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Presentation Abstract

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Presentation Title: Influencing behavior and neuroanatomy in the mammalian nervous system *via* ancestral experiences

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Topic: ++F.02.v. Fear and aversive learning and memory: Modulation

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Abstract: Ancestral experience can influence future generations. Perhaps, one of the more striking examples of this comes from the observation that exposure of pregnant women to the Hunger Winter of 1944 profoundly affected the physiology and behavior of the gestating babies for several generations. Needed to understand the mechanisms of such transgenerational inheritance of trauma are paradigms wherein an ancestral generation is subjected to perturbations that can then be followed across generations. Toward this goal, we subjected F0 mice to an olfactory fear conditioning protocol wherein an odor is paired with a mild foot-shock. This allows us to ask how the quality of an environmental cue associated with an aversive outcome in the ancestral generation (F0) is perceived and inherited by the F1 and F2 generations. We report that fear conditioning adult mice (F0 generation) to Acetophenone causes subsequently conceived F1 and F2 male offspring to display a behavioral sensitivity to Acetophenone, despite their having no prior exposure to this odor. Acetophenone is detected by the M71 odorant receptor in the Main Olfactory Epithelium and we find that the F1 and F2 generations have increased numbers of M71 neurons in the nose, and larger M71 glomeruli in the olfactory bulbs indicative of structural changes in the nervous system accompanying the behavioral sensitivity. Cross-fostering experiments and IVF experiments suggest that the transgenerational effects of ancestral olfactory experience are inherited at the behavioral and structural levels. These data lead us to conclude that pre-conception parental olfactory experience can profoundly influence how future generations navigate their olfactory space as adults. From a translational perspective, this work allows us to appreciate how ancestral experiences may influence the nervous systems of future generations potentially contributing to inherited risk for the manifestation of neuropsychiatric disorders such as phobias, anxiety, and Post Traumatic Stress Disorder (PTSD).

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