FATS AND PROTEINS
RESEARCH FOUNDATION, INC.
3150 DES PLAINES AVENUE • DES PLAINES, ILLINOIS 60018
(5 MINUTES FROM CHICAGO'S O'HARE AIRPORT)
TELEPHONE AREA CODE 312 827-0139

THE DIRECTOR'S DIGEST
D. M. DOTY
TECHNICAL DIRECTOR

October 22, 1970
No. 76

SOIL DISPERSANTS DERIVED FROM COLLAGEN

For the past several months Dr. Warner Linfield and his associates at the Illinois Institute of Technology Research Institute (IITRI), under contract with FPRF, have been investigating the feasibility of developing collagen based soil dispersants for use in synthetic detergent formulations as a replacement for carboxymethylcellulose (CMC). The collagenous raw material used in the investigation was a partially heat-hydrolyzed proprietary material designated as SP-100.

The research approach used by the IITRI research was to crosslink SP-100 and some of its derivatives with appropriate compounds in non-aqueous solvents. Although suitable physical and chemical tests failed to establish the degree of crosslinking, detergency evaluation tests revealed that modifications of the starting material had occurred. In the detergency evaluation tests the collagen derivatives were compared with carboxymethylcellulose in a typical "built" detergent formulation containing LAS, sodium silicate, sodium tripolyphosphate and sodium sulfate.

The more important and interesting findings developed in this feasibility study are summarized below.

1. When Aquadag (an aqueous colloidal graphite suspension) was used as the soiling agent, the collagen derivatives were more effective than CMC in retaining the whiteness of test cloths. In contrast to CMC the effectiveness of the collagen derivatives increased with increasing concentration of the material in the detergent formulation.

2. The data suggest that the higher molecular weight collagen derivatives are better soil dispersants than low molecular weight derivatives.

3. With Aquadag as the source of soil, all of the collagen derivatives were superior to CMC when evaluated by whiteness retention of test cloths in repetitive washings (Table 1).

4. The collagen derivatives were ineffective in soil redeposition tests when EMPA standard soil cloths were used (Table 2). It is postulated that the collagen derivatives tested were of too low molecular weight to disperse the soil particles containing oil from the EMPA test cloth.

5. A detergent formulation containing LAS, SP-100, cocodiethanolamide, metsosilicate, sodium sulfate, NTA, but no phosphates was as effective as the standard detergent of the Association of Home Applicance Manufacturers (AHAM), but not as effective as Tide, in removing soil from EMPA and U. S. Testing Co. test cloths in water with a hardness of 135 ppm.

These results, particularly the finding that a collagen derivative might replace phosphate as a "builder" in synthetic detergents, are most promising. If additional research confirms these findings an enormous new market for collagen can be developed.

Table 1. Percentage Whiteness Retention in Repetitive Washings (Aquadag as Source of Soil)

Test Material (2%)	Number of Launderings				
	2	4	6	8	10
None	17.1	17.9	18.5	18.9	19.2
CMC	19.9	21.1	22.6	25.5	24.7
SP-100	24.9	26.0	26.9	27.4	27.7
Derivative II-12	26.2	26.5	27.6	27.8	28.2
Derivative I-6	33.8	32.2	31.1	30.3	29.5
Derivative II-14	32.6	30.9	29.9	28.9	28.2
Derivative II-10B	23.7	24.5	24.9	25.3	25.3
Derivative I-4	26.1	26.6	26.8	27.1	26.9

Table 2. Percentage Whiteness Retention in Repetitive Washings With EMPA Soil Cloth as Source of Soil

Test Material (2%)	Number of Launderings				
	2	4	6	8	10
None	79.6	61.8	50.7	43.3	38.7
CMC	91.4	82.7	74.6	68.0	62.8
SP-100	79.3	62.4	53.9	45.2	40.5
Derivative II-12	79.0	61.4	50.8	43.3	38.6
Derivative I-6	78.8	62.0	51.8	44.5	40.0
Derivative II-14	78.9	62.1	51.4	44.4	39.7
Derivative II-10B	79.3	62.8	51.7	45.4	40.5
Derivative I-4	79.2	62.4	51.4	44.6	39.8