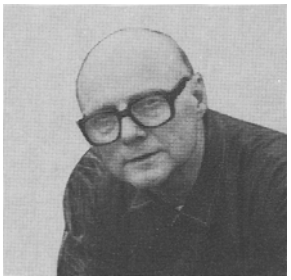

Vegetable Proteins in Meat Products, Problems and Possibilities

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ABSTRACT

The author considers the use of vegetable protein products in the meat industry promising. Development will probably be slower than anticipated, but the use is likely eventually to become quite substantial. One may even anticipate products which replace certain traditional meat products altogether. Nutritionally such development would be completely acceptable. It should also be acceptable from a consumer's point of view, provided adequate information is given in each case. In this respect one may note that information given to the consumers about the composition of traditional or contemporary mixed meat products is quite inadequate in many instances. The specific restrictions often placed on the use of vegetable protein products appear as adherence to tradition more than a real concern for consumer's protection or health.

INTRODUCTION

Many countries are presently considering regulations, normally increasingly restrictive, with regard to using vegetable protein products and meat together in one food. Considering that the technology with regard to the manufacture of vegetable proteins for the use in meat products has improved very rapidly in recent years, this somewhat restrictive attitude may appear surprising or even illogical. It is characteristic that restrictions apply mainly to the admixture of vegetable proteins to meat. To be strictly logical, one might be equally justified in considering restrictions on the admixture of meat to vegetable products, but no regulatory effort has this viewpoint in mind.

INGREDIENTS IN MEAT PRODUCTS

When evaluating what a meat product may contain, most authorities and probably also most consumers seem to be of the opinion that a meat product should consist of pure meat. In reflecting a bit on this, one may, however, realize that a very common ingredient in many meat products, even such which are otherwise considered as just one piece of meat, is water. Thus, a great many cured products are prepared with a yield considerably above 100%, because water and curing ingredients have been added. Adding water to meat products not only results in a lower price per unit of finished products, but may also in many cases, e.g., for cooked ham, improved texture, juiciness and overall acceptability.

When it comes to chopped or comminuted meat products, use of many ingredients is common. First, it need be stressed that many products which are considered meat products are of limited nutritive and organoleptic value, e.g., connective tissue, rind, etc. A common ingredient is also fat, which may be added in quite large amounts. Fat is considered a meat product, but may actually not be particularly desirable in large concentrations, seen from the consumer's point of view.

Another less popular meat additive is actually blood or various derivates thereof. Many authorities and consumers object to using such products in meat products, although we here deal with a product of high nutritive value. Meat products are often also mixed with other animal protein products, e.g., casein, whey protein, etc. Many authorities have a somewhat relaxed attitude towards such additions because they are animal products.

The meat industry uses a great many other admixtures to mixed meat products. They are often classified as binders but actually serve the same purpose as that for which they are used in the kitchen, namely for extending the meat. In this category fall many carbohydrate products, e.g., flour, starch, rusk, potatoes, etc. Countries have different rules and regulations with regard to the use of such products, but often they have been in use for so long that their use is not questioned.

Lately, the vegetable protein industry has developed a great many rather sophisticated products with a pleasing texture, flavor etc., and well suited for mixing into meat products. As mentioned, there is a tendency to guard against use of these products although from a nutritional and organoleptic point of view often they are more desirable than several of the other meat or nonmeat ingredients.

ADULTERATION

One of the requirements is, of course, that no product should be so composed or designated as to mislead the consumers or actually be adulterated. Consumers have a right to know the composition of the product they obtain even if a modified product might be preferable on, say, organoleptic criteria. It does appear, however, as if this problem is mainly a question of informative labeling.

Admittedly, informative labeling may be quite difficult to design in practice. The meat product may contain carbohydrates, vegetable protein, monosodium glutamate, salt, phosphate, etc. Need we then replace the product designation by a recipe? Further, what should the percentage in the recipe apply to – dry matter in all the cases? The meat content might in that case in many products appear surprisingly low, e.g., some sausage products might not even have meat as the main ingredient. Further, as is argued above, one is to declare in the list of ingredients vegetable proteins, casein, etc. Would it then not be equally reasonable to list such components as homogenized rind, connective tissue, etc.?

Difficulties here encountered may in some cases be solved by adopting product standards, e.g., a product designated cooked ham may consist only of the lean meat portion with the fatty tissue adhering thereto of the hind thigh of a pig prepared with no more than 7% added water, 3% added salt, 0.3% added phosphate and 0.15% added nitrite.

In the view of the author, various devices may be used for informing the consumer as adequately and as practically as possible. However, there does not appear to be any justification for placing restrictions on the amount of

TABLE I

Contribution from Meat to the Danish Diet, Percent of Calories and Nutrients

	Average daily diet includes	Calories contributed by meat	% Over recommended daily allowance	% Contribution from meat
Calories	3,508	450	125	13
Protein, g	105	36	188	34
Calcium, mg	2,070	20	203	1
Phosphorus, mg	2,210	345	217	16
Iron, mg	25	5	175	20
B_1-vit, μg	2,631	655	150	25
B_2-vit, μg	3,648	390	170	11
B_{12}-vit, μg	11	4	300	36
C-vit, mg	140	2	250	1

various ingredients, whether of animal or vegetable proteins in a food product. In a way, this would be no more defensible than to argue that a consumer could not serve on the table a dish of rice and meat with a ratio of rice to meat by weight of more than three.

WHOLESOMENESS

Some concern applies to the wholesomeness of the various components used in meat products. It goes without saying that they should all be as free of toxic substances as any ordinary food is known to be. Some of the raw materials used for vegetable protein manufacture contain toxic substances, and some processes by which they are manufactured may cause toxic substances to be formed in the product. All vegetable proteins should comply with normal requirements with regard to freedom of such substances, and much care is taken in their manufacture to see to it that this is adhered to.

NUTRITIONAL CONSIDERATIONS

Much concern over the use of a vegetable protein relates to a concern for the health of the consumer, i.e., a concern that the consumer should obtain an adequate, healthy diet.

First, we do accept that there is no foundation for the conviction often entertained in previous years that animal products are essential for human health. Many persons and even many societies consist of vegetarians or vegans. Besides, nutritional experimentation has determined the basic human requirements of various nutrients. If this is satisfied by our diet, with proper allowance for availability of the nutrients during ingestion, it is irrelevant from where these nutrients are obtained.

When one looks at Table I, it will be obvious that at least in so far as the Danish population is concerned, all nutrients are taken in greater quantities than the recommended daily allowances call for. The over-intake of each nutrient is such that even leaving out all meat products from the diet would make the diet adequate even if meat were replaced with a refined fat containing no nutrients at all.

Having considered this it becomes obvious that where vegetable proteins are used in small amounts, their use will have no measurable effect on the nutritive value of the human diet. There would be no justification for requiring that these food components which would be taken only in very small amounts should be fortified in any way.

Concern is then voiced that vegetable protein products may eventually replace quite substantial amounts of meat. Instinctively, many feel that then the vegetable protein products should contain all the nutrients normally contained in significant amounts in meat and to the same extent in which they are present in the meat. This argument too appears illogical. Table I clearly indicates that at least the Danish population has no deficiency with regard to any nutrient. If a deficiency were found, one would consider which food product would be most suitable as a vehicle for fortification. This might not necessarily be the vegetable protein. More importantly, however, the table indicates that no such fortification is necessary. Needless to say, that one would arrive at the same result without any calculations simply by accepting that various persons eat various amounts of meat and vegetable, cereal, fruit, etc. If we were to suggest one particular food be fortified, we would be illogical unless we also prescribed for the consumer the ratio in which they should consume the various common food.

The vegetable protein industry in the USA was very anxious to see rules promulgated for vegetable proteins to be fortified so as to make them equally nutritious as lean meat. Obviously, it would be of great commercial value to be able to state that the nutritive value of these products was the same as that of meat which they are designed to replace, but such a legal requirement would have no nutritional justification.

FUNCTIONAL PROPERTIES OF VEGETABLE PROTEINS

Especially the more sophisticated vegetable protein products serve various functional properties. Thus, they normally have a high water-binding capacity, i.e., they prevent the formation of jelly in a cooked, mixed meat product, or they may considerably reduce cooking loss, especially where a chopped meat product has been frozen. Some vegetable proteins also act as fat binders, i.e., they prevent the separation of fat in a meat product when cooked. However, this property is less pronounced for vegetable protein products than for some milk proteins.

POTENTIAL USES FOR VEGETABLE PROTEINS

Products in Their Own Right

It would be tempting to suggest that vegetable protein products be developed to serve as products in their own right, i.e., new appealing food products not heretofore in use. However, food habits are difficult to change, and we must accept that a consumer will much more readily take to a new type of sausage than to a product designated "xyz." In general, it seems that the outlook for the use for vegetable protein products in this respect is not very bright.

Meat Substitutes or Meat Analogs

One may then propose that vegetable products be used alone, but in products similar to the common meat products, i.e., sausages, hamburgers, chops, etc. Here again attempts have been made, but sales have been limited mainly to religious groups looking for variety and for religious reasons abstaining from the use of meat products.

Meat Extenders

One might consider vegetable protein products as meat extenders, i.e., less expensive substitutes for lean meat, to be added in substantial amounts without a significant, adverse affect on taste. One example of this use is the well known American school lunch program where up to 30% meat proteins are permitted replaced by vegetable proteins. Also, noncaptive groups show an increasing consumption in this category, e.g., significant amounts of chopped meat sold today have substantial amounts of vegetable protein added, with the admixture appropriately declared on the label, etc. As mentioned above, this addition has been particularly popular for meats to be frozen, since the slight denaturation of meat proteins caused by freezing results in an increased cooking loss which may be offset by replacing a few per cent of the meat protein with an appropriate vegetable protein.

Vegetable Proteins as Binders

Many comminuted meat products, especially those that are cooked, are prepared with small amounts of vegetable protein products added mainly for the purpose of improved water-binding.

Combination Products

There has been a great deal of interest in the manufacture of products which in the USA were suggested designated combination meat products, i.e., whole meat products such as ham, shoulders, etc., cured with a solution of water, soluble vegetable protein, salt, phosphate and nitrite. These products may be prepared with a much higher yield than normal, e.g., 150% instead of 114%. Problems of discoloration, lack of uniformity with regard to water-binding, slight off-tastes, etc., have for the time being delayed any such development.

Vegetable Proteins in Developing Countries

It is often suggested that refined vegetable protein products, often designated meat analogs, might serve a particular purpose in low income countries. It is argued that meat is expensive and often outside the reach of poor consumers in these countries. A closer consideration will suggest that this might not be a wise development. Low income consumers in those countries subsist on a diet, the protein content of which is almost exclusively of vegetable origin. It appears unwise to suggest that the vegetable proteins already taken should be replaced by some which have undergone a complicated manufacturing process, this adding to the cost of their diet without improving it. One might suggest such uses to help variety in a monotonous diet, but costs seem to be prohibitive also for the use for this purpose.