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Genetic roots of 'orchid' children

Some kids may inherit sensitivity to family contexts, for better or worse

By Bruce Bower

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A Swedish expression that translates as "orchid child" refers to a youngster who blossoms spectacularly if carefully nurtured but withers badly if neglected. Scientists have now identified gene variants that may help to cultivate orchid children by heightening their sensitivity to both good and bad parenting.

In a group of kids tracked from ages 5 to 17, those who inherited certain forms of a gene involved in learning and memory and had inattentive parents displayed higher rates of delinquency and aggression than their peers, says a team led by psychologist Danielle Dick of Virginia Commonwealth University in Richmond. Children who carried the same gene variants but grew up with involved parents misbehaved less often than other kids, the researchers report in a paper to appear in *Psychological Science*.

Dick's team focused on *CHRM2*, a gene that modulates brain transmission of acetylcholine, a chemical messenger that boosts brain-cell activity. Other researchers have linked alterations of *CHRM2* to a propensity for developing alcoholism, without looking for contributions of disrupted family relationships or other environmental factors to that association.

"Our findings suggest that *CHRM2* is a plasticity gene involved in creating biological sensitivity to a person's environmental context," Dick says.

A small but growing number of studies suggest that several genes initially thought to make people prone to developing depression and other disorders do so only in stressful environments, while carriers of the same genes reap benefits in supportive settings (*SN Online*: 1/29/09), remarks psychologist Jay Belsky of the University of California, Davis.

In a study published online last year in the *Journal of Child Psychology and Psychiatry*, Belsky and a colleague found that teenage boys who possess as many as five previously identified "risk alleles" for various behavioral problems develop more of those difficulties than their peers if exposed to poor parenting. Boys who inherit the same genes adjust particularly well in supportive families, Belsky says.

In 2009, Dick's team reported similar context-sensitive effects among boys and girls carrying variants of a gene involved in transmission of a brain chemical called gamma-amino butyric acid.

A species that adapts to diverse, rapidly changing habitats — such as *Homo sapiens* — evolves genes that make some individuals extremely responsive to environmental conditions, for better or worse, Belsky proposes.

Studies of infant temperament and development indicate that roughly 20 percent of children qualify as highly sensitive to family environments, estimates psychologist Michael Pruess, a Davis colleague of Belsky's.

Dick and her colleagues examined data from 452 boys and girls living in three U.S. cities who were interviewed annually starting in kindergarten. DNA obtained from saliva samples was analyzed for nine common alterations of *CHRM2*.

Kids who inherited any of three variants on both copies of *CHRM2* showed behavioral sensitivity to parental monitoring, a measure of how much parents know about their children's friends and activities.

Each child and his or her mother rated that youngster's delinquent and aggressive behaviors. Based on those reports, three-quarters of volunteers experienced modest parental monitoring and 22 percent of parents knew a lot about their children's daily whereabouts. Remaining parents knew little about their children's lives.

About 14 percent of participants inherited at least one *CHRM2* variant associated with environmental sensitivity. Any brain or other biological effects of these gene variants remain as elusive as an orchid in a vacant lot.

SUGGESTED READING :

J. Belsky and K. Beaver. Cumulative-genetic plasticity, parenting and adolescent self-regulation. *Journal of Child Psychology and Psychiatry*. Published online Oct. 6, 2010. doi:10.1111/j.1469-7610.2010.02327.x. Abstract available:

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D. Dick et al. Role of GABRA2 in trajectories of externalizing behavior across development and evidence of moderation by parental monitoring. *Archives of General Psychiatry*, Vol. 66, June 2009, p. 649. Abstract available:

B. Ellis and T. Boyce. Biological sensitivity to context. *Current Directions in Psychological Science*, Vol. 17, June 2008, p. 183. doi:10.1111/j.1467-8721.2008.00571.x. Abstract available:

For more on Danielle Dick's research, go to:

For more on gene-environment interaction research, go to:

CITATIONS & REFERENCES :

D. Dick et al. *CHRM2*, Parental monitoring, and adolescent externalizing behavior: Evidence for gene-environment interaction. *Psychological Science*. Published online March 24, 2011. doi:10.1177/0956797611403318. Abstract available: