

## Sympathetic nerve activity changes following acute exposures to electronic and tobacco cigarette smoking in humans

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**Background/Introduction:** Tobacco cigarette (TC) smoking acutely increases blood pressure and sympathetic nerve activity, whereas there are scarce data on the impact of electronic cigarette (EC).

**Purpose:** The aim of the study was to assess the acute effects of TC, EC and sham smoking on blood pressure, heart rate and sympathetic nervous system in healthy subjects.

**Methods:** We studied 12 normotensive male habitual smokers (mean age 33 years) free of cardiovascular disease. The study design was randomized and placebo controlled with 3 experimental sessions (sham smoking, tobacco cigarette smoking, and e-cigarette smoking) in random order, each session on a separate day. Subjects smoked 2 tobacco cigarettes containing 1.1 mg nicotine or simulate smoking (sham smoking) with the 2 cigarettes separated by 5 minutes. Additionally, participants smoked e-cigarettes for a period of 5 and 30 minutes. In all occasions, sympathetic drive was assessed by muscle sympathetic nerve activity (MSNA) (baroreflex-dependent) and skin sympathetic nerve activity (SSNA) (baroreflex-independent) based on established methodology (microneurography).

**Results:** After the first and second TC smoking, there was significant increase in mean arterial pressure (MAP) (by 6 and 8 mmHg, respectively, overall  $p < 0.001$ ) and heart rate (by 8 and 12 beats/minute, respectively,

overall  $p < 0.001$ ) compared to baseline. Similarly, EC smoking at 5 and 30 minutes compared to baseline was accompanied by augmentation of MAP (by 6 and 10 mmHg, respectively, overall  $p < 0.001$ ) and heart rate (by 5 and 9 beats/minute, respectively, overall  $p < 0.001$ ). Sham smoking was accompanied by a reduction in MAP after the first and second cigarette compared to baseline (by 2 and 4 mmHg, respectively,  $p = 0.001$ ), whereas there was no significant difference in heart rate ( $p = \text{NS}$ ). The first and second TC smoking was characterized by lower muscle MSNA (by 6 and 6 bursts/minute, respectively, overall  $p < 0.001$ ) compared to baseline, whereas SSNA was increased (by 9 and 10 bursts/minute respectively, overall  $p < 0.001$ ). Additionally, EC smoking at 5 and 30 minutes caused a decrease in MSNA (by 8 and 8 bursts/minute, respectively, overall  $p < 0.001$ ) and an augmentation in SSNA (by 7 and 9 bursts per minute, respectively, overall  $p < 0.001$ ) compared to baseline. Sham smoking had no significant effect on MSNA and SSNA ( $p = \text{NS}$  for both).

**Conclusions:** Sympathetic, pressor and heart rate unfavorable responses to EC smoking are similar to those elicited by TC in healthy subjects. Our findings provide novel insights into the negative impact of EC on cardiovascular system and support opinions recommending great caution concerning EC use.