Nanolaminated Coatings of Microemulsion for Better Delivery of Bioactives in Foods

The prevention of human diseases through diet, rather than the treatment of diseases after their development, could have great potential health and financial benefits for society. There are a number of diseases that can be prevented or treated by delivering food-grade bioactive functional components to specific locations within the gastrointestinal tract. For example, a number of natural and synthetic compounds have been found to be effective at either treating and/or preventing various types of colon disease, such as Crohn disease, ulcerative colitis, and colorectal cancer. To exhibit these beneficial health effects, these bioactive compounds usually have to be present in an active form and at sufficiently high levels at the site-of-action (*i.e.,* in this case the colon). Nevertheless, many of these bioactive agents cannot be utilized because they cannot be conveniently delivered to the colon at sufficiently high concentrations.

Dr. Julian McClements and his team at University of Massachusetts have developed a novel nanotechnology based method of delivering bioactive components to different regions of the gastrointestinal tract. Nano-laminated coatings, fabricated from dietary fibers and/or proteins, are formed around tiny lipid droplets that carry the encapsulated bioactive agent. These nano-laminated coatings can be designed so that they protect the encapsulated component until it needs to be delivered at a particular location within the GI tract. These delivery systems can be fabricated entirely from food-grade components (lipids, proteins, polysaccharides) using simple processing operations (homogenizing, mixing).

Food-grade delivery systems, based on the nanolaminated coatings described above, could be used to encapsulate, protect and deliver bioactive components. These delivery systems could be used to enhance the activity of bioactive food components delivered through foods and therefore help to prevent diseases, such as cancer, heart disease and hypertension.

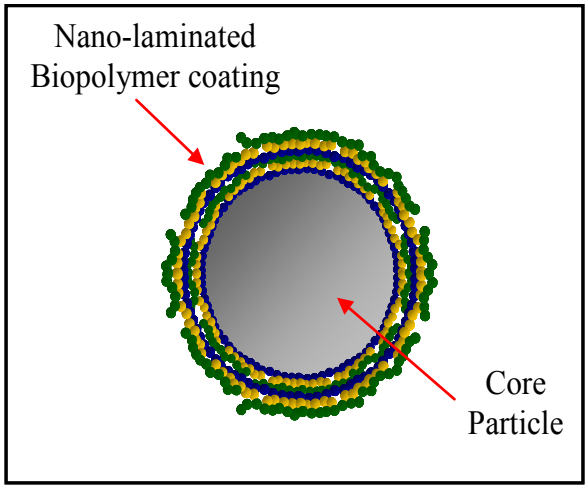

Figure 1. Schematic representation of a nanolaminated particle consisting of a lipid core and a multilayer dietary fiber shell. The shell can be designed to control the retention and release of an active compound within the human gastrointestinal tract. For example, for colonic delivery, a dietary fiber coating would resist digestion in the stomach and small intestine, but would be degraded in the colon due to the action of bacterial

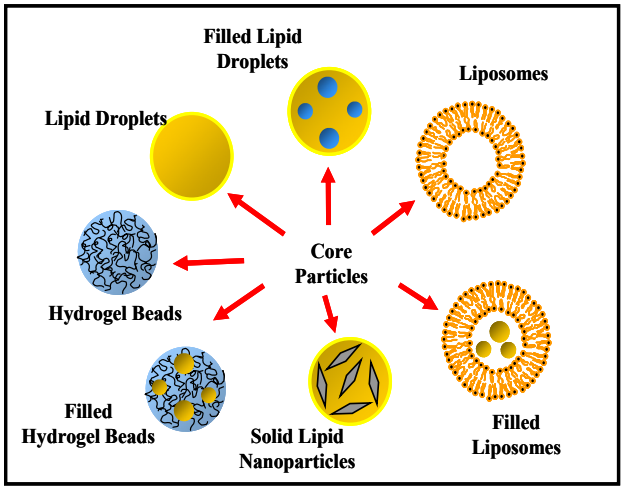

Figure 2. Examples of various kinds of particles that could form the core of nanolaminated particles – other types are also possible. Various lipophilic, hydrophilic, or amphiphilic molecules could be incorporated into these particles.

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A patent application on “Controlling release of bioactive components in the GI tract using nanolaminated coatings” has recently been submitted.

Contributing Agencies: USDA/CSREES