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Eating away your teeth

Even sugar-free foods and drinks can damage your teeth. CHOICE testing reveals the worst offenders.

NUTSHELL

>> It's not just sugary foods and drinks that are bad for your teeth; acidic foods and drinks – including sugar-free ones – can damage tooth enamel, eroding it and making teeth more susceptible to decay.
 >> High-risk foods include some muesli bars and processed fruit snacks; high-risk beverages include soft drinks, fruit cordials and fruit drinks.

Until 1996, the health of Australian kids' teeth was improving, but since then tooth decay has been on the rise. On average, six-year-old children now have two decayed or filled baby teeth, while 15-year-olds have two decayed, missing or filled permanent teeth. Experts particularly blame our increasing consumption of sugary snacks and drinks, including fruit juices; on average, Australians drink about 113L of soft drink per year, an increase of 240% over 30 years. But there are many other foods and drinks that are potentially harmful for teeth.

In collaboration with the Australian Dental Association (Victorian Branch), CHOICE tested a broad range of 50 foods and 35 drinks, all popular brands and products readily available in most supermarkets (see tables, page 26). It comes as no surprise that lollies and fizzy drinks can be bad for teeth, but products such as some muesli bars and processed fruit snacks can also contribute to tooth erosion and decay. Unfortunately, many of these foods are promoted as "healthy" snacks for kids' lunch boxes.

The riskiest foods and drinks

Scientific studies consistently point to sugars as the most important dietary factor in causing tooth decay. Less well known, however, is the fact that acidic foods and drinks, even sugar-free ones, can also damage teeth. Acid can directly damage the enamel surface of teeth – a process

known as dental erosion (see How Tooth Decay and Erosion Occur, below right). A recent survey found 68% of Australian children aged between six and 15 had at least one tooth that showed signs of erosion. We compared the sugar content and acidity (see What is pH?, below) of 85 processed foods and drinks and categorised them as high, moderate or low risk – see How We Test, below.

- **High-risk** food or drinks contain a lot of sugar and also have high acidity (red squares in the tables, page 26).
- **Moderate-risk** products either contain a lot of sugar or have high acidity, but not both (amber triangles).
- **Low-risk** products contain less sugar and are not highly acidic (green circles).

WHAT IS pH?

Familiar to swimming pool owners, pH is a scale of acidity and alkalinity. Strong acids have a pH of 0; strong bases 14. Foods or drinks with a pH below 5.5 can cause erosion of the dental enamel.

	pH	EXAMPLE
Acids	0	Strong acid
	1	Stomach acid
	2	Lemon juice
	3	Vinegar
	4	Tomato juice
	5	Rainwater
Neutral	6	Milk
	7	Pure water
	8	Egg whites
	9	Baking soda
	10	Tums® antacid
	11	Ammonia
	12	Soapy water
	13	Bleach
	14	Strong alkali



pH 5.5
(teeth can start to dissolve above this line)

HOW WE TEST

Our tester blends each food with an equal weight of deionised water, then measures the pH and acid reserves (as the volume of base [0.1M sodium hydroxide] required to adjust the pH to 7.0). Cordials are diluted with water following the instructions on the label, while other drinks are tested without adding water; for carbonated drinks, the pH is measured immediately after opening and again after the drink has gone flat. Values for sugar content are taken from the nutrition information on the label.

The worst offenders

Foods Not surprisingly, all confectionery products on test are in the high-risk category. Two brands, Wonka Fruit Tingles and Warheads Juniors Extreme Sour Hard Candy, stand out as the worst. They contain more than 80% sugar, and they're more acidic (with pH values of 2.35 and 2.06 respectively) than any other food or drink on test. They also have high acid reserves, making it harder for saliva to neutralise the acid, so the teeth are exposed for longer.

Of greater concern, though, is the fact that some of the muesli bars on test, as well as other products promoted for kids' lunch boxes such as processed fruit snacks, fall into the high-risk category. These foods are often sticky, which increases the time the teeth are exposed to sugar and acid. Uncle Tobys Fruit Fix and Robern Frubears also have high acid reserves, further increasing their potential to damage teeth.

Drinks Fizzy drinks feature prominently in the high-risk category. Market leader Coca-Cola packs 10 teaspoons of sugar into a 375mL can of Coke; it's also very acidic (pH 2.53) as it contains phosphoric acid. Pepsi contains even more sugar and is even more acidic (pH 2.45). Sugar-free "diet" alternatives such as Coke Zero and Pepsi Max can also damage teeth.

Caffeine-loaded V Energy drink stands out as having a higher acid reserve than most other soft drinks. Fruit

cordials such as Golden Circle Pineapple Crush, and fruit drinks such as Pop Tops Apple Blackcurrant Drink, can also be in the high-risk category. Fruit juices, often seen as healthy, can cause dental erosion due to their acidity. Studies show that fruit juices are the most resistant to saliva's buffering effect, followed by fruit-based carbonated drinks.

The Australian Beverages Council argues drinks leave the mouth quickly and are less likely to cause tooth decay than foods that stick to the teeth. However, they can still cause erosion. A study of children in the UK found dental erosion was associated with consumption of fizzy drinks (and to a lesser extent, fruit juices). >

FRUIT FIX

Some fruits themselves can be acidic enough to cause dental erosion. Lemons and other citrus are obvious examples, but white grapes and Red Delicious apples are also fairly acidic (pH 4.03 and 4.37 respectively). Less acidic fruits include bananas and melons. While fruit can be sweet, most of the sugar is fructose. The bacteria in our mouths find fructose harder to deal with than ordinary sugar (sucrose), so fruits are generally less harmful to teeth than processed foods with similar sugar content.

A recent survey of Australian children aged 6-15 found 68% had at least one tooth showing signs of erosion



HOW TOOTH DECAY AND EROSION OCCUR

Teeth are made up of thousands of tiny crystals of calcium phosphate that are in a constant state of flux as calcium and phosphate ions move back and forth between the tooth enamel and saliva. Under acidic conditions (pH less than about 5.5), there is a net loss of calcium and phosphate ions from the tooth (a process known as demineralisation).

Tooth decay (dental caries) is caused by bacteria in plaque, which forms as a layer on the surfaces of teeth. These bacteria use sugar for energy, and produce acids as a by-product that can damage the crystals of the teeth. The more often you have sugary foods or drinks, the more acid the bacteria makes and the more damage that occurs.

If you only eat three meals a day, with no sugary snacks or drinks in between, the bacteria

have only three opportunities to produce acid, so there is minimal damage to your teeth. However, sugary drinks and snacks extend the time the bacteria are producing acid, increasing your risk of tooth decay. As damage accumulates, the tooth can become weak and break down, leading to a hole or cavity that may require a dental filling. If this process continues it can cause complete breakdown of the tooth, the only treatment option for which is extraction.

Dental erosion is caused by acids that come directly from foods or drinks (or from stomach acids regurgitating into the mouth). This acid attack is stronger than that produced by the bacteria in the tooth decay process, and leads to the complete dissolution of the outer crystals of the tooth. Every time

an acidic food or drink passes your teeth and drops the pH in the mouth below 5.5, there's a chance the outer crystals are dissolving and reducing the amount of tooth you have left.

Fortunately, your teeth are constantly bathed in saliva, which contains protective components such as calcium and phosphate ions that can help repair some of the damaged crystals. Saliva can also wash sugar and acid into the stomach and neutralise some of the acids. However, if sugary or acidic foods are consumed too often and too regularly, the damage they cause cannot be balanced by the repair properties of saliva and damage to the teeth will accumulate. Additionally, saliva also has difficulty neutralising the damaging acids of foods or drinks that are very acidic or have high acid reserves.

Foods

HIGHER SUGAR; HIGHER ACIDITY		HIGHER SUGAR; LOWER ACIDITY	
<p>Allen's Snakes Alive Capilano Pure Australian Honey Chupa Chups Goulburn Valley Fruit & Cereal Bars Tropical Fruits IXL Strawberry Jam Kellogg's Nutri-Grain bars Mentos Fruit 4-pack Natural Confectionery Company Mixed Jellies Robern Frubears Apple SPC Fruit Sorbet Orange</p>	<p>SPC Get Real Combo Fruit Snacks SPC Get Real Rude Raspberry Snacks Sun Apricot Bar Uncle Tobys Apricot muesli bars Uncle Tobys Fruit Fix Apple, Strawberry & Grape Uncle Tobys Yoghurt Tops Raspberry Warheads Juniors Extreme Sour Hard Wonka Fruit Tingles 4 pack X-treme Candy Straps Sour Strawberry</p>	<p>Arnott's Iced VoVo Arnott's Raspberry Shortcake Arnott's Tiny Teddies Honey Arnott's Tim Tam Originals Carmen's Muesli Bites Apricot Go Natural Berry Pieces in Yoghurt Kellogg's Coco Pops Kellogg's Froot Loops Kellogg's K-time Twists</p>	<p>Kellogg's LCMs Kaleidos Kellogg's Nutri-Grain Nestlé Milo Cereal Nutella Paradise Strawberry Mallows Sun Sesame Bar Uncle Tobys Crunchy Apricot muesli bars Uncle Tobys Vita Brits High Fibre Bites Honey</p>
LOWER SUGAR; HIGHER ACIDITY		LOWER SUGAR; LOWER ACIDITY	
<p>Ajitas Vege Chips Malt Vinegar Arnott's Snack Right Fruit Pillow Apple & Sultana Go-Gurt Strawberry Yoghurt Heinz Fruit Wobblers Pears in Raspberry Flavoured Jelly</p>	<p>Jols Pastilles Forest Berries Sugar Free Nestlé Diet Yoghurt No Fat Mixed Berry Nestlé Finding Nemo Yoghurt Sunnyboy Glug Cola Uncle Tobys Roll-Ups Apple Berry Flavour</p>	<p>Sanitarium Weetbix Kids Smiths Crisps Original Smiths Crisps Salt & Vinegar The Wiggles ABC Letter Biscuits Honey with Yoghurt Vegemite</p>	

USING THE TABLES Foods (above) with higher acidity have pH values of less than 5 (after blending with an equal volume of water); drinks (below) with higher acidity have pH values of less than 4. Foods with higher sugars contain 15% sugars or more; drinks with higher sugars contain 7.5% sugars or more. These are the criteria that switch on red lights (for a lot of sugar) under the traffic light labelling system.

Drinks

HIGHER SUGAR; HIGHER ACIDITY		HIGHER SUGAR; LOWER ACIDITY	
<p>Berri Orange Juice No Added Sugar Coke Fanta Orange Fuze Tropical Punch Golden Circle Apple Juice No Added Sugar Golden Circle LOL Go Mango Golden Circle Orange Juice Golden Circle Pineapple Crush</p>	<p>Golden Circle Sunshine Punch Just Juice Apple Blackcurrant LA Ice Cola Pepsi Pop Tops Apple Blackcurrant Drink Red Bull Energy Drink Sprite V Energy Drink</p>	<p>Berri Low Acid Orange Juice Berri Orange Juice Classic Sanitarium Up & Go Liquid Breakfast Banana & Honey</p>	
LOWER SUGAR; HIGHER ACIDITY		LOWER SUGAR; LOWER ACIDITY	
<p>Coke Zero Cottee's Diet Cordial Lemon Crush No Added Sugar Cottee's Lemon Crush Fruit Juice Cordial Diet Coke Gatorade Fierce Grape Glaceau VitaminWater Triple-X</p>	<p>Pepsi Max Powerade Isotonic Lemon Lime Powerade No Sugar Red Bull Energy Drink Sugar Free Sprite Zero Staminade Lemon Lime Fusion V Energy Sugar Free</p>	<p>Milk Sanitarium Up & Go Vive Low Sugar Water</p>	

DID YOU KNOW?

7 ways to prevent tooth decay and erosion

If you have a sensible diet, a good flow of saliva, a regular teeth and gums cleaning routine and your teeth get appropriate exposure to fluoride, you're less likely to suffer decay or erosion. So to prevent damage to your teeth:

- **Brush twice a day and floss once a day**
 But don't brush your teeth immediately after acidic foods or drinks, as you can wear away the softened enamel before saliva has had a chance to re-harden it.

- **Limit (don't snack on) sugary foods and drinks**, as these allow bacteria in the plaque to produce the acids that dissolve teeth. Particularly avoid sticky snacks such as some muesli bars that hold the sugar in your mouth for longer.
- **Limit highly acidic foods and drinks**
 Using a straw can reduce the contact of an acidic drink with your teeth.
- **Restrict high-risk foods and drinks to a once-a-week treat** They will do less

damage if you have them at mealtimes and if rapidly cleared from the mouth by rinsing with water or following them with a protective food such as an unsweetened dairy product or sugar-free chewing gum.

- **Use fluoride toothpaste**, as exposure to fluoride can help control the development of decay.
- **Drink fluoridated water** to stay hydrated instead of sugary or acidic soft drinks.
- **Have regular dental check-ups.**