Scientists spy enzyme that makes us unique

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Have you ever wondered why you inherited your mother's smile but not your father's height? Researchers at the Universities of Leeds and Dundee are one step closer to unravelling how nature combines both maternal and paternal DNA to create genetically unique offspring.

In a world first, Leeds researchers Professor Simon Phillips, Dr Stephen Carr and Dr Jonathan Hadden, together with Professor David Lilley at Dundee, have mapped the 3 dimensional structure of an enzyme responsible for splitting DNA strands – a process at the heart of human individuality.

The discovery of the T7 endonuclease 1 enzyme's structure was made by using x-ray crystallography techniques. The enzyme is derived from a bacteriophage – a naturally occurring virus-like agent that attacks bacteria – but the molecular processes are expected to be similar in other organisms, including humans.

"Whilst the enzyme was known to play a central role, its physical structure, which is crucial to understanding the splitting process, has never been seen before. We've now got a 3D picture of it at work, and seen it at the point at which it is about to cut through the DNA strands. This is a major breakthrough in investigating the fundamental mechanisms at work behind the formation of a person's DNA and how viruses replicate their DNA in the body," says Professor Phillips.

In humans, this process starts at conception when maternal and paternal DNA strands join together at random points in their sequence. Enzymes

such as T7 endonuclease 1 are then responsible for severing the strands at this junction, thus creating a third, unique DNA sequence for the offspring.

However, Professor Phillips says it will be some time before this process can be observed in humans. “It’s too important a discovery to rush. Our next step is to examine the process in a more complex system than bacteriophage, such as yeast,” he says.

Source: University of Leeds