

Vestigial Structures

<http://www.bookrags.com/research/vestigial-structures-wap/>

Vestigial structures may also be molecular, as in the case of *vestigial genes* that exist in most species. For example, although humans cannot manufacture their own vitamin C, most other mammals can because they possess a gene enabling them to produce an enzyme (L-gulonogamma-lactone oxidase) which in turn makes it possible for them to produce vitamin C. Humans possess a defective copy of this gene that does not produce the required enzyme (or any other product). This gene was presumably disabled by mutation at a time in primate evolution when its loss was not a significant disadvantage, and now remains as a vestigial genetic sequence.

Why do we need Vitamin C in our diet?

<http://www.scienceinAfrica.co.za/2006/September/evolution.htm>

This is a good example of how a disease we see today results directly from evolution occurring in the very distant past. It is well-known that humans must eat lots of vitamin C to stay healthy. Vitamin C is a nutrient found in many fresh fruits and vegetables, particularly the citrus fruits. Without it, humans develop a terrible disease called scurvy, which is one of the most serious diseases affecting teenagers today, causing bleeding gums, bruises, and even death. Most other mammals (like your dog) synthesize their own vitamin C, and therefore don't get scurvy. Why do we get it? Because our bodies do not make vitamin C (ascorbic acid). We have the same genes for vitamin C production as other mammals, but a frame-shift mutation has made one of these genes non-functional [1].

But we are not alone in having this mutation - it is a trait we share with other primates [2]. This tells us that this mutation likely occurred in the distant past, perhaps even in the ancestor of all primates sometime around 70 - 80 million years ago. What is most curious is that this mutation didn't get weeded out of the gene pool of those early primate ancestors by the evolutionary force of natural selection. But there is a good reason for that, as early primates (like most primates today) lived in tropical regions and ate lots of fruits (e.g. they were largely frugiverous), and therefore the mutation was not lethal to these animals and was passed on to all descendents. Only in relatively recent times has this lack of the ability to synthesize vitamin C become a problem for humans, who moved out of tropical environments, developed agriculture, started traveling on ships, and eating [carbohydrates]. That's when we started getting sick. Feed our closest primate relatives such a diet and they get sick, too!

Plagiarized Errors and Molecular Genetics

<http://www.talkorigins.org/faqs/molgen/>

Guinea pigs and primates, including humans, get sick unless they consume ascorbic acid in their diet. For humans and guinea pigs, ascorbic acid is thus a vitamin (vitamin C), while most other species can synthesize their own ascorbic acid and thus do not require this molecule in their diet. The reason humans and guinea pigs cannot manufacture their own ascorbic acid is that they lack a functional gene encoding the enzyme protein known as L-gulonogamma-lactone oxidase (GLO), which is required for synthesizing ascorbic acid. In most mammals functional GLO genes are present, inherited—according to the evolutionary hypothesis—from a functional GLO gene in a common ancestor of mammals. According to this view, GLO gene copies in the human and guinea pig lineages were inactivated by mutations. Presumably this occurred separately in guinea pig and primate ancestors whose natural diets were so rich in ascorbic acid that the absence of GLO enzyme activity was not a disadvantage—it did not cause selective pressure against the defective gene.

Molecular geneticists who examine DNA sequences from an evolutionary perspective know that large gene deletions are rare, so scientists expected that non-functional mutant GLO gene copies—known as "pseudogenes"—might still be present in primates and guinea pigs as relics of the functional ancestral gene. In contrast, Creationists believe that humans and guinea pigs were each created independently of all other species and must have been "designed" to function without GLO. If this were true, these two species would not be expected to carry a defective copy of the GLO gene. In fact, GLO pseudogenes have been detected in both guinea pigs and humans (Nishikimi et al. J Biol Chem 267: 21967, 1992; Nishikimi et al. J Biol Chem 269:13685, 1994), consistent with the evolutionary view; presumably, related pseudogenes also exist in non-human primates that require dietary vitamin C.

29+ Evidences for Macroevolution

http://www.talkorigins.org/faqs/comdesc/section2.html#mol_vestiges

Vestigial characters should also be found at the molecular level. Humans do not have the capability to synthesize ascorbic acid (otherwise known as Vitamin C), and the unfortunate consequence can be the nutritional deficiency called scurvy. However, the predicted ancestors of humans had this function (as do most other animals except primates and guinea pigs).

Therefore, we predict that humans, other primates, and guinea pigs should carry evidence of this lost function as a molecular vestigial character (*nota bene*: this very prediction was explicitly made by Nishikimi and others and was the impetus for the research detailed below) (Nishikimi et al. 1992; Nishikimi et al. 1994).

Confirmation:

Recently, the L-gulano- γ -lactone oxidase gene, the gene required for Vitamin C synthesis, was found in humans and guinea pigs (Nishikimi et al. 1992; Nishikimi et al. 1994). It exists as a pseudogene, present but incapable of functioning (see prediction 4.4 for more about pseudogenes). In fact, since this was originally written the vitamin C pseudogene has been found in other primates, exactly as predicted by evolutionary theory. We now have the DNA sequences for this broken gene in chimpanzees, orangutans, and macaques (Ohta and Nishikimi 1999). And, as predicted, the malfunctioning human and chimpanzee pseudogenes are the most similar, followed by the human and orangutan genes, followed by the human and macaque genes, precisely as predicted by evolutionary theory. Furthermore, all of these genes have accumulated mutations at the exact rate predicted (the background rate of mutation for neutral DNA regions like pseudogenes) (Ohta and Nishikimi 1999).

Paragraph 6: Explain to your reader how and why the human inability to manufacture vitamin C is an important piece of evidence supporting human evolution from a common ancestor with other primates.

You may use quotations from the above four passages or from other sources.