In Vivo fMRI Reveals Severely Disrupted Neural Connectivity in the Brain Following Exposure to Dangerous 'Bath Salt' Drug

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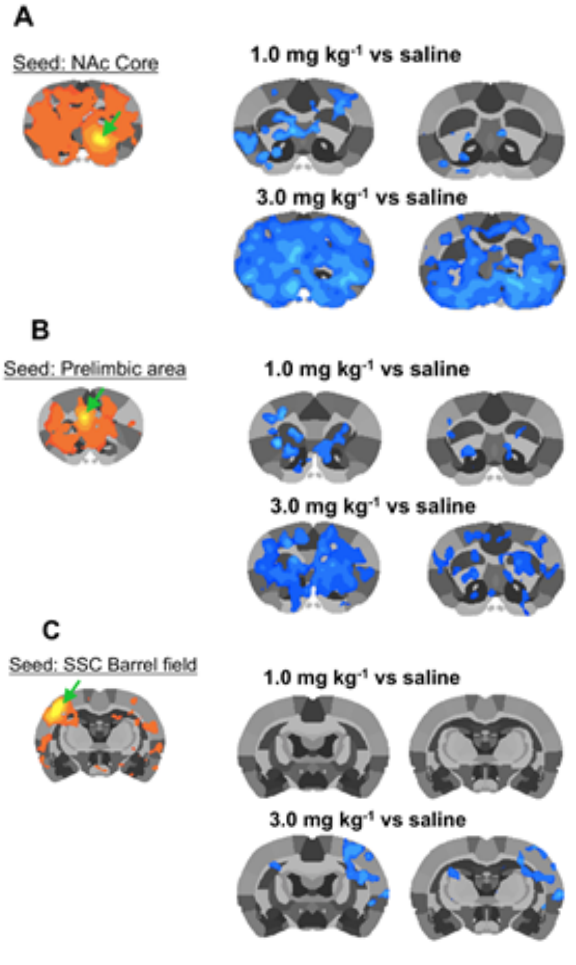
Designer synthetic drugs with potent addictive properties have emerged in recent years as a public health hazard. In particular, synthetic cathinones, also known as 'bath salt' drugs, have been shown to cause adverse effects on social, emotional and cognitive behavior. Based on the psychosis-like and hallucinatory effects of one of the most dangerous of these bath salt drugs, 3,4-methylenedioxypyrovalerone (MDPV), we hypothesized that it would elicit disruptive effects on the brain's resting-state neural networks.

Male rats were imaged following administration of a single dose of MDPV or saline. Dose levels were 0.3, 1.0, or 3.0mg of MDPV per kg body weight). Resting state brain fMRI, consisting of blood oxygenation level dependent (BOLD) images, were acquired at 4.7 Tesla.

Detailed functional neural connectivity analysis across 150 regions of interest in the rat brain revealed extensive disruption of connectivity, particularly between frontal cortical and striatal areas. *These results evidence a novel in vivo mechanism for the deleterious effects of MDPV as well as a biomarker that can be used to test the efficacy of potential treatments for the psychosis and longer term negative behavioral effects of these drugs.* Finally, this MagLab research advances the use of functional and structural neural connectivity analysis of drug addiction in animal models.



A 'bath salt' drug reduces functional connectivity with the living rat brain, in the (A) nucleus accumbens, (B) prelimbic cortex, and (C) somatosensory cortex. At left in (A)-(C) are shown composite statistical maps for each seed region. Green arrows show the seed region. At right, maps of functional connectivity contrast the effects of the MDPV bath salt drug versus saline, with the bath salt showing more extensive regions of low functional connectivity (the regions shown in blue).

Facilities: AMRIS Facility, 4.7 T

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