

## LETTERS TO THE EDITOR

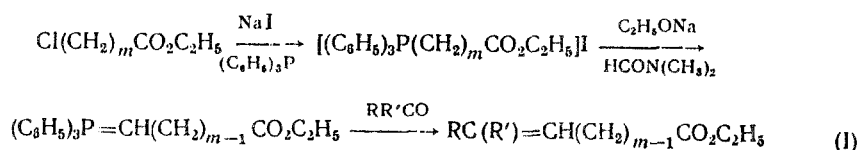
### NEW METHOD OF SYNTHESIZING UNSATURATED ACIDS

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Unsaturated acids of the general formula  $RC(R') = CH(CH_2)_{2n+1}COOH$  ( $n \geq 3$ ) are widely distributed in nature and play an important part in the metabolism of plants and animals [1]. The synthesis of these acids presents considerable difficulties [2] and up to now it has been impossible to synthesize many of them.

We developed a new method of preparing acids of this type, based on the Wittig reaction:



( $m \geq 3$ ). By this method we were able to prepare ylides from phosphonium salts of esters of higher  $\omega$ -halo acids, which do not undergo the Wittig reaction under normal conditions. Thus, from pelargonaldehyde and ethyl  $\omega$ -chlorodecanoate we obtained a 67% yield of ethyl eicosen-11-oate [(I),  $R = n\text{-C}_8\text{H}_{17}$ ,  $R' = \text{H}$ ,  $m = 10$ , b. p. 171-173° (1 mm);  $n_D^{20}$  1.4530;  $d_4^{20}$  0.8736], whose cis-isomer has been isolated from the oil of the seeds of different plants of the mustard family. From ethyl  $\omega$ -chlorononanoate and enanthol we synthesized the ethyl ester of hexadecen-9-oic acid [(I),  $R = n\text{-C}_6\text{H}_{13}$ ,  $R' = \text{H}$ ,  $m = 8$ , b. p. 134-135° (1 mm);  $n_D^{20}$  1.4488;  $d_4^{20}$  0.8746; yield 51%], whose cis-isomer (palmitoleic acid) is present in almost all known fats and phosphatides [1]. Analogously, from ethyl  $\omega$ -chloroundecanoate and butyl methyl ketone, we obtained ethyl 12-methylhexadecen-11-oate [(I),  $R = n\text{-C}_4\text{H}_9$ ,  $R' = \text{CH}_3$ ,  $m = 10$ , b. p. 143-145° (1 mm),  $n_D^{20}$  1.4670;  $d_4^{20}$  0.8920; yield 47%].

Since  $\omega$ -chloro-substituted acids are readily accessible at the present time [3], the method proposed offers wide possibilities for the preparation of various ethylene and polyene acids and also acids with a branched chain.

### LITERATURE CITED

1. F. R. Hilditch, *The Chemical Constitution of Natural Fats* (London, 1956).
2. W. J. Gensler, *Chem. Revs.* **97**, 191 (1957).
3. R. Kh. Freidlina and E. I. Vasil'eva, *Khim. Nauka i Prom.* **2**, 2 (1957).