protein is used very little in Canada. This was attributed to its negative image, and also to conflicting regulatory interests; thus there is little likelihood of the use of soya protein in Canadian dairy products in the near future.

One of the participants indicated that Colombia was discouraging promotion of fabricated infant foods that would replace breast feeding. This was attributed to incomplete nutritional knowledge of infant dietary requirements. However, infant foods could be used after the baby is 4 months old.

Labeling was said to sometimes inhibit the use of soya protein, but this was not considered to be significant. The discussion centered on the nutritional adequacy of vegetable proteins and the merits of a "common sense" approach. One of the participants asked if anyone had demonstrated nutritional deficiency in a vegetarian diet. There was no reply, which prompted a suggestion that the slate should be wiped clean regarding the approach to regulatory controls.

A comment was made that consumers sometimes are skeptical even about vitamin fortification which is looked upon by some as adding chemicals. As a result, manufacturers have been prompted to offer foods with and without added vitamins.

On a global basis, regulations vary widely. Poland has no limitations on the use of soya proteins in meats, according to one participant. A Mexican scientist was successful in bypassing regulations by marketing directly through pediatricians. His oat-soya food mix was used as a supplement or an artificial milk in cases where breastfeeding was not available. He implied that acceptance of the product was speeded up by this procedure.

SESSION VI B—MEETING NUTRITIONAL OBJECTIVES WITH SOYA PROTEINS

G.N. BOOKWALTER, Recorder, Northern Regional Research Center, Agricultural Research, Science and Education Administration, USDA, Peoria IL 61604

Session was cochaired by R. Bressani, INCAP, Guatemala, and J.J. Rackis, USDA. The panelists were round table speakers Dan Hopkins, Ralston Purina, U.S.; George Bookwalter, USDA; Benjamin Torun, INCAP, Guatemala; David Cook, Mead Johnson, U.S.; Oliver Miller, Loma Linda Foods, U.S.; and Walter Wolf, USDA. The session emphasized how soya proteins can be used to meet nutritional objectives of various users.

In a discussion of soya proteins in mixed protein systems, it was emphasized that animal proteins can be supplemented by introducing isolated soya proteins into the food systems; this increases the total protein available. Nutritional studies have shown that mixtures of soya protein and meat or soya protein and fish are of a biological quality similar to meat or fish protein fed alone. It was also mentioned that, in addition to providing high biological quality, soya proteins are used in food systems to provide functional properties such as texture, emulsification, water binding capacity and suspension in water. Examples of the use of soya proteins for functionality were given, such as emulsified meat systems and dairy food systems.

Another participant showed that soya protein in the form of defatted, toasted flour, flakes or grits could be used to improve both the quality and quantity of cereal-based food mixtures. Two types of formulated foods fortified with soya are included in the Food for Peace Program. Blended Food Supplements meeting nutritional guidelines were developed to satisfy the dietary requirements of preschool children; these include standardized mixtures known as Corn-Soya-Milk, Instant Corn-Soya-Milk, Wheat-Soy Blend and Whey-Soy Drink mix. A second type of formulated foods is Fortified Processed Foods, which are soya-fortified at levels to improve their nutritional value without changing their functional properties. Standardized mixtures of this group include Soy-Fortified Bulgur, Soy-Fortified Bread Wheat Flour, Soy-Fortified Cornmeal, Soy-Fortified Sorghum Grits, and Soy-Fortified Rolled Oats. Fortified Processed Foods are intended for dietary improvement of the general population. It was pointed out that, in addition to improving nutritional quality, soya products also contribute functional properties such as texture and protection from oxidation in cereal-based food systems.

Clinical tests with premature infants showed no differences between soya or milk formulas in growth or nitrogen retention, and there were fewer complications related to the gastrointestinal tract with the soya formula. However, absorption of calcium and phosphorus from soya-based formulas was less than from milk; therefore, these formulas should be supplemented with minerals. It was concluded that soya formulas could be fed to premature infants as therapeutic agents for a limited time. Nevertheless, adequacy of feeding soya-based formulas to full-term infants has been documented by many studies. A recent Chinese feeding experiment with 100 infants on soya-rice-egg mixtures resulted in growth rates similar to those of infants fed human or cow's milk. Soya-based formulas were advantageous for jaundiced infants undergoing phototherapy because they prevented the diarrhea that is common when these patients are fed human or cow's milk.

Although soya protein is used as a food for infants who are allergic to cow's milk or are lactose intolerant, soya protein can also be a primary cause of allergy. Likewise, processing may affect protein quality and other nutritional characteristics. Soya-based foods may require a higher feeding level to meet nutritional needs because digestibility of some soya products is lower than that of many foods of animal origin.

Soya proteins are widely used both by strict vegetarians and by lacto-ovo vegetarians, who use milk and egg products. The major motivations for using soya products are health and economics. The use of soya protein in feeding the elderly is also being studied. It was emphasized that further research is needed to identify the nutritional requirements of the elderly, especially when affected by disease, trauma and drugs.

One participant affirmed that development of food uses for soya protein is closely interrelated with nutritional studies. Several important developments in animal nutrition studies of soya proteins are: the beneficial effects of cooking; the discovery of methionine as the first limiting essential amino acid; the discovery and isolation of trypsin inhibitors; the retarded growth attributed to trypsin inhibitor; the association of raw meal with pancreatic hypertrophy in chicks and rats; the hypersecretion caused by trypsin inhibitor; the negative feedback mechanism for control of pancreatic secretion; and the contribution of trypsin inhibitors and protein digestibility to growth inhibition. One of the participants commented on the absence of pancreatic hypertrophy in swine and monkeys.

Several important developments in human nutritional studies of soya proteins are: the absorption and retention of nitrogen and the growth rates for protein isolates plus methionine are equal to those for cow's milk in infant studies; methionine supplementation of isolates may be unnecessary for growing children; methionine may be limiting at low soya protein intakes, but adequate at 38 to 45 g/day for adults; soya isolate was equivalent to 80% of egg protein; and mineral metabolism was normal for adults fed a soya concentrate diet. One of the participants commented that calcium was readily available when added to soya proteins. Research needs in soya protein nutrition are: long-term studies with humans; resolving the need for methionine supplementation; elucidating the mechanism of trypsin inhibitor action for soya and other foods, development of rapid methods for measuring protein quality; and investigations to resolve vitamin and mineral fortification needs.

A discussion developed on the question of whether a young child could consume enough corn or wheat to satisfy protein requirements–the response was negative. Additional comments were made regarding clinical results on needs for methionine supplementation, which had been previously discussed.

Enzymatic digests are sometimes used for therapeutic feeding, and further research is needed in the area of predigested proteins.

One of the participants stated that fabricated foods would have to cost about 50% of their natural food counterparts in order to change consumer eating habits. He attributed the major problems of acceptance to food customs and organoleptic differences.

A comment was made regarding the importance of calories in the diet relative to plant protein utilization. It was suggested that the USDA guidelines for minimum caloric content of Blended Food Supplements be increased. Subsequent discussion indicated that caloric density of Blended Food Supplements had been increased by USDA; However, clinical studies with infants had shown the importance of caloric availability to protein utilization.

One participant spoke about people under stress and why they tend to lose nutrients. One observation indicated this was caused by a marked increase in energy requirements, along with increased losses of nitrogen in the urine.

There appeared to be a lack of consensus on the protein requirements for elderly people, but there was support for the proposition of maintaining the same protein consumption while decreasing caloric intake by about 5%/year.

It was concluded that nutritional objectives can be met for all age groups throughout the world with soya proteins.

SESSION VI C—Labeling and Compliance Assurance of Soya Protein Foods

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Session was cochaired by E.W. Lusas, Texas A & M University, U.S., and B. Torun, INCAP, Guatemala. The panelists were round table speakers Douglas Hagg, Dawson Foods, U.S.; John Vanderveen, FDA Bureau of Foods, U.S.; C.E. Bodwell, USDA; Arthur Eldridge, USDA, and Ed Lusas.

Requirements for soya protein products purchased by the U.S. Government for the School Lunch Program and for the Department of Defense were discussed. The proportion of hydrated textured vegetable protein to meat, poultry or fish is set at a 30% maximum when used in the Type A school lunch program. Compositional requirements for textured vegetable proteins were said to include standards for protein, fat, magnesium, iron, thiamin, riboflavin, niacin, vitamin B_6, vitamin B_{12}, pantothenic acid and protein efficiency ratio. Labeling requirements specify inclusion of the phrase "textured vegetable protein" on the carton. The Department of Defense has approved the use of granular soya protein concentrate to extend ground beef. Soya protein concentrate granules must meet specifications for protein, moisture, crude fiber, ash and fat. The beef and hydrated soya protein concentrate granules are ground and blended in 80 to 20 ratio. Flavor characteristics of the granular protein concentrate are critically tested. It was pointed out that this soya protein must receive a flavor score of 6.0 or higher when tested by the USDA Northern Regional Research Center flavor evaluation methodology. Rigorous military testing disclosed no significant differences in sensory traits of the ground beef product with or without added granular soy protein concentrate. The military has saved about $18 million annually by using granular soya protein concentrate. Feedback information confirms justification of the use of this soy protein by the military as a cost-reducing extender.

Provisions of the U.S. tentative regulations for Plant Protein Products were discussed. The objective of the regulations, according to one participant, is to define primary products, name finished products, provide for guidance in ingredient testing and establish guidelines for nutritional equivalence. The foods covered by the regulations are: breakfast and lunch meats, seafood, poultry and other meats, eggs, cream cheese, cottage cheese, and other cheeses. Primary products are defined as flour when they are less than 65% protein, protein concentrate when they are between 65 and 90% protein, and protein isolate when above 90% protein. The product must be named according to which ingredient predominates. Nutrient requirements are simple for some products, such as cream cheese, but are more complex for others. The nutrients listed for each of the six product classes are primarily those recognized in FDA regulations relative to U.S. recommended daily allowances. Substitutions of up to 30% can be made if the protein quality of the vegetable protein is equal to or 80% that of casein. Substitutions above 30% are allowed if the protein quality is equal to or above that of casein. It was pointed out that USDA has not yet finalized regulations for the use of vegetable proteins, but directives allow vegetable proteins at levels up to 3½% as binders in most processed meats. In products covered by standards, vegetable proteins can be used if the requirements of the standard for the valued ingredient are first met. If the added vegetable protein looks like meat and is present in amounts greater than 10% in either raw meat or cooked products, it must be