

fruit juice, smoothies and nutrition

a handy little book with
graphs and everything

a communication for health
professionals and the media



contents

hello	4
chapter one: fruit and health	6
what's all the fuss about fruit and veg?	8
five is the magic number	9
it's official	10
are you getting enough?	11
sugar and juices and smoothies	12
chapter two: micronutrients	14
vitamins and minerals	16
antioxidants and phytochemicals	18
chapter three: fibre	22
chapter four: physiological response	28
blood glucose	30
dental health	32
conclusion	34
FAQs	35
references	38

hello

We all know that fruit and vegetables are an essential part of a healthy diet. They help protect us from heart disease and some cancers, they're a vital source of vitamins and minerals and they taste good too. Most of us are aware that we're supposed to consume at least 5 portions of fruit and veg a day, but even so, only a third of adults in the UK actually get that much.

The UK Department of Health has confirmed that fruit juices and smoothies count towards your 5-a-day, and their positive contribution to diets can be seen in independent, large-scale dietary surveys which show that fruit juice drinkers have better diets overall, better health indicators like insulin sensitivity and are at a lower risk of obesity^{1,2,3}.

This little book will tell you why a smoothie or juice a day is good for your health. We look at the nutritional content of fruit juices and smoothies, showing that they contain a wealth of beneficial vitamins, minerals and antioxidants. We also illustrate how smoothies are low GI and contain all the fibre found in whole fruit, making them one of the healthiest choices in the chilled aisle. We're extremely proud of the positive contribution our smoothies and juices make to a healthy diet.

You probably know a lot of this already. We've simply collated all of the most up-to-date information in one place. We hope you find it useful.

innocent



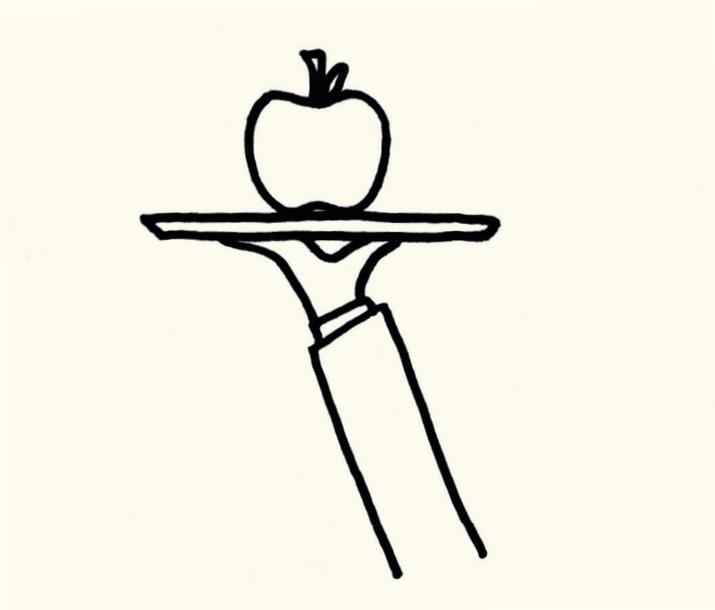
chapter one:

fruit and health

what's all the fuss about fruit and veg?

Scientific reviews show that higher intakes of fruit and vegetables are strongly associated with a reduced risk of hypertension, coronary heart disease and stroke^{4,5}. As heart disease is the single largest cause of death worldwide, helping people to increase their consumption of fruit and vegetables is a key global public health priority.

It's been estimated that if all of us in the UK achieved our 5-a-day every day, then we could prevent nearly half of the estimated 33,000 premature deaths every year that result from diet-related diseases⁶.



helping people to eat more fruit and veg is a global public health priority

five is the magic number

UK dietary advice is to consume at least five portions of fruit and vegetables a day, commonly referred to as getting your '5-a-day'. It's a recommendation that's supported by official guidance from the World Health Organization and the Food and Agriculture Organization, who recommend a minimum daily intake of at least 400g of fruit and veg⁷.

It's estimated that every extra portion of fruit or veg you consume a day reduces your risk of heart disease by up to 7%⁸.

The UK Department of Health has confirmed that fruit juice and smoothies count towards your 5-a-day provided they meet certain criteria (more information is provided over the next couple of pages)⁹. Happily, all innocent juices and smoothies meet these criteria, and contribute to your 5-a-day.



all innocent juices and smoothies contribute to your 5-a-day

it's official

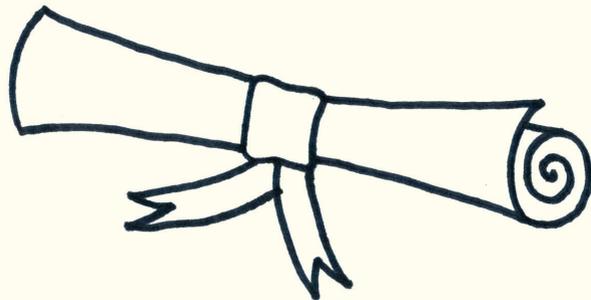
Here is the official UK Department of Health criteria for fruit juice, smoothies and your 5-a-day.

Juice

One 150ml glass of unsweetened 100% fruit or vegetable juice can count as one portion of your 5-a-day, which includes any innocent juice. But you can only get a maximum of one portion of fruit and veg from juice each day; any further glasses of juice won't count towards your total.

Smoothies

One smoothie containing all the edible pulped fruit or vegetables may count as more than one 5-a-day portion, but this depends on the quantity of fruits or vegetables and/or juice used, as well as how the smoothie has been made. Smoothies can only count as a maximum of two of your 5-a-day, however much you drink. A 250ml innocent smoothie gives you two of your 5 portions, in one tasty hit.



**a 250ml innocent smoothie
gives you 2 of your 5-a-day**

are you getting enough?

Unfortunately, although most of us are aware of the recommendation, only a third of adults actually manage to get their 5-a-day. Fruit juice contributes significantly to these figures, with an average intake for adults of 61ml per day; in other words, without juice, far more people would miss their 5-a-day target¹⁰.

Data from the UK National Diet and Nutrition Survey shows that fruit juice consumption is associated with a higher diet quality in terms of intake of important micronutrients like magnesium, potassium and folate¹¹. Moreover, fruit juice consumers typically have a higher intake of whole fruit and vegetables, which indicates that fruit juice is not regarded as a substitute for whole fruit, but rather a complement to it¹².



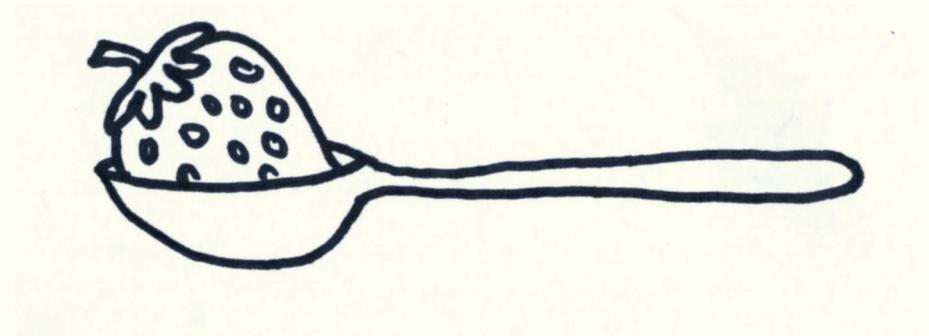
**only a third of adults in the UK
manage to get their 5-a-day**

sugar and juices and smoothies

Contrary to what some newspaper headlines would have you believe, 93% of us have less than one glass of fruit juice a day¹³.

An innocent smoothie provides exactly the same quantity (weight-for-weight) and type of sugars that you would find in an equivalent amount of whole fruit.

On average a 250ml fruit smoothie provides around 32% of the daily reference intake for total sugars, which is all made up of sugars naturally present in the fruit. A 150ml glass of unsweetened fruit juice will provide 13% of your daily reference intake for total sugars.



**we never add sugar to any of
our juices or smoothies**

chapter two:

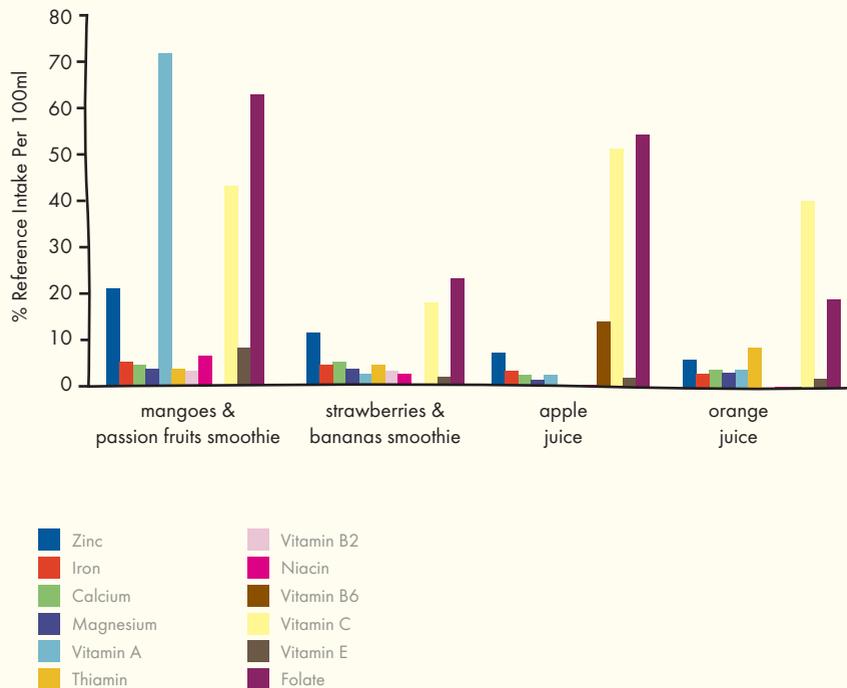
micronutrients

vitamins and minerals

Fruit contains a wealth of vitamins and minerals and many of these are found in fruit juice and smoothies.

We've conducted routine vitamin and mineral analysis on our drinks. This chart shows the presence of a whole host of micronutrients in innocent juices and smoothies, with amounts given as a percentage of the dietary guideline (reference intake) per 100ml. Vitamin C and folate were the main vitamins found.

Fig 1. Vitamins and minerals in our drinks

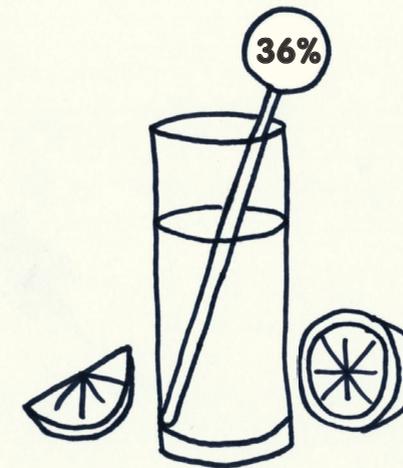


A 150ml glass of an innocent fruit juice typically provides 36% of an adult's daily requirement of vitamin C, and a 250ml bottle of an innocent smoothie provides 28%. Vitamin C is a water-soluble antioxidant vitamin that performs a huge variety of roles in the body. It contributes to:

- normal energy yielding metabolism
- the normal function of the immune system
- the reduction of tiredness and fatigue

Folate is another water-soluble vitamin, which, like vitamin C, the body is unable to make and so needs to be provided through the diet. Folate is essential for a number of functions, contributing to:

- normal blood formation
- normal maternal tissue growth during pregnancy
- normal psychological function



a glass of innocent juice provides 36% of your daily requirement of vitamin C

antioxidants and phytochemicals

The US Institute of Medicine defines an antioxidant as “a substance in foods that significantly decreases the adverse effects of reactive species, such as reactive oxygen and nitrogen species, on normal physiological function in humans”¹⁴. In other words, antioxidants help protect us from damage to cells caused by free radicals whizzing around our bodies, which could otherwise contribute to the onset of health problems such as heart disease and cancer.

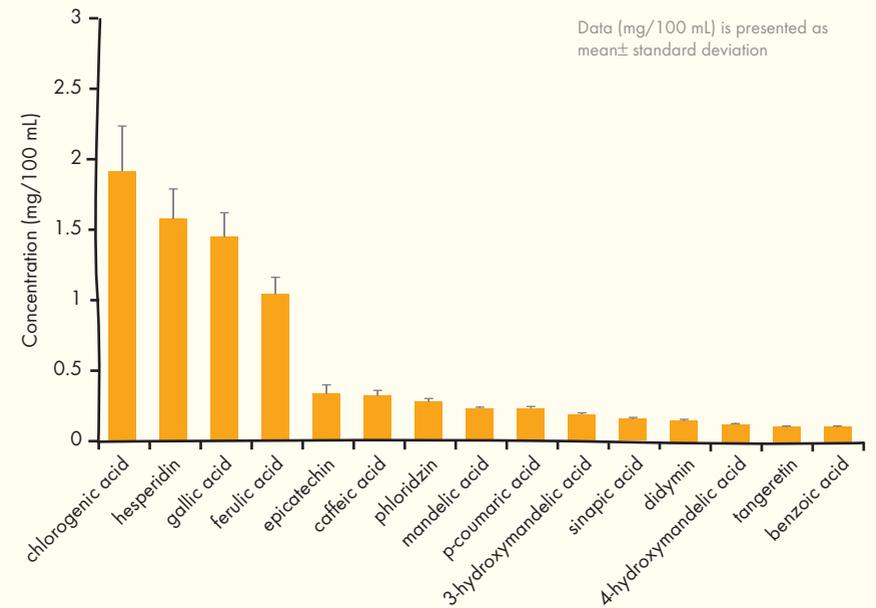
Researchers at the Rowett Institute of Nutrition and Health assessed the antioxidant capacity of innocent fruit juices and smoothies using four different methods (FRAP, TEAC, ORAC and HORAC) and found all samples behaved as antioxidants¹⁵. The results are below and overleaf. These findings have also been replicated by independent pieces of analysis which show that fruit juices have antioxidant properties, just like whole fruit^{16,17}.

Beyond vitamin C and folate, there are many other phytochemicals (plant compounds) in our fruit juices and smoothies that could contribute to their antioxidant capacity. The researchers found there were at least 48 different compounds in four of our drinks with smoothies having a greater variety of phytochemicals – probably a reflection of them containing at least 5 different fruits.

Fig 1. Phytochemical concentration in innocent drinks



Fig 2. Major phytochemicals (> 0.1 mg/100 mL) present in an innocent mangoes & passion fruits smoothie

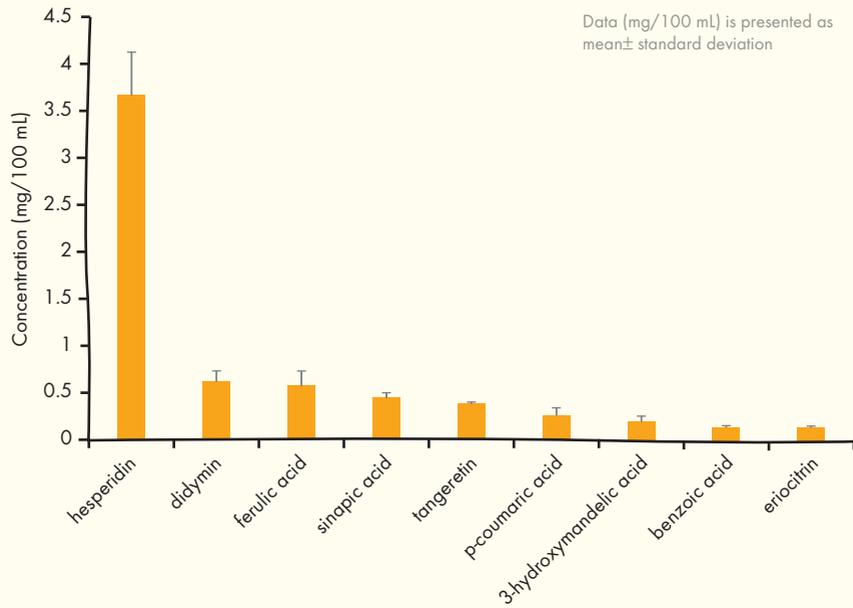


“The fruit juices and smoothies were found to be rich in bioactive phytochemicals. In general, the smoothies contained a wider range of compounds whereas the juices were found to contain fewer compounds in the higher concentration range, but contained large amounts of single phytochemicals; namely hesperidin in orange juice and chlorogenic acid in apple juice.”

Wendy Russell and Charles Bestwick
Rowett Institute of Nutrition and Health

fruit juices & smoothies have antioxidant properties, just like whole fruit

Fig 3. Major phytochemicals (> 0.1 mg/100 mL) present in innocent orange juice

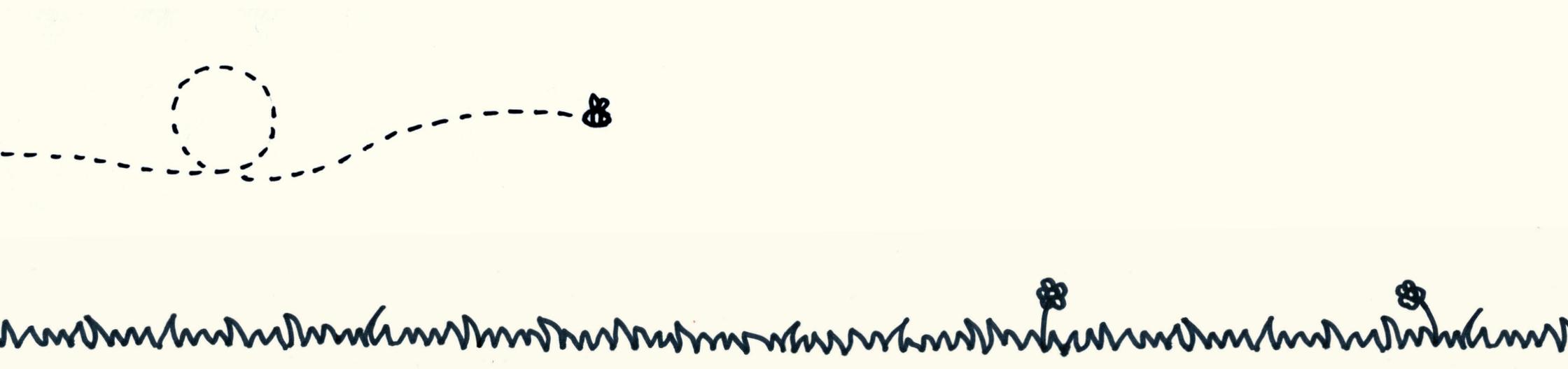


There is emerging research on the potential benefits of the following phytochemicals and the great news is they are present in our drinks.

Table 1. Phytochemicals in our drinks¹⁵

Phytonutrient	Present in which fruit	Our drinks
Hesperidin: Associated with vitamin C and supports the function of vitamin C in the body	Oranges and other citrus	SB MP OJ
Ferulic acid: Associated with the function of vitamin C and E and with normal skin and tissue maintenance	Oranges and other citrus	SB MP OJ
Chlorogenic acid: Associated with maintaining normal blood sugar management	Stone fruits, seeds of fruits such as apple	SB MP AJ
P-Coumaric acid: Associated with the reduction of oxidative stress	Associated with fruits as a constituent of pollen (the building block of all fruit)	SB MP OJ

Key
SB = strawberries & bananas smoothie, MP = mangoes & passion fruits smoothie, OJ = orange juice, AJ = apple juice



chapter three:

fibre

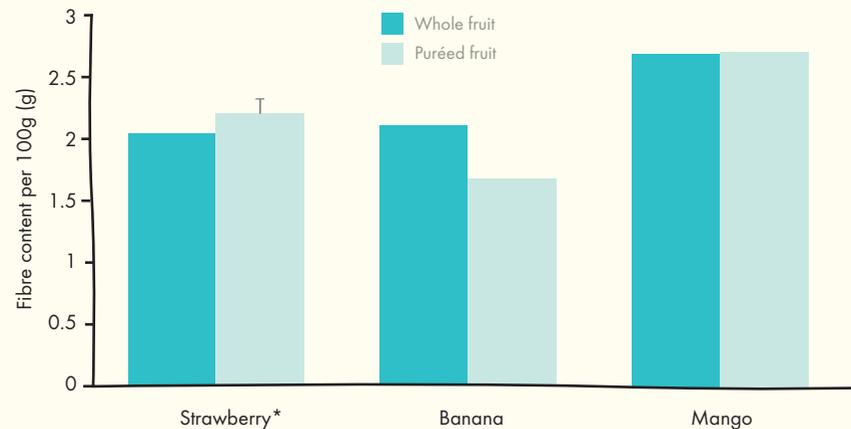
fibre

Smoothies contain fibre because they contain puréed fruit in addition to juice. We know that the structural fibre in fruit is not destroyed through puréeing or chewing because nutritional and microscopic analysis shows comparable quantities of fibre before and after puréeing (more detail in the next couple of pages).

A 250ml bottle of an innocent smoothie typically provides 13% of an adult's daily requirement of fibre. That's an amount equivalent to two portions of your 5-a-day, such as an apple and a handful of strawberries.

Oxford Brookes University carried out research to understand how the fibrous structure of fruit is affected by puréeing and chewing on a microscopic level¹⁸. Here are the results.

Fig 1. Nutritional analysis of whole and blended fruit



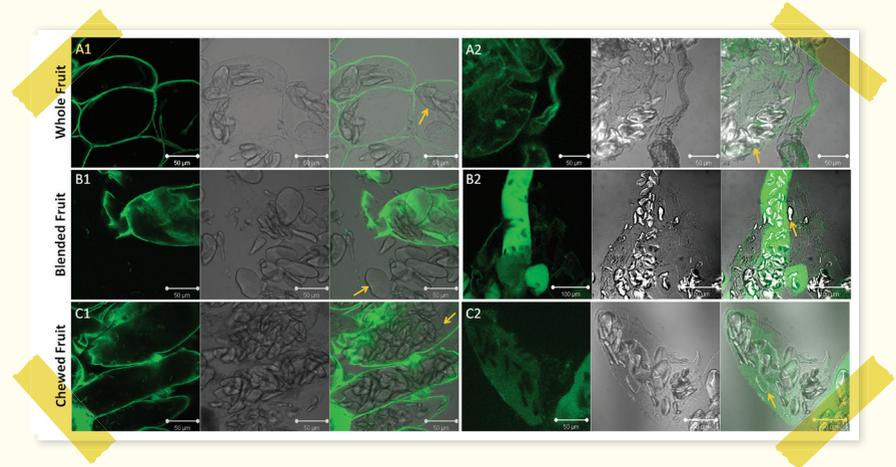
*This result allows for a margin of error and shows that the fibre in a whole strawberry is comparable to the fibre in strawberry purée

**a 250ml innocent smoothie provides
13% of your daily requirement of fibre**

Cellular material in whole, chewed and puréed fruit

Microscopic analysis confirms that all the cellulose and pectin in fruit cell walls are still present after puréeing. These images show whole, puréed and chewed bananas and strawberries staining positively for cellulose (left hand side) and pectin (right hand side).

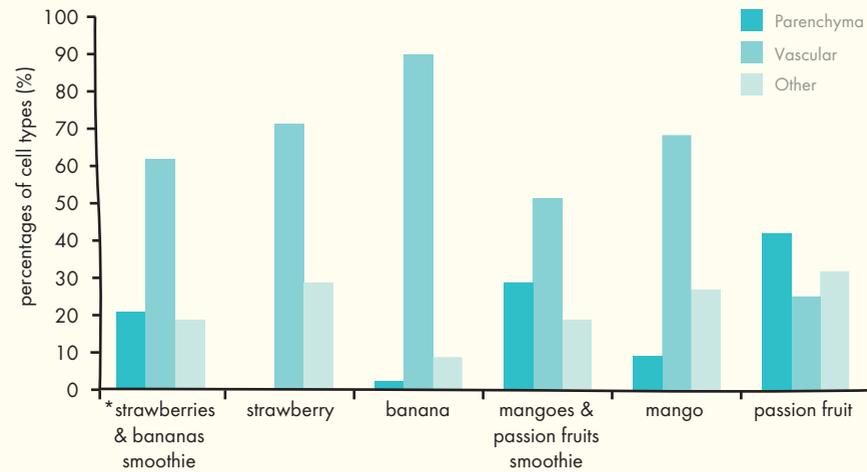
Fig 2. Staining cellulose and pectin in bananas



Cellular material in smoothies

Analysis shows that smoothies typically contain about 17-18% cellular material, and this is comprised of a mixture of vascular tissue (like xylem vessels for transporting water), parenchyma 'packing' tissue and other unidentified cell types (see Figure 3). Scanning electron microscopy shows examples of cell types surviving the production process in an innocent strawberries & bananas smoothie (see Figure 4).

Fig 3. Cell types found in fruit and smoothies

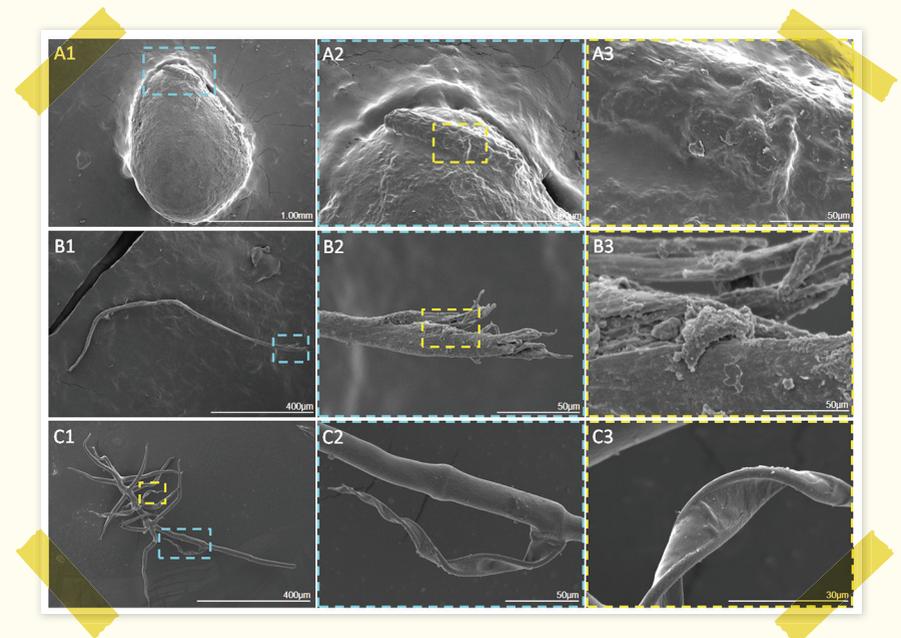


*The increase in parenchyma is due to the apple, orange, grape and lime juice present in this smoothie

“Our research clearly shows that puréeing fruit does not destroy its fibrous structure. This is particularly evident when you look at a smoothie under the microscope and can see big chunks of undamaged cellular material.”

Professor Chris Hawes,
Oxford Brookes University

Fig 4. Strawberries & bananas smoothie structures by scanning electron microscopy



Key - Comparative scanning electron micrographs of tissue and structures found within strawberries & bananas innocent smoothie. A1= strawberry seed, A2= enlarged image of area indicated in A1 (blue box) and A3 = enlarged image of area indicated in A2 (yellow box). B1 fibrous structure, B2 = enlarged image of area indicated in B1 (blue box) and B3 = enlarged image of area indicated in B2 (yellow box). C1 helical fruit tissue, C2 = enlarged image of area indicated in C1 (blue box) and C3 = enlarged image of area indicated in C1 (yellow box).

chapter three:

physiological response

blood glucose

Carbohydrates are important in providing us with a steady supply of energy, and dietary guidelines recommend we get about half of our energy from them. Most of the carbohydrates in fruit are sugars, and there is fibre in there too. There is no added sugar in any innocent smoothies or fruit juices. An innocent smoothie provides exactly the same quantity (weight-for-weight) and type of sugars that you would find in an equivalent amount of whole fruit. On average a 250ml innocent smoothie provides around 32% of the daily reference intake for total sugars, which is all made up of sugars naturally present in the fruit, and a 150ml glass of innocent juice provides 13%.

Carbs are digested and absorbed at different speeds. The glycaemic index (GI) measures the increase in blood glucose levels during the two hours after eating a particular kind of food. A study shows that GI levels of smoothies and juices are typically low, and comparable to those of fruit such as apples and berries, which means they have the same effect on blood glucose levels¹⁹.

Cell walls are thought to play an important role in affecting the bioavailability of nutrients. Because the cellular material survives juicing and puréeing, the nutrients are only released once we have consumed the drinks, which means we get the full benefit of them. Other studies also show that like whole fruit, fruit juice and smoothies typically have a low GI. This is believed to be because all of the fruit cellular materials like cellulose and pectin survive juicing and puréeing (as shown by the microscopic work) and help to control the release of sugars.

fruit juice and smoothies
typically have a low GI

Oxford Brookes University conducted some research on two of our smoothies and found that both are low GI²⁰. The research showed that an innocent strawberries and bananas smoothie has a GI of 39, and the mangoes and passion fruits smoothie 36, meaning that – contrary to what is sometimes reported – the sugars found naturally in a smoothie are absorbed slowly.

These figures show the steady increase of blood glucose after drinking an innocent strawberries & bananas smoothie and a mangoes & passion fruits smoothie.

Fig 1. Glycaemic response curves for glucose and the strawberries & bananas smoothie

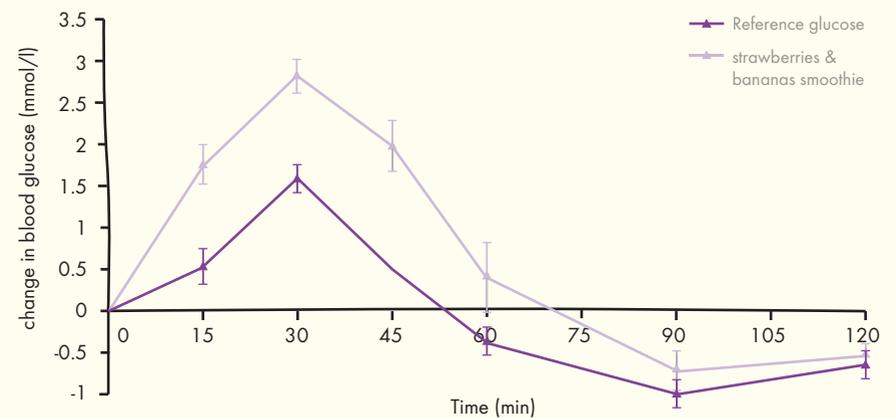
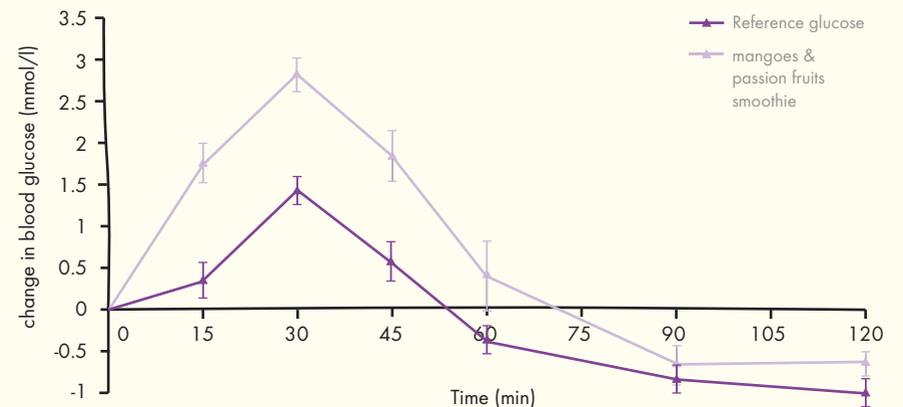


Fig 2. Glycaemic response curves for glucose and the mangoes & passion fruits smoothie

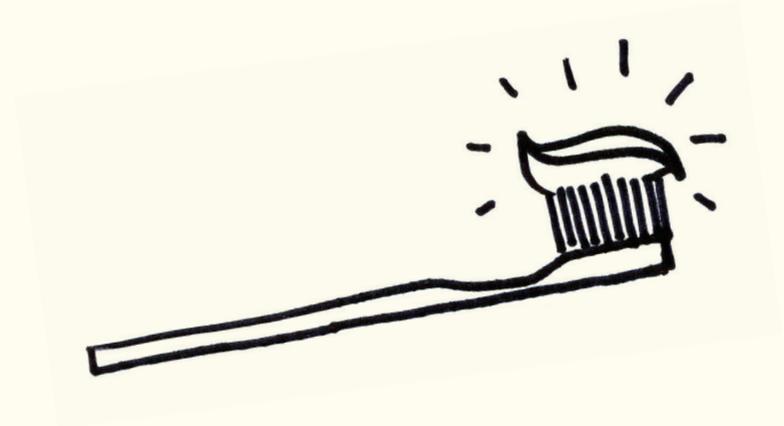


dental health

Recent data from Leeds Dental Institute has confirmed that there is no significant difference between eating whole and juiced fruit when it comes to the effect on your teeth. Specifically, the research looked at the enamel demineralising effects of intrinsic and extrinsic sugars when comparing whole or juiced apples, oranges, grapes, carrots and tomatoes²¹.

This replicates findings from an earlier study looking at apples, oranges and bananas, in whole, homogenized and juiced form²². In other words, the available evidence suggests that the impact of sugars and acid in fruit on dental health is not affected by pureeing or juicing, and drinking an innocent smoothie or juice has a very similar effect on your teeth to eating the whole fruit.

Dental experts believe that any food or drink that contains sugars or acids, including fruit, could damage your teeth if you don't look after them properly. So remember to always brush them twice a day with a fluoride toothpaste, and it is recommended to keep food and drinks that contain sugars or acids to mealtimes, use a straw and avoid swishing liquids round your mouth and chew sugar-free gum after eating.



**smoothies & juices have the same effect
on your teeth as eating whole fruit**

conclusion

Fruit and vegetables are an essential part of a healthy diet and research shows they protect us against heart disease and some cancers. Yet unfortunately, two thirds of the UK population fail to meet the 5-a-day recommendation.

innocent fruit juices and smoothies have been recognised by the Department of Health as counting towards 5-a-day intakes because they comply with the guidelines. Both contribute significant amounts of vitamin C and folate, as well as over 48 plant compounds that are believed to be beneficial to health. Smoothies are especially good because they count as two of your 5-a-day and a 250ml bottle typically provides 13% of an adult's daily fibre requirement too.

We also know that the sugars found naturally in innocent smoothies are absorbed slowly, as they are with whole fruit.

So all in all, the evidence suggests that innocent fruit juices and smoothies provide many of the beneficial properties of whole fruit and can make a positive contribution to a healthy diet.

We hope you've found this information and research useful. If you have any questions, feedback, or just fancy a chat about smoothies and juices, drop us a line at dontbottleitup@innocentdrinks.co.uk.

FAQs

Are fruit juices and smoothies healthy?

Fruit juices and smoothies have been given a rough time in the media recently. In particular, there have been discussions around their sugar content, and how the blending process affects the fruit's fibre. However, given the scientific evidence, we know that fruit juices and smoothies can play a valuable part in contributing to your overall health. Not only do they help you on your way to your 5-a-day, but they also contain valuable nutrients, and, in the case of smoothies, fibre too.

Does drinking fruit juice or smoothies cause weight gain?

Several studies have shown that people who drink fruit juice in line with dietary recommendations have better diets overall, have better health indicators (like insulin sensitivity) and are at a lower risk of obesity than people who don't drink fruit juice^{1,2,3}.

And let's be really clear, there's no secret to why we put on weight. If we consume more calories than we use, then our body stores them for later, no matter where those extra calories come from. The crucial thing is to get the balance right.

On average, a 150ml serving of our fruit juice provides 3% of your daily calories and a 250ml serving of our smoothies provides 7% (based on a total daily intake of 2000 calories). And of course, the good news is that with each calorie you consume via a fruit juice and smoothie, you also get all the positive nutrients like vitamin C, and in the case of smoothies, the fibre as well.

Are fruit juices and smoothies ok for children?

Children ought to be eating a balanced diet, and by the time they're five, they should be getting their five portions of fruit and veg every day. Official government advice says that a 150ml glass of pure, unsweetened, 100% fruit juice counts as one portion of fruit.

Our smoothies and juices are suitable for children aged 12 months and over. Between 1 and 4, fruit juices and smoothies are a useful source of vitamin C to help with the absorption of iron.

We also make Fruity Water, a refreshing blend of 50% pure fruit juice and 50% spring water, which is a good option for children under 5.

The Children's Food Trust refers to fruit juices as a healthier drink option, and includes them in its standards for school lunches²³. We don't add anything but fruit to our kids' smoothies and juices, so we think they're pretty good additions to lunchboxes. It's important to note that as with adults, children should eat a balanced diet, and look after their teeth properly.

Does the process of making and bottling your smoothies affect their nutritional value?

We pasteurise all of our drinks to make sure that they're safe to drink. The analysis we have done (see page 18) shows comparable levels of antioxidants and phytochemicals in our drinks as the whole fruit. Media reports that suggest all nutrients are killed off with pasteurisation are incorrect.



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**all the nutrition information provided in this
booklet is correct as of June 2014**



innocent

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