SYMPOSIUM: SOY PROTEINS

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Vegetable Protein—A Delayed Birth?[1]

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ABSTRACT

Manufacturing technology related to vegetable protein is ahead of its marketing counterpart. Communication among technical, marketing, and consumer groups is required if formed vegetable protein is to succeed as a foodstuff. Perhaps, the final status of vegetable protein will be determined by how well these communication lines are established.

INTRODUCTION

Even though there is a considerable amount of soy protein being manufactured today, its incorporation into human foods is almost as an incidental additive. In certain types of meat products, the ability of soy to bind water is far more importnat than its role as a nutrient. There are other examples in which soy serves as an inexpensive filler and, in fact, has very little identity other than as a name in very fine print on the ingredient panel. The question of whether or not soy protein can be utilized successfully by the food industry is complex, and some of the more important aspects of this question will be discussed.

PRESENTING SOY PROTEIN TO CONSUMERS

As we know, the world, unfortunately, is still divided into the haves and the have nots, and, in most cases, the acceptance of a foodstuff is very dependent upon its method of presentation. This is particularly true in the more affluent societies. At the present time, the ground meat industry is probably the largest user of soy protein, and, in most cases, the consumers of these meat patties are not aware that they contain soy, because they are served to them on a finished basis.

A striking paralellism can be drawn between oleomargarine and soy protein. The common factors between both of these commodities is their relationships to the so called natural counterparts as they relate to cost and taste. The appeal of margarine to the consumer was its low cost, as compared with butter, but its principal drawbacks in the beginning were its taste and consistency, as this latter quality relates to mouth feel. Since margarine as a commodity had to stand on its own as a complete identity, many changes had to be affected to make it competitive with butter. Needless to say, as a result of good research and development efforts, margarine came into its own and has traded roles with butter as a volume commodity.

The question we now pose is whether or not we could offer this same story with some sort of fabricated soy product. It would be worthwhile to go back in time and determine how far we have progressed with respect to commercialization since we first began to appreciate the

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potentials of protein from soybeans. We investigated the various protein fractions, determined their amino acid profile, purified them, and made fibers out of them. Then we made the cardinal mistake of putting bunches of fibers together and saying, "Doesn't that look like chicken breast," or "Isn't that just like ham?" One might quantify this effort and reward it with an "A" in commercial art. These products certainly did not taste like their meat counterparts, and, worst of all, they suffered from the comparison of natural vs imitation or, even worse, synthetic. For some unknown reason, even among the more intelligent and sophisticated people, both imitation and synthetic are negative words in the sense that we have been conditioned to believe that "natural" is the ultimate condition.

Very recently, the director for environmental and consumer affairs of the National Milk Producers Federation, in asking for an exemption from the food surveillance provisions of S-2373, said he feared that consumers might be mislead into believing that imitation products are equal to their natural counterparts.

Let us suppose, for example, that it were possible to prepare a product from a vegetable protein which was identical in every characteristic to chicken meat and it was compared with the latter where the participants were aware of the nature of each product; it is very doubtful that there would be a statistical stand-off as regards preference. It has been proven time and time again products which are as good as, or better than, established products can win in blind panel evaluation but will lose miserably when complete identifications are afforded to the panel participants. What then are the solutions? Before we can fight words like "imitation" or "synthetic," we must open up a channel of communication whose sole purpose is to educate the consumer.

CHALLENGE TO SCIENTIFIC COMMUNITY

The scientific community affiliated with industrial research has become very complacent. Why? Is it because we, like so many other groups, have become so highly specialized that we no longer see or feel any responsibility for the total picture, or is it because we find it easier, less risky, or whatever terms you want to use to let someone else take the next step; let someone else assume the responsibility? We are very good at talking among outselves, and that is where the conversation ends. It is very seldom that we have the opportunity of working with a truly new product, particularly one which holds so much promise for so many people throughout the world. The great inventors of our times, the Bells', the Fords', the Edisons' not only invented, not only manufactured, they communicated. This is what we need to do.

Vegetable protein, in the sense that we are talking about, is a fabricated food, and, consequently, we have the ability to build features into these products which have saleable characteristics other than just protein value. People in affluent populations become concerned with factors, such as general health, physical appearances, etc.

One of the best examples regarding physical appearance relates to a certain nameless product which was sold as a liquid in a can. It contained a minimal amount of calories and was fortified with vitamins and minerals, and, if the regime suggested by the manufacturer was followed carefully, a person would be pleasantly thinner in a few weeks. After consuming the original product, anyone will quite agree that it tasted terrible, and, if anyone had said that a product such as this would be successful and would make untold millions of dollars, we would have said that they were insane. The success of that product was due solely to the human desire to become slim and had nothing to do with the taste or mouth feel of the product. If the individual caloric intake were decreased voluntarily, there would have been no need for the product.

In the fabricated food field, which is ca. a 15 billion dollar market today, extruded snacks, baked snacks, and potato chips account for ca. 30-35% of this market. It has been said that the last thing we really needed was another potato chip. The point is that a marketing group found a hole in an already saturated market and, by fabricating a chip that was uniform in shape and that could be stacked and uniquely packaged, was able to create a synthetic need for an otherwise old product.

In the case of fabricated vegetable proteins we already have a real and absolutely legitimate need, and our basic problem is to find the means and methods to fulfill this obligation. The consumption of soy protein is less than 1% of the fabricated food market. If all the projections regarding the growth of the world population are even reasonably correct, then the need for protein will reach catastropic proportions by the year 2000 when it is estimated that the world population will reach 6 billion. Certainly this demand cannot be met by animal protein, and it is becoming increasingly problematic if fish protein could fill the void. It has been shown in the past that foodstuffs which were given away in feeding programs quickly were labeled "poverty foods" and, as such, became objectionable. The quickest way to gain product acceptability in the less affluent society, where the real need is, is to have that product consumed on its own merit in a more affluent society. This is our challenge, because we have the raw materials, the technology, the marketing know-how, and the need.

As previously mentioned, in today's society, general health is a serious consideration, particularly as it relates to longevity. Many people are designated precardiac and are advised that they have a serious cholesterol problem which can be rectified or controlled by necessary dietary changes. Basically, this means elimination of eggs and shell fish, reduction in red meat intake, and the avoidance of saturated fats. We certainly have a category of people here who would listen to the vegetable protein story, insofar as we can control the protein to fat ratios in a finished product which is cholesterol free. One company, not involved in vegetable proteins, has very successfully marketed an egg product in frozen form with the "no cholesterol" claim.

Another company engaged in vegetable protein manufacture is marketing several frozen breakfast items made from soy protein, and they clearly are stating that the product is cholesterol free and contains no animal fat. The success of these products, all other things being equal, clearly will be tied to the flavor of products, which in the case of breakfast sausage types mostly is derived from spices.

FLAVOR IMPROVEMENT

As noted previously, products had been made simulating animal muscle, and the flavor system was incorporated into the fiber matrix. Needless to say, the flavoring systems were inadequate, and they still are inadequate when incorporated into a fiber or even an expanded-extruded soy piece at the time of manufacture. There is a long road ahead before we arrive at the right flavor marriage with the variety of textured vegetable proteins available, and, for several years to come, the flavor system for any particular product will be an integral part of the rehydration phase rather than directly incorporated with the protein.

Just to divert for a moment, soy happens to be one of the more difficult proteins to flavor because of its native lack of blandness and the astringent character which develops in the higher range of purities. In this paper, we have been talking about soy in particular and vegetable protein in general, but some of the other potential protein sources, such as peanut, cottonseed, rapeseed, etc., should

not be excluded. In all probability, the so called "ultimate vegetable protein" will be a blend of the aforementioned to balance off the amino acid profile. We would like to have a range of beef flavors going from rare roast beef to pot roast, fried chicken to roasted chicken, etc., but, at the present time, we must settle for beef gravy-and chicken gravy-types. The direction in which flavor improvement will occur leads to much speculation as it relates to the particular vegetable protein source. To date, we have made concentrates and isolates of very high purity, and, to improve some characteristics, such as solubility and taste, we have investigated mild chemical hydrolysis and various forms of enzyme hydrolysis.

Just to digress for a second, we have seen a revolution in the starch industry in end-product characteristics as a result of chemical modification of the starch. We know that the so called meaty flavors are related directly to thiol moieties existing in meat reacting with sugars and available peptides during cooking. Because there is a great deal of work in progress in the area of reacted flavors, it is not beyond the realm of possibility that we might consider chemically modifying the protein to produce reactive centers such that meaty flavors are developed during the fabrication process. This fact, coupled with our current and future knowledge on the chemical compositions of those moieties responsible for various types of flavors, should produce some interesting results.

By the same token, the label declaration would be equally interesting. This, of course, raises the question of what do we call our end-products containing vegetable protein. If we incorporate a simulated meat product in either a frozen or dehydrated dinner, both the pictorial representation and the name become a serious problem. It is difficult to forecast the attitudes of the various governmental agencies involved in food regulations, but, if the graphics used to advertise the product resemble in any way, shape, or form the corresponding dinner containing meat, there would be very strict rules regarding the product name. This is one of the reasons why it is so important to communicate the soy protein story to the consumer, so that they are fully aware of the nature of the item being purchased. According to the government, we consumers are stupid and easily deceived, and, therefore, we must be protected.

In a school lunch-type program, many meals with both eye and taste appeal can be prepared and accepted on their own merits, because it is not necessary to give the meal a name or identify the ingredients. This could apply equally to institutional feeding programs, and, in this sense, fabricated vegetable protein could be considered a technical success. In the armed forces, nobody could identify the meat served at meals, and it, therefore, became known as "mystery meat." Although the meal was perfectly acceptable, no one goes into a butcher shop and asks for "mystery meat." We must be able to identify what we consume. In considering fabricated soy products, we cannot neglect the combination of soy protein with meat, particularly when the less expensive cuts, such as "cutter and canner" can be shredded and recombined with soy. The labeling problems in this instance are even greater, since very strict regulations regarding the meat content of many prepared foods already exist. These problems are not insurmountable, but they will take time.

In the final analysis, we recognize that convenience foods, ranging from a single item to a complete meal, are fast becoming a way of life in America. The acceptance of single pan dinners in which the household contribution is the meat portion, may well be one of the ways to introduce textured vegetable to the consumer. Several prototypes containing fabricated vegetable protein recently have been introduced; the climate for their acceptance is right and, whether or not this is true, will depend, to a large degree, upon the quality of the advertising and, most certainly, upon the quality of the product. In this latter respect, poor products could destroy the market for some indeterminate period, and, consequently, every manufacturer with a serious desire to participate in the expansion of vegetable proteins has a definite responsibility in the area of product quality.

The ultimate in the marketing of fabricated proteins will be the time when they are sold as slices, chunks, granules, etc., solely for what they really are. What is happening in the market place today represents progress, and, in any cycle of events, the best place to begin is at the beginning. We have had the birth, let us now proceed with childhood.

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