



University of
Nottingham

UK | CHINA | MALAYSIA

‘Opportunities to address nutritional vulnerability in older people’

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**innovating
food** for seniors

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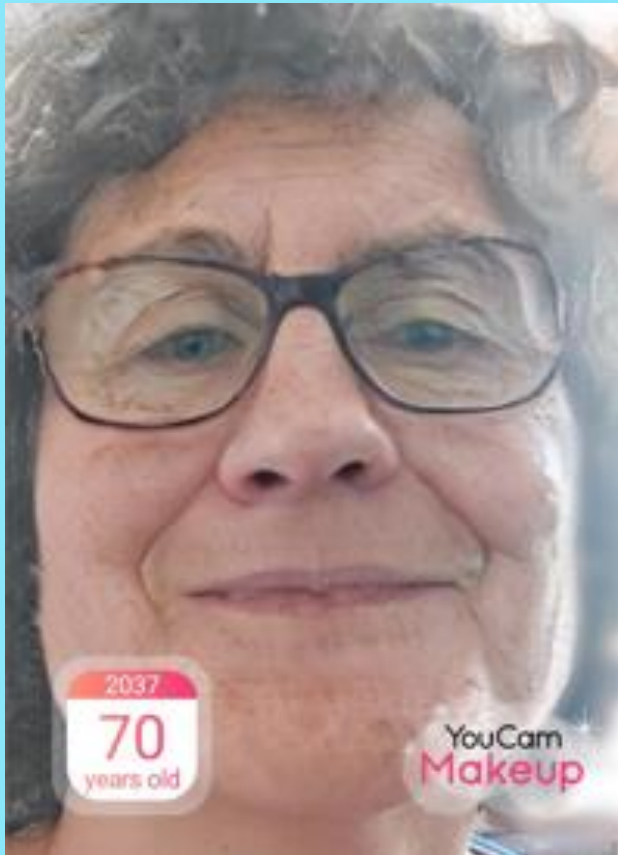


Aims of presentation

- To introduce a broad view of the 'diverse and dynamic' nature of the nutritional needs of older people
- Explore practical opportunities for reducing nutritional vulnerability
 - considering where a 'personal food chain' may break down
 - the 'snowball' effect of acute illness
- Provide a taste of how the University of Nottingham might help you achieve your goals (Thanks to others for slides!)

What is an 'older person'?

You and me in 10, 20, 30, 40 years time!

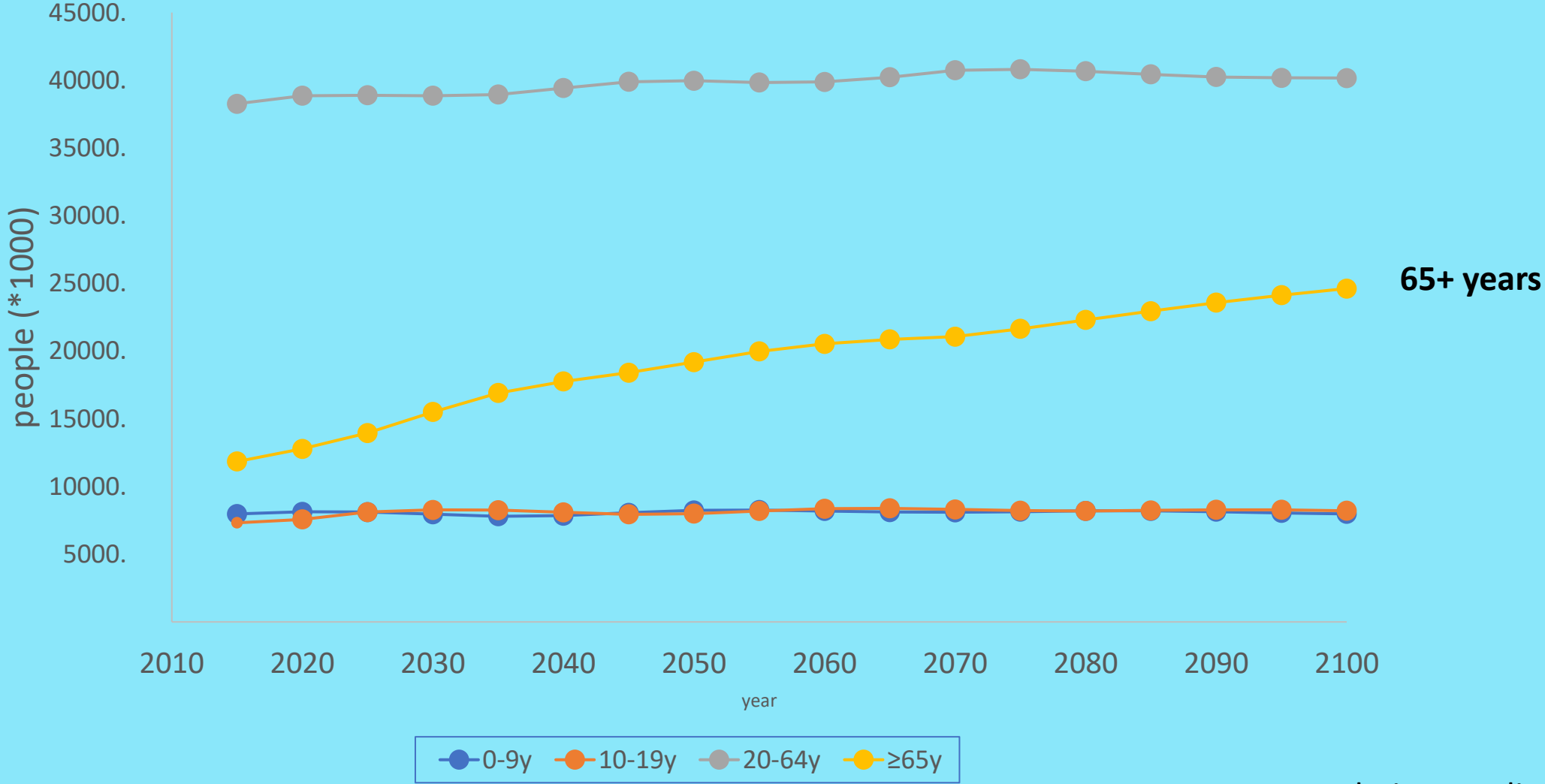


Great individual variability now and in the future!

'Older people are just like you and me but sometimes need a little bit of extra support'- a 15 year old

United Nations and WHO:
use both 60+ and 65+

UK Population Predictions



Healthy ageing

WHO defines it as:

“the process of developing and maintaining the **functional ability** that enables **well-being** in older age.”

We are not just talking about avoiding disease.

The United Nations Decade of Healthy Ageing
(2021–2030)

Relevant policy

The NHS Long Term Plan

Chapter 1: a new service model for the 21st century

'We will boost *out of hospital* care....'

Emphasis will be on

- preventing 'unnecessary admissions' to hospitals and residential care
- 'ensure a timely transfer from hospital to community'.

Can we identify a model for healthy aging?



Mrs Jones*: 93 years old

‘Living independently with minimal support’

*Name changed, permission obtained to use pictures and personal details

What may have contributed to this lady's good health?

- ❑ Genetics (up to 25% of variability)
- ❑ Mother's health and diet before and during pregnancy (eg. Folic acid pre-conceptually, intrauterine conditions impact on birth weight and subsequent health)
- ❑ Absence of environmental related risk factors (e.g. occupational factors)
- ❑ Socio economic status
- ❑ An element of good fortune **but healthy aging is not random!**

Adherence to lifelong behaviours that reduce the risk of 'lifestyle related diseases'

- ❑ Non-smoker
- ❑ Moderate alcohol intake (e.g. body weight, liver function, bone density)
- ❑ An active, non-sedentary lifestyle throughout her life
- ❑ Appropriate diet (quality and quantity) to avoid diseases resulting from
 - ❖ excess (e.g. obesity and its comorbidities)
 - ❖ deficiency (e.g. osteoporosis).
- ❖ **Successfully adapted to change** through her life including changing **dietary requirements.**

What may these changes have been?

29 years old



????????

93 years old



Energy

In general, with aging energy requirements decrease

Why??....

Reduced level of activity.... **Not inevitable!!!!!!**

Reduced amount of 'lean body tissue including 'metabolically active' muscle- **Not inevitable decline... can be reduced by activity and adequate protein intake!!!!**

Sarcopenia- pathological loss of **muscle mass** and **function**.
Includes sarcopenic obesity.

What is frailty?

Maintaining muscle mass is important in avoiding 'Frailty'.

Frailty is typified by:

- reduced muscle strength
 - fatigue.
- Around 10% of people aged over 65.
 - Between 25% and a 50% for those aged over 85.

'Frailty **isn't the same** as living with **multiple long-term health conditions**. There's often overlap, but equally someone living with **frailty** may have **no** other diagnosed health conditions.' Age Uk (2022)

Protein

Now recommended that older adults have a **higher intake of protein**, as this contributes to the maintenance of **muscle mass**. 1.0–1.2 g protein/kg body weigh. Not all older people achieve this intake.

Very important that **dietary energy requirement** is met, or will use dietary protein for energy leading to loss of muscle mass

(see work by Prof Paul Greenhaff and others at the University of Nottingham).

Vitamins and minerals

Recommendations currently the same as younger adults.

Apart from Vitamin D:

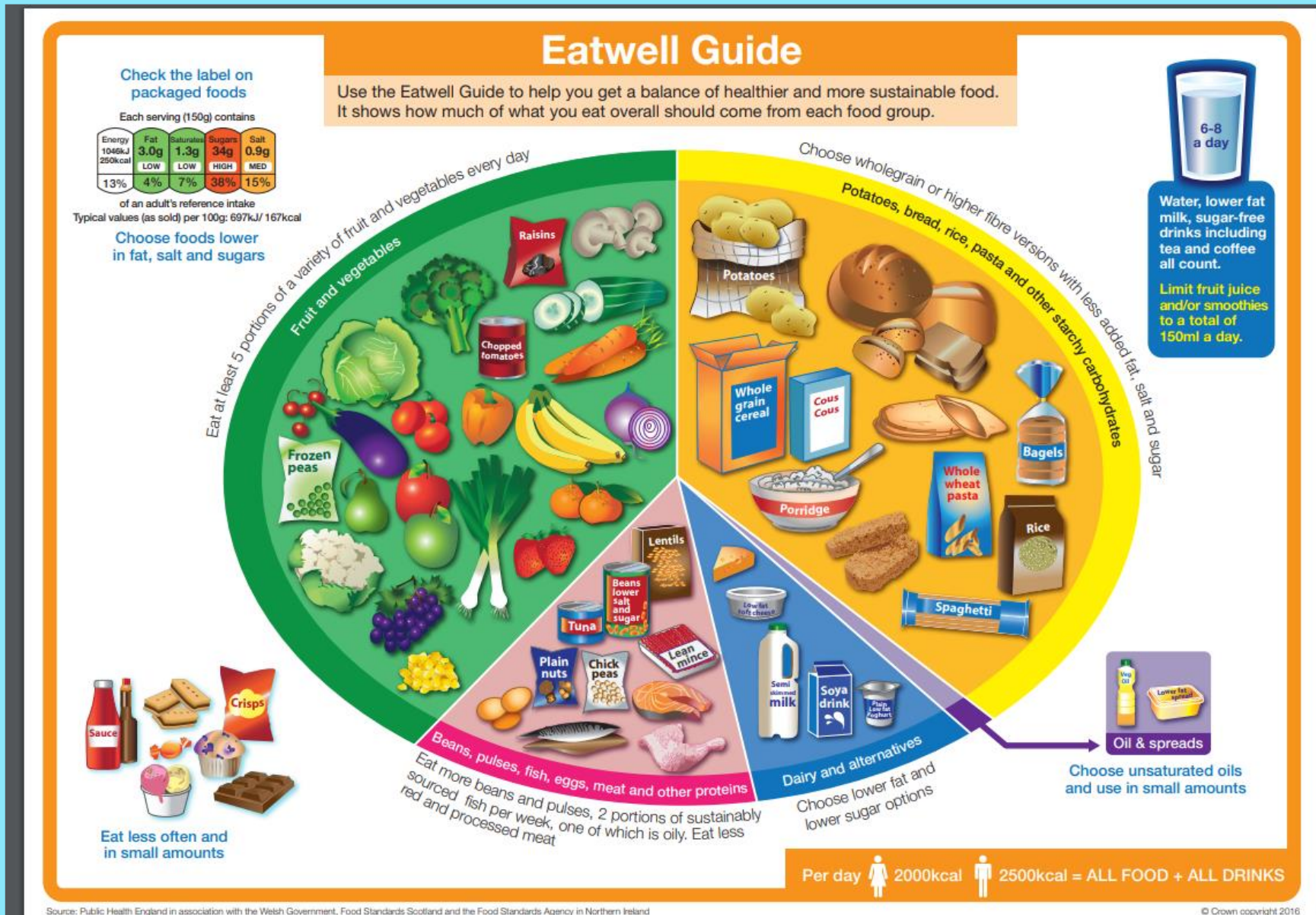
recommended that a **10 micrograms daily** supplement is taken all year and especially if low exposure to sunlight.

General point

Given that **energy intake** may have **reduced**, vitamin and mineral intake may be compromised by lower overall food intake.

Ensure the food consumed is **sufficiently nutrient** dense.

Eatwell guide applies to older people in good health.



SACN Statement on nutrition and older adults living in the community- January 2021

Concluded:

'High levels of overweight and obesity in older adults':

- 87 % of men and 68 % of women aged 65–74 years,
- 69 % of men and 58 % of women aged 75 years and over were living with overweight or obesity.

'Underweight less common'

<1 % of men and 3 % of women aged 65–74 years

7 % of men and 3 % of women aged 75 years and over.

'Evidence of low micronutrient intakes and status'

E.g. vitamin A, riboflavin and folate, Fe, Ca and Zn, vit D.

- **BAPEN's Nutrition Screening Week surveys (2007-11)**
- Estimated that malnutrition (or “undernutrition”) affects over 3 million people in the UK.
- 1.3 million are **over the age of 65.**
- Risk of malnutrition is seen in :
 - **25-34% of patients admitted to hospital**
 - **30-42% of patients admitted to care homes**
 - 10-14% of those living in sheltered accommodation.

What might challenge Mrs Jones' current positive position?
Currently her '**Personal Food chain**' is intact.



Able to obtain familiar food and drinks she likes via a weekly supermarket shop



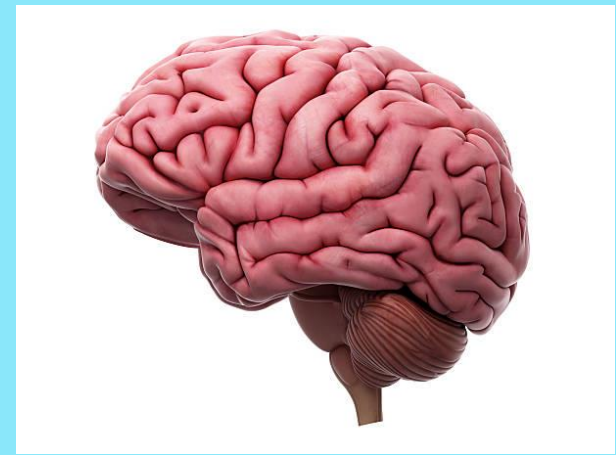
Since her husband died her son drops her off to meet at the café for lunch with friends, do her shopping, and then he collects her, helping load and unload the shopping. She puts it away once home.



She remembers that she needs to eat and drink at appropriate times and importantly, whether she has done so.



Her memory is not as good as it was but she manages.

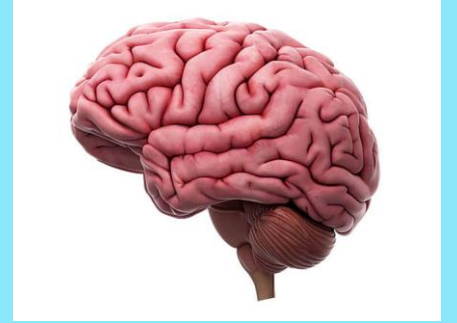




- For breakfast and tea she can 'put together a meal' from the ingredients she has in the fridge and store cupboards (pictorial prompts) .
- For lunch she has a complete ready meal
- She remembers where drink and food are kept
- Recognises and selects appropriate drinks and foods.
- Physically manages the packaging
- Operates the microwave effectively, using packet instructions to prompt her.

Prompts





- Remembers to eat and drink what she has prepared





- Likes the food and drink having chosen it herself.
- Has sufficient manual dexterity and co-ordination to consume the food.

- effective dentition
- flavour preferences change with age





Able to consume sufficient of a varied diet
hence
meets her fluid and nutritional requirements



How might the chain be broken?

Mrs Jones gets a cold

The 'food chain' now



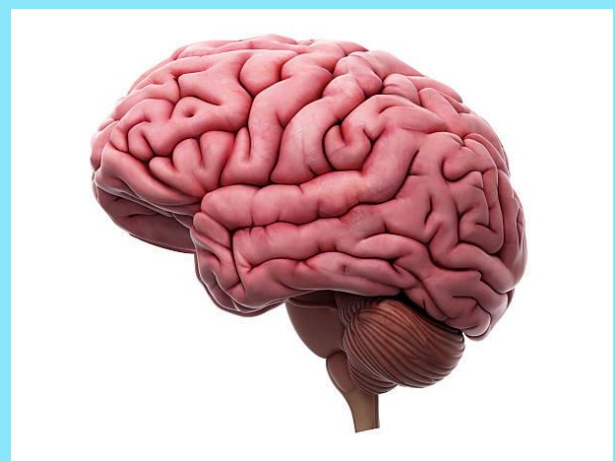
Food still available from the last shop she did with her son





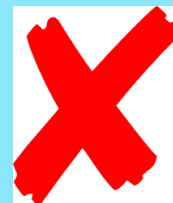
Remembers that she needs to eat and drink at appropriate times and whether she has done so but doesn't feel hungry.

It feels too much of an effort to make a cup of tea between meals so she leaves it.





- She just has toast for breakfast
- For lunch she has a ready meal but preparing it tires her and she sleeps through the afternoon, not making a drink.
- Still tired by tea-time, she just has bread and jam and piece of cake instead of opening a tin of soup and making a ham and salad sandwich as usual.

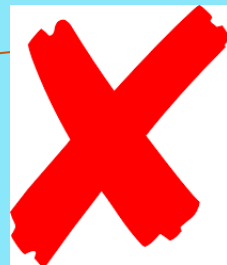


- Remembers to eat and drink what she has prepared





- She doesn't particularly enjoy the drink and food as it seems tasteless.
- Has sufficient manual dexterity and co-ordination to consume the food but becomes tired quickly and leaves some.





Has not meet her fluid or nutritional requirements:
Fluid- no milk on cereal or soup and less tea.
Food- reduced quantity and importantly
variety.



Does this matter over a few days?

Yes!!!!

Mrs Jones is vulnerable to:

the 'snowball effect of acute illness' and the start of a 'downward spiral'.

Saturday morning

Her son arrives to take her shopping.

Having fallen she has been on her bedroom floor for 12 hours. She has a potentially fractured her upper arm, is very confused and is admitted to hospital.

Diagnosed with a **urinary tract infection (UTI)**.

Dehydration has contributed to this, the dizziness and muscle weakness (contributing to the fall). She is also experiencing **delirium**. As this resolves it becomes apparent she has poorer concentration and memory attributed to a **transient ischaemic attack**.

What is delirium?

'Delirium is an episode of acute confusion'.

- Can be misrecognised as dementia
- Preventable and treatable

Risk factors (multiple):

- Age
- Acute illness
- Lack of fluid and food intake
- Being in hospital or an unfamiliar environment

Age Uk (2022)

After several days Mrs Jones is discharged
She is determined to remain independent at home.

Review of the 'Personal Food chain'.



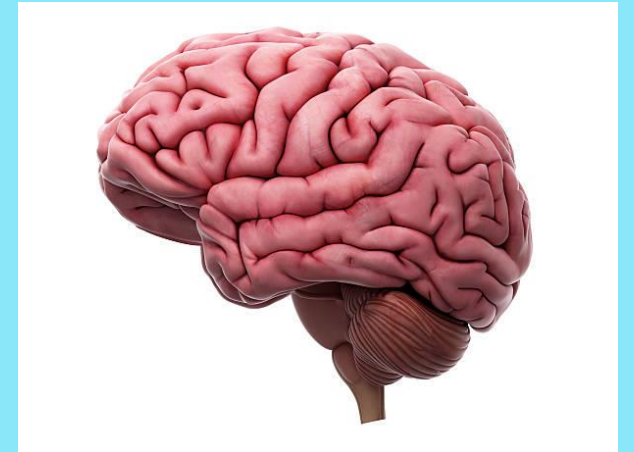
On returning home initially limited food available.



Feeling weak and fearing a fall she asks her son to do her shopping but does visit the Café. She decides not to go again as the menu confused her and she stumbled on dimly lit steps. Social isolation and decreased activity result.



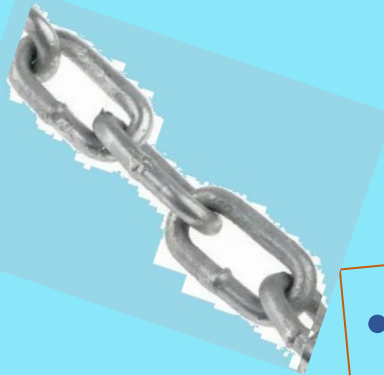
With a poorer memory she sometimes wonders if she has had lunch so eats a piece of cake.

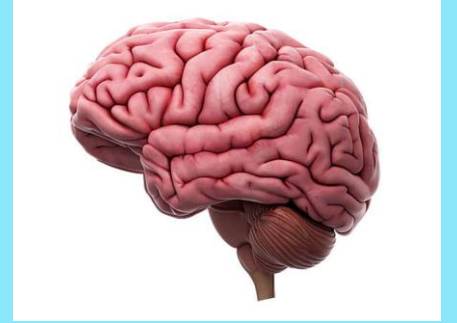




- For breakfast she manages to make toast.
- Items bought by her son are not her 'usuals, making recognition difficult and she gets a bit muddled about where he has put things away for her.
- The instructions on the microwave packet seem very confusing.
- She struggles to open the packets with her bruised hand and arm.
- The microwave seems sometimes to have broken
- Bread and jam is easy for tea, or sometimes a cake.



- 
- She is puzzled to find prepared food still in the kitchen when she goes to make her next meal.
 - Unable to carry both her cup and plate through from the kitchen, with her bruised arm, she then forgets to have a drink after her meal.





- She tries some of the things her son brought her but doesn't really like the unfamiliar taste.
- Eating is tiring with her bruised hand and arm, and she finds foods that are not soft difficult to eat without her top false teeth (which were lost in hospital).



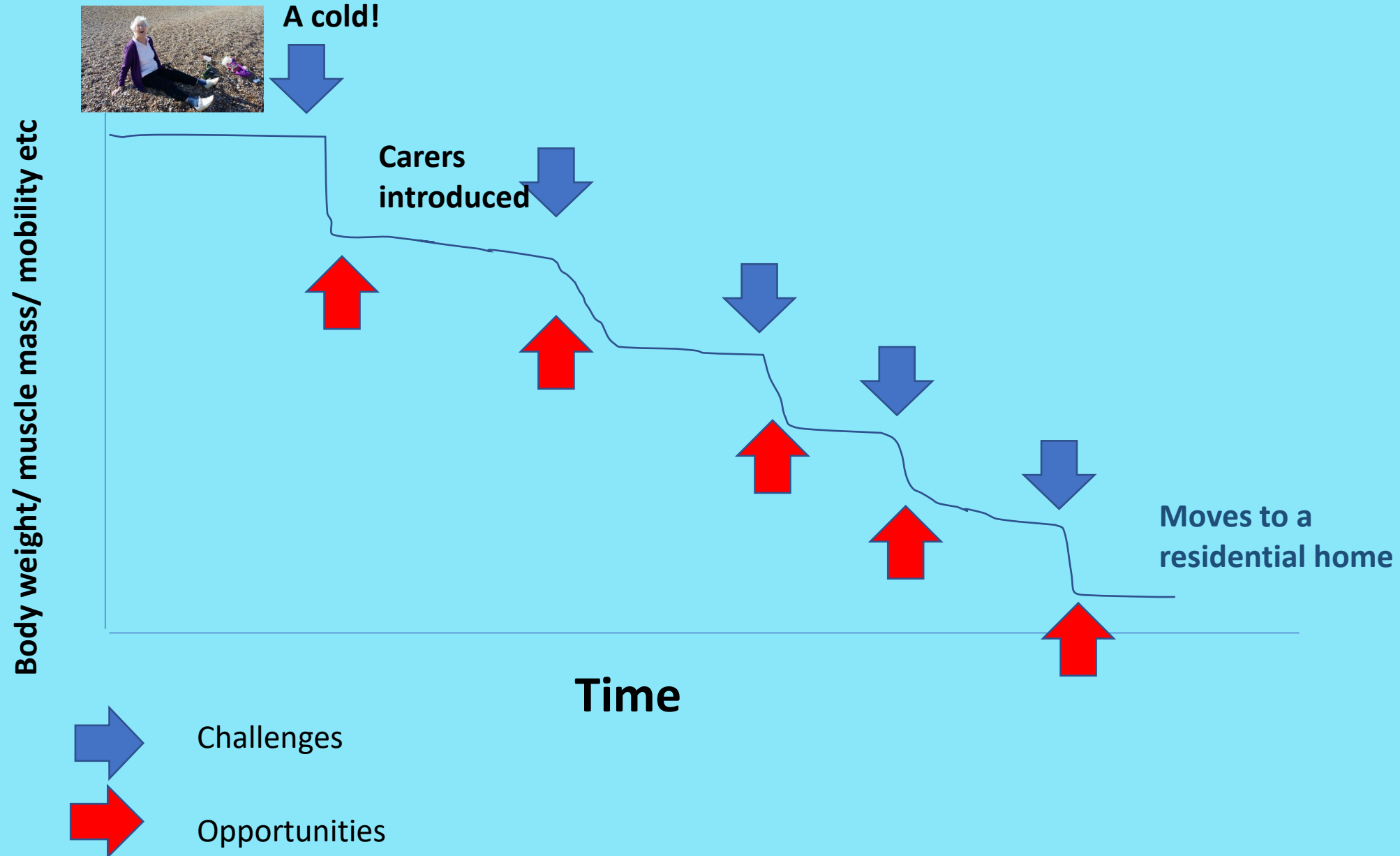


Her diet remains inadequate leading to risk of further dehydration, weight loss (including muscle loss), and global undernutrition.

A care package is introduced for Mrs Jones. Unfortunately, due to insufficient visit time, inadequate staff training and the misperception that her restricted diet was her preference, her dietary intake remains limited.



The 'snowball effect' of episodes of acute illness



Potential opportunities to stop the 'snowball effect'
- See relevant modules

1. Addressing hydration

Module 2: 16 and 38

2. Supporting older people in remaining socially engaged

Module 5: 45

3. Increasing protein intake

Module 2: 17

And finally.....

A 'taste' of what the
University of Nottingham can offer
to support you!

Unique human investigation facilities to study food related research questions



Studying Oral Nutritional supplements:
Dr Sophie Lester, Prof Ian Fisk, myself and others in
collaboration with Danone.

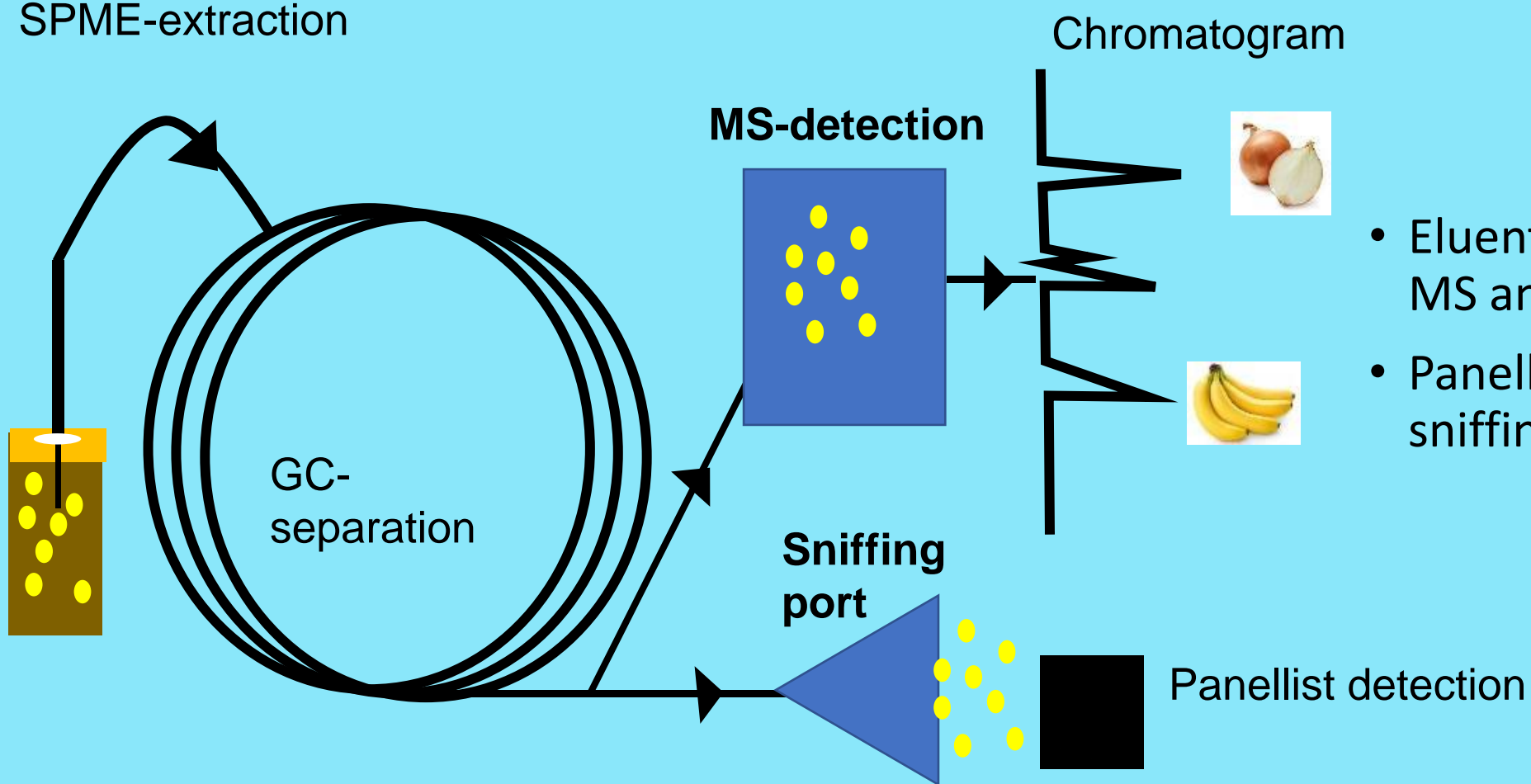


1. **Characterise the flavour profile** of Compact energy and identify the origin of aroma.
2. **Understand** how ageing impacts on the **flavour perception** of Compact Energy
3. **Investigate novel processing** conditions and ingredients to modulate the formation of aroma compounds.
4. **Explore** relationships **between flavour, drivers of liking and appetite** in target population (undernourished older adults)
5. **Modify flavour** to meet changes in preference and validate strategy in target population
6. **Provide product guidelines** which improve consumer liking with potential positive impact on compliance

Techniques used

Gas-Chromatography Olfactometry (GCO)

SPME-extraction



- Eluent from GC split between MS and sniffing port
- Panellist places nose at sniffing port to detect aroma

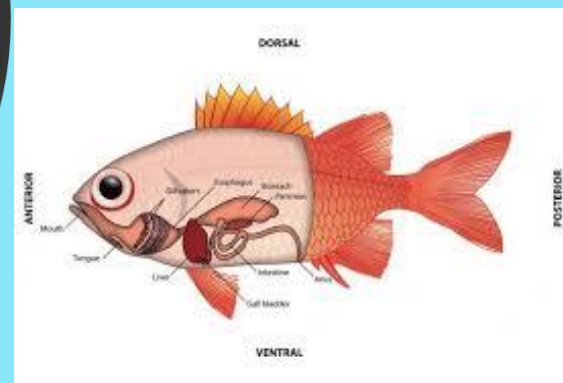
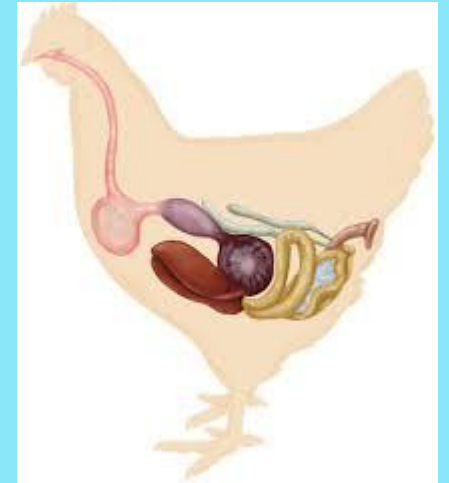
Sensory testing

Atmospheric pressure chemical ionisation (APCI-MS) to measure temporal aroma release.



The Future Protein Platform: Prof Andy Salter

£1 million investment by University into research into novel sources of protein for food and feed

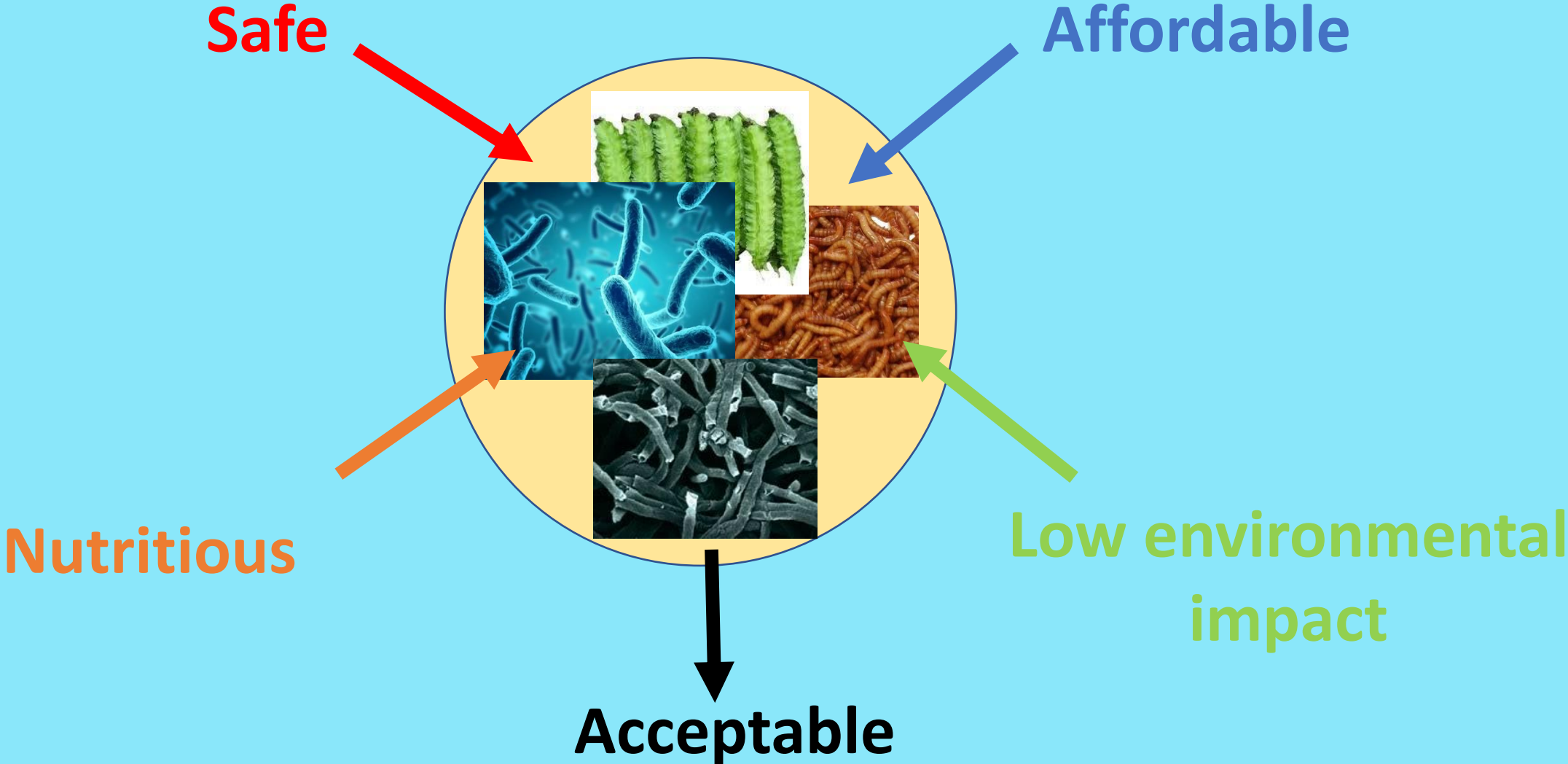


Plants

Single Cell Organisms

Insects

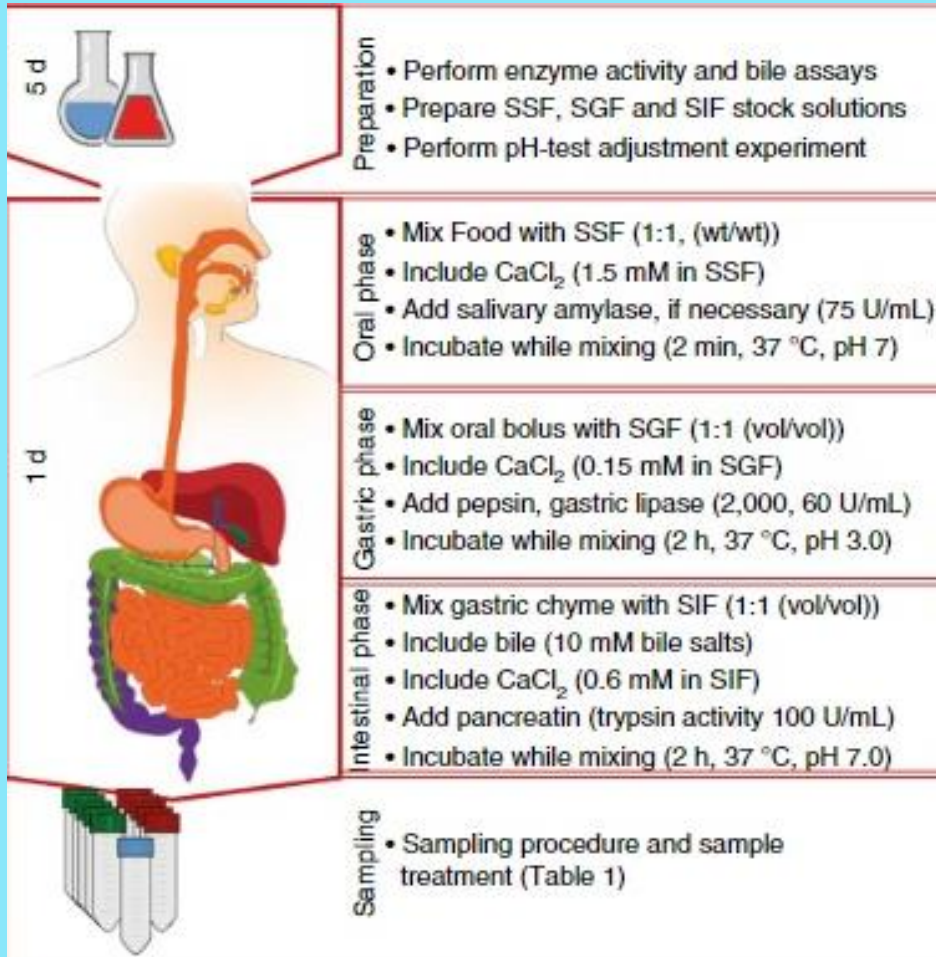
Requirements of Novel Sustainable Protein Sources



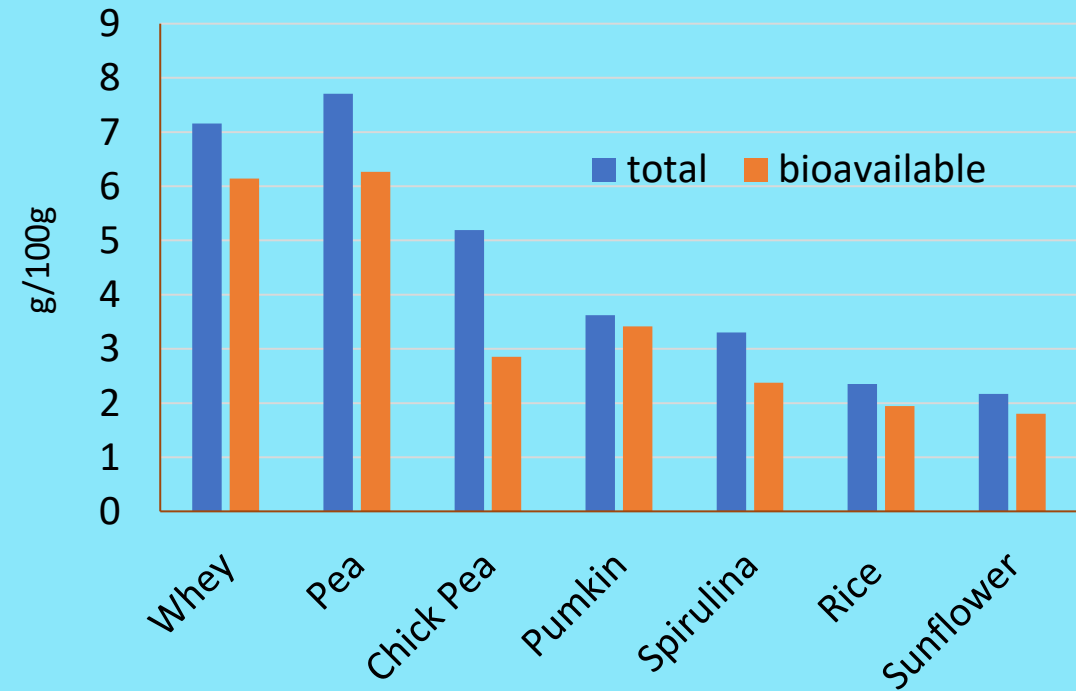
Reduce environmental impact by:

- Producing more sustainable novel sources of protein for human consumption
- Producing more sustainable sources of protein for animal feed.

Determination of digestion using In Vitro system



Bioavailability of lysine from various proteins



Ensuing protein is available to the consumer..

Whole-body MR Imaging



Sally Eldeghaidy

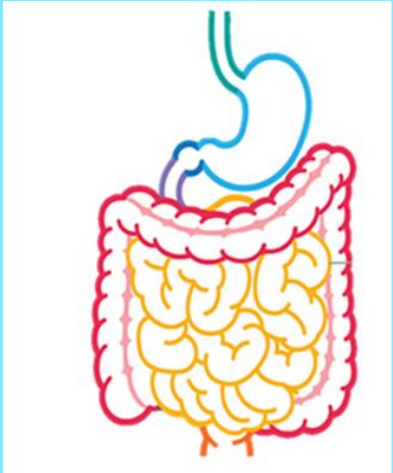
Combining brain, gut imaging and blood responses in a single MRI session



Wide-bore 3T Philips scanner



Body muscle and fat composition

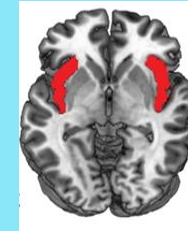


Brain-gut axis



Brain imaging

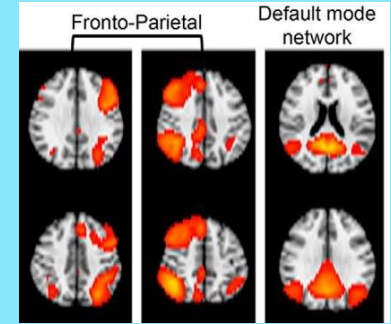
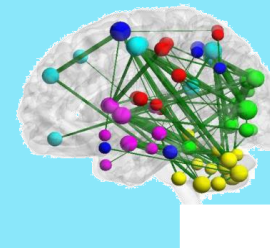
Task fMRI



Cerebral blood flow (ASL)

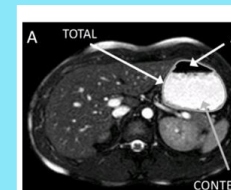


Functional connectivity/Resting state fMRI

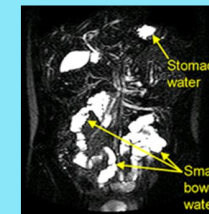


Gut imaging

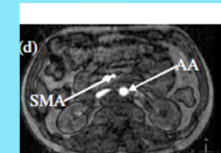
Gastric volume



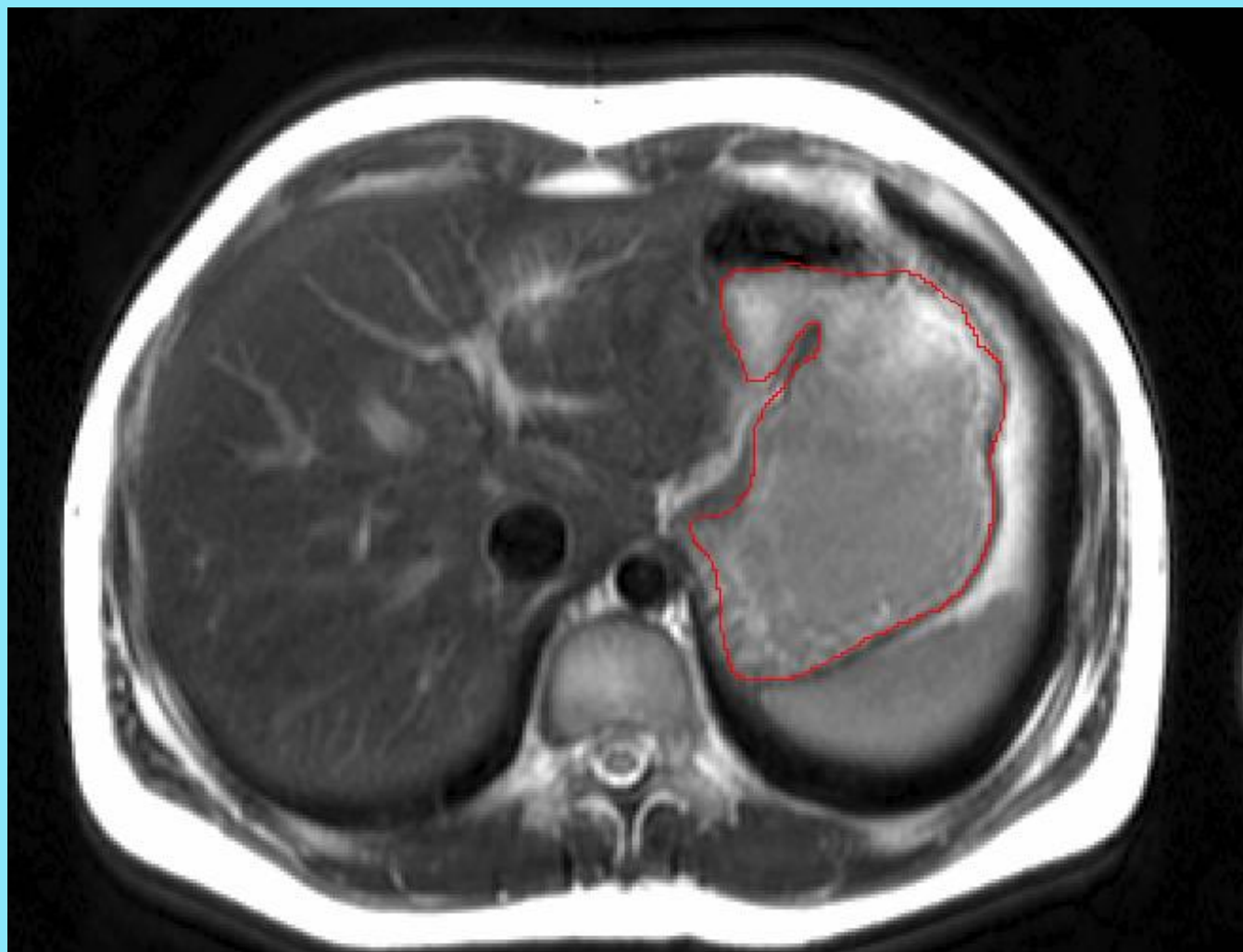
Small bowel water content

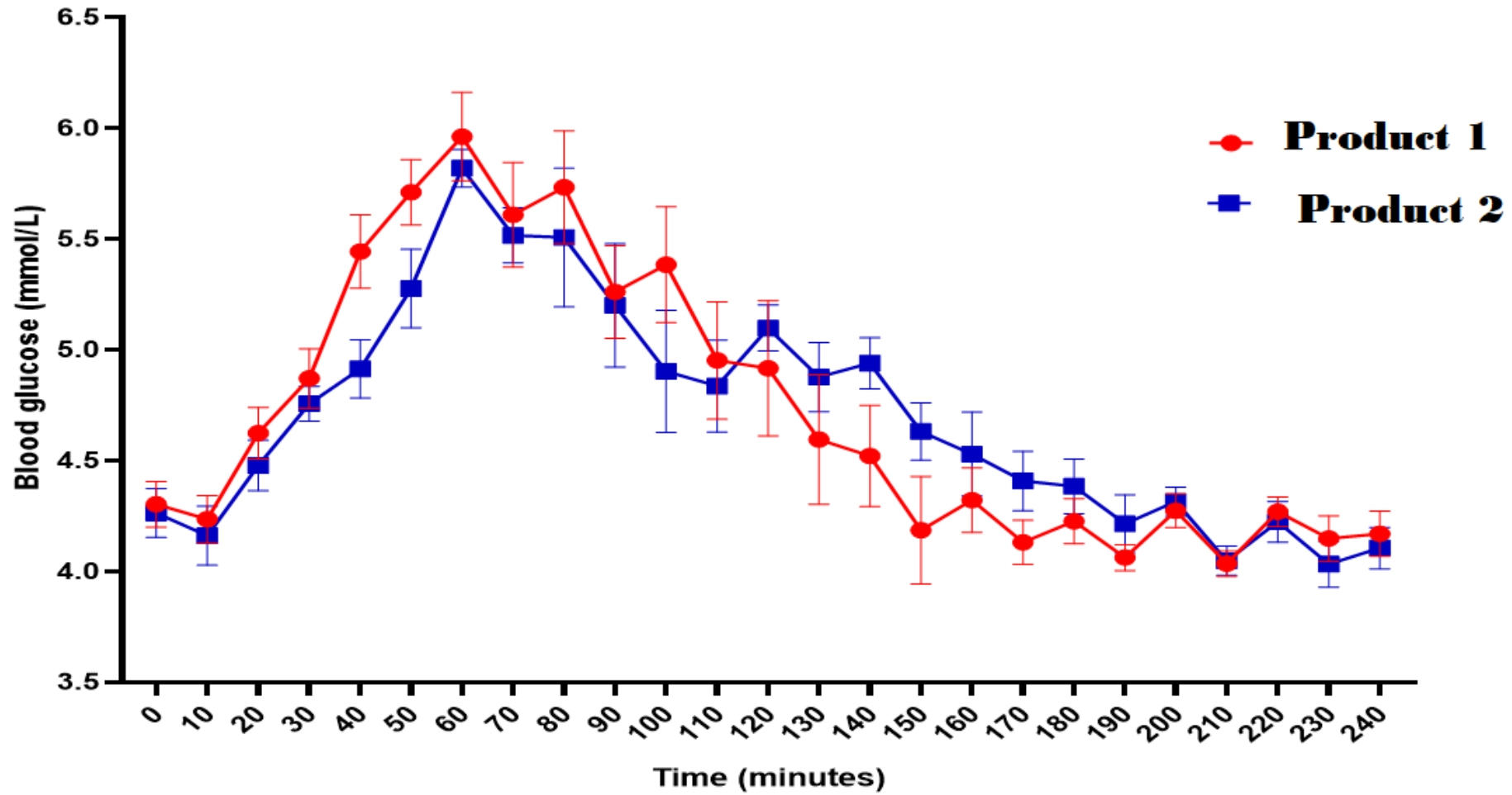


SMA Blood flow



Method of
gastric volume
measurements





Pattern of blood glucose (arterialised) following consumption of different products. (n=7). Samples were taken every 10 minutes

In conclusion:

- Nutritional requirements of older people are similar to those of other adult groups, **however** meeting those requirements requires an agile response to diverse broader challenges.
- A 'personal food chain' may break down and acute illness can trigger a 'snowball' effect.
- The University of Nottingham is able to offer a diverse range of techniques of relevance to food and nutrition research.. with integrating different techniques a particular strength.