

Breakfast chemistry

Breakfast is considered to be the most important meal of the day. There is a great deal of chemistry behind the food on our breakfast tables

Discussions about how long to grill toast have occurred in households for decades. Whether you like your bread barely warmed or cremated, chemistry is involved in making the toast taste different, depending on the cooking time.

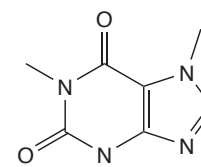
The reaction behind this phenomenon is the Maillard reaction, which is a non-enzymatic browning reaction. Here amino acids and reducing sugars react to form brown polymers called melanoidins, and the extent to which the Maillard reaction occurs contributes to the different tastes (Chemistry Review Vol. 11, No. 2, pp. 30–33). This reaction also occurs in other food and drinks, such as during the roasting of coffee.

Cereals are often fortified with vitamins and minerals — for example, iron is often added to cornflakes. Iron is an important metal in our body's biochemistry, particularly as Fe^{2+} is the metal ion in the protein haemoglobin, found in red blood cells (pp. 10–14). The iron binds to oxygen, which is transported in the blood through the body from the lungs (Chemistry Review Vol. 31, No. 4, pp. 31–33).

Cereals also provide a good source of dietary fibre (roughage). The NHS states that eating plenty of fibre can lead to a lower risk of heart disease, stroke, type 2 diabetes and bowel cancer. It is recommended that adults should consume 30g of fibre a day.

Dietary fibre comprises the parts of plants that are not digested in the small intestine. These parts include cellulose, which is a polysaccharide found in plant cell walls. However, the fibre is (at least partially) broken down by bacteria in the large intestine, which improves the gut flora and supports our immune system.

Many people like to wake up with a caffeine buzz, provided by their beverage of choice — often tea or coffee. There are debates about whether caffeine is good or bad for our health (Chemistry Review Vol. 32, No. 2, pp. 8–12). Caffeine molecules bind to adenosine receptors on nerve cells, causing an increase in nerve activity, leading to a faster heart rate and a feeling of alertness.

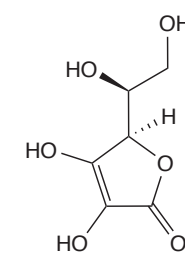


Caffeine

Coffee beans are the roasted seeds of fruit from *Coffea* plants. The processing determines the flavour of the final product, with a variety of reactions (including Maillard reactions) producing a range of compounds (Chemistry Review Vol. 21, No. 4, pp. 19–23).

Tea comes from the leaves of the *Camellia sinensis* shrub. The specific treatment of the leaves determines the blend of flavour compounds that are released when the tea is brewed (Chemistry Review Vol. 21, No. 1, pp. 10–15).

The refreshing taste of fresh orange juice is due to the organic acids (including citric and ascorbic acids) it contains, combined with sugars and a range of phenolic compounds that impart flavour. Ascorbic acid (vitamin C) is an antioxidant that protects us from damaging free radicals (Chemistry Review Vol. 23, No. 4, p. 34), so drinking a glass of orange juice gives us a healthy start to the day.



Ascorbic acid (vitamin C)

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