

## Study: No-fat, low-fat dressings don't get most nutrients out of salads

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The vegetables in salads are chock-full of important vitamins and nutrients, but you won't get much benefit without the right type and amount of salad dressing, a Purdue University study shows.

In a human trial, researchers fed subjects salads topped off with saturated, monounsaturated and polyunsaturated fat-based dressings and tested their blood for absorption of fat-soluble carotenoids — compounds such as lutein, lycopene, beta-carotene and zeaxanthin. Those carotenoids are associated with reduced risk of several chronic and degenerative diseases such as cancer, cardiovascular disease and macular degeneration.

The study, published early online in the journal *Molecular Nutrition & Food Research*, found that monounsaturated fat-rich dressings required the least amount of fat to get the most carotenoid absorption, while saturated fat and polyunsaturated fat dressings required higher amounts of fat to get the same benefit.

"If you want to utilize more from your fruits and [vegetables](#), you have to pair them correctly with fat-based dressings," said Mario Ferruzzi, the study's lead author and a Purdue associate professor of food science. "If you have a salad with a fat-free dressing, there is a reduction in calories, but you lose some of the benefits of the vegetables."

In the test, 29 people were fed salads dressed with butter as a saturated fat, canola oil as a monounsaturated fat and corn oil as a polyunsaturated

fat. Each salad was served with 3 grams, 8 grams or 20 grams of fat from dressing.

The soybean oil rich in polyunsaturated fat was the most dependent on dose. The more fat on the salad, the more carotenoids the subjects absorbed. The [saturated fat](#) butter was also dose-dependent, but to a lesser extent.

Monounsaturated fat-rich dressings, such as canola and olive oil-based dressings, promoted the equivalent carotenoid absorption at 3 grams of fat as it did 20 grams, suggesting that this lipid source may be a good choice for those craving lower fat options but still wanting to optimize absorption of health-promoting carotenoids from fresh vegetables.

"Even at the lower fat level, you can absorb a significant amount of carotenoids with monounsaturated fat-rich canola oil," Ferruzzi said. "Overall, pairing with [fat](#) matters. You can absorb significant amounts of carotenoids with saturated or polyunsaturated fats at low levels, but you would see more carotenoid absorption as you increase the amounts of those fats on a salad."

The findings build on a 2004 Iowa State University study that determined [carotenoids](#) were more bioavailable — absorbed by the intestines — when paired with full-fat dressing as opposed to low-fat or fat-free versions. Ferruzzi; Wayne Campbell, a Purdue professor of nutrition science; Shellen Goltz, a Purdue graduate student in food science; and their collaborators, Chureeporn Chitchumroonchokchai and Mark L. Failla at Ohio State University, are the first to study different types of fats in differing amounts in human subjects.

Ferruzzi and colleagues will next work on understanding how meal patterning affects nutrient [absorption](#). He is trying to determine whether people absorb more [nutrients](#) if they eat vegetables at one time or if

consumption is spread throughout the day.

**More information:**

## **ABSTRACT**

### **Meal Triacylglycerol Profile Modulates Postprandial Absorption of Carotenoids in Humans**

Shellen R. Goltz, Wayne M. Campbell, Chureeporn Chitchumroonchokchai, Mark L. Failla, Mario G. Ferruzzi

**Scope:** Dietary lipids are considered to be primary potentiators of carotenoid absorption, yet the amount and source required to optimize bioavailability has not been systematically evaluated. The objective of this study was to examine the impact of both amount and source of triacylglycerols on postprandial absorption of carotenoids from vegetable salads.

**Methods and results:** Healthy subjects ( $n = 29$ ) were randomized using a Latin square design ( $3 \times 3$ ) and consumed three identical salads with 3, 8 or 20 g of canola oil, soybean oil or butter. Blood was collected from 0–10 h and triacylglycerol-rich fractions (TRLs) were isolated by ultracentrifugation. Carotenoid contents of TRL fractions were analyzed by HPLC-DAD. Considering all lipid sources, 20 g of lipid promoted higher absorption compared to 3 and 8 g for all carotenoid species (p

**Conclusion:** While both amount and source of co-consumed lipid affect carotenoid bioavailability from vegetables, amount appears to exert a stronger effect.

Provided by Purdue University

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