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Genetic and environmental hormonal response to stress in children depends on family context

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A study conducted on 346 19-month-old twins by an international team led by Université Laval professor of psychology Michel Boivin reveals that the genetic and environmental bases of hormonal response to stress depend on the context in which a child grows up. This is the first time such an effect has been reported in young humans. The researchers explain the details of their findings in the latest edition of the *Archives of General Psychiatry*.

The study shows that, for children growing up in a favorable family environment, genetics account for 40% of the individual differences in cortisol response to unfamiliar situations. Cortisol is a stress hormone produced in new, unpredictable or uncontrollable contexts. In contrast, if children are raised in difficult family circumstances, the environment completely overrides the genetic effect as if it had established a programmed hormonal conditioning to stress.

The researchers already assumed that variability in cortisol production among individuals exposed to the same stressful conditions depended on both genetic and environmental factors. In order to estimate precisely these genetic and environmental contributions, they studied 130 identical twins who share 100% of their genes and 216 fraternal twins who share close to 50% of their genetic makeup. Each child, accompanied by its mother, was brought into a room, and then successively exposed to a clown and a noisy robot. “These are not traumatic events, but they are

sufficient to cause behavioral changes in most children of that age," explained Professor Boivin.

The researchers measured cortisol levels in the children's saliva before and after this experience and analyzed this data as a function of each child's family environment. Specific risk factors—tobacco use during pregnancy, low family income, low education level, single parenthood, very early parenthood, low birth weight, maternal hostility toward the child—have known effects on cortisol levels in children.

Almost a quarter of the families who participated in the study had at least four of these risk factors and were classified in the "difficult family context" category. The data indicate that genetic factors account for 40% of the individual variability in cortisol response among children from a favorable family background, but this contribution drops to zero in children growing up in difficult family circumstances.

Researchers do not yet know whether the conditioned cortisol response leads to permanent differences in cortisol production among children from families at risk. However, Boivin believes that this study confirms the importance of intervening early with families to reduce the risk of a disrupted conditioned stress response in young children. "A transient rise in cortisol level is a normal response to stress. But continuously high levels of this hormone could be harmful to the child's development in the long run," warns the researcher.

Source: Université Laval