

The parasites have two problems with sickle cells. They find it harder to invade and live in deformed cells, plus sickle cells are removed by the body's normal disposal processes more quickly than normal cells. Therefore some parasites are eliminated from the body before they can do more damage.

Molecular Cause

Sickle cell anaemia is a good example of a single mutation causing multiple problems. The root cause is the substitution of one base pair in DNA's code for haemoglobin, which leads to the substitution of one amino acid in the protein part of the haemoglobin molecule. This results in the molecules having a slightly different shape so that they tend to line up and form stiff rods that distort the shape of the red cells. The distorted red cells damage capillaries, which leads to the death of the surrounding tissue. People who have two mutant genes suffer from severe anaemia and damage to their vital organs because they can only make sickle cells. Those who have one normal and one mutant gene produce a mixture of normal cells and sickle cells. This decreases the severity of the disease significantly but such people still suffer with problems caused by the sickle cells.

A good mutation?

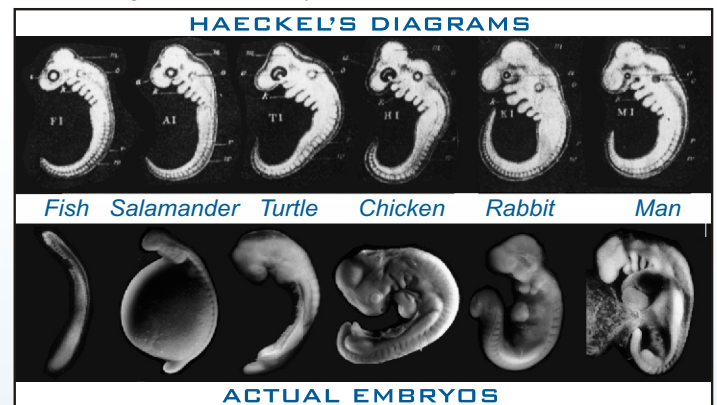
The Centre of Disease Control in Atlanta (Georgia, USA) spends millions of dollars each year treating people with sickle cell disease. The gene was brought to America during slave days, when black people were removed from Africa to the USA. There is no way anyone with the disease would call it a good mutation. They would rather have a different way of combatting malaria. Normal people who live in malaria prone areas do develop some resistance to the parasites, without sickle cells, so the "positive" effect of the sickle cell mutation is actually very small.

DO EMBRYOS SHOW EVOLUTIONARY STAGES?

Many biology textbooks still reproduce a set of diagrams, originally published by Prof. Ernst Haeckel in 1874, showing human and animal embryos passing through stages where they have gill slits like a fish and a tail like a monkey. The drawings are meant to convince students that human embryos relive their evolutionary past as they develop. This idea has been summarised in the catchy phrase "ontogeny recapitulates phylogeny." (Ontogeny means development, phylogeny means evolutionary history). In 1997 Haeckel's work received scathing criticism from Dr Michael Richardson, a lecturer at St George's Hospital Medical School, London, UK.

"Embryonic Liar" was the headline used by the *Times* (London, UK) in a report of Dr Richardson's study.¹⁰ The *Times* goes on to say: "One of the most famous biologists of the 19th Century has been accused of being a scientific fraud, a faker, who has muddied the waters of embryology for generations. As famous in his day as Darwin, Ernst Haeckel was a giant among German biologists... Dr Michael Richardson, has shown that Haeckel's last bequest to science is deeply flawed." *This is one of the worst cases of scientific*

fraud," says Dr Richardson. *"It's shocking to find that someone I thought was a great scientist was deliberately misleading. It makes me angry."* Richardson assembled an international team of collaborators, collecting marsupial embryos from Australia, Puerto Rican tree frogs, snakes from France and an alligator embryo from Manchester, amongst others. He found that, contrary to what Haeckel had asserted, the embryos of different species are not all the same. In fact, they are so different that the drawing Haeckel made could not possibly have been done from life. *"What he did was to take a human embryo and copy it, pretending that the salamander and the pig and all the others looked the same at the same stage of development. They don't."* There is only one word for this, and Dr Richardson doesn't flinch from using it. *"These are fakes."*



The worst aspect of Haeckel's fraud is his drawings had already been exposed as frauds by Prof. Wilhelm His of Leipzig University in 1874 shortly after Haeckel published them and more than 120 years prior to Dr Richardson's study.¹¹ Haeckel's peers in Germany got him to admit that he relied on memory and used artistic license in preparing his drawings, according to Dr Scott Gilbert, a developmental biologist at Swarthmore College, Pennsylvania.¹² Yet the fraud lives on, and Haeckel's embryo drawings, along with the phrase "ontogeny recapitulates phylogeny" continue to be used as evidence for evolution in the 21st Century.

Why have these fraudulent diagrams been reproduced for so long?

Haeckel originally used the diagrams to promote his passionate belief in the theory of evolution. Haeckel was a popular and persuasive speaker and became the leading spokesman for Darwinian evolution in Europe. The embryo diagrams and the ontogeny catchphrase became inextricably linked with evolution. To cast doubt on embryonic "evidence" was to cast doubt on evolution.

What about the gill slits and tail?

The "gill slits" are a series of ridges and grooves in the region between the head and trunk of the embryo. They develop into bones, muscles and other structures of the face and neck. They are never gills and never slits. Also, since an embryo needs a spinal column before the pelvis and legs can grow, in the early stages of development the lower end of the spinal column is very prominent for a short time. Thus, the "tail" is simply the end of the spine and is incorporated into the growing pelvis.