

Hiding vegetables in kids' foods can increase vegetable intake

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Preschool children consumed nearly twice as many vegetables and 11 percent fewer calories over the course of a day when researchers Penn State added pureed vegetables to the children's favorite foods.

"Childhood [obesity rates](#) are on the rise, and at the same time children are not eating the recommended amount of vegetables," said Barbara Rolls, holder of the Helen A. Guthrie Chair in [Nutritional Sciences](#).

"Vegetables have been shown to help lower [calorie intake](#). The problem is getting kids to eat enough vegetables."

In their study, the researchers served vegetable-enhanced entrées to 39 children between the ages of 3 and 6 on three separate days. They tested three familiar foods -- zucchini bread for breakfast, pasta with a tomato-based sauce for lunch and chicken noodle casserole for dinner. The team modified the standard recipes for these foods by adding a variety of puréed vegetables to reduce the calories in the entrées by 15 percent and 25 percent.

"We incorporated several vegetables into the dishes, including broccoli, cauliflower, zucchini, tomatoes and squash," said Maureen Spill, a post-doctoral fellow in nutritional sciences and the study's lead author. "We were pleased to find that the children found the vegetable-enhanced versions to be equally acceptable to the standard recipes."

According to Spill, the children ate the same weight of food regardless of the vegetable content of the entrées. And when they ate the vegetable-

enhanced entrées as opposed to the standard-recipe entrées, their daily [vegetable intake](#) nearly doubled while their calorie intake decreased by 11 percent. The team's findings are online today in the *American Journal of Clinical Nutrition*.

Rolls and Penn State colleagues Alexandria Blatt, a recent Ph.D. recipient and Liane Roe, a researcher, both in nutritional sciences, found similar results when they served vegetable-enhanced entrées to adults. That work appeared in the April 2011 issue of the *American Journal of Clinical Nutrition*.

"Regarding [children](#), some people argue that hiding vegetables in foods is deceptive and that doing so suggests that whole vegetables are not acceptable," said Rolls. "But I don't agree. Parents modify recipes all the time. For example, it is well-accepted that applesauce can be used to replace oil in cake batter."

Spill noted that serving vegetables both within entrées and as side dishes is a great way to increase daily vegetable intake even more. "Preparing vegetable-enhanced entrées is a technique that should be used with other strategies, such as providing vegetables as snacks and side dishes. Together these strategies can substantially increase children's vegetable intake while also teaching them to like [vegetables](#)."

Provided by Pennsylvania State University

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