

What are antioxidants? And are they truly good for us?

January 11 2018, by Jacqui Adcock



Products that contain antioxidants are marketed as essential for good health.
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Antioxidants seem to be everywhere; in superfoods and skincare, even chocolate and red wine. Products that contain antioxidants are marketed as essential for good health, with promises to fight disease and reverse ageing.

But are they really as good for us as we're led to believe?

What are antioxidants?

The term antioxidant covers a wide range of molecules (atoms bound together by chemical bonds) that protect other molecules from a chemical process called [oxidation](#). Oxidation can damage vital molecules in our cells, including DNA and proteins, which are responsible for many body processes.

Molecules such as DNA are needed for cells to function properly, so if too many are damaged, the cell can malfunction or die. This is why antioxidants are important. They can prevent or reduce this damage. In the body, uncontrolled oxidation is typically caused by highly reactive molecules known as free radicals.

What is oxidation?

Oxidation is a common chemical reaction where electrons are transferred from one molecule to another. Electrons are one of the subatomic (smaller than an atom) particles that make up pretty much everything. As electrons move during an oxidation reaction, bonds can be broken and the structure of the molecules changed.

Not all oxidation reactions are bad. They are essential for life and involved in many important processes. In [cellular respiration](#), glucose (a sugar from the food we eat) is oxidised by oxygen (from the air we

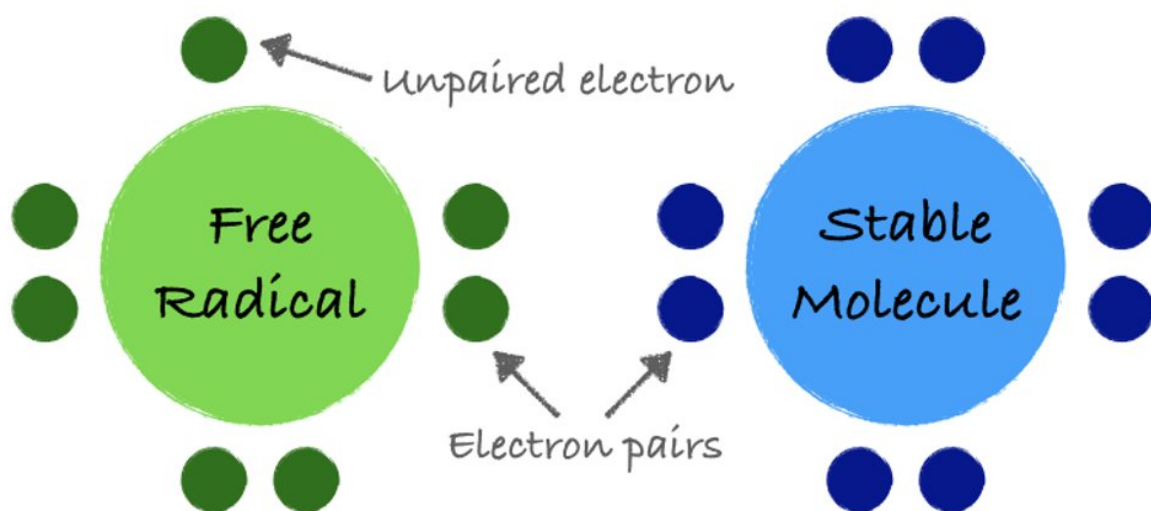
breathe), producing carbon dioxide, water and energy to fuel our bodies. Household bleaches oxidise coloured stains into colourless molecules.

Less desirable [oxidation reactions](#) include the rusting of metals and oxidative food spoilage.

What are free radicals?

Free radicals are simply molecules with one or more unpaired electrons. Electrons like to be in pairs, so unpaired electrons can result in unstable and highly reactive molecules. To become stable, the free radical must steal an electron from another molecule (or give one away). When a molecule loses an electron, that molecule has been oxidised and itself becomes a free radical.

This new free radical can steal an electron from another molecule, starting a chain reaction. This process permanently changes the structure of the molecules, causing irreversible damage.



Unpaired electrons make free radicals unstable and highly reactive. Credit:
Author provided

But if an antioxidant is present, it can donate an electron to the free radical, stabilising it and stopping the [chain reaction](#). The antioxidant sacrifices itself and is oxidised instead of the other molecule, becoming a free radical. But unlike most [molecules](#), the antioxidant is able to stabilise the unpaired electron and does not become highly reactive. This process deactivates the antioxidant.

Free radicals aren't always bad for you. Their highly reactive and destructive nature is used by the body's immune system. Certain white blood cells, called [phagocytes](#), can engulf foreign particles, such as bacteria, then seal them off and release free radicals to destroy them.

Free radicals are generated naturally by our bodies, but can be increased by [lifestyle factors](#) such as stress, poor diet, pollution, smoking and alcohol. Our bodies can handle some free radicals, but if too many are formed it can overwhelm the body's normal defences.

Free radical damage is thought to be one of the causes of ageing and contribute to various diseases. For example, [free radical damage](#) to DNA can cause [genetic mutations and promote cancer](#).

All antioxidants aren't equal

So, if [free radicals](#) are dangerous and cause ageing and disease, and antioxidants can neutralise them, then getting more antioxidants should be good for you, shouldn't it? Unfortunately, it's not as simple as that. Yes, high antioxidant levels and low oxidative stress are [associated with good health](#), but not all antioxidants are equal.

Antioxidants come from many sources. Some are [naturally produced in the body](#) and some [naturally occur in foods](#) we eat. Antioxidants (natural or synthetic) can also be [added to foods](#) that don't normally contain them, either for their (supposed) health value or to preserve the food (antioxidants also prevent oxidation in foods).

A [healthy diet](#) is the most effective way to get the antioxidants your body needs. [Fruits, vegetables, grains, eggs and nuts](#) are all useful sources of antioxidants. Despite the marketing hype, antioxidants found in so-called superfoods are no more effective than those in regular fruit and veg, so you're better off saving your money.

But it's a different story when it comes to [antioxidant supplements](#). Research has found antioxidant supplements may cause more harm than good. A [2012 meta analysis](#) of over 70 trials found antioxidant supplements are ineffective or even detrimental to health. The reasons are unclear, but the added nutritional benefits from consuming antioxidants in a [healthy diet](#) is likely to contribute to this. Also, the high concentrations of antioxidants associated with supplement use can lead to problems.

Too much of a good thing

There are a number of reasons why high concentrations of antioxidants may be harmful. At high concentrations, antioxidants may:

- [act as pro-oxidants](#), increasing oxidation
- protect dangerous cells (such as [cancer cells](#)) as well as healthy cells
- reduce the health benefits of exercise have unwanted side effects, such as [nausea](#) and [headaches](#), or even reach [toxic levels](#).

There is no magic pill, but a healthy diet can provide you with all the [antioxidants](#) you need to fight free [radical](#) damage.

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