living & Nursing Home
- Measured:
 - Salt taste & Olfaction
- Results:
 - Clear trend between impairment & level of dependence

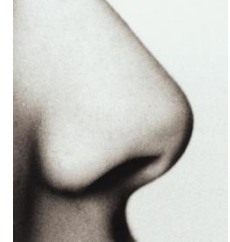


Sulmont-Rossé et al. (2015) *Chem Senses*, 40, 153-164.

Olfaction is a similar story...

- Diminished olfaction with age more common than taste decline
- Effects > 50% of adults 65-80 yrs; ca. 75% of adults > 80

Doty & Kamath (2014) *Frontiers in psychology*



By Sniffing (Orthonasal):



Younger group (20 – 40 yrs)

Average = 0.03 mg/ L

Older group range (65+ yrs)

Average = 0.35 mg/ L

14 x higher

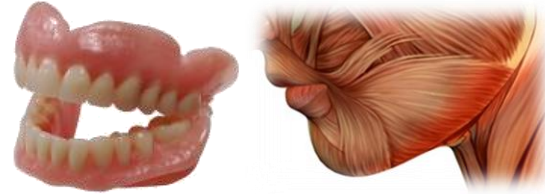
By Tasting (Retronasal):



Older group needed a bigger increase in
caramel flavour in milk to notice the increase

What about Texture ?

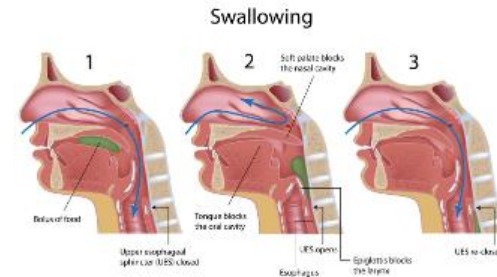
Dentition & Muscle strength influence chewing



25% OAs have **swallowing difficulties** (dysphagia)

50% of institutionalised / hospitalised OAs

Poor **salivary flow** effects taste, chewing & swallowing....could it also make high protein drinks / foods feel very **dry**



Yet we want to fortify foods for older people with Whey Protein

- Whey digested & absorbed faster
- Muscle protein synthesis rate greater from whey
- Aim to increase muscle protein synthesis & avoid Sarcopenia
- Anabolic resistance: need for exercise + protein

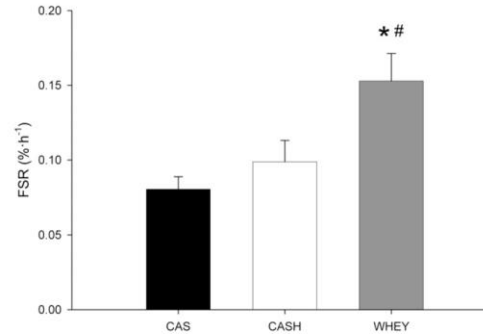


FIGURE 5. Mean (\pm SEM) mixed muscle protein fractional synthetic rates (FSR), with tissue-free L-[1-¹³C]phenylalanine enrichments as precursor, after ingestion of casein (CAS; $n = 16$), casein hydrolysate (CASH; $n = 16$), and whey (WHEY; $n = 16$). Data were analyzed with ANOVA with Bonferroni correction. *WHEY significantly different from CAS, $P < 0.01$. #WHEY significantly different from CASH, $P < 0.05$.



Pennings et al (2011) Whey protein stimulates postprandial muscle protein accretion more effectively than do casein and casein hydrolysate in older men. *American Journal of Clinical Nutrition* 93:997-1005

SO, WHAT CAN WE DO ?

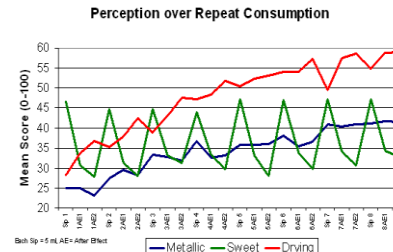
Taste Enhancement



Nutrient Fortification



Texture Optimisation



Our approach to taste enhancement...

Use **natural ingredients** rich in **umami** taste compounds



- ✓ Maximum levels of “UMAMI” ingredients in a meat dish
- ✓ Keep Sodium levels constant

Hospital Study: Methods

Samples:

Control vs Enhanced cottage pies

Enhanced pie: Soy Sauce and Concentrated Tomato Extract
Enhanced gravy : Soy Sauce



Location:

Elderly Care Wards in RBH NHS Trust



Volunteers:

31 Older Patients (aged 65+)
11 male, 20 female



Protocol:

Consent , Screening
Liking and preference test on
minced meat
Measurement of consumption
of the two **cottage pies**

Hospital study: Results

	Control	Enhanced	significance
Preference minced meat (number of people)	6	24	p=0.001
Consumption (g)	119	137	n.s.

- ✓ Enhanced significantly preferred
- ✓ A trend but no sig. difference in consumption

Dermiki et al. (2013) *Nutrition and Aging*, 2,69-75

Dermiki et al (2013) *JSFA*, 93(13): 3312-3321

So, is enhancement effective?

- Difficult to demonstrate ↑ intake, but we found ↑ preference**so Yes**
- Song & Bredie (2016):
 - “Flavor and texture modifications usually enhance food liking of most **dependent** elderly.”
- Doets & Kremer (2016):
 - “Most flavour enhancement/enrichment strategies do not increase liking in **independent** living seniors”

Song, Giacalone, Johansen, Frøst, Bredie (2016). Trends in Food Sci & Tech, 53, 49-59

Doets & Kremer (2016) *FQP*, 48, 316-332

Why Fortification?

Recent BDA 2017 Guidelines for Nutritionally Vulnerable Adults in Health Care Settings

Hospital patients can be broadly categorised into the following two groups:

- 'Nutritionally well' - normal nutritional requirements and normal appetite or those with a condition requiring a diet that follows healthier eating principles
- 'Nutritionally vulnerable' - normal nutritional requirements but with poor appetite and/or unable to eat normal quantities at mealtimes; or with increased nutritional needs.

Nutrient	DRV Nutritionally Well	DRV Nutritionally Vulnerable
Energy (kcal)	Range from 1840 (women 75+ yrs) to 2772 (men 19-24 yrs)	
Protein (g)	Women 45g, Men 56g	Range from 66g (60kg adult) to 83g (75 kg adult)

Development of Fortified Foods (Project mappmal)

Research Article



Received: 31 October 2013

Revised: 3 November 2013

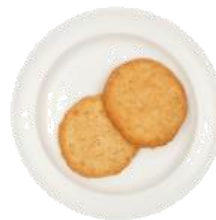
Accepted article published: 6 December 2013

Published online in Wiley Online Library:

(wileyonlinelibrary.com) DOI 10.1002/jsfa.6522

The effect of macro- and micro-nutrient fortification of biscuits on their sensory properties and on hedonic liking of older people

Roussa Tsikritzi,^a Paula J Moynihan,^b Margot A Gosney,^c Victoria J Allen^c and Lisa Methven^{a*}



The Effect of Nutrient Fortification of Sauces on Product Stability, Sensory Properties, and Subsequent Liking by Older Adults

Roussa Tsikritzi, Jianqiu Wang, Vanessa J. Collins, Victoria J. Allen, Yiannis Mavrommatis, Paula J. Moynihan, Margot A. Gosney, Orla B. Kennedy, and Lisa Methven

S1100 Journal of Food Science • Vol. 80, Nr. 5, 2015

Development of Fortified Snacks, more recent trials...

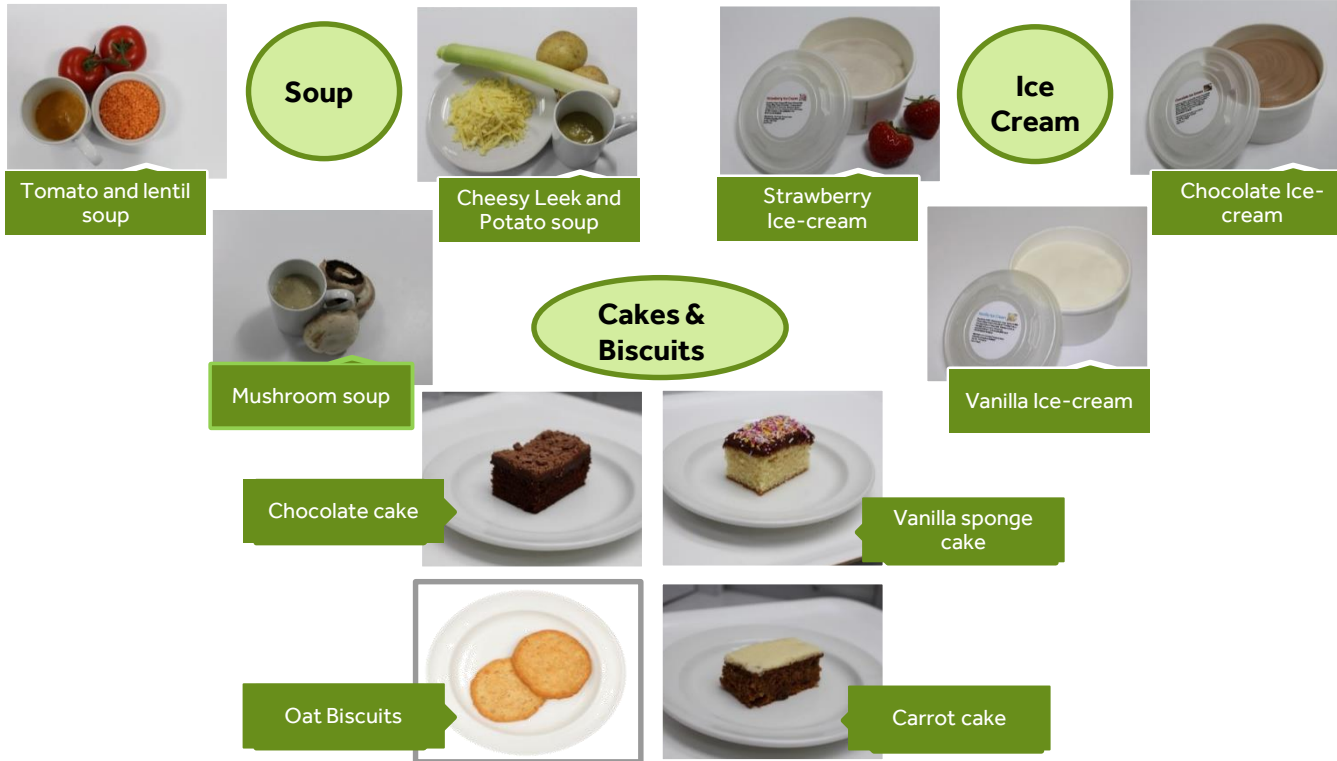
Pilot NIHR (BRC) Study

Aims:

- To determine whether fortified snacks are **chosen** by older hospital patients
- To determine whether fortified snacks are **consumed**
- To determine **which products** are chosen and consumed
- To weigh intake and determine sample size for full trial

Royal Berkshire 
NHS Foundation Trust

University Hospital Southampton 
NHS Foundation Trust



Promising results....

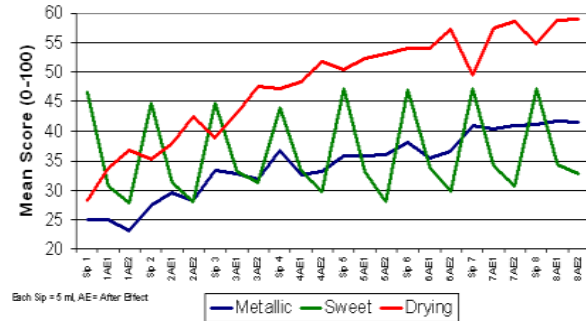
Products offered 3 times per day, of 423 products chosen:

	Median Weight Consumed (g)	% consumed	Median Energy intake (kcal)	Median Protein intake (g)	Median Liking score (0-10)
Biscuit	45	97	209	5.2	9
Cake	46	81	166	5.2	8
Ice-cream	111	87	342	7.9	8
Soup	129	68	123	3.5	8

Future Trials...we need to ensure snack intake not intake of subsequent meal

Further investigation of the Perception of Protein Fortified Foods and Beverages

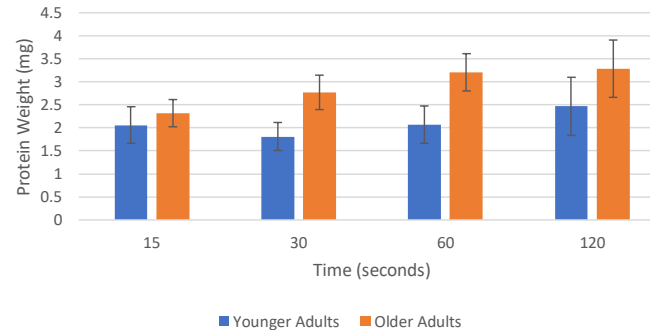
Perception over Repeat Consumption



Why protein fortified beverages increase mouthdrying over consumption.

We propose this is due to mucoadhesion of the protein.

Protein remaining in the mouth after swallowing



More protein may remain in mouth for older adults



We are investigating:

- Influence of saliva flow rate
- Effect on perception of protein fortified drinks and snacks

Let's not forget the “Over” Debate:

Issues relating from a Taste for Sugar, Salt & Fat

- Excess sugar & fat in diet : high BMI & diabetes
- Excess salt & fat : CHD
- **How can food choice change in older age & increase risk?**
 - Reduced sense of **taste** : increased use of sugar, fat & salt
 - Increased need for **convenience** food : less nutritionally balanced foods
 - Less **money** to spend on food: purchase & intake of highly processed high sugar / salt / fat foods (they're cheaper !)
-**does the food industry carry a responsibility here ??**

Summary & New Challenges

- Taste & Flavour **Enhancement** for dependent older adults
- Nutrient **Fortification** : Protein (& micronutrient)
- Need Better Understanding of **Appetite control**
 - Increased understanding of **sensory/ nutrient feedback mechanisms**
- More focus on **Texture** for Older adults
- **Foods in retail that are Affordable, Nutritionally Balanced, appropriate Portion Sizes, appropriate Packaging**

Thank you



- Our Volunteers
 - Dr Maria Dermiki
 - Prof Orla Kennedy
 - Prof Margot Gosney
 - Prof Helen Roberts
 - Dr Stella Lignou
-
- PhD & Project Students
 - RBH NHS Trust Catering
 - RBH and Southampton NHS Clinical
 - MMR Sensory panel

