EVALUATION OF DRY BLENDING FOR INFANT FORMULA MANUFACTURE

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ABSTRACT

Blending experiments and storage trials were carried out to assess the feasibility of manufacturing infant formula through dry blending of high fat whey powder (HFWP) with whole milk powder (WMP) or a base powder (BP) made from skim milk, sucrose and corn oil.

An indication of cohesiveness of the components of the blends was obtained by measuring compressibility using an Instron testing machine. Compressibility decreased in the following order: BP, WMP, HFWP, lactose and ascorbic acid. Particle size determination using a laser sizer indicated that the particle size increased in the above sequence.

Scanning electron microscopy revealed no evidence of an ordered mixture for either whey powder with milk powder or the powders mixed with ascorbic acid. The mixtures did not exhibit complete randomness and segregation. They are thus termed 'pseudorandom mixtures'.

HFWP was blended with WMP or BP to achieve a target ratio 50:50 in both an experimental ribbon blender and a pilot ribbon blender. Using Response Surface Methodology, load ratio and mixing time but not rotation speed were found to have significant effects on the homogeneity with the experimental ribbon blender. At load ratio 0.4, the time for reaching a certain homogeneity was shorter than that at load ratio 0.8. The cohesiveness of BP impaired its mixing.

A mixing index based on a satisfactory sample standard deviation has an acceptable value of 1. Both powder ratio scores and ascorbic acid level could be mixed below a MI of 1.5 but above 1. As to

protein, fat, carbohydrate, the mixtures reached the acceptable MI. The secondary nutritional requirements such as the ratio of whey protein to casein and the ratio of unsaturated fatty acid to saturated fatty acid were above 1 when the powder ratio MIs were higher than 1.

After mixing WMP and HFWP for 10 minutes differences of sensory quality could not be detected by the taste panelists even though the MI was still above 1.

Unblended and blended samples of WMP and HFWP were tested through a 180 day storage trial at 20°C, 30°C and 40°C. There was no significant difference between unblended and blended samples on the criteria of TBA, PV, HMF, oxidised flavour and caramel flavour at the 5% probability level.

Using the Arrhenius approach, at 20°C, the shelf lives of unblended and blended samples were estimated as 1628 days and 1090 days respectively, with an oxidised flavour limit of 3.5 out of 7 points. The shelf lives were 480 days and 466 days based on a PV limit of 2 milliequivalents O_2 per kg fat.

Dry blending is a feasible technique for manufacturing infant formula, with acceptable homogeneity of the main components of the blended samples and with normal storage stability. The cohesiveness of the components and the design of blender are important factors in improving homogeneity. Further trials are recommended in both experimental and commercial plants.

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