



WHY CALORIES DON'T COUNT

DR GILES YEO

Webinar key messages
summarised for you.



1

NOT ALL CALORIES ARE EQUAL →

WHAT IS A CALORIE?

Calories are units of heat.



1 calorie aka 'heat' calorie = energy needed to raise the temperature of 1ml of water by 1°C at sea level.

1 Calorie aka kcal or 'food' calorie = energy needed to raise the temperature of 1litre of water by 1°C at sea level.

1 calorie = 4.184 joules of energy.

1 Calorie = 4.2 kilo joules (kJ) of energy.



WHY DON'T CALORIES COUNT?

When you compare calorie content of one food it makes sense, for example 200 calories of chips is double 100 calories of chips.

When you compare 200 calories of chips to 200 calories of broccoli it is a different story.



The number of calories actually in food

≠

The number of calories on the label

≠

The number of usable calories we finally get from food

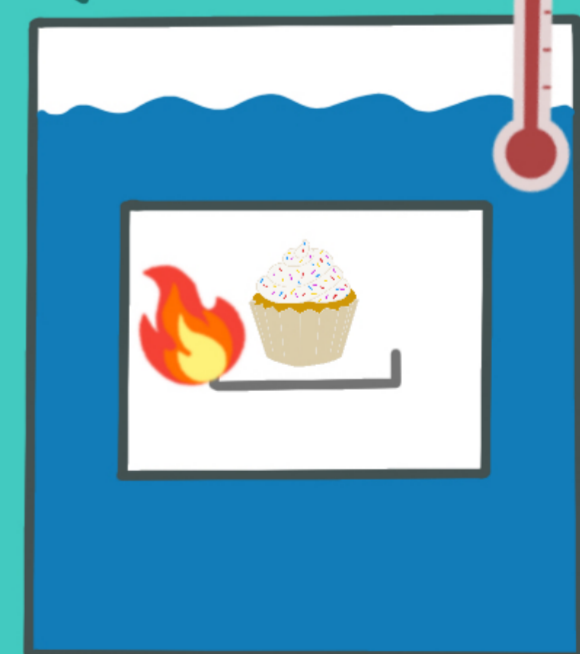
HOW DO WE MEASURE CALORIES IN FOOD?

Calories in food are measured using a bomb calorimeter.

A sample of desiccated food is placed into a sealed chamber, which is then pressurised with pure oxygen at 30x the pressure of the atmosphere. The food is burnt to a crisp.

Surrounding this sealed container (the bomb) is a water jacket with a known volume of water.

The temperature rise of the water is used to calculate the total calories in the food.

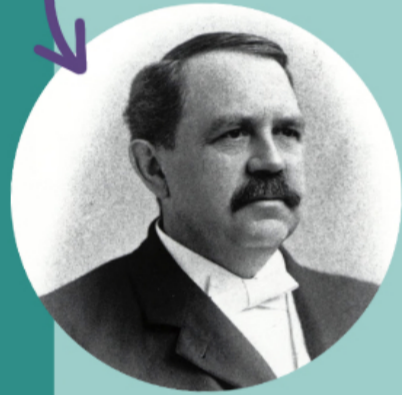


THE DISCOVERY OF CALORIC AVAILABILITY →

Energy 1046kJ 250kcal	Fat 3.0g	Saturates 1.3g	Sugars 34g	Salt 0.9g
13%	4%	7%	38%	15%

HUMANS ARE NOT BOMB CALORIMETERS

There are differences between how many calories we absorb from different foods. This was first discovered 140 years ago by chemistry professor Wilbur Olin Atwater.



For 20 years, Atwater's work focused on calculating the calorie content of thousands of different types of foods.

METHOD:

Put food through a bomb calorimeter to determine the total amount of calories in the food.

Feed the food to fasted human participants.

Measure the calories in the stools of the participants after digestion using a bomb calorimeter.

THE ATWATER GENERAL FACTORS

FAT = 9 KCAL PER GRAM

CARBOHYDRATES = 4 KCAL PER GRAM

PROTEIN = 4 KCAL PER GRAM

These calculations are still used today on food labels all over the world!

WHAT COULD ATWATER NOT CALCULATE 120 YEARS AGO?

Atwater's work was a great discovery at the time, helping us to get closer to a more accurate calorie calculation, informing calorie information for over a century!

But Atwater did not discover how much energy our bodies use to metabolise the nutrients in food. This is the final missing puzzle piece.

HOW DO WE UTILISE CALORIES AS ENERGY?



On average we eat around 2,000 calories a day, theoretically enough energy to boil our blood! This doesn't happen because our bodies do not use the energy provided by food all at once. We metabolise our food and store energy to be used as we need it.



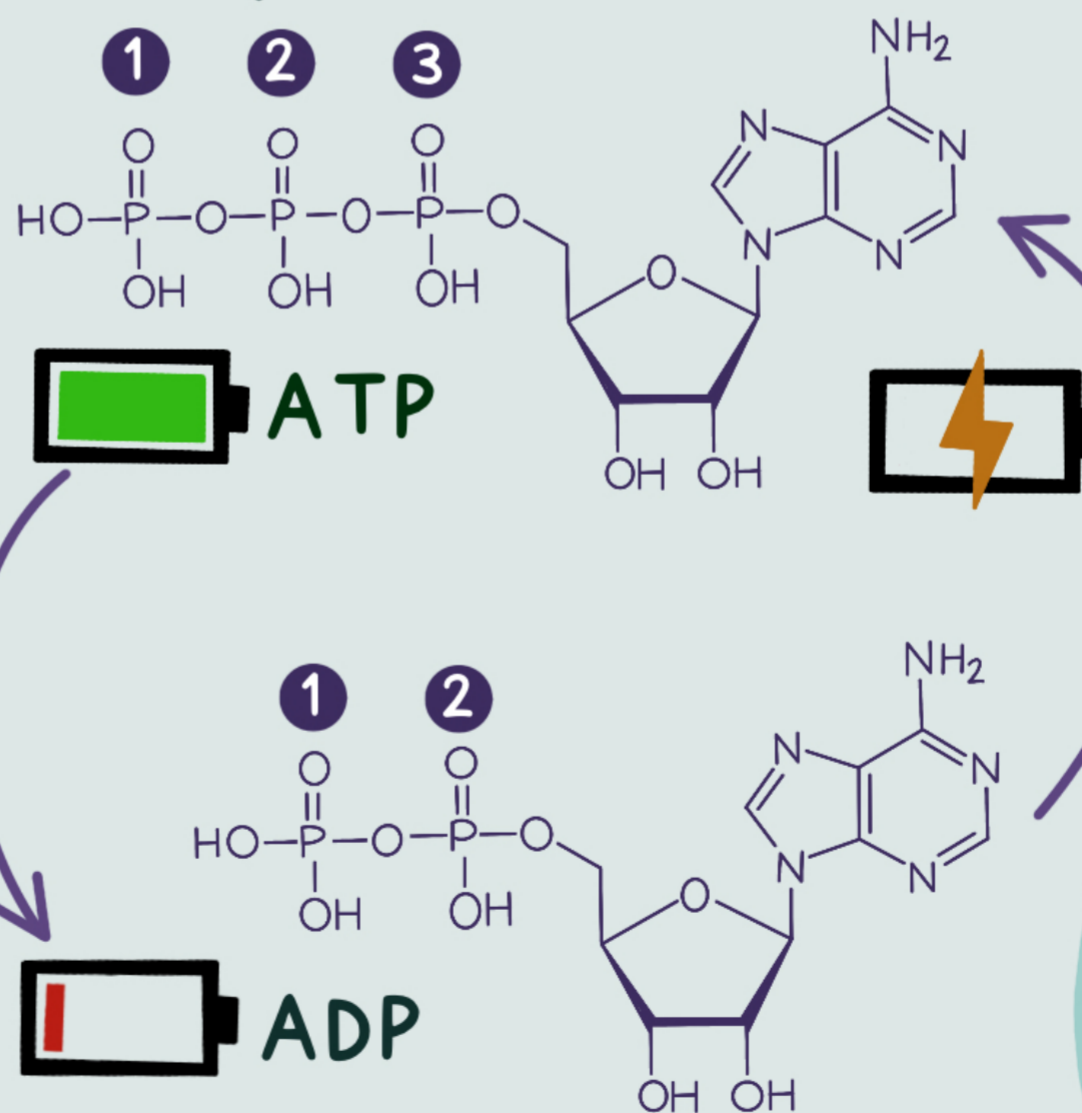
HOW DOES FOOD PROVIDE ENERGY?

Protein, fat and carbohydrates are all metabolised into intermediate nutrients (amino acids, fatty acids and glucose) before being transported around the body. When these intermediate nutrients reach the cell, they are metabolised into transportable units of energy called adenosine triphosphate (ATP).



ATP has three phosphate groups which have very high energy bonds between them.

When you break the bond and a phosphate group is removed, ATP becomes adenosine diphosphate (ADP) and a charge of energy is released.



ENERGY FROM FOOD

PHOSPHATE

PHOSPHATE

ENERGY

When our food is metabolised, we 'recharge' the ADP back to ATP, ready to use again for energy.

CALORIC AVAILABILITY OF MACRONUTRIENTS



PROTEIN CONTENT MATTERS!

Most of our energy is stored in the body as fat, with a small amount of energy stored as glycogen.

Carbohydrate and fat are composed entirely of carbon, hydrogen and oxygen which makes them almost interchangeable when it comes to storage in the body.

Unlike carbohydrate and fat, we don't have a store of protein. Protein is either metabolised and used immediately or stored as fat.

While protein is composed of carbon, hydrogen and oxygen too, it also contains nitrogen. The nitrogen needs to be stripped out of the amino acid before the energy can be used or stored.

THIS PROCESS USES ENERGY!



ENERGY IS USED TO METABOLISE FOOD



ENERGY CONSUMED



CALORIES LOST THROUGH FAECES

DIGESTED ENERGY



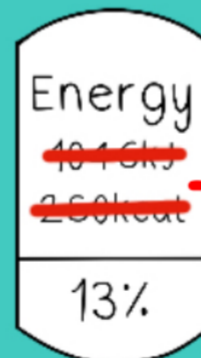
NITROGEN LOSS THROUGH URINE

METABOLISABLE ENERGY



DIET INDUCED THERMOGENESIS

NET METABOLISABLE ENERGY



175kcal

BASAL METABOLIC RATE

PHYSICAL ACTIVITY



PROTEIN

30% of the calories from protein are used by the body to strip out nitrogen and metabolise amino acids into energy.

5

VS

CARBS

10% of calories from complex carbohydrates and **5%** of calories from simple carbohydrates are used to package the energy up into useable units.

VS

FAT

Fat is incredibly energy dense and **98-100%** of calories will be absorbed.

WE EAT FOOD NOT CALORIES

? WHAT SHOULD WE BE COUNTING INSTEAD?

- ✓ ~16% OF YOUR DAILY ENERGY INTAKE FROM PROTEIN
- ✓ >30G OF FIBRE PER DAY
- ✓ <5% OF YOUR DAILY ENERGY INTAKE FROM FREE SUGAR
- ✓ MEAT-FREE DAYS



A HEALTHY DIET IS A PRIVILEGE

There is an uncomfortable link between socio-economic class and health.

↓ SOCIO-ECONOMIC CLASS = ↑ RISK OF OBESITY AND OTHER DIET-RELATED ILLNESSES

There are complex reasons why, but a large part of the reason is because quick, easy and cheap foods tend to be ultra-processed.

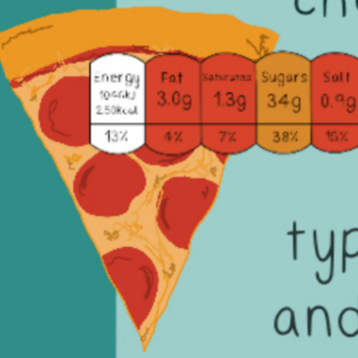


CALORIC AVAILABILITY & POPULAR DIETS

The entire concept of caloric availability is why popular diets work, even if just for the short to medium term.

All diets that 'work' for weight loss manage to create a calorie deficit.


This is done through one of three ways:

- 1 Calorie restriction e.g. low calorie diets, group weight loss support
- 2 High protein (>16% total calories) e.g. Keto, Atkins etc.
- 3 High fibre e.g. Plant-based diets




Energy	Fat	Saturated	Sugars	Salt
1050kJ	3.0g	13g	34g	0.9g
13%	4%	7%	38%	10%

Ultra-processed foods are typically low in protein and fibre, and higher in salt, sugar and fat - therefore they tend to be very calorically available.



“ We need to talk about how we can consider making ultra-processed foods better, because it does annoy me when people say "replace that chocolate bar with a banana".



Sometimes life demands a chocolate bar, sometimes life demands a banana. The question to ask is, how do we make a better chocolate bar?

