Cannabis effects on driving lateral control with and without alcohol

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Received: March 20, 2015; Received in revised form: June 10, 2015; Accepted: June 11, 2015; Published Online: June 23, 2015
Altmetric 73
DOI: http://dx.doi.org/10.1016/j.drugalcdep.2015.06.015
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Highlights

- •We model cannabis' effects on driving lateral control via sophisticated simulator.
- •Models are based on blood THC and breath alcohol concentrations during driving.
- •THC increased standard deviation of lateral position (SDLP); 0.26 cm per μg/L THC.
- •Alcohol increased SDLP 0.42 cm per 0.01 g/210 L; additional lateral control measures.
- •During-drive 7–10 μg/L blood THC produced similar SDLP to 0.05 g/210 L breath alcohol.
- •Concurrent alcohol and cannabis produced additive rather than synergistic effects.

Abstract

Background

Effects of cannabis, the most commonly encountered non-alcohol drug in driving under the influence cases, are heavily debated. We aim to determine how blood Δ^9-tetrahydrocannabinol (THC) concentrations relate to driving impairment, with and without alcohol.

Methods

Current occasional (≥1×/last 3 months, ≤3days/week) cannabis smokers drank placebo or low-dose alcohol, and inhaled 500 mg placebo, low (2.9%)-THC, or high (6.7%)-THC vaporized cannabis over 10 min *ad libitum* in separate sessions (within-subject design, 6 conditions). Participants drove (National Advanced Driving Simulator, University of Iowa) simulated drives (~0.8 h duration). Blood, oral fluid (OF), and breath alcohol samples were collected before (0.17 h, 0.42 h) and after (1.4 h, 2.3 h) driving that occurred 0.5–1.3 h after inhalation. We evaluated standard deviations of lateral position (lane weave, SDLP) and steering angle, lane departures/min, and maximum lateral acceleration.

Results

In N = 18 completers (13 men, ages 21–37years), cannabis and alcohol increased SDLP. Blood THC concentrations of 8.2 and 13.1 μg/L during driving increased SDLP similar to 0.05 and 0.08 g/210 L breath alcohol concentrations, the most common legal alcohol limits. Cannabis-alcohol SDLP effects were additive rather than synergistic, with 5 μg/L THC + 0.05 g/210 L alcohol showing similar SDLP to 0.08 g/210 L alcohol alone. Only alcohol increased lateral acceleration and the less-sensitive lane departures/min parameters. OF effectively documented cannabis exposure, although with greater THC concentration variability than paired blood samples.

Conclusions

SDLP was a sensitive cannabis-related lateral control impairment measure. During drive blood THC ≥8.2 μg/L increased SDLP similar to notably-impairing alcohol concentrations. Despite OF's screening value, OF variability poses challenges in concentration-based effects interpretation.

Keywords:

Cannabis, Alcohol, Driving, Lateral control, THC, Oral fluid