In hospital or at home: what makes a healthy diet healthy?

Martin Wiseman FRCP FRCPath

University of Southampton

and

WCRF International

Society for Acute Medicine, October 2014
What makes a healthy diet healthy?

• What IS a healthy diet, and why?
• Why do we need to eat?
• Where do our tissues get nourishment?
• Is it the same for everyone?
• Physical activity and diet
• Lifecourse
• Conclusions
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The eatwell plate

Use the eatwell plate to help you get the balance right. It shows how much of what you eat should come from each food group.

41

Dietary Reference Values for Food Energy and Nutrients for the United Kingdom

Report of the Food Standards Agency and the Committee on Medical Aspects of Food Policy

RECOMMENDATIONS

BODY FATNESS
Be as lean as possible within the normal range of body weight

PHYSICAL ACTIVITY
Be physically active as part of everyday life

FOODS AND DRINKS THAT PROMOTE WEIGHT GAIN
Limit consumption of energy-dense foods
Avoid sugary drinks

PLANT FOODS
Eat mostly foods of plant origin

ANIMAL FOODS
Limit intake of red meat and avoid processed meat

ALCOHOLIC DRINKS
Limit alcoholic drinks

PRESERVATION, PROCESSING, PREPARATION
Limit consumption of salt
Avoid mouldy cereals (grains) or pulses (legumes)

DIETARY SUPPLEMENTS
Aim to meet nutritional needs through diet alone

BREASTFEEDING
Mothers to breastfeed; children to be breastfed

CANCER SURVIVORS
Follow the recommendations for cancer prevention
A healthy diet...

• Plenty of plant foods, especially wholegrains and pulses, vegetables and fruits
• Not too much saturated (and *trans*) fatty acids, salt, sugar, alcohol
• Regular fish, especially oily
• Modest amounts of meat, dairy
• Avoid lots of energy dense foods/sugary drinks
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A healthy diet...

• To maintain micronutrient status
• To support optimal growth and development
• To optimise body composition
• To maintain functional capacity
• To prevent chronic diseases of ageing
Nutrition – a demand-led process

Growth and development are not a passive response to the environment, but follow a genetically and epigenetically determined programme

This programme creates a pattern of demands for energy and nutrients that varies over time, between people and with environmental exposures

Maintaining normal structure and function after maturation also creates demands
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Meeting demands
Diet and endogenous synthesis

• We need energy and nutrients (substrates and cofactors) to support metabolic processes

• Some nutrients we cannot make (minerals); others we have evolved to expect in the environment and so have not preserved pathways for their synthesis (vitamins)
  - “essential nutrients”

• We have preserved synthetic pathways for nutrients that we need but cannot expect to obtain preformed in sufficient amounts (eg glucose)
  - “non-essential nutrients”
Meeting demands
Diet and endogenous synthesis

Growth and development follow a predetermined programme

This programme creates a set of demands for energy and nutrients

Meeting the demands depends on metabolic capacity as much as dietary nutrients
What if metabolic capacity is impaired?
What if metabolic capacity is impaired?

Reductive adaptation
Somalia: relief camp during famine 1992/93

487 adults: Weight 35 kg, BMI 13.1 kg/m²; Overall mortality 21%

377 non-oedematous, 83 oedematous, 27 not studied

Mortality in non-oedematous 20%; oedematous 37%

<table>
<thead>
<tr>
<th>Mortality</th>
<th>High protein (16.4%)</th>
<th>Low protein (8.5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oedema</td>
<td>14/27 (52%)</td>
<td>14/52 (27%)</td>
</tr>
<tr>
<td>No oedema</td>
<td>64/291 (22%)</td>
<td>11/86 (13%)</td>
</tr>
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</table>

Appetite poor, better

Weight change (oedema) +7.2 g/kg/d, -6.3 g/kg/d

Collins et al. Am J Clin Nutr
Adverse cardiometabolic effects of products of adipocytes

Lyon 2003; Trayhurn et al 2004; Eckel et al 2005
Expansive adaptation
Meeting demands
Diet and endogenous synthesis

• Healthy people have a range of metabolic capacities (eg synthesis of “non-essential” nutrients)

• Healthy nutrition is at least as much about maintaining metabolic capacity as about what you eat

• Unhealthy people may lack metabolic capacity expected in healthy people
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Department of Health

Report on Health and Social Subjects

41

Food, Nutrition, Physical Activity, and the Prevention of Cancer: National Perspective
Energy intake around 20 MJ/day
Energy intake around 20 MJ/day

Energy expenditure around 25-40 MJ/day
Is it the same for everyone?

No! Neither quantity nor quality

Both demands and metabolic capacity vary with:

• Age
• Sex
• Physiological state
• Environment and behaviour
• Physical activity
• Illness
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Figure 2A

Summary activity levels, by age and sex
Base: Aged 16 and over

Men

Women
Figure 3E

Objective and self-reported measures of average daily minutes of MVPA time, by age and sex

Base: Aged 16 and over

**Men**

<table>
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<tr>
<th>Age group</th>
<th>Minutes</th>
<th>Accelerometry</th>
<th>Self-reported</th>
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<td>90</td>
<td>80</td>
<td>70</td>
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<td>35-44</td>
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**Women**

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Accelerometry data are based on those with 4 or more days' valid accelerometry.
Energy Balance and Dietary Fat

Daily Energy Balance

Fat Energy %

Stubbs et al 1995
Trend in adult obesity prevalence (%)  
Health Survey for England 1993 to 2009

- Females
- Males

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<th>Males</th>
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Sedentary behaviour & prevalence of MetS
NHANES 1999-2000 n1626 MW >20y

Metabolic competence

Insulin sensitivity
Lipid metabolism
Blood pressure
Vascular reactivity
Inflammation

Outcome (e.g., CVD, cancer)

Fitness

Physical activity

Fatness
Metabolic competence

Insulin sensitivity
Lipid metabolism
Blood pressure
Vascular reactivity
Inflammation

Fitness

Physical activity

Fatness

Energy expenditure
Energy intake
Food intake
Nutrient intake

Outcome
eg CVD
cancer
Nutritional benefits associated with increasing physical activity

- Increased total energy expenditure

- Increased energy intake (food)
  - Greater likelihood of meeting micronutrient needs

- Increased intake of nutrients

- Optimised body composition

- Better metabolic control
• We are not evolutionarily programmed to be sedentary

• We are programmed to be active

• Physical activity is an integral aspect of nutrition

• Physical activity confers several benefits
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OF THE NATURAL CONDITION OF MANKIND
AS CONCERNING THEIR FELICITY AND MISERY

….the life of man, solitary, poor, nasty, brutish, and short

Thomas Hobbes, Leviathan, 1651
Infant Mortality

Expectation of life at birth

England and Wales 1846-1991

Death rate per 1,000 Live Births

Source: OPCS
Total and healthy life expectancy by deprivation in UK

ONS 2005
Four simple health behaviours and mortality in 20244 men and women aged 40-79 years, EPIC-Norfolk 1993-2007, RR in those <65y and 65y+

Score 0-4
1 Non smoker
1 Alcohol >0 <14 units/wk
1 Not inactive
1 Blood vitamin C >50 umol/l
(5 servings fruit and vegetable daily)

Equivalent 14 years

Adjusted for age, BMI, social class

Khaw et al PLOS Medicine 2008
Developmental Origins of Health and Disease

Evidence of a relationship between birth weight and risk of non-communicable disease in adult life:

- Type II diabetes
- Hypertension
- CVD
- Other...

Coronary heart disease
Standardised mortality ratios for 10141 men and 5585 women

**Graph:**
- Standardised Mortality Ratio vs Birthweight (pounds)
  - Men
  - Women
IMPACT OF OFFSPRING SIZE AND GROWTH ON CANCER RISK
Lifecourse

• Genes provide the background against which environmental exposures act
• Early life experience (as well as genes) can influence phenotype for life
• Susceptibility to disease depends on genes, early life experience and adult lifestyle and environment
• Healthy eating for the whole life starts at - or before - conception
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Healthy nutrition

• Meeting demands through diet and metabolism

• Being able to do everything you need
  – Functional competence
  – Physiological
  – Metabolic
  – Cognitive
  – Social
  – Etc

• In sickness and in health
So healthy nutrition depends on:

What you eat
What you are
What you do and CAN do

All are interrelated
Most people are inactive and have similar demands....
Most people are inactive and have similar demands.... but not everybody.
Healthy eating depends on meeting your demands....

...and being active improves metabolic capacity.
Eating for health; nutrition in ill-health

• Nutrition starts with the body’s demands
  – Often altered in illness
  – Variable between people
  – Quantity and quality

• Meeting demands depends on metabolic capacity as much as exogenous supply
  – Metabolic capacity is often impaired in illness
  – Overwhelming capacity leads to adverse outcome

• Physical activity is a necessary part of health, and has multiple benefits
  – So called “healthy eating” can in part be seen as compensating for low activity

• Mismatch between supply and demand, and compromised metabolic capacity, lead to problems
  – In healthy and unwell alike
THANK YOU!