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File: ■ Black Currant (*Ribes nigrum*, Grossulariaceae)
■ Immune Response
■ Smoking

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RE: Consumption of Black Currants before Smoking May Improve the Oral Immune Response of Healthy Smokers

Konić-Ristić A, Šavikin K, Zdunić G, et al. Acute effects of black currant consumption on salivary flow rate and secretion rate of salivary immunoglobulin A in healthy smokers. *J Med Food*. 2015;18(4):483-488.

Smoking has been shown to alter the content of saliva and potentially compromise the role of the oral immune response. Black currants (*Ribes nigrum*, Grossulariaceae) and other polyphenol-rich foods have been shown to have beneficial effects on oral health, including antioxidant and antimicrobial effects. The aim of this consecutive intervention study was to investigate the acute time-dependent effects of smoking and black currant consumption on immunological parameters of saliva, including salivary flow rate (SFR), salivary immunoglobulin A (sIgA) concentrations, and sIgA secretion rates (sIgA SRs), from healthy smokers.

All subjects in the study had a history of smoking (>10 years and had >10 cigarettes in the last year). Subjects were excluded if they had health problems, including poor oral health and immunological problems; consumed antioxidants/supplements or alcohol (>20 g alcohol/day); or performed intense physical activity. The study was conducted at the Centre of Research Excellence in Nutrition and Metabolism (CENM) of the Institute of Medical Research at University of Belgrade in Belgrade, Serbia.

A total of 8 subjects (mean age, 34.4 ± 2.5 years; 7 females and 1 male) participated in the study. For the 48 hours before the study, subjects were instructed not to consume any foods containing anthocyanins (e.g., berry fruits, red-colored vegetables) and not to exercise excessively.

After an overnight fast, the first saliva samples were taken from the subjects before the experiment and were identified as time 0 (T0). They were then provided 1 cigarette to smoke (intervention 1 [i-1]), and saliva samples were taken at 5, 30, and 60 minutes (T5, T30, and T60) after i-1. Subsequently, subjects were provided with a test meal consisting of 100 g of black currant berries (obtained from a commercial orchard in western Serbia). Subjects were instructed to wash their mouth afterwards and then

smoke the second cigarette (i-2), after which saliva samples were obtained at T5, T30, and T60. Then for i-3, subjects were provided a 100-g meal of black currant berries, but no cigarette. Saliva samples were obtained only at T5 for i-3.

SFR was calculated by dividing the sample volume (mL) with the time (min) taken to produce it. sIgA concentrations also were measured. sIgA SRs were calculated by multiplying values of sIgA concentrations and SFRs.

Overall, a significant difference was found for SFR when the 8 time points were evaluated by repeated-measures analysis of variance (ANOVA) ($P<0.0005$). Post hoc analysis of i-1 indicated SFR was reduced at all time points compared to baseline, but was significantly reduced only at T60 ($P=0.03$). When black currant intake preceded smoking (i-2), a nonsignificant increase in SFR at T5 was observed in comparison to T60 from i-1 ($P=0.074$). All other time points in i-2 were not significantly different from T5 in i-2. Consuming the black currant meal alone (i-3) resulted in a significantly higher SFR at T5 in comparison to all other time points assessed in the study ($P<0.01$).

Repeated-measures ANOVA of the time points indicated both sIgA concentrations and sIgA SR values also had significant differences ($P<0.008$ and $P<0.02$, respectively). All 3 times points after smoking (i-1) were not significantly different than baseline for both sIgA and sIgA SRs. After the addition of the black currant meal in i-2, a significant decrease of both sIgA concentrations and sIgA SRs was observed at T5 in comparison with T5 from i-1 ($P=0.09$) and baseline ($P=0.046$), respectively. All other time points and comparisons with i-1 and i-2 indicated a decreasing trend for sIgA only. At T60 in i-2, sIgA SR values were significantly higher than T5 in i-2 ($P=0.025$). For the last intervention (i-3), which included the black currant meal without a cigarette, there were no significant differences observed at T5 in relation to any of the time points in the study for both sIgA and sIgA SRs.

It was also found that there was a significant negative correlation between sIgA concentrations and SFR, irrespective of time ($r=-0.507$, $P<0.001$).

The results of this study indicate that black currants may improve the oral immune response of smokers. Specifically, the authors suggest that consuming a meal of black currants before smoking will prevent the reduction of SFR. However, this was not supported by a significant change, but only by an increasing trend. Consuming black currants before smoking did significantly increase sIgA concentrations and sIgA SR values, 5 minutes post intervention. Although these results suggest black currants may improve the oral immunological status of smokers, larger studies are warranted that investigate additional parameters that better define the immune-modulating effects of these berries.

—Laura M. Bystrom, PhD

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