

Effect of Chronic Vitamin D Enriched Mushroom Intake on Anthropometric Measures and Quality of Life in Older Men and Women



Kelsey E. Clark¹, Lauren E. Zakroczemski¹, Brian T. Williams², Harold W. Burton¹, Amy Millen³, and Peter J. Horvath¹

¹Dept. of Exercise and Nutrition Sciences, ²Dept. of Physiology and Biophysics, ³Dept. of Epidemiology and Environmental Health



Abstract

Vitamin D intake has been shown to be beneficial in weight management and quality of life. To determine the effect of chronic vitamin D enriched Portabella mushroom intake on anthropometric measures and quality of life in older men and women, seventeen subjects, six men and eleven women between 36 and 66, were screened for vitamin D levels and general health. They were randomized to take either 2 large vitamin D enriched portabella mushroom caps with approximately 14,000 IU D2 (Vit D) or 2 unenriched portabella mushroom caps (control) a week for twelve weeks. Anthropometric measures (weight, BF%, BMI, LBM) and quality of life surveys (Yale Physical Activity Survey, SF36v2-general health survey, CES depression survey, and a 3 day diet record) were taken at baseline and again after 12 weeks. The group taking enriched mushrooms lost an average of 1.7 kg in body weight ($p=0.02$) primarily due to a 1.5 kg body fat loss with no change in lean muscle mass. Quality of life measurements did not change throughout the duration of the study. We conclude chronic mushroom intake may lead to reduced body weight and body fat.

Background

Vitamin D, known for bone health, has a role in the prevention/relief of chronic diseases (cancer, diabetes, heart disease). There are two isomers of vitamin D; D2 and D3. D3 is made by skin exposure to ultraviolet B light (from an animal sterol, cholesterol.) D3 is also obtained from supplements, a limited number of foods (e.g., fish, eggs), and fortified foods (e.g., milk and milk products, beverages, margarine, cereals). D2 is derived from ergosterol by exposure to UV B light with mushrooms being the main non-animal source. D2 content varies widely between mushroom preparations from 8 IU/g in sundried Portabella to 461 IU/g UV B in Portabella. Serum 25-hydroxyvitamin D (25(OH)D) is the preferred biomarker for D status. About 90% of circulating 25(OH)D is from D3 (9) and is reduced at latitudes as far north as Buffalo (~43°N latitude) with little synthesized from November to April. Aside from being an excellent vehicle for dietary vitamin D intake, mushrooms are low in calories, fat-free, cholesterol-free and very low in sodium. They provide important nutrients, including selenium, potassium, riboflavin and niacin. Recent research has also shown that increasing intake of low-energy-density foods (meaning few calories given the volume of food), specifically mushrooms, in place of high-energy-density foods, like lean ground beef, may be an effective method for reducing daily energy and fat intake while still feeling full and satiated after the meal.

Purpose

- To determine if consumption of vitamin D enriched mushrooms improves vitamin D status.
- To determine if consumption of vitamin D enriched mushrooms alters body composition and quality of life measures.

Hypothesis

- Consumption of vitamin D enriched mushrooms for 12 weeks will improve vitamin D status.
- Consumption of vitamin D enriched mushrooms for 12 weeks will improve body composition and quality of life measures.

Funding

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Methods

Study participants, consisting of older (36-66 yrs.) generally healthy males and females of various ethnic backgrounds were screened for vitamin D levels and general health. Vitamin D insufficient ($<30\text{ng/mL}$ 25 (OH) D) participants were randomized into either a control group who consumed "placebo," unenriched Portabella mushroom caps or an experimental group who consumed enriched Portabella mushroom caps with approximately 14,000 IU D2 (Vit D). Each group received 2 large mushroom caps a week over the course of twelve weeks. Body composition, circulating 25(OH)D levels and overall health measures were evaluated at the initial screening visit and at the completion of the study (12 weeks). Anthropometric measures were taken including weight, body fat %, body mass index, and lean body mass. Health measures included questionnaires on skin type, sun exposure, Food Frequency Questionnaire, and physical activity (Yale Physical Activity Survey, YPAS). YPAS will allow for energy expenditure estimation and activity type determination. Quality of Life was assessed using the 36 question SF-36 survey which is a previously validated health survey which provides functional health status and well-being with physical and mental summaries. The CES depression survey was also given to measure the subjects' general depression levels.

Image 1. Bod Pod



Image 1. Bod pod- used for body composition measures

Table 1. Participant Demographics

Subject Characteristics (n=17)	Mean ± SD
Characteristics	
Age (y) 6 Males, 11 Females	53.6 ± 9.8
Height (m)	1.67 ± 0.16
Weight (kg)	87.3 ± 26.0
Body Mass Index	32.2 ± 10.6
Body Fat (%)	32.3 ± 12.5
Vitamin D (25 OH D) (ng/mL)	23.1 ± 5.9

Participant demographics showing enrolled subjects who passed the study screening.

Results

Figure 1. Vitamin D Status Changes

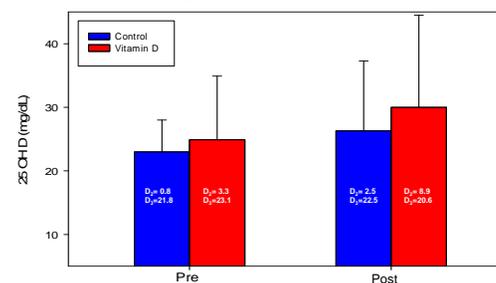


Fig. 1. Vitamin D Status Changes The control group improved D status from a mean ± SEM of 23.0 ± 5.0 Pre to 24.9 ± 10.0 Post and VitD group improved 26.3 ± 11.0 Pre to 30.0 ± 14.5 Post.

Results

Figure 2. Body Composition Changes

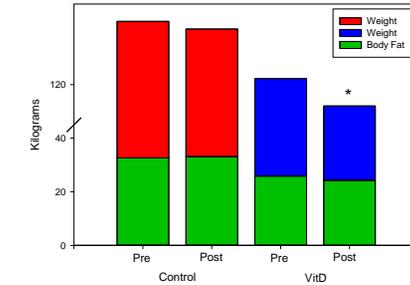


Fig. 2. Body composition changes. Body weight changes between pre and post mushroom supplementation. There was a significant reduction in body weight in the Vitamin D group ($p=0.02$). This change was due to the loss of fat mass, which trended toward significance in the Vitamin D group. Lean muscle mass was not changed. * $(p<0.05)$.

Figure 3. 25 OH D status vs. SF-36v2 Physical Health Scores

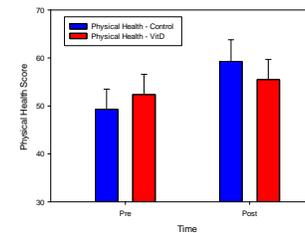


Fig. 3- Serum 25 OH D status vs. Physical Health score adjusted for gender and age. Results were not significantly different.

Figure 4. 25 OH D status vs. SF-36v2 Mental Health Scores

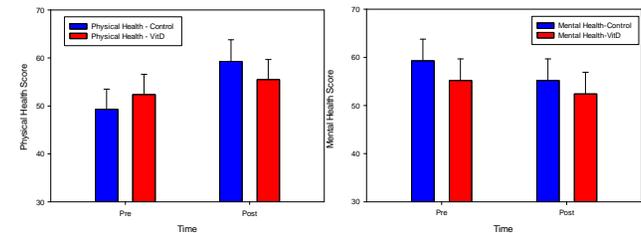


Fig. 4- Serum 25 OH D status vs. Mental Health score adjusted for gender and age. Results were not significantly different.

Table 2. Quality of Life Survey Results

Quality of Life Survey Results	Control-Pre	Control-Post	Vitamin D-Pre	Vitamin D-Post
Yale Physical Activity Survey (kCal)	8891 ± 2653	6419 ± 2653	11803 ± 2814	12016 ± 2814
CES Depression Survey	4.67 ± 1.38	6.04 ± 1.38	5.75 ± 1.47	6.25 ± 1.47
Three Day Diet Record (kCal)	1792 ± 204	1814 ± 204	1898 ± 217	1976 ± 217
SF36 Physical Health	49.3 ± 4.2	50.4 ± 4.2	52.4 ± 4.2	55.5 ± 4.2
SF36 Mental Health	59.3 ± 4.5	55.2 ± 4.5	55.2 ± 4.5	52.4 ± 4.5

Participant survey results showing pre and post study data for both Control and VitD groups.

Summary

This study showed that Vitamin D enriched mushrooms may positively effect body composition. The participants lost weight which was primarily due to a decrease in their body fat. The participants did not change their average daily caloric intake or expenditure throughout the study, showing that their body composition changes may be due to the increased Vitamin D2 intake.