



Press release - science

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Saved by junk DNA

Leuven, Belgium - VIB researchers linked to K.U.Leuven and Harvard University show that stretches of DNA previously believed to be useless 'junk' DNA play a vital role in the evolution of our genome. They found that unstable pieces of junk DNA help tuning gene activity and enable organisms to quickly adapt to changes in their environments. The results will be published in the reputed scientific Journal *Science*.

Junk DNA

'Most people do not realize that all our genes only comprise about 3% of the total human genome. The rest is basically one large black box', says **Kevin Verstrepen**, heading the research team. 'Why do we have this DNA, what is it doing?'

Scientists used to believe that most of the DNA outside of genes, the so-called non-coding DNA, is useless trash that has sneaked into our genome and refuses to leave. One commonly known example of such 'junk DNA' are the so-called tandem repeats, short stretches of DNA that are repeated head-to-tail. 'At first sight, it may seem unlikely that this stutter-DNA has any biological function', says **Marcelo Vincés**, one of the lead authors on the paper. 'On the other hand, it seems hard to believe that nature would foster such a wasteful system'.

Unstable repeats

The international team of scientists found that stretches of tandem repeats influence the activity of neighboring genes. The repeats determine how tightly the local DNA is wrapped around specific proteins called 'nucleosomes', and this packaging structure dictates to what extent genes can be activated. Interestingly, tandem repeats are very unstable - the number of repeats changes frequently when the DNA is copied. These changes affect the local DNA packaging, which in turn alters gene activity. In this way, unstable junk DNA allows fast shifts in gene activity, which may allow organisms to tune the activity of genes to match changing environments - a vital principle for survival in the endless evolutionary race.

Evolution in test tubes

To further test their theory, the researchers conducted a complex experiment aimed at mimicking biological evolution, using yeast cells as Darwinian guinea pigs. Their results show that when a repeat is present near a gene, it is possible to select yeast mutants that show vastly increased activity of this gene. However, when the repeat region was removed, this fast evolution was impossible. 'If this was the real world' the researchers say 'only cells with the repeats would be able to swiftly adapt to changes, thereby beating their repeat-less counterparts in the game of evolution. Their junk DNA saved their lives'.



Relevant scientific publication

This research appears in the authoritative journal *Science* (Vinces et al., Unstable tandem repeats in promoters confer transcriptional evolvability).

Funding

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Info for the editor

This research has been done by **Marcelo Vincés**, **Matthieu Legendre** and colleagues from the VIB laboratory of Systems Biology, K.U.Leuven – under direction of **Kevin Verstrepen**.

More info: www.vib.be/Research/EN/Research+Departments/Systems+Biology
and <http://sysbio.harvard.edu/csb/verstrepen/>

VIB

VIB, the Flanders Institute for Biotechnology, is a non-profit research institute in the life sciences. Some 1100 scientists and technicians conduct strategic basic research on the molecular mechanisms that control the functioning of the human body, plants, and micro-organisms. Through a close partnership with four Flemish universities – Ghent University, the Katholieke Universiteit Leuven, the University of Antwerp, and the Vrije Universiteit Brussel – and a solid investment program, VIB unites the forces of 65 research groups in a single institute. Their research aims at fundamentally extending the frontiers of our knowledge. Through its technology transfer activities, VIB strives to convert the research results into products for the benefit of consumers and patients. VIB also develops and distributes a broad range of scientifically substantiated information about all aspects of biotechnology. More info at: www.vib.be.

K.U.Leuven

The University of Leuven is Belgium's largest university and one of the oldest universities in Europe, founded in 1425. It is a comprehensive university with 14 faculties, with a long tradition of high-quality interdisciplinary research and teaching. The University of Leuven has over 33,000 students (12 percent international) and over 17,000 staff members (8,600 in the various university departments and 8,700 at UZ Leuven, the university hospital). More info at: www.kuleuven.be

Harvard

Founded in 1636, Harvard is the oldest university in the USA and arguably the richest and most renowned university in the world. About 6,700 undergraduate and 13,000 graduate students are guided by 3,000 faculty members and 13,000 staff members. Harvard counts 7 American presidents and 43 Nobel Laureates under its students, alumni and staff members.

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