Short communication

Whey protein isolate could be used both for functional foods development and as an alternative material for flavor encapsulation

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Abstract:

Introduction: The rise of nutrition-related diseases these last decades, has led to various modifications changes in food consumption and nutritional habits. The consumer perception that the food we consume directly affects our health has increased the demand for food with oriented value (health promoting effect) added. However, these foods sometimes don't match consumer acceptability due to many factors including some modifications in overall flavor by reducing aroma compound intensity or producing off-flavor components. In regard to the latest trend oriented towards the production of foods gathering both health-promoting effect and consumer's acceptability, this paper aims at bringing up to view the possibility of developing value-added foods that promote consumer's health benefits and enhance acceptability through the release of flavor at the desired place.

Keywords: whey protein isolate, functional food, flavor, Encapsulation.

INTRODUCTION

The last decades have been marked by an increasing rate of various public health related problems; such as obesity and its related consequences (WHO, 2014). Several studies have reported that, the rate of obesity have doubled between 1980 and 2015 in more than 70 countries with a prediction of a rise of up to 1.35 billion and 537 million people that will be overweight and obese respectively, by 2030 [1-3]. This prediction sounds alarming and will definitively have a socio-economic impact that needs to be avoided. A possible strategy will be to consume food items that have the potential to control appetite with different satiety responses based on calorie contents and different macronutrient compositions [4,3]. Indeed, proteins induce the highest satiety feeling while fats cause the lowest. High fat diets and diets containing high amounts of simple sugars suppress the reward system (DEFINE REWARD SYSTEM), increase the expression of neuropeptide Y (NPY), and decrease Pro-opiomelanocortin (POMC) in the hypothalamic arcuate nucleus whereas, proteins induce satiety through increasing POMC and activating the melanocortin pathway [5]. The type and quality of protein may determine its ability to control appetite. It has been shown that diets high in milk and dairy products could prevent weight gain[3,6]. Furthermore, whey protein is more effective than casein, soy, and egg albumin in suppressing hunger and reducing food intake. Indeed, known as the soluble class of dairy proteins, Whey protein represents 20% of the total bovine milk protein [7] and is used in the food industry as an immune-enhancing constituent due to its range of bioactive functions such as prebiotic effects, promotion of tissue repair, maintenance of intestinal integrity, destruction of pathogens, and elimination of toxins [8,7].

Along the same line, studies previously conducted by [9,10] 1991 highlighted Whey Protein's ability to produce glutathione (GSH) and the fact that cysteine is the limiting amino acid for the production of intracellular GSH making them an interesting potential dietary adjunct for cancer patients. Through its associated enzymes, GSH has a major role in cell protection against free radicals, ionizing radiation, reactive oxygen species, and carcinogens [11,7]. Moreover, it can be used as a basis for many other applications like encapsulation; a process aiming at protecting different compound such as flavor component from its environment until release or interaction is desired. In the dairy and food industries, encapsulation technology is used for stabilizing sensitive components, controlling the release of core materials like flavor and physically separating reactive or incompatible ingredients and thereby increasing product shelf life [12].

Flavor is among the most valuable ingredients in any food formula. Indeed, flavor plays an important role in both consumer satisfaction and further consumption of foods. Its stability in different foods has been of increasing interest due to its link with the quality and acceptability of foods. However, various factors such as manufacturing and storage processes, packaging materials, and ingredients in foods often affect the overall flavor by rather reducing aroma compound intensity or producing off-flavor components. In regard to the latest trend oriented towards the production of foods gathering both health-promoting effect and consumer's acceptability, different methods to protect the bioactive compound used have been suggested and tested over the past years. One of them is encapsulation which is defined as a process in which small solid particles, or droplets of liquids or gases, are separated from other particles and from the external medium using a thin film or a vesicular system.

This process can mainly be physical, chemical or electrostatic adsorption to the surface of metal particles [13-15]. A wide range of coating materials including celluloses, gums, lipids, phospholipids and whey protein isolate can be used in the field of food and nutraceuticals. Indeed, protein-based polymers have superb features owing to their high drug-binding capacity and biodegradability. Whey protein is a versatile protein-based vehicle for drug delivery systems. It has been shown to be non-toxic, biocompatible, and biodegradable. Therefore, it has been considered as an ideal biomaterial for the design of advanced drug delivery systems. Protein-based cargo acts as a synthetic polymers counterpart for innovative delivery systems. However, depending on the carrier material and the method used, encapsulation may provide several advantages to the encapsulated compounds and the by-product as well. Some of these advantages and benefits concerning the food sector include the reduction of toxicity, sustained release, moisture stability, targeted delivery, prolonged shelf-life, improvement of texture and flavor, reduction of side effect and improvement of bioavailability. Despite the advantages provided by the different carriers, some of them are highly sensitive to temperature and pH variations. Consequently, more investigations have to be carried out on the use of compounds that stabilize and modify vesicle structures and also improve the production and storage methods that minimize the disadvantages and stimulate their use by the food industry.

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