COMMON QUESTIONS

about the science of 100% juice

This Q&A relates to the recently published umbrella review on 100% juice and health[1]:

What about dental health? Isn't 100% juice bad for our teeth?

The eligibility criteria in the umbrella review were limited to systematic literature reviews with meta-analysis on 100% juice. No studies on dental health met these criteria.

The highest quality evidence available on 100% juice and dental health, a 2019 systematic review without meta-analysis, reported no adverse effects in children and some dental erosion in adults, but concluded that the effects are "not conclusive"[2]. This was because the studies were done in conditions not reflective of real-world intake, e.g. sipping 1 cup of juice over a 10-minute period, 4 times per day, using devices that lack normal saliva action.

When it comes to assessing the effect of any food on dental health, it is important to consider the context of consumption and the person's dental hygiene practices.

What about satiety? Is 100% juice not just empty calories?

There are very few studies on 100% juice and satiety, and no systematic reviews or meta-analysis conducted, so satiety was not included in the umbrella review.

In a 2009 randomised trial, 100% apple juice was less satiating than a whole apple[3]. However, there was still a subsequent reduction in the calorie intake in the next meal for the apple juice arm vs. control, equivalent to the calorie contribution of the apple juice. This indicates that while apple juice was less satiating than a whole apple, it still had a satiation value and was not "empty calories".

Recent media headlines suggested that 100% juice leads to higher body weight in children. What do you make of these headlines?

The headlines were related to a recent systematic review and meta-analysis on 100% juice and BMI[4]. The data showed that a glass of 100% fruit juice was associated with higher BMI in children and not in adults. In sub-analysis, the association with higher BMI remained in children 8 years and younger, and not in children 9 years and older. The association in children 8 years and younger was very small (a difference of about 250 grams for an average 8-year child who is 130 cm tall) and the data was from observational studies only, which the authors rated as very low-quality using GRADE.

These data suggest that a glass of 100% fruit juice each day is not associated with weight gain in adults and older children, and a smaller serve size is recommended in younger children.

The evidence in the umbrella review differs between intervention vs. observational studies. Why?

It's difficult to say. We know that observational studies are subject to higher levels of reporting bias and confounding vs. randomised controlled trials. It is possible that the subjects in observational studies are incorrectly self-reporting their juice intake as 100% juice, while consuming juice with additives such as added sugars, and confounding the results.

We also know that observational studies track people over a longer period. It is possible that the current intervention studies on 100% juice are not long enough to detect small changes, although some of the intervention studies lasted up to 18 months.

Does the type of juice matter?

Not all juices have been studied in equal measure, and rarely compared to each other in head-to-head trials. It is difficult to make strong conclusions about one type of juice being superior to another.

Enjoying a wide variety of 100% juices, including both fruit and vegetable, is a practical strategy to deliver a wider variety of different nutrients and bioactives.

What about 100% vegetable juices? What should dietary recommendations consider for these beverages?

There are few studies on 100% vegetable juice, and none met the eligibility criteria of the umbrella review. At this stage, we suggest that 100% fruit and vegetable juices belong together in dietary guidance, as this approach encourages a wider variety of nutrients and bioactives in the diet. The special treatment of vegetable juice from fruit juice is not warranted by current high-level evidence.

What about whole fruit? Shouldn't we be recommending this over juice?

Whole fruit should, of course, remain a central part of dietary guidance and recommendations for 100% juice should not undermine whole fruit consumption.

At the same time, whole fruit and 100% fruit juice are not always interchangeable, being consumed in different ways, at different times, and having different price points. 100% juice can have a role in dietary guidance, both as a healthful beverage choice, and as part of a pragmatic solution to address low fruit and vegetable intake.

What is the optimal serve size for 100% juice?

The current Australian Dietary Guidelines advise that 1 serve of 100% fruit juice = 125 mL (½ cup). But the kJ contribution of a food or beverage is typically used to determine its serve size in Dietary Guidelines, and ~200 mL of 100% juice is the equivalent kJ to 1 serve of fruit (~350kJ).

In the umbrella review, there was evidence of benefit across a wide range of doses, including at quantities <240mL and >240mL per day. There was also no evidence of weight gain, increased BMI, or increased waist circumference in adults across a wide range of doses, from 120 mL to 750 mL per day.

For very young children aged <6 years, a serve size of less than one glass (<250 mL) per day is recommended[5].

I've heard that 1 glass of juice is equivalent to drinking 4 pieces of fruit. Is this true?

It varies based on the type and size of the fruit, and the type of juice. For a 250 mL glass of 100% orange juice, the juice from around 2.5 oranges is used.

It's important to note however that because not all the fruit is made into juice, it is not the equivalent to drinking the same quantity of sugars or kJ as 2.5 oranges. Rather, a 250 mL glass of 100% orange juice provides the same sugars and kJ as about 1.15 whole oranges[6].

How can juice provide health benefits when it is high in free sugars?

A 125 mL serve of 100% fruit juice provides around 5-10 grams of free sugars.

Many different foods and drinks, spanning both core (e.g. 30 grams oats sweetened with honey, or 250 mL almond milk) and discretionary (e.g. 1 chocolate frog, or 75 mL soft drink) can contribute 5-10 grams of free sugars, but they are not equivalent for health.

It is important to consider the free sugars contribution of juice in the wider context, including its nutritional contribution, bioactive composition, and health effects, when making dietary recommendations.

How can 100% juice be healthy when it is processed?

100% juice is classified as a minimally processed food under the NOVA classification system, irrespective of whether it is freshly made at home or store-bought.

Also, while this minimal processing of whole fruit to produce 100% juice can reduce the quantity of some nutrients like fibre, it can also enhance the availability of others. For example, some of the bioactives, such as carotenoids, are more bioavailable in 100% juice vs. whole fruit, due to these being released from the plant cell wall in the juicing process.

Isn't this research biased due to the industry funding?

As an independent organisation on a mission to positively impact global human health through food, integrity is a core value for FOODiQ Global. We are committed to managing any potential bias or perception for bias in industry-funded research. Mitigation strategies include pre-agreement to publish regardless of research findings, and limiting funder involvement to assisting with developing the research question and providing broad topic feedback. The funders of research at FOODiQ Global do not contribute to the final methodology used, interpretation of results, or drafting of manuscripts. We pre-register the study design and publicly share our research data[7]. These strategies have been in place for years at FOODiQ Global and align with existing guidelines: Guiding Principles: An Updated Framework for Industry Funding of Food and Nutrition Research[8].

The umbrella review was funded by Hort Innovation and AUSVEG. The documents developed by FOODiQ to translate the science was made possible by funding from Australian Beverages Council Limited. Our aim here is to facilitate evidence-based knowledge and understanding on the topic, and to enable informed discussion.

Got another question about the umbrella review?
Please send it to us: info@foodiq.global

References: **1.** Beckett (2024) https://doi.org/10.1093/nutrit/nuae036 **2.** Liska (2019) https://doi.org/10.3389/fpubh.2019.00190 **3.** Flood-Obbagy (2009) https://doi.org/10.1016/j.appet.2008.12.001 **4.** Nguyen (2024) https://doi.org/10.1001/jamapediatrics.2023.6124. **5.** Heyman (2017) https://doi.org/10.1542/peds.2017-0967 **6.** Australian Food Composition Database (2022) **7.** Beckett (2023) https://doi.org/10.17632/6t3yx49wbs.1 **8.** Larrick (2022) https://doi.org/10.1093%2Fjn%2Fnxac106

FOODiQ global

FOODiQ Global carried out the umbrella review and developed this Q&A document. The umbrella review was funded by Hort Innovation and AUSVEG. This Q&A document was funded by the Australian Beverages Council.