

The emergence of new genes in evolution

A gene arises from a gene. Genes are similar. Duplications and gradual diversifications of genes led to the emergence of gene families and superfamilies.

Genes can arise by the following mechanisms:

1. exon rearrangement
2. gene duplication
3. retrotransposition
4. gene fusion and fission

Exon shuffling

- the exons of different genes can be joined to form a new gene

Gene duplication

- uneven crossing-over, uneven exchange between sister chromatids, slippage of DNA polymerase
- gene duplication is the basis of diversification
- the whole gene, part of it or even a cluster of genes can be duplicated
- if the gene is only in two copies in the genome (on the chromosome from the father and mother), then mutations in it usually cause the loss of its function, and are therefore disadvantageous for the bearer. In such a case, at most, a mutation can occur that improves the original function, but a new function cannot arise, because the old one would be lost. However, if the gene is **duplicated**, even multiple times, mutations in its copies can lead to **the emergence of a new function**, which can be evolutionarily advantageous and therefore preferred. Thus, the mutation in the duplicated gene spreads in the population.
- gene duplication turns forbidden mutations into tolerated ones

Retrotransposition

- "copy and paste"
- moving sections of DNA in the genome

Links

Source

- lectures biology and genetics, 1.LF UK