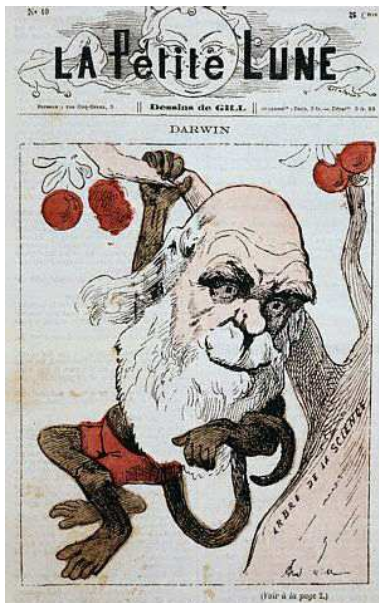


Darwin's dessert

Vivienne Baillie Gerritsen

Charles Darwin has been resting in Westminster Abbey since April 1882 and scientists have been wondering ever since what it was that he suffered from for most of his adult life. It is a well-known fact that the famous naturalist steered clear of many official gatherings and was barely able to defend his theory of evolution because of chronic ailments of all sorts which kept him from being the sociable man he may otherwise have been. Many have thought that the origin of his various complaints – which were as diverse as vomiting, severe headaches, palpitations, eczema and flatulence – were purely psychosomatic. Others have suggested that Darwin must have been afflicted by some kind of illness such as Chagas' disease or, more recently, Crohn's disease. What everyone seems to agree upon though is that Darwin was definitely suffering from a form of gastrointestinal disorder which may well have involved an inherited lactose intolerance. Lactose intolerance is brought about by the lack of the enzyme lactase which breaks down lactose, thus making it digestible.



Caricature of Charles Darwin
La Petite Lune (Paris, 1880s)

Source: Wikipedia

Lactose is a sugar and found in notable quantities in milk. Many humans – almost half of the world population – lose the ability to digest lactose during their childhood or in early adulthood, and hence become lactose intolerant. Common symptoms are stomach pains, diarrhea and flatulence, which are easily dealt with by

avoiding dairy products. The capacity to digest lactose, however, does persist in a number of populations, namely Northern Europeans. It is thought that this may have something to do with the beginnings of domestication and farming which took place in that part of the world about 10'000 years ago – although it is a very short time to account for the acquisition of a genetic trait. One other form of lactose intolerance is genetic – and known as congenital lactase deficiency. This is far more serious than the usually mild acquired intolerance to lactose which follows weaning, and can cause the death of newborns unless it is rapidly diagnosed.

Lactose is a source of energy. The enzyme lactase breaks it down to galactose and glucose – two other sugars – in the small intestine. Lactase is found in the brush border of the small intestine. While one part of it is lodged in the epithelial cell membrane, another protrudes into the intestinal lumen, ready to catch lactose which has been ingested. The enzyme itself seems to be expressed only shortly before the end of term, ready to digest lactose when the newborn drinks its mother's milk. Then, in more than half of the human population, lactase expression declines during childhood causing a perfectly benign intolerance to lactose, and thus dairy products. Although there seems to remain sufficient lactase to deal with up to 250 ml of whole milk per day.

The molecular factors which trigger off, or hinder the process of, lactose intolerance in childhood or early adulthood are still unknown. But it seems that lactase expression is brought to a halt after transcription. Consequently, the lactase is not delivered to the small intestine or perhaps simply incapable of inserting itself in the epithelial membrane. In the case of congenital lactase deficiency, however, it seems that the enzyme's structure is modified and, as a consequence, the lactase cannot bind lactose and, hence, cannot break it down.

A number of researchers believe that Darwin may not have benefited from the persistence of lactose breakdown into adulthood. There could be a number of reasons for it. It could have been hereditary. Many members of the Darwin family suffered from ailments such as those described by Darwin himself in his 'Diary of Health' – although to a lesser degree. What is more, Darwin loved rich food. As mentioned by his wife Emma, desserts rich with cream and eggs were a favourite. And when the naturalist was put onto dairy free diets, his health improved. What is more, fatigue, doubt and depression – which were three close companions of the author of the theory of evolution – could have also kindled physical symptoms, and the regular ingestion of potions such as arsenic, bismuth, amyl nitrite, morphine,

quinine and calomel in an attempt to soothe his pains cannot have helped. Darwin was also acutely ill on the Beagle. Some believe he could have been infected by *Trypanosoma cruz* which is found in the excrement of a famous Pampas bug, *Triatoma infestans*. One of which had become a “pet” on board the Beagle... *Trypanosoma cruz* infects the small intestine – amongst other organs – which would have struck yet another blow to Darwin's already weak tolerance to lactose.

One way to find out whether Darwin really suffered from inherited lactose intolerance would be to exhume his remains and have a look at his DNA. But no one at Westminster Abbey wants to do this. And, besides trying to understand what it is the great naturalist suffered from, rummaging around his DNA would not lead to groundbreaking revelations that would contribute to the rapid diagnosis of congenital lactase deficiency in newborns for instance. Indeed, DNA-based diagnoses need to be developed to replace current clinical tests which are slow. Understanding the molecular processes involved in lactase expression and hence lactose intolerance or persistence is also of great biological interest, as are the recent and seemingly rapid evolutionary forces involving lactase regulation in humans. Something Darwin would no doubt have gladly looked into.

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