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**Simulation & Modeling of a System**

The process of expressing a model, including its development and operation, is known as modeling. This model is similar to a real system, which helps the analyst predict the effect of changes to the system. A system simulation is the functioning of a model in terms of time or space that aids in the analysis of the performance of an existing or prospective system. Simulation modeling is the process of creating and analyzing a digital prototype of a physical model to predict its performance in the real world.

**Simulation and Modeling in Food industry:** Nanoemulsions have small droplet size and are kinetically stable colloidal systems. They have enhanced functional properties in comparison to conventional emulsions. The composition and structure of the nanoemulsions can be controlled for the encapsulation and effective delivery of bioactive lipophilic compounds. Nanoemulsions have potential application in the food industry for the delivery of nutraceuticals, coloring and flavoring agents, and antimicrobials. The nanoemulsion formulations of active ingredients can be used for developing biodegradable coating and packaging films to enhance the quality, functional properties, nutritional value, and shelf life of food**.**

**How simulation and modeling used in food industry using nanoemulsions:**

The technological limitations developing functional foods is the low solubility, stability, and bioavailability of the bioactive compounds. Most of the bioactive food ingredients are susceptible to degradation during food processing and oxidative deterioration during storage Certain bioactives have low solubility but rapid metabolism which reduces its bioavailability, whereas some are volatile and sensitive to processing conditions These challenges can be overcome by the use of nanoemulsions to encapsulate bioactive compounds for their use in food matrix. The encapsulation of bioactive compounds in an oil phase or emulsiﬁer ensures it stability, bioavailability, and controlled rate of release. The nanoemulsion based delivery system should have compatibility with food matrix and minimal eﬀect on the organoleptic properties of the food such as its ﬂavor, appearance, and texture. The encapsulation of bioactive compound can protect it from processing conditions and prevent its degradation Frontiers in Sustainable Food Systems Aswathanarayan and Vittal Nanoemulsions and Their Food Applications

for long duration from temperature, light, pH, and oxidative conditions during storage. The application of nanoemulsion based delivery system for foods requires that the technique is

economically feasible for industrial scale production.