

Researchers identify genes that distinguish mammals from other animals

December 5 2017

What distinguishes mammals from other vertebrates? Researchers from the Hospital del Mar Medical Research Institute (IMIM) have been trying to answer this question in collaboration with the researchers from the Universitat Pompeu Fabra (UPF). To do this, they analysed the sequenced genomes of 68 mammals and identified 6,000 families of genes that are only found in these animals. These are genes with no homologues outside mammals. In humans, it is estimated that they represent 2.5 percent of the genes that code for proteins. The study has been published in the journal *Genome Biology and Evolution*.

Dr. Villanueva-Cañas says that the aim of the work was to "understand which [genes](#) define mammals as a class. In other words, which genes are only found in this group." He designed a set of programs that made it possible to compare the genomes of 68 mammals. These included Homo sapiens and other primates, as well as other mammals including the Iberian lynx. With this data, he generated a catalogue of around 6,000 families of genes exclusive to the mammals. At the same time, he assigned them a possible age of origin according to the species in which they are present. He also tried to figure out what these genes do using expression data (RNA sequencing) from different tissues, to see where and how they are expressed, and proteomic data to check if they produce proteins.

Some of these genes have a de novo origin, and do not come from the duplication of pre-existing genes. De novo genes are important for acquiring new functions during evolution, as was demonstrated by

another study led by Dr. Albà ("[Origins of de novo genes in human and chimpanzee](#)," published in *Plos Genetics*). The new study has identified the functions of some of these genes, related to how the skin is structured and why it is different from that of, for example, reptiles, as well as other genes involved in the [mammary glands](#) characteristic of mammals. They have also identified antimicrobial peptides, which participate in the body's defence against pathogens.

The researchers say that the genes they have found are short and usually only a few tissues. Dr. Albà says, "Studies like this help us understand how new genes form during evolution and whether they play an important role in the adaptation of organisms to their environment. Cataloguing [mammal](#) genes is the first step in understanding their functions. It brings us closer to defining a set of pieces that originated at the start of their evolution and which are common to all of them, or some of their subgroups."

Dr. Villanueva-Cañas says, "We still we do not know the function of an important part of our genes, so it is necessary to make an effort to characterise them." This is the case of one that was identified during the study (neuronatin), which plays a so-far-unknown role in brain development.

More information: Villanueva-Cañas, J.L., Ruiz-Orera, J., Agea, M.I., Gallo, M., Andreu, D. & Albà, M.M. (2017). New Genes and Functional Innovation in Mammals. *Genome Biology and Evolution*, 9, 1886–1900.

Provided by IMIM (Hospital del Mar Medical Research Institute)

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