HIGHLIGHTS

HUMAN GENETICS

Genetically speaking

According to the linguist Noam Chomsky, all languages share a universal grammar, and underlying this commonality are innate language skills. But practically nothing is understood of how directly these language skills derive from individual genes. Potentially informing this discussion, Anthony Monaco and colleagues now reveal the genetic basis of a severe speech and language disorder.

The KE family has been the focus of debate among psychologists and neurologists. It is a large, three-generation family beleaguered with a severe language and speech impairment that is inherited in an autosomal-dominant fashion. Affected members experience difficulty in identifying phonemes (the smallest unit of sound in a spoken language) and understanding sentences. The language skills that most of us exercise unconsciously — such as the use of plurals, verb tenses, and various word order and combination rules — must be learnt by heart by affected members of the KE family. But these individuals are also impaired in the mouth and facial movements needed to form and articulate words. So, whether their language deficiencies stem from motor-neural problems associated with speech and hearing, or from difficulty with grammatical rules, has been controversial.

Monaco's team, who previously mapped the gene to chromosome 7, has now tracked the so-called *SPEECH1* locus to a region containing a gene, *FOXP2*, that encodes a novel putative DNA-binding protein belonging to the family of forkhead/winged-helix transcription factors. All affected members of the KE family carry a point mutation within this gene, which alters an amino acid in the DNA-binding domain of FOXP2. Additional evidence to support the pathological significance of defects in *FOXP2* comes from the finding that the gene is disrupted by a chromosomal rearrangement in an unrelated individual who has a similar speech and language disorder to that of the KE family.

So how do defects in *FOXP2* contribute to language deficits? Brain imaging studies have previously shown that affected members of the KE family have basal ganglia pathology and so it is feasible that mutation of *FOXP2* leads to perturbation in basal ganglia formation during development. Even so, it would remain an open question whether such a developmental abnormality is a key link between language deficits and the networks in the brain that underlie grammar and linguistics.

The challenge will evidently be to determine the role of FOXP2 and how it contributes to language function. Although animal models of FOXP2 defects might shed light on the function of the transcription factor at the cellular level, it will be difficult to resolve its function in linguistics. Nevertheless, an exciting avenue for future research is the possibility of a better understanding of human language through comparative genomics. By comparing the *FOXP2* gene in humans and in our close primate relatives it might be possible to trace the thread of language evolution.

Carina Dennis
Senior Editor, Nature

References and links

ORIGINAL RESEARCH PAPER Lai, C. S. L. *et al.* A forkhead-domain gene is mutated in a severe speech and language disorder. *Nature* **413**, 519–523 (2001)
FURTHER READING Pinker, S. Talk of genetics and vice versa. *Nature* **413**, 465–466 (2001)
WEB SITE
Anthony Monaco's lab:
http://www.well.ox.ac.uk/monaco/index.shtml