The reinforcing effects of acetaldehyde in the posterior ventral tegmental area of alcohol-preferring rats.

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Abstract

Acetaldehyde (ACD), the first metabolite of ethanol, is a biologically active compound, which may mediate some of the reinforcing, behavioral and neurotoxic effects of ethanol. The objective of this study was to test the hypothesis that ACD is reinforcing within the mesolimbic system. The intracranial self-administration (ICSA) technique was employed to determine whether ACD was reinforcing in the posterior ventral tegmental area (VTA), a site that supports the reinforcing actions of ethanol. Adult female alcohol-preferring (P) rats were implanted with guide cannulae aimed at the posterior VTA. Subjects were placed in two-lever operant chambers 7-10 days after surgery. Responding on the "active lever" on a fixed ratio 1 (FR1) schedule of reinforcement caused the delivery of 100 nl of infusate, whereas responses on the "inactive lever" were without consequences. Rats were assigned to one of five groups that self-administered either artificial cerebrospinal fluid (aCSF) throughout all eight sessions (4 h in duration) or 3- and 6-, 11- and 23-, 45- and 90- and 180- and 360-microM ACD for the eight sessions, with the lower concentration of ACD given for the initial four sessions and the higher concentration of ACD given for the last four sessions. A second experiment examined the acquisition (first four sessions), extinction (aCSF in sessions 5 and 6) and reinstatement using 90-microM ACD. A third experiment examined the effects of extending the time-out period (from 5 to 55 s) on the number and pattern of infusions of 23-microM ACD. Adult P rats readily self-administered 6-90-microM ACD and discriminated between the active and inactive levers. Furthermore, rats self-administering 90-microM ACD also demonstrated extinction behavior when aCSF was substituted for ACD and gradually reinstated active lever responding when ACD was reintroduced. P rats maintained similar numbers of infusions and infusion patterns under both time-out schedules. Overall, the data indicate that ACD is a potent reinforcer within the posterior VTA of the P rat.