Effect of dextrose equivalent (DE) of maltodextrin (MD) on the morphology of spray-dried powder containing emulsified fish oil

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Functional food compounds such as fish oil are unstable against light, heat, and oxygen. Stability of those compounds can be imparted by encapsulating them with sugar or protein into a powder. Spray-dried powders of fat-soluble functional compounds are produced by preparing the emulsion solution of functional oil using wall material and emulsifiers, and then spray-drying them. Dextrose equivalent (DE) of maltodextrin (MD) as wall material affects significantly the morphology of spray-dried powder. In this study, effect of DE of MD on the morphology of spray-dried powder was investigated. Fish oil as core material (40wt% in the solid), sodium caseinate as emulsifier (3wt%), MD (57wt%) at various DE were used to form the encapsulant of emulsified fish oil in spray-dried powder. This solubilized solution was emulsified with polytron homogenizer and/or high-pressure homogenizer. The emulsified solution was spray-dried with the spray dryer under the following conditions: an atomizer speed of 10,000 rpm, air flow rate of 110 kg/h, the temperature and flow rate of the infeed solution at 50 ?C and 30 mL/min, inlet-air temperature 160 ?C. The spray-dried powder was washed with hexane. The surface oil in this washed hexane of spray-dried powder was measured with an TLC-FID. Surface and cross-sectional images of the microcapsules were taken using a scanning electron microscope (SEM). The vacuole diameters were measured using more than 30 the cross-sectional photographs. The number of vacuoles in the spray-dried powder was determined by analyzing CLSM images of over 300 fluorescent stained spray-dried powders. The vacuole size and number significantly depended on the DE of MD. The vacuole size and the number of vacuoles in the spray-dried powder were smaller when MD with large DE was used. The surface oil ratio?(surface-oil content to total oil) was correlated with the ratio of vacuole diameter to particle diameter.