VITAMIN D ENHANCEMENT IN MUSHROOMS USING PULSED LIGHT

Increasing Awareness of Vitamin D Nutritional Value

Research shows that vitamin D enhances the absorption of calcium and magnesium – making it critical for healthy bones and teeth. New studies are reporting vitamin D will also reduce the risk of breast cancer, colon cancer, prostate cancer, autoimmune disease and cardiovascular disease. However, there is increasing concern that a critical deficiency of vitamin D exists in infants and adults. Adding to that concern are studies that suggest there is a need to increase the current Recommended Daily Allowance (RDA).

Obtaining Vitamin D – a Challenge for Many

Over 40% of American adults are deficient in Vitamin D. The body can make adequate vitamin D providing it is exposed to enough sunlight. It does not have to rely on dietary sources until sunlight exposure is low, such as in winter, or in people who purposely reveal little skin to the sun or have dark skin. Getting 100% of your vitamin D needs from food alone has been hard. Natural food sources for vitamin D are limited to a few animal sources, such as some fish and fish liver oils. A few foods, such as milk, cereal, and some fruit juices are fortified with vitamin D. Mushrooms have a natural level of ergosterol and when exposed to sunlight they synthesize vitamin D2 just like humans do.

Mushrooms as a Source of Vitamin D

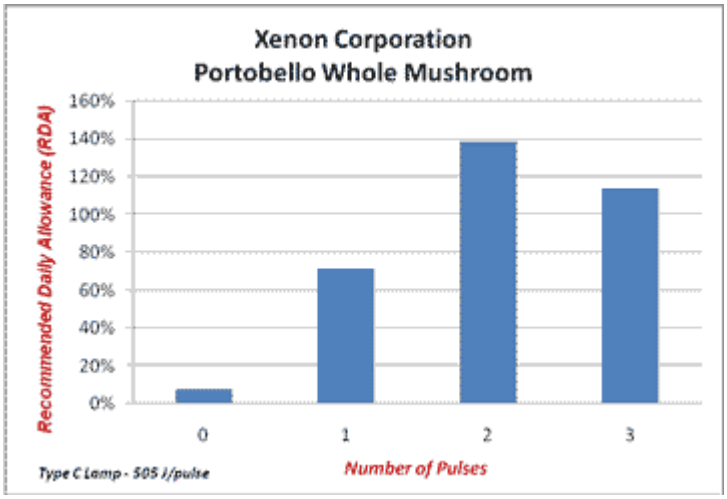
Mushrooms are the only non-animal food that can provide Vitamin D, but usually only in small amounts. Mushrooms have relatively high levels of ergosterol, which, when exposed to UV light gets converted to ergocalciferol (known as vitamin D_2). A study performed by the United States Department of Agriculture [(1)] demonstrated how continuous UV exposure can accelerate vitamin D in mushrooms – achieving levels > 100% RDA in 8 minutes of exposure time. Work done by The Pennsylvania State University [(2),] using pulsed light, demonstrated that vitamin D can be increased >100% RDA in under 4 seconds.

(1) Journal of Agriculture and Food Science; *Vitamin D_2 Formation From Post-Harvest UV-B Treatment of Mushrooms (Agaricus bisporus) and Retention During Storage*; June 2008)

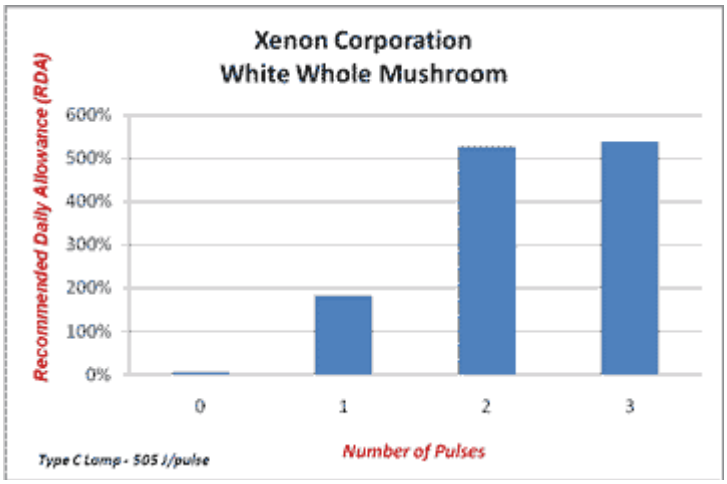
(2) Mushroom Short Course; *Mushroom Nutritional Research*; Dr. Robert Beelman Professor of Food Science, The Pennsylvania State University; June 2008

Study on Portobello and White Mushrooms using Pulsed Light

Results from tests performed at Xenon Corp's lab in Wilmington, MA on Portobello and White mushrooms, show that as few as 2-pulses, applied in under one second (3 pulses/second flash rate), increase vitamin D to over 100% RDA. The system used for this study was a commercially available model RC-847 controller and 16-inch lamp housing, model LH-840. These results are shown below.



Vitamin D Enhancement for Portobello Mushrooms



Vitamin D Enhancement for White Whole Mushrooms

Comparison of Pulsed Light and Continuous UVB Light

Studies were performed by the Process Foods Research Unit at the USDA-ARS, Western Regional Research Center in Albany, CA focused on the effect of higher continuous UVB light intensity on mushrooms when delivered over a short time. Results of this study demonstrated a higher UVB light intensity delivered over 8 minutes will produce an equivalent amount of vitamin D_2 when compared to long periods of low intensity UVB exposure. Studies performed at Pennsylvania State University and Xenon Corp's lab, using high peak energy pulsed light, demonstrated achieved vitamin D levels in mushrooms RDA >100% in only seconds. Pulsed light accomplished in seconds what required minutes when UVB lamps were used.

Deployment of Pulsed Light System in Mushroom Processing

Xenon Corp's 16-inch pulse light lamp housing, mode LH-840 is easily mounted over an existing in-line conveyor system moving fresh mushrooms from the cleaning/cutting area to the packaging area. This results in significantly reduced handling when compared to UVB lamp systems typically mounted off-line over a mushroom growing bed. In addition to the longer exposure time required for UVB lamps, on the order of 8 minutes, added handling is required to move mushrooms from the UVB exposure beds to the conveyor.

Pulsed Light system used today for Vitamin D enhancement

Dole Mushrooms (USA) has been using the RC-847/LH-810 system to treat Portobello mushrooms.