'Smart' genes put us at risk of mental illness

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(Medical Xpress)—Humans may be endowed with the ability to perform complex forms of learning, attention and function but the evolutionary process that led to this has put us at risk of mental illness.

Data from new research, published today in the journal *Nature Neuroscience*, was analysed by Dr Richard Emes, a bioinformatics expert from the School of Veterinary Medicine and Science at The University of Nottingham. The results showed that disease-causing mutations occur in the genes that evolved to make us smarter than our fellow animals.

Dr Emes, Director of The University of Nottingham's Advanced Data Analysis Centre, conducted an analysis of the evolutionary history of the Discs Large homolog (Dlg) family of genes which make some of the essential building blocks of the synapse—the connection between nerve cells in the brain. He said: "This study highlights the importance of the synapse proteome—the proteins involved in the brains signalling

processes—in the understanding of cognition and the power of comparative studies to investigate human disease."

The study involved scientists from The University of Edinburgh, The Wellcome Trust Sanger Institute, the University of Aberdeen, The University of Nottingham and the University of Cambridge.

This cross-disciplinary team of experts carried out what they believe to be the first genetic dissection of the vertebrate's ability to perform complex forms of learning, attention and function. They focussed on Dlg—a family of genes that humans shared with the ancestor of all backboned animals some 550 million years ago. Gene families like the Dlgs arose by duplication of DNA, changed by mutation over millions of years and now contribute to the complex cognitive processes we have today. However, this redundancy and subsequent accumulation of changes in the DNA may have led to increased susceptibility to some diseases.

Components of the human cognitive repertoire are routinely assessed by using computerised touch-screen methods. By using the same technique with mice researchers were able to probe the cognitive mechanisms conserved since humans and mice shared a common ancestor—around 100 million years ago. By comparing the effect of DNA changes on behavioural test outcomes this research showed a common cause of mutation and effect of learning changes in both mice and humans.

Dr Emes said: "This research shows the importance of discerning information from data and how the power of computational research combined with behavioural and cognitive studies can provide such novel insight into the basis of clinical disorders. This research provides continued support that discovery occurs at the boundary of disciplines by the integration of data."

This latest research continues earlier work by the Genes to Cognition Consortium in the same journal (Emes et al *Nature Neuroscience* 2008 doi:10.1038/nn.2135) where the evolutionary origin and history of the collection of proteins forming the synapse were first explored.