Multiscale modeling of drug use: from neurobiology to behavior and back.

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We present a pilot model that will integrate a number of existing theories and models of addiction at different scales: from neurobiology to behavior and epidemiology through modeling feedback loops and connections that span across temporal and physical scales. This framework is the first step to describe a "virtual substance user" which includes a 3D visualization of brain processes during craving, intoxication, and withdrawal phases. The model stems from an ongoing NIDA funded R01 project which describes the behavior of heroin addicts in the context of a heroin market. Neurobiology is modeled with a simple opponent process and drives daily behaviors of the users. At the same time, the dynamics of heroin market affects the neurobiological processes of the users and changes the patterns of use.