

# *Science You Can Use*

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**Dear Science:** A health-food company that advertises on TV claims that its products – dried fruits and vegetables in capsule form – can help you get your daily fruits and vegetables if you don't have time to eat the “real thing”. Is this true? -- Buck R.

**Dear Buck:** Let's call what the company you mention sells “Fruits and Vegetables in Capsules” (FVCAPS). Then the short answer to your question is: “It depends on what the seller means by ‘helps’”, and the seller isn't saying. To put this problem in perspective, let's look in turn at

1. What the FVCAPS seller is selling.
2. Whether there is a daily need for fruits and vegetables.
3. Whether is possible to determine how well FVCAPS meets your daily nutritional requirements.
4. Whether FVCAPS are safe to consume.
5. Whether it is possible to compare the price of the ingredients in FVCAPS to the price of their fresh equivalents.

*What is the FVCAPS seller selling?* Based on the seller's literature, FVCAPS are made by “freeze-drying” fruits and vegetables, then grinding the resulting freeze-dried material to a fine powder, then packaging the resulting powder in a cellulose capsule. The fruit FVCAPS contain only dried, powdered fruit; the vegetable FVCAPS contain only dried, powdered vegetables.

The seller claims that “veggie” FVCAPS contain broccoli, cabbage, carrot, cauliflower, cayenne pepper, celery stalk, garlic, kale, onion, shiitake mushroom, soybean, spinach, sweet potato, wheatgrass, and zucchini. The seller says that the “fruit” FVCAPS contain aloe vera, apple, banana, blueberry, cherry, cranberry, grape, grapefruit, lemon, mango, orange, papaya, pineapple, raspberry, strawberry, and tomato.

The labels on the seller's packaging says that each FVCAPS capsule contains about two grams of freeze-dried, powdered fruit or vegetable matter. The weight of the fresh equivalents of the freeze-dried fruits and vegetables in FVCAPS is about 20 times the freeze-dried weight. This means that one capsule of FVCAPS is nutritionally equivalent to 40 grams of fresh ingredients of the same kind.

For the sake of the analysis, let's assume that freeze-drying and powdering fruits and vegetables loses none of the nutritional value of their fresh equivalents.

*What is your daily need for fruits and vegetables?* This is a loaded question: it assumes that you have a daily requirement *specifically* for fruits and vegetables. What our bodies actually require are specific amounts of specific vitamins and minerals (and carbohydrates, protein, soluble fiber, and fat) each day. The US Food and Drug Administration maintains a quantitative

list of these requirements (see US Food and Drug Administration, “Daily Value and Percent Daily Value: Changes on the New Nutrition and Supplement Facts Labels”, <https://www.fda.gov/media/135301/download>). How we meet these minimum daily requirements can vary. In theory, it would be possible to create a concoction that met our daily nutritional requirements but contained nothing we would recognize as “ordinary” food, including fruits, vegetables, meats, bread, rice, etc. For example, some “vitamin” pills can meet all the FDA minimum daily requirements for vitamins and minerals. In everyday life, of course, we typically eat fruits and vegetables to obtain our minimum daily requirements of minerals, vitamins, and part of the soluble fiber we need.

*Is it possible to determine how well FVCAPS meets your daily needs?* No. The seller provides no information about how much of each fruit, or vegetable, is in their product. Without this information, it is impossible to determine how well FVCAPS meets your minimum daily needs.

The FVCAPS seller’s literature in fact dodges this question, by saying, “You can always eat more fruits and vegetables.” That comment, taken literally, is of course wrong: there really is a limit to how many cayenne peppers, or prunes, you could ingest in a day.

*Is it safe to consume FVCAPS?* The short answer right now is that FVCAPS have no known harmful effects on people who are in good health, who are not taking any medications, and who have no allergies to the ingredients in FVCAPS. If you are taking medications, or have any health problems or allergies, consult with your doctor to determine whether it is safe to consume FVCAPS.

*Is it possible to compare the price of the ingredients in an FVCAPS capsule with the price of the fresh counterparts of those ingredients?* Because the seller does not provide any information about the *quantity* of any ingredient in FVCAPS, it is not possible to make this comparison.

The problems that arise in answering questions (1) and (3)-(5) above are not unique to FVCAPS. The sellers of many over-the-counter “dietary-supplement” products (other than vitamin pills) typically do not provide enough information to answer these questions, and currently (September 2023), the law does not require sellers to disclose that information. FVCAPS, in fact, satisfies all the current labeling requirements for products of its kind.

For further information, see US Food and Drug Administration, “Is It Really ‘FDA Approved’?”, <https://www.fda.gov/consumers/consumer-updates/it-really-fda-approved>.

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*Jack Horner is a systems engineer. Thanks to Clancey Maloney for suggesting this topic.*