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

February 17, 1971
No. 80

CHEMICAL NATURE OF RENDERING ODORS

FPRF has been supporting a project at the Illinois Institute of Technology Research Institute (IITRI) to determine the chemical nature of odorous emissions form the rendering process (see Director's Digest No. 69, March, 1970). This study has been completed and a summary of the results is presented below.

The analytical approach to the problem utilized the combined techniques of gas chromatography, mass spectrometry and odor sensory evaluation. Analyses were made on plant air samples from different locations in three rendering plants in the Chicago area. In addition, vapor samples from prepressed cracklings, finished cracklings and rendered fat from these plants were analyzed. These "simulated" air samples were found to contain the same components in the same relative concentrations as the air samples obtained directly from the plants. Following this discovery, a "simulated" sample from prepressed cracklings from a fourth rendering plant and a "simulated" sample from a feather cooker were analyzed.

Semi-quantitative evaluation of the total odorous compounds present in air in different parts of the plants studied yielded the following results.

Plant Area	Odor Component Concentration Micrograms (10^{-6}g.)/liter
Press ventilator	27-50
Press area	4.5-8.5
Raw stock area	1.9-3.8
Cooker dump area	3.1-5.8
Cooker condenser	11

Because of the high concentration and undesirable odor of the compounds present in the press ventilator and press area most of the analytical effort was concentrated on air samples from this area or on "simulated" samples from prepressed cracklings. Many of the same compounds were found to be present in all the samples and differences between samples were primarily the results of variations in relative concentration of the odorous components.

Thirty odorous compounds were positively identified by mass spectrography, and several other compounds tentatively identified by the Kovats Index from gas chromatography and the odor "note" of the isolated vapor. The nature of the compounds identified is as follows.

Alkanes (hydrocarbons) - C-5 to C-8
Alcohols - C-2 to C-5
Aldehydes - C-2 to C-9
Ketones - C-3, C-4
Acids - C-2 to C-5
Acrylonitrile
2-Methyl Tetrahydrofuran
Toluene, Benzene and Dichlorobenzene
Dipropyl sulfide

The odor threshold for these compounds varies from 1.5 picograms (10^{-12}grams) per cubic centimeter of air for butyric acid to approximately 100,000 pg./cc. for ethyl alcohol and acetone. The aldehydes, which occurred in greatest concentration in most of the samples studied, have odor thresholds in the range 100 to 4000 pg./cc.

These results clearly indicate that any system to control rendering odor emissions must destroy or remove sulfur compounds, aldehydes and volatile fatty acids from the air. The data also confirm previous findings that more than 99% of the odorous compounds must be destroyed or removed to attain concentrations below the detectable level.

FPRF members can obtain a copy of the 72-page, highly technical, detailed summary report on this study by requesting it from the Foundation office.