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The gene that led to the human intelligence boom has been found

An array of early human skulls, culminating in Homo Sapiens. The gene that led to our brains s sudden growth has been found
The Washington Post/Getty

By **Alice Klein**

How did humans get so smart? A random reshuffle in our ancestor's genome more than 3 million years ago let our brains grow three times as large.

David Haussler at the University of California, Santa Cruz and his colleagues were comparing brain development in humans and monkeys when they found one key difference. Human brain growth appeared to be driven by a gene called *NOTCH2NL* that was not found in monkeys.

Further studies revealed that *NOTCH2NL* controls the number of brain cells we develop. It delays the transformation of stem cells to brain cells, so that more stem cells can divide and grow and ultimately turn into more brain cells.

By comparing the genomes of humans and other primates, the researchers determined that *NOTCH2NL* first appeared between 3 and 4 million years ago. It came about due to an extremely rare gene conversion event, in which part of the genome is reshuffled.

Beefed-up brains

The arrival of *NOTCH2NL* would have allowed us to grow three times more brain cells, says Haussler. This matches with the fossil record, which shows human skulls starting to expand soon after the gene appeared. "If it hadn't have happened, we wouldn't be here talking about it," says Haussler.

Our Neanderthal and Denisovan relatives inherited the same *NOTCH2NL* gene from our common ancestor, allowing them to grow bigger brains as well. However, they didn't develop the same level of intelligence as our species. "That's the big mystery," says Haussler.

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It's possible that the gene laid the foundation for intelligence by providing extra brain cells, but other things needed to happen later to wire them together in an effective way, he says. "There were probably hundreds of other genes involved."

One of the drawbacks of *NOTCH2NL* is that it can sometimes go awry. Babies occasionally get extra copies, causing their brains to grow too big.

Or they can get too few copies, causing the opposite problem. Other defects in the gene are thought to trigger certain forms of autism and schizophrenia. "That's the trade-off we had to make for bigger brains," says Haussler.

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