

---

Symposium TP-1  
Thursday, July 27, 2006

## **Gene-environment interactions and the socialization of aggression in Rhesus monkeys**

**Stephen J. Suomi**  
**Laboratory of Comparative Ethology**  
**National Institute of Child Health and Human**  
**Development, NIH**



Recent research with both humans and rhesus monkeys has provided compelling evidence that the socialization and regulation of aggression may be in part the product of specific gene-environment (G x E) interactions throughout development. For example, one form of a polymorphism (“short” allele) in the promoter region of the serotonin transporter (5-HTT) gene is associated with poor control of aggressive behavior, high impulsivity, and low serotonin metabolism throughout juvenile and adolescent development in monkeys who experienced insecure early social attachments but not in monkeys who developed secure attachment relationships with their mothers during infancy. In contrast, monkeys possessing the “long” allele of the 5-HTT gene exhibit relatively normal levels of aggression, and impulse control, and serotonin metabolism regardless of the relative security of their early attachment relationships. One interpretation of these G x E interaction data is that the long 5-HTT allele somehow confers resiliency to adverse early attachment relationships on those individuals who carry it (“good genes”). An alternative interpretation of the same data is that secure attachment relationships somehow confer resiliency to individuals who carry alleles that may otherwise increase their risk for adverse developmental outcomes (“maternal buffering”). These two interpretations are not mutually exclusive, but the differences in their respective implications for developing effective strategies for successful intervention and even prevention of excessive and inappropriate aggressive and impulsive behavior in affected individuals are considerable.

*Communicating author:*

*Stephen J. Suomi.*

*Laboratory of Comparative Ethology, National Institute of Child Health and Human Development, National Institutes of Health.*

*6705 Rockledge Drive, Suite 8030, MSC 7971, Bethesda, MD 20892-7971, U.S.A.;*

*E-mail: [ss148k@nih.gov](mailto:ss148k@nih.gov)*

*Tel: 301-496-9550; Fax: 301-496-0630*