Viruses in genome important for our brain

Over millions of years retroviruses have been incorporated into our human DNA, where they today make up almost 10 per cent of the total genome. A research group at Lund University in Sweden has now discovered a mechanism through which these retroviruses may have an impact on gene expression.

Retroviruses are viruses that incorporate their own genetic information by using reverse transcriptase to make a DNA strand based off on its own RNA genetic information. Some retroviruses are known to be dangerous, like HIV, but others are relatively harmless.

The viruses studied by Johan Jakobsson and his colleagues in Lund are called endogenous retroviruses (ERV) as they have existed in the human genome for millions of years.

It is known that genes that control the production of various proteins in the body is accounted for by 2% of the whole genome while endogenous retroviruses account for 8 to 10% of the whole genome. There is currently very few information regarding these ERV and knowing more about it may unlock a huge section of the human brain never known before.

Research has discovered that there are several retroviruses in the genome that serves as a sort of receptor for a protein called TRIM28. This protein has the ability to affect gene expression when bounded to these retroviruses and affects the genes adjacent to them in the DNA helix. This mechanism may behave differently in different people due to the nature of retroviruses in the genome. Further research shows that this may be the cause for some neurological diseases such as ALS, schizophrenia and bipolar disorder.

Reasearch has be ongoing regarding ERV and its role in neutrons but the study was conducted on mice and there are multiple differences between retroviruses in mice and humans. Research is still ongoing whether ERV has a role in the development of the brain and or its functions.

Lund University. "Viruses in genome important for our brain." ScienceDaily. ScienceDaily, 12 January 2017. <www.sciencedaily.com/releases/2017/01/170112110840.htm>.

Study identifies a key to bone formation, vertebrate evolution

Researchers in a USC-led study said they have identified a key action of a watershed gene critical to bone formation and the evolution of vertebrates.

The Sp7 or Osterix gene possibly emerged 400 million years ago and it is responsible for the expression of osteoblasts during cell differentiation that eventualy leads to bone formation. The Sp7 gene is present is many bone forming vertebrates from a tiny frog to the blue whale.

This new study is to take a very close look at the correlation between bone-forming ability and a Sp7-like gene and how Sp7 directs bone-secreting cells called osteoblasts to form the skeleton.

Many groups of vertebrates have an Sp7 gene or a similar type of gene and from evolutionary history the Sp7 gene is an acquired characteristic down the line that led to the evolution of bone formation.

It is known that the Sp7 gene encodes for a transcriptional regulator that regulates osteoblast specific genes but recent studies indicate that the Sp7 interacts with another transcriptional regulators called the Dlx family. Further investigation and inquiry regarding the Sp7 and the Dlx family is being conducted.

University of Southern California. "Study identifies a key to bone formation, vertebrate evolution: Tiny gene answers big question about the rise of the vertebrate skeleton." ScienceDaily. ScienceDaily, 28 April 2016. <www.sciencedaily.com/releases/2016/04/160428132126.htm>.

Scientists discover organism that hasn't evolved in more than 2 billion years

An international team of scientists has discovered the greatest absence of evolution ever reported -- a type of deep-sea microorganism that appears not to have evolved over more than 2 billion years. But the researchers say that the organisms' lack of evolution actually supports Charles Darwin's theory of evolution.

Sulfur bacteria was examined by scientists and a sample of it from 1.8 billion years ago was compared to one from now. Using cutting-edge technology the samples of bacteria were observed to be the same and are essentially indistinguishable from each other.

The finding astounded scientists as this was evidence that a species has not evolved for more that 2 million years. Evolution is an accepted theory but the lack of it requires explanation.

Charles Darwin's writings on evolution focused much more on species that had changed over time than on those that hadn't. So how do scientists explain a species living for so long without evolving?

Evolution implies that it would occur when the physical or environmental changes puts selective pressure. If the micro-organisms did not change over all this time this means that the environment is essentially identical now and 2 million years ago.

Loss of altruism (and a body plan) without a loss of genes

An international team of researchers found that the evolutionary loss of the "altruistic" worker caste in ants is not accompanied by a loss of genes.

Ants are social insects and they are typically distinguished into workers and queens. Research has shown that workers and queens express different genes and this was hypothesised that specific altruistic genes present in workers that promote sociality.

To test this hypothesis different species of ants are tested on. There are ants where the worker class does not exist and they exploit the workers of other species and use them for their own.

The ants were monitored and compared for evidence of worker genes that degrade when the worker class was no longer produced. The research showed that there were no worker genes in the genome. The species of ants that did not produce any workers and there weren’t any change in the genome. This was interesting in that when a trait disappears the genes for it should disappear over time but this is not what happened here. This implies that there may not be any genes that are altruistic or this change is not reflected by a loss of genes.

Further experimentation was conducted in order to test if expression of genes during the development of an ant was any different in a species with a worker class and one without.

The result came out with a resounding no, there was no change or major difference that could account for the loss of the worker class. The results show that evolution of traits may be only affected by changes in pre-existing genes and not necessarily must be facilitated by changes in the protein coding genes.

Earlham College. "Loss of altruism (and a body plan) without a loss of genes: How evolutionary biology in ants doesn't play by the rules." ScienceDaily. ScienceDaily, 11 August 2015. <www.sciencedaily.com/releases/2015/08/150811103549.htm>.

The late evolutionary event that gave rise to modern life

The emergence of oxygen-producing bacteria more than two billion years ago gave rise to life as we know it today, and now a new study reveals that this happening might have occurred multiple times.

Th origin of oxygenic photosynthesis in Cyanobacteria transformed earth by altering the course of evolution. When and how Cyanobacteria evolved with the ability to produce oxygen form photosynthesis is still poorly understood. Scientists analysed three groups of Cyanobacteria, Oxyphotobacteria, Melainabacteria, and the ML635J-21 clade, only the first of which is known to produce oxygen. From the data none of the genomes contain genes for energy reaction to create oxygen. This indicates that the late common ancestor of Cyanobacteria was not capable of photosynthesis.

Rather, Oxyphotobacteria probably gained the ability for photosynthesis through lateral gene transfer after their divergence from the Melainabacteria, the authors say. Given when these bacterial groups diverged, which recent estimates peg to be about 2.5 to 2.6 billion years ago, these results strengthen the possibility that the rise of oxygen about 2.3 billion years ago was directly caused by the evolution of oxygenic photosynthesis.

American Association for the Advancement of Science. "The late evolutionary event that gave rise to modern life." ScienceDaily. ScienceDaily, 30 March 2017. <www.sciencedaily.com/releases/2017/03/170330142323.htm>.