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Publication

Epigenetic Transgenerational Inheritance of Altered Stress Responses. David Crews, Ross Gillette, Samuel Scarpino, Mohan Manikkam, Marina Savenkova and Michael Skinner. *Proceedings of the National Academy of Sciences* 5;109(23):9143-8.

Summary

This study investigates the ability of an environmental exposure, agriculturally used fungicide vinclozolin, to promote epigenetic transgenerational inheritance of altered stress responses and behavioral modifications. A collaboration between the laboratories of Dr Michael Skinner at Washington State University, Pullman Washington, and Dr David Crews at the University of Texas at Austin, Austin Texas, studied transgenerational effects of the Vinclozolin on brain development and the ability of an individual to respond to stress. Using physiological and gene transcriptome analyses of brain regions underlying social, memory, and anxiety behaviors, the research team demonstrated how ancestral exposure reprograms the brain transcriptome and causes transgenerational effects on gene expression and behavior three generations removed from the exposure. The authors demonstrate how ancestral exposure changes the great-grandchildren's response to life challenges in an experiment with male rats. A two 'hit' paradigm was used. The first 'hit' consisted of fetal exposure to an environmental chemical that promotes epigenetic transgenerational inheritance of altered physiological parameters. The second 'hit', 3 generations removed from the first, consisted of chronic restraint stress during adolescence, a common model used in social and anxiety behavior research. Stress in adolescence has powerful and permanent effects on brain and behavior. The consequence is substantial interactions of these two modes of epigenetic change on the brain and behavior. For example, transgenerationally imprinted males when stressed, do not have a preference for strange or familiar males and altered anxiety behaviors, whereas control males strongly prefer familiar males – demonstrating social and anxiety behavioral alterations. Observations demonstrate that ancestral exposures to an environmental compound can influence your stress response and behavior, and you will pass this on to your descendants.

Highlights

- That environmental exposures of a gestating female can promote transgenerational effects on how an individual responds to stress. What your great-grandmother was exposed to when she was pregnant may influence your stress response and behavior, and you will pass this on to your grandchildren.
- That a combination of ancestral exposures promoting epigenetic transgenerational inheritance altered brain development, and a chronic stress promotes the behavior phenotypes you have of anxiety and social behavior characteristics.