

## Summary of Discussions on Session E

### Cereals, Snacks and Bakery Products

T.H. APPLEWHITE, Recorder, Kraft Inc., Glenview, IL USA

In responding to the questions on the processing, properties, economics and acceptability of vegetable proteins in snack and bakery product applications, the panel covered a variety of topics. Several short papers were presented orally, one of which follows this summary.

Although it is possible to produce high density, vegetable protein-fortified snacks, it was pointed out that these would not replace main meals. The fried, expanded whole soybeans were suggested as a nutritious snack, but it was noted that the complex carbohydrates were not affected by the processing. Further, although the processing of intermediate moisture snacks is very feasible, products cannot be held at less than 20% moisture without humectants and preservatives. Along this line, it was felt that production of "fruit analogs" would present formidable technical obstacles, and the suggestion was advanced that vegetable proteins should be utilized to produce "new" foods rather than substitutes for existing ones.

In a detailed discussion on the chemistry and physical properties of wheat gluten, it was stated that the unique structure of the branched polypeptides evidently confers the properties that allow wheat gluten on hydration to become highly elastic. If carefully dried (below 55 C), the gluten can be rehydrated to an elastic state. However, it is denatured rapidly above 60 C, and elasticity is irreversibly lost. Gluten also can be modified chemically with bisulphite or proteases if care is taken not to overtreat it. These will soften the wet product. For increases in PER, soy protein-gluten mixtures can be extended together or just mixed, but oxidizing agents also should be avoided with these mixtures. Wheat gluten as produced via the wet process is more than 70% protein, and little value was visualized in utilizing air classification on wheat flour where perhaps a 15-20% protein content fraction could be attained. In comparing wheat gluten to other vegetable proteins, it was noted that there are other vegetable proteins with similar elastic, protein structures, but it was not

felt that wheat gluten would have the encapsulating (film-forming) properties of zein.

Moving into the protein fortification of staples, it was agreed that soy protein appears to be the most economical for bread fortification on a PER basis. Although casein has a PER of 3 vs. soy protein at 2, soy flour is 51% protein and NFDM protein content is only 33%, and in the U.K. there is a difference of about \$200/MT in favor of soy. It was further agreed, however, that not all staples, e.g., rice and cereals, are compatible with soy. Thus, each country and each situation must be considered as an individual case. Key examples of this sort included the use of legumes (chickpeas and broadbeans) plus sesame meal in Jordan to supplement protein foods. And, in India, locally grown cottonseed (processed via the liquid cyclone) and groundnut meal are used to produce high protein mixtures. However, India also has a very successful school lunch program utilizing soy protein with and without added lysine for bread fortification. In the Philippines, as well, soy protein-extended flour has reduced the cost per child fed by 1cent/day. In considering the unique needs of countries around the world, it was agreed that more information is needed on local protein sources. Touching on various existing and potentially new protein sources for fortification: fish protein concentrate was discounted as too expensive; winged beans have many programs but no positive results; other legumes are potentially useful but may produce significant quantities of by-products; and cottonseed meal (liquid cyclone) for use in Africa must be supplemented with soy protein or wheat gluten to make it extrudable.

The panel closed with plea for the development of more information on the world's protein resources, for the reduction of trade barriers to the movement of these materials around the world, and for the recognition of individual countries' needs and customs in the development of these new protein foods.