# Methionine restriction as a healthy ageing strategy, is it safe and plausible in humans?

## NuGOweek 2015

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**FOOD AND NUTRITION**
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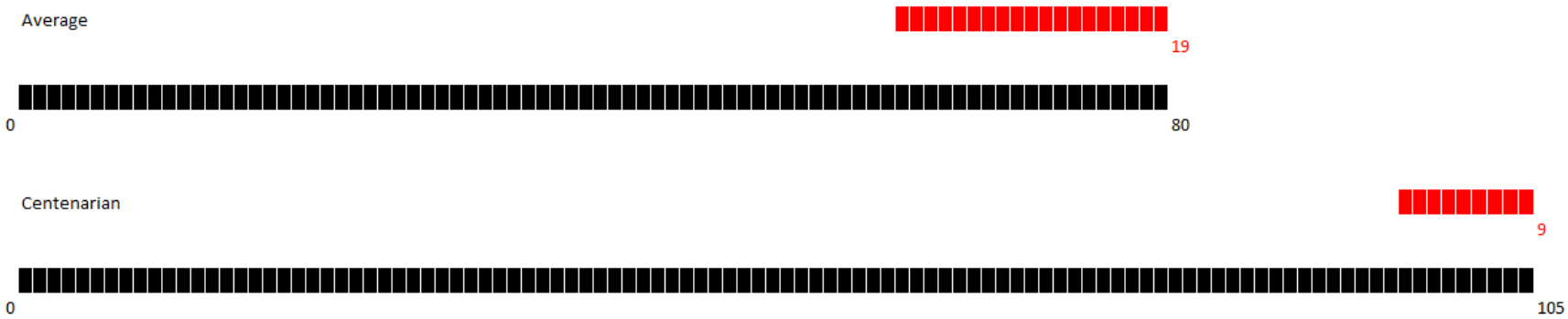
# Defining healthy ageing




(Adapted from National Geographic Magazine, May 2013)

- Centenarians **live longer** and have a **compressed morbidity** (red markers) compared to the average life-span

# Australia's ageing population

- It is estimated that the percentage of people aged 65 years and over will increase from 14 per cent in 2012 to 25 per cent by 2101

(Australian Bureau of Statistics 2012)

- The prevalence of age-related chronic diseases such as cancer, cardiovascular disease, dementia and type 2 diabetes is increasing

- Chronic diseases are a significant health concern, impacting heavily on the use of health services and contributing to major funding pressures on the health care system

- One of the key risk factors of chronic diseases in Australia is poor diet

(Australian Institute of Health and Welfare 2012)

# Methionine

- Methionine is an essential amino acid necessary for normal growth and development

- Methionine and its derivatives are involved in several fundamental biological processes such as DNA methylation, protein synthesis and polyamine synthesis

- Methionine metabolism occurs via the "*de novo*" and "*salvage*" pathways

(Finkelstein 1990)

# Methionine restriction and life-span extension

- Methionine restriction increases lifespan in rodents

- Effect of methionine restriction was independent of any effect of caloric restriction which is also known to extend life-span

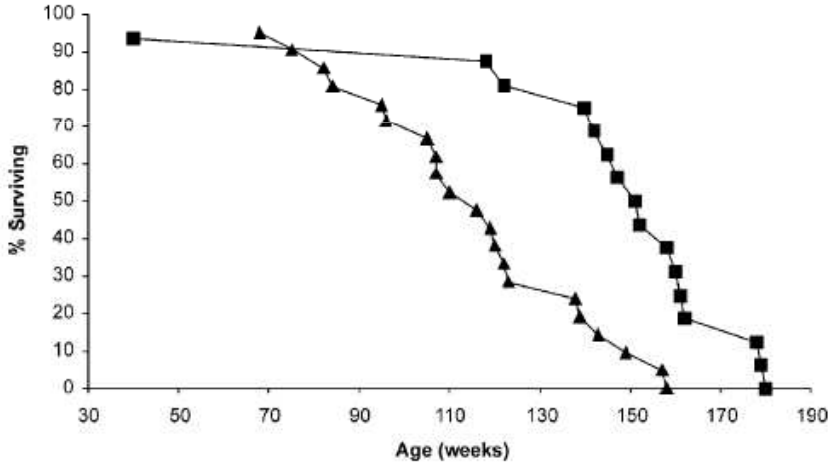
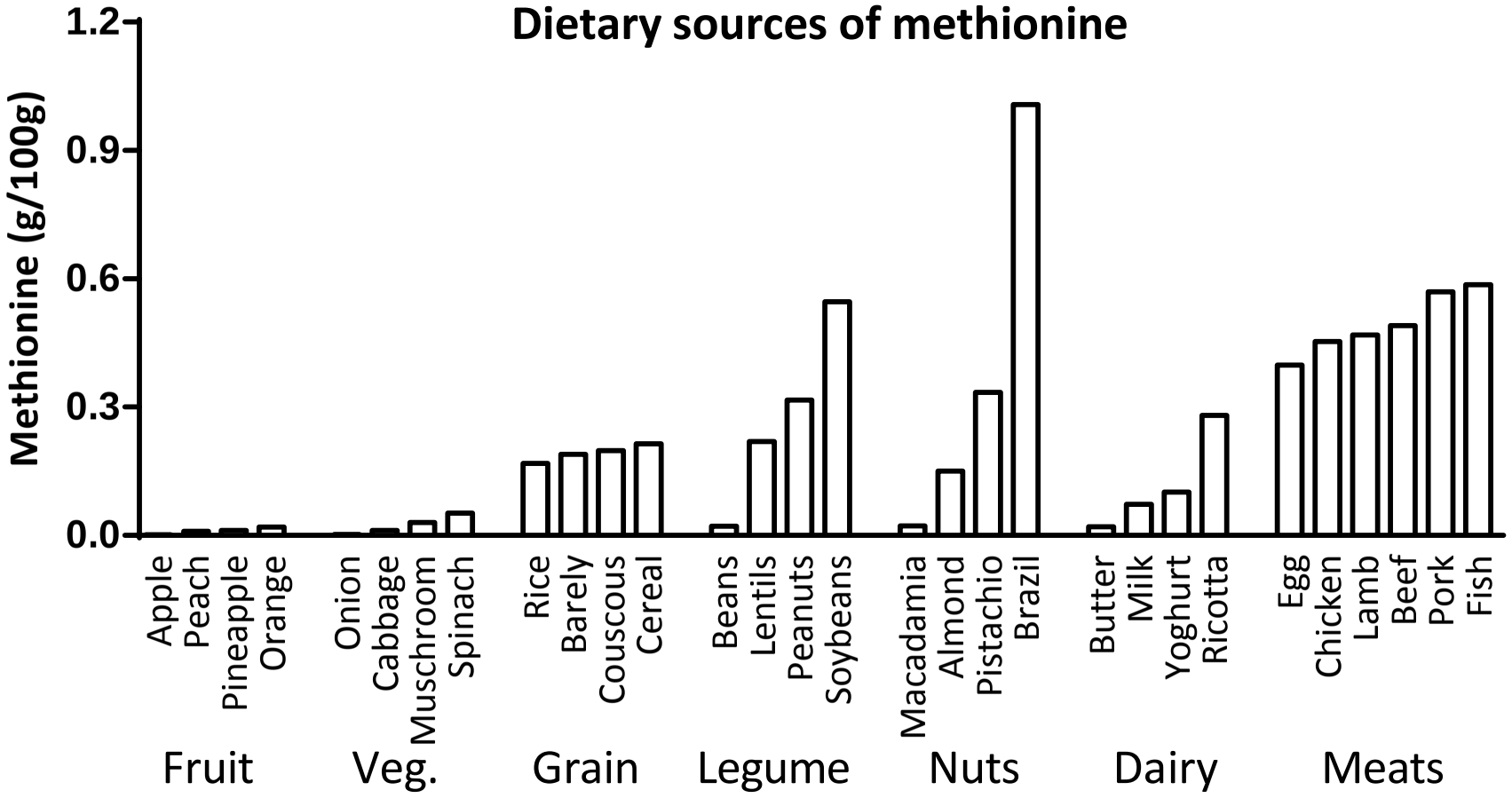



Fig. 1. Survival of Fischer 344 male rats fed a purified diet containing 0.86% (-▲-) or 0.17% (-■-) methionine beginning at 8 weeks of age.

**Methionine Restricted Diet**
42% increase in mean survival
44% increase in maximal longevity

(Adapted from Zimmerman *et al.* 2003)

# Methionine restriction in humans



# Methionine restriction human clinical trial

- A diet low in methionine extends a healthy lifespan in rodents but it is unknown whether this effect exists in humans

- There are relatively few studies which investigate methionine restriction in humans as a strategy for longevity and even fewer which utilise a methionine restricted dietary pattern with whole foods

- Pilot clinical trial over 4 weeks to test the safety and feasibility of methionine restriction as a lifestyle choice for the community and as a base diet for future longer term clinical trials.

# Aims & hypotheses

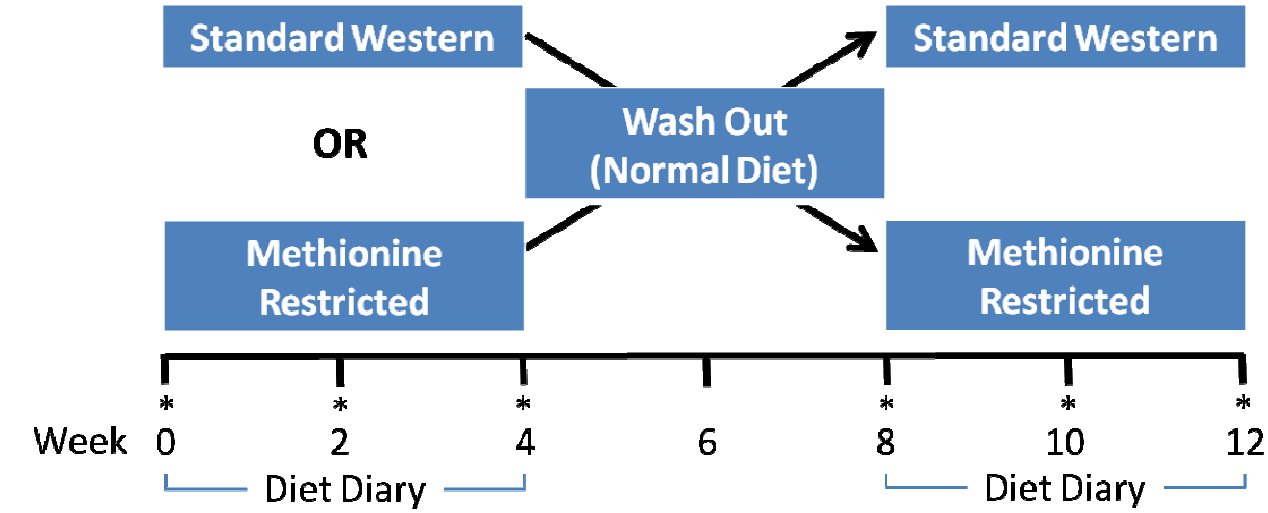
## Aims

- To determine if a methionine restricted dietary pattern using whole foods is safe, feasible and deliverable to the community
- To determine nutrient intake values of a methionine restricted dietary pattern

## Hypotheses

- A methionine restricted dietary pattern based on whole foods is safe, feasible and deliverable to the community
- A methionine restricted dietary pattern is nutritionally sufficient

# Study design




* Blood collection

Note: Each participant will consume both the standard Western diet **and** the methionine restricted diet over the course of the study

- Participants consulted with a dietitian every 2 weeks during the intervention
- Main meals were provided to participants
- n = 20/group

# Sample diets

| | Methionine Restricted Diet | Standard Western Diet |
|---|---|---|
| **Breakfast** | 2 pieces of Toast with Honey/Jams + 1 glass Orange Juice | 1 cup Cereal/Oats with 250 ml whole Milk |
| **Lunch** | 100 g Fruit Salad or Greek Salad | 150 g Chicken Caesar Salad |
| **Dinner** | 1 serve (227 g) Vegetarian Lasagne | 300 g grilled T-bone Steak with steamed vegetables and mashed potatoes |
| **Snack** | 50 g Almonds or Raisins | 50 g Cashew nuts or Walnuts |
| **Methionine Intake** | ~ 0.8 g | ~ 2.8 g |

# Inclusion and exclusion criteria

- **Inclusion Criteria:**
  - Male or Female
  - Aged 50-70
  - Healthy with no history of cancer
  - Body mass index (BMI) in the healthy/overweight range: 18.5-29.9

- **Exclusion Criteria:**
  - History of smoking
  - Medications/supplements which contain folate, B vitamins or methionine
  - Current vegetarians/vegans

# Summary

- A methionine restricted dietary pattern is practical at least over the short term
- Plasma methionine is not an accurate indicator of methionine status, particularly in response to short term altered dietary methionine intake
- Longer term interventions are required to determine suitability of a methionine restricted dietary pattern for healthy ageing

# Team

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# Thank you

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