

22. Defense against mutations

Do we have any proof that mutations can improve organisms? There is good evidence that shows mutations cause harm to organisms. Now we know that the structure of the cell is so complex and its workings must be so precise that any, even the smallest changes could upset its functioning and would cause its obliteration. For example, it has been identified that more than 150 genetic diseases are caused by mutations of the molecular complexes in the respiration system alone. Mutations of the spliceosome which cause errors in splicing genes result in serious genetic diseases in humans such as spinal muscular atrophy and lymphocytic leukemia.

Since it is impossible to prevent DNA mutations, the integrity of the cell is protected by not storing critical information in the DNA. This way the cell is protected from mutations. The most important information about cell architecture and its functioning is in the cell itself and is transmitted from cell to cell during reproduction. It is in this way that the continuation of life and the uniformity of all cells in organisms is secured.

However, most of the important information is coded in DNA and this information must also be protected during reproduction. To do this cells use very sophisticated repair mechanisms. Cells have complex signaling networks that carefully monitor the integrity of the genome during DNA replication. They initiate the repair of faulty DNA sequences. This shows that organisms have a very effective system of protection against the consequences of mutations. So the obvious question arises: Why would evolution provide such extensive protection from the effects of mutations if these mutations were supposedly be responsible for the development of organisms? This proves that mutations are “not wanted” by nature.

There are some parts of the cell which are so critical that must not be changed. Therefore genes describing these parts must not mutate. We call these genes “conserved”. This means that they have not changed over many millions of years. These include genes responsible for photosynthesis, respiration, transcription and translation, ribosomes, RNA polymerase and many others.

Of course we cannot prevent these genes from mutating, but the result of such mutations is lethal to the organisms. Consequently these mutated genes are removed from the population. It is assumed that 3-8% of the human genome has conserved sequences.

The most critical parts of any organism are mitochondria. Any malfunction of mitochondria is lethal. Most of the genes describing mitochondria are in the cell nucleus. However there are about 13 proteins which are very critical. Genes coding these proteins are placed in mitochondria. This means that each cell has many thousands of copies of these genes. This way mutations cannot change these genes.

To summarize: Because most mutations are lethal and harmful, organisms have a very good protection against mutations. They have a special built-in gene repair mechanism. The critical genes are “conserved” and very critical genes have multiple copies in the cell. This proves that mutations are not beneficial to organisms.