



# FATS AND PROTEINS RESEARCH FOUNDATION, INC.

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## "THE DIRECTOR' DIGEST"

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### ENZYMATIC RENDERING

Over the past several years a considerable amount of money and research effort has gone into the project on enzymatic rendering. You will recall that a Special Fund for these studies was established by NRA (later transferred of course to FPRF). The basic concept of the research was to develop a process that would produce a soluble high quality protein meal, free of bone, for use in milk replacers, pet food and possibly in starter rations for broilers and baby pigs.

Extensive research at Battelle Memorial Institute indicated clearly that a product with the properties outlined above could be produced by means of a process whereby the raw stock was digested with an appropriate enzyme and then the bone and fat separated by centrifugation. The water was removed from the protein solution by spray drying or other appropriate means to yield a soluble protein powder that was apparently of good nutritive quality as indicated by amino acid analyses.

Following these laboratory studies, the process was tested in a pilot plant at Theobald Industries. Numerous problems were encountered and progress was slow. However, most of the operating problems were solved and approximately one ton of finished protein meal was produced. Unfortunately feeding trials with swine and chicks showed that the meal was not of sufficiently high nutritive quality to be used as the sole source of protein in the ration. Careful consideration of all factors involved clearly indicated that these unsatisfactory feeding trial results were due to the presence of solubilized collagen protein in the final product.

To overcome this shortcoming, Battelle Memorial Institute has re-evaluated the feasibility of the process with more critical selection of enzymes and modification of the temperatures used in the process to prevent solubilization of collagen protein. The data from these studies show clearly that with appropriate enzymes and careful temperature control most of the high quality globular protein can be solubilized with only minimal amounts of collagen dispersed (Table 1).

Table 1. Separation of Raw Material by Laboratory Enzyme Treatment. (Four hours digestion at 50°C.)

Enzyme Code No.	Raw Amt. mg.	Stock q.	Protein in Raw Stock q.	Solubilized Protein		Tallow q.	Insoluble Residue q.
				q.	Hydroxy-proline N* Protein N.		
None	200	200	21.0	4.1	0.025	71.9	36.4
P2	200	200	21.0	5.0	0.029	63.2	37.8
P2	88	200	21.0	6.6	0.027	72.4	32.6
B2	200	200	21.0	6.5	0.025	71.7	34.6
B2	55	200	21.0	6.7	0.030	74.9	32.6
B3	200	200	21.0	6.7	0.030	-	32.7
B3	200	200	21.0	6.7	0.024	71.6	33.5

\*Low ratios indicate low amounts of collagen

The essential amino acid content of the solubilized protein indicates that it should be good nutritive quality (Table 2).

Table 2. Some Amino Acids in Protein Solubilized by Different Enzymes

Enzyme No.:	None	P2	B2	B3	Soybean Meal*
Arginine g./16 g.N	2.22	2.22	2.77	2.14	7.7
Histidine "	1.12	1.32	1.52	1.43	2.6
Isoleucine "	2.18	2.88	3.13	3.18	4.7
Leucine "	5.03	6.36	6.74	6.42	7.6
Lysine "	4.97	5.70	6.34	5.86	6.3
Methionine "	0.89	1.36	1.56	1.38	1.3
Threonine "	2.43	3.19	3.27	3.48	4.1
Valine "	3.39	4.35	4.66	4.69	4.7
Hydroxyproline "	3.06	2.64	2.73	2.98	-

\*Given for comparison

Because of these promising results, we have asked Battelle to study the modified process in a pilot plant. This will establish the economics of the process and demonstrate its applicability to different types of raw stock. We will also obtain from the pilot study enough finished material to use in feeding trials.

It is, of course, unfortunate that this investigation has required such a long period of time. However, the importance and potential value of the project to the rendering industry fully justify the expense and time put into the project. To our knowledge there is no other rendering process in use or under study that will result in the clean segregation of a soluble, high quality protein meal, a clean bone fraction and a collagen protein fraction. The process, if finally successful, offers a technique whereby a renderer can definitely control the composition of his finished proteins and thereby increase the acceptance of his products in the marketplace.

SEASON'S GREETINGS

On behalf of the staff and all Officers and Directors of FPRF I want to wish each of you a most happy Holiday Season and a rewarding and prosperous New Year.