Subsecond dopamine changes during reward-related behavior

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Release of dopamine into the extracellular space has been highly implicated in motivated behavior. However, the specific behavioral elements to which it is linked are less clearly understood. This is chiefly because the components that make up the behavior occur in close temporal proximity (a few seconds), whereas classic neurochemical measurements in awake animals can only resolve chemical transmission on the order of minutes. One approach to circumvent this problem has been the use of elegant experimental designs that 'dissect' the behavior into motivational and reward components. While these approaches significantly advance our knowledge, they do not allude to the precision of the relationship between changes in dopamine and behavior, nor is it clear how well the results can be extrapolated to 'intact' behavior.
With the use of fast-scan cyclic voltammetry at carbon-fiber microelectrodes, dopamine can be detected and chemically resolved multiple times a second. We have applied this technology to record extracellular dopamine in the nucleus accumbens of behaving rats to elucidate the precise temporal relationship between dopamine changes and reward-related behavior. Data will be presented for rats making operant responses to obtain either a natural reinforcer (sucrose) or a drug of abuse (cocaine).

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