

FIXATION ON HISTOLOGY

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Charles Darwin and the kissing bug

No greater name stands alone in biology than that of Charles Robert Darwin. Born in Shrewsbury, England on 12th February 1809, he became renowned for his contributions to the science of evolution. It was in December of 1831 that he boarded the sailing vessel HMS Beagle for a five-year voyage to study the natural world. Although he had previously been healthy, he suffered a bout of heart tremors and chest pain in Plymouth while waiting for the ship to set sail. Throughout the voyage, Darwin was troubled with seasickness and in 1834 whilst in Chile, he was confined to bed for several weeks with a fever attributed to typhoid. Otherwise, his health was relatively good, and he returned from the voyage two years later.

In 1837, Darwin married his wife Emma and later that year had a recurrence of the heart palpitations he had suffered whilst waiting to sail some years earlier. From that time forward, his health deteriorated with daily bouts of vomiting, regular stomach aches, severe boils, mouth ulcers, fatigue, trembling, anxiety, and depression. Although countless medical experts at the time failed to provide an accurate diagnosis, his libido was not in question as he went on to father ten children. Darwin was plagued by ill health for the rest of his life yet during that time, he managed to write productively. His landmark publication 'On the Origin of Species' was published on 24th November 1859 and today still remains the foundation of the history of evolution.

Charles Darwin died on 19th April 1882 at the age of 73 from an apparent heart attack. Since his death, numerous attempts have been made by the medical fraternity to explain his mystery illness. From

psychological factors to natural causes, none of the suggestions have really stood the test of time. One common proposal was that his illness existed as a consequence of poisoning by the many chemicals he had used in his scientific work. Arsenic, morphine, and formaldehyde for example are all known to have toxic side effects, some of which bore a similarity to the symptoms that Darwin had displayed. Over many years, there have been other explanations for his illness, and these include multiple allergies, hypochondria, Crohn's disease, and systemic lactose intolerance.

However, one of the most convincing suggestions for his ill health is the parasitic infection known as Chagas disease. A silent killer once endemic in Latin America, the insects which spread the disease thrive in countries such as Bolivia and Chile. The bugs are blood-sucking insects of the *Triatoma* genus and are associated with the transmission of serious disorders such as Chagas disease (Figure 1). Also known as American trypanosomiasis, it is caused by the single-celled parasite *Trypanosoma cruzi*. The disease is transmitted by the infected feces of the blood-sucking bugs that live in the cracks of walls and roofs of poor-quality housing such as those constructed from mud and straw. Once the bugs bite and ingest blood, they defecate on the victim. Because the bugs emerge at night to feed, they are commonly called the 'assassin' or the 'kissing' bugs as they have a habit of feeding around the mouths of their prey. The most recognized marker of acute Chagas disease is Romaña's sign which appears as a swelling of the eyelids (Figure 2). This occurs on the side of the face close to the bite wound or where the faeces of the bug were deposited or accidentally rubbed into the eye.



Figure 1. The Triatoma bug

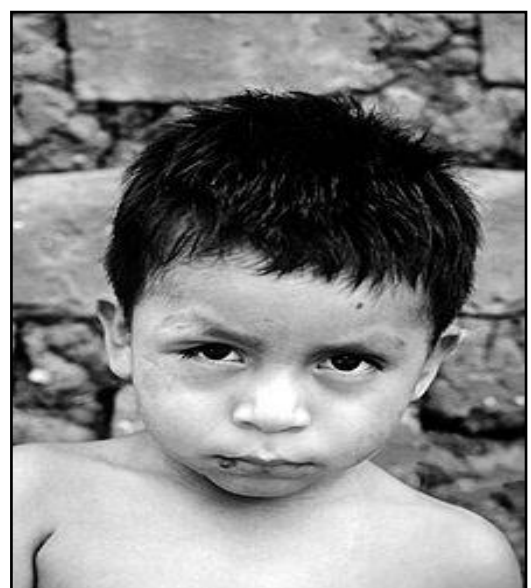


Figure 2. Romaña's sign on the eyelid

Currently, the diagnosis of Chagas disease is made by serological testing antibodies to *Trypanosoma cruzi* and by the microscopic observation of the parasite in Giemsa-stained blood smears (Figure 3). Treatment is long and the frontline prescription medicines are toxic. However, if the drugs are given soon after infection, they are 100% effective in killing the parasite. If left untreated, some patients will develop nervous and digestive problems over many decades, and it may also prove fatal as a result of heart muscle damage.

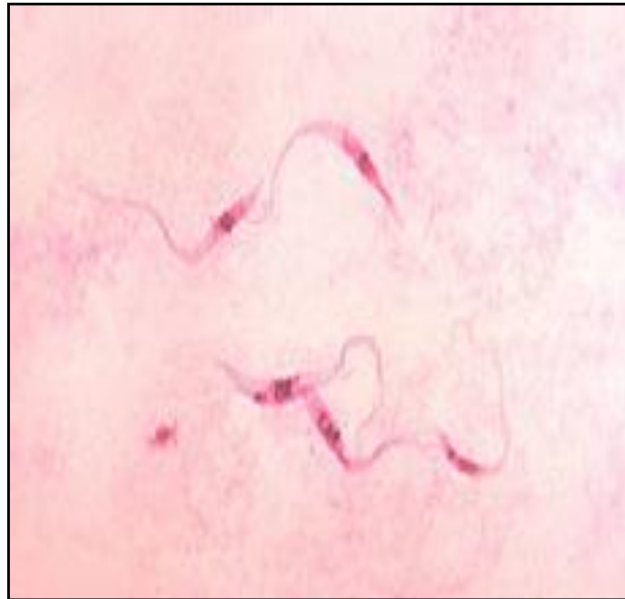


Figure 3. Giemsa-stained *Trypanosoma cruzi*

So why is this disease relevant to the demise of Darwin? While on the voyage, Darwin had studied the *Triatoma* bug for many months whilst in Chile. During that period, he had suffered a severe illness which although it was attributed to typhoid, records show that no other person on the voyage was affected. Darwin had also reported that one of the officers on the *Beagle* had kept a *Triatoma* bug as a pet and allowed it to feed on his blood. Many of the gastrointestinal and cardiac signs and symptoms that develop during the acute and chronic phases of Chagas disease were manifest throughout the life of Darwin. Although many proposals have been put forward for his illness, Chagas disease is a genuine contender as it often goes undiagnosed and is a frequent cause of sudden cardiac death.

In the modern world, Chagas disease has been reported in both Europe and North America. With global travel on the increase, millions of people are affected worldwide, particularly in migrants from

Latin America. In the United Kingdom, the Chagas Hub is a collaboration of healthcare professionals, researchers and members of the Latin American community that are united to tackle the disease. With an estimated disease burden more than seven times greater than that of malaria, the World Health Organization has classified Chagas disease as one of the most important neglected diseases on the planet.

Further reading

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5. The Chagas Hub - London Centre for Neglected Tropical Disease Research. <https://www.londonntd.org/news/the-chagas-hub-tackling-chagas-disease-in-the-united-kingdom>
6. World Health Organization and Chagas disease. [https://www.who.int/news-room/fact-sheets/detail/chagas-disease-\(american-trypanosomiasis\)](https://www.who.int/news-room/fact-sheets/detail/chagas-disease-(american-trypanosomiasis))

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