Robert Beelman, PhD

Education: PhD, The Ohio State University, PhD Food Technology, 1970; MS, The Ohio State University, MS Food Technology, 1967; BS, Capital University, BS Biology, 1966

Research Interests: General area of research interest involves development of cultural and postharvest practices for fruit, vegetable and mushrooms to improve their composition, quality, stability and safety of food products produced from them. Recent research has focused on development of methods to enhance the levels of important bioactive components of cultivated mushrooms in order to improve their nutritional/and or medicinal value. For example, commercially practical methods have been developed to enhance the levels of selenium, ergothioneine and ergocalciferol (vitamin D_2) that can make mushrooms, or their products, as the best sources of these compounds in a plant-based diet.

Selenium levels can be increased to predictable levels by the addition of sodium selenite to the growth substrate via addition to commercially-produced compost supplements, and the mushrooms incorporate the selenium into organic form, mostly selenomethione. Selenium-enriched fresh mushrooms can be can be cultivated as an excellent dietary source of selenium, or they can be enriched to very high levels that can be used as dietary supplements or food ingredients that can be employed to enrich other food products with selenomethione.

Ergothioneine (Ergo) is a very stable and potent antioxidant that is produced in nature only by fungi and a few Mycobacteria. Apparently, Ergo gets into the food chain via plants that take it up from fungi growing in the soil. We recently demonstrated that Ergo is concentrated in mushrooms to levels that make mushrooms by far the best known dietary source. We have identified cultural methods to enhance the levels of Ergo beyond what is naturally present. Since Ergo is the only known dietary antioxidant that has its own genetically-coded transporter in humans, considerable interest has arisen from researchers worldwide to investigate its physiological function and possible nutritional role. Most recent research indicates that it protects developing erythrocytes against damage from ferryl hemoglobin, a highly reactive intermediate in auto-catalytic oxidation that leads to heme degradation. This led German pharmacology researchers to conclude "a lack or Ergo may represent a precipitating factor in the genesis of chronic inflammatory diseases" and, "supplementation of Ergo could provide a new therapeutic strategy for chronic inflammatory diseases."

Current research is also focused on developing practical methods to enrich mushrooms with vitamin D_2 by converting naturally-present ergosterol to ergocalciferol (vitamin D_2) by exposure to UV light. We pioneered the use of Pulsed UV light to do this rapidly and effectively. Mushrooms with 200 percent of the current RDA for vitamin D can be produced in one second of postharvest exposure to a Xenon Corp UVB bulb, without any adverse effects on product quality.