reagent was prepared in the usual way, the yield was only 7.3%. Since a Grignard reagent seems never to have been prepared from an α-(halomethyl)-heterocycle,[2] it seemed of interest to investigate typical reactions.

Carbonation of the reagent solution in the usual way gave a total yield of 45% of two pure crystalline acids, after separation by extensive fractional recrystallization. The normal product, 2-thienylacetic acid,[3] m. p. 61–62.5° (no depression in admixture with an authentic sample; 5.82 g.), predominated over the isomeric 2-methyl-3-thenoic acid[4] (3.13 g.); m. p. 115–117°.

Both products were characterized by conversion to unique derivatives. 2-Thienylacetamide[3] melted at 147–148°; the mixture melting point with an authentic sample was not depressed. 2-Methyl-3-thenoic acid was oxidized by alkaline potassium permanganate to thiophene-2,3-dicarboxylic acid,[5] m. p. 272–274° (dec.), which was converted by boiling acetic anhydride to the anhydride[5]; m. p. 140–141°.

Addition of the 2-thenyl reagent to an excess of ethyl chlorocarbonate in ether, with cooling in a Dry Ice–acetone-bath, followed by saponification, yielded 17.9 g. (72%) of 2-methyl-3-thenoic acid, identical with the minor product of carbonation. None of the normal acetic acid could be detected.

Investigation of other reactions of the 2-thenyl reagent and of the preparation of reagents from other halomethyl heterocycles is in progress. This work was supported by a grant-in-aid from the Graduate School.

(2) See, in this connection, Gilman and Hewlett, *Rec. trav. chim.*, [4] **51**, 93 (1932); Blicke and Burckhalter, THIS JOURNAL, **64**, 477 (1942); and Lecocq and Buu-Hoi, *Compt. rend.*, **224**, 658 (1947); and, concerning reagents from β-halomethyl compounds, Campaigne and LeSuer, THIS JOURNAL, **70**, 1555 (1948); and Sherman and Amstutz, *ibid.*, **72**, 2195 (1950).

(3) Blicke and Zienty, *ibid.*, **63**, 2945 (1941); Ford, Prescott, and Colingsworth, *ibid.*, **72**, 2109 (1950); Crowe and Nord, *J. Org. Chem.*, **15**, 81 (1950); and Cagniant, *Bull. soc. chim. France*, **847** (1949). Melting points are corrected.

(4) Steinkopf and Jacob, *Ann.*, **515**, 273 (1935).

(5) Linstead, Noble and Wright, *J. Chem. Soc.*, 911 (1937).

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF OREGON RUSSELL GAERTNER
EUGENE, OREGON

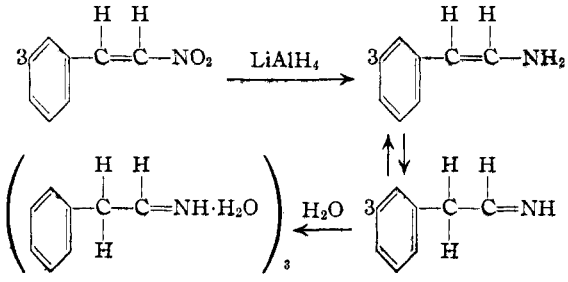
RECEIVED JULY 10, 1950

REVERSE ADDITION OF LITHIUM ALUMINUM HYDRIDE TO NITRO OLEFINS

Sir:

In an extension of our earlier studies[1] on the reduction of nitro olefins with lithium aluminum hydride, a series of experiments in this laboratory has shown that the nitro groups of ω-nitrostyrene and 1-phenyl-2-nitropropene-1 can be selectively reduced by the reverse addition of the calculated amount of lithium aluminum hydride at sub-zero temperatures. When the first compound was treated in this way, hydrolysis of the intermediate organo-metallic complex with 20% aqueous sodium potassium tartrate led to the isolation of phenylacetaldimine (b. p. 100–102° (4 mm.)), a viscous oil of characteristic odor (yield 45%). On standing in air it formed a white crystalline solid which, after recrystallization from petroleum ether (30–60°), melted at 83–85°. This compound is believed to be identical with the phenylacetaldimine hydrate trimer, $(C_6H_5CH_2CH{=}NH\cdot H_2O)_3$, reported previously.[2] *Anal.* Calcd. for $C_{24}H_{33}N_3O_3$: C, 70.04; H, 8.08; N, 10.21. Found: C, 70.12; H, 7.93; N, 10.05.

The probable course of these reactions is, in agreement with earlier observations[3]



Treatment of the aldimine with 2,4-dinitrophenylhydrazine[4] gave the corresponding 2,4-dinitrophenylhydrazone (m. p. 121–121.5°). *Anal.* Calcd. for $C_{14}H_{12}N_4O_4$: N, 18.66. Found: N, 18.52.

Benzyl methyl ketimine (b. p. 116–118° (4 mm.)), (yield 60%) obtained by the selective reduction of 1-phenyl-2-nitropropene-1, also formed a hydrate trimer (m. p. 63–65°) but less readily than did phenylacetaldimine. *Anal.* Calcd. for $C_{27}H_{39}N_3O_3$: C, 71.42; H, 8.66; N, 9.33. Found: C, 71.50; H, 8.52; N, 9.23. The ketimine also gave the corresponding 2,4-dinitrophenylhydrazone (m. p. 162.5–153.5°). *Anal.* Calcd. for $C_{15}H_{14}N_4O_4$: N, 17.83. Found: N, 17.96. The melting points of the 2,4-dinitrophenylhydrazones of the aldimine and ketimine showed no depression when mixed with authentic samples.

Experiments on the acidic hydrolysis of the intermediate organo-metallic complexes, obtained from ω-nitrostyrene and 1-phenyl-2-nitropropene-1, have led to the isolation of phenylacetaldehyde (yield 5%). (*Anal.* of methone deriv. Calcd. for $C_{24}H_{30}O_4$: C, 75.36; H, 7.91. Found: C, 75.22; H, 7.75) and phenylacetone (yield 75%), respectively (*Anal.* of semicarbazone. Calcd. for $C_{10}H_{13}N_3O$: C, 62.80; H, 6.85. Found: C, 62.65; H, 6.58). Thus, the application of the reverse addition of lithium aluminum hydride to nitro olefins could lead to a convenient method of synthesis of higher homologs of carbonyl compounds since nitro olefins of the above type are readily formed by the condensation of aldehydes

(1) Gilsdorf and Nord, *J. Org. Chem.*, **15**, 807 (1950).

(2) Grignard and Escourrou, *Compt. rend.*, **180**, 1883 (1925).

(3) Hochstein and W. G. Brown, THIS JOURNAL, **70**, 3484 (1948).

(4) Shriner and Fuson, "Identification of Organic Compounds," 3rd ed., John Wiley and Sons, Inc., New York, N. Y., 1948, p. 171.

with nitro paraffins. Further investigations on the formation of these carbonyl compounds are in progress.

The analyses reported were carried out by A. A. Sirotenko of this Department. The nitro paraffins used in this study were obtained through the courtesy of the Commercial Solvents Corporation.

COMMUNICATION NO. 198 FROM THE
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RECEIVED JULY 27, 1950

THE PREPARATION OF RADIOACTIVE PROGESTERONE AND DESOXYCORTICOSTERONE LABELED IN RING A[1]

Sir:

The usefulness of tagged progesterone (I) and DOCA (II) in the study of the metabolism of these hormones and of the etiology of certain diseases of mal-adaptation prompted their preparation from 3-keto-Δ^4-etiocholenic acid methyl ester (III). Side chain labeled I has previously been reported.[2] Fission[3] of III with ozone yields (55%) the corresponding open ring A keto-acid, *i. e.*-3,5-seco-5-oxo-17-carbomethoxy-etiocholan-3-oic acid (IV), which, as its methyl ester V, adds, under the usual Reformatsky conditions, the elements of methyl bromoacetate (VI). Simultaneously the intermediate products undergo dehydration and cyclization back to III. Respectively, with carboxyl and methylene labeled VI, the products are III-3-C^{14} and III-4-C^{14}. Both series of reactions have been conducted; that with the more readily available VI-1-C^{14} is reported herewith. From III-3-C^{14}, 21-diazoprogesterone-3-C^{14} (VII) was obtained in the usual manner,[4,5] and converted, as described, to both I-3-C^{14} and II-3-C^{14} with a specific activity of approximately 250,000 counts per milligram per minute. All counts were determined in the windowless flow counter operating at 40–50% efficiency, and are expressed below as disintegrations registered per minute per millimole.

V (formed with diazomethane from 3.17 g. of IV) was subjected to the Reformatsky reaction with 2 molar proportions of VI-1-C^{14} (2.8 g., containing approximately 3 millicuries of C^{14}).[6] The ether soluble neutral reaction products were refluxed (5 hours) in 20% concentrated hydrochloric acid in acetic acid, and then absorbed on alumina (90 g.). Fractional elution gave 300 mg. of III-3-C^{14}, melting at 130–132° (no depression on admixture with III) and counting 1.5×10^8. To the mother liquors of the above, 300 mg. of carrier III was added, and the mixture was recrystallized to yield a further 300 mg. of III-3-C^{14} counting at 7.3×10^6. The two were combined and saponified (4 hours reflux in 6% methanolic KOH) to the free etio acid (400 mg.). Its acid chloride, formed through the action of oxalyl chloride on the sodium salt,[5] was subjected to the usual Arndt–Eistert reaction[4,5] with diazomethane to give 240 mg. of 21-diazoprogesterone-3-C^{14} (VII), m. p. and mixture m. p. 163–170°.

Desoxycorticosterone-3-C^{14} 21-acetate (65 mg.) was obtained from VII (125 mg.) on hydrolysis with acetic acid.[4,5] The final product, separated and purified by sublimation, had m. p. and mixture m. p. 151–153°, count 8.4×10^7.

Progesterone-3-C^{14} was derived from VII through the general reaction between a diazoketone and HI described by Wolfrom and Brown.[7] VII (100 mg.), in chloroform, was shaken with concentrated hydriodic acid (liberation of iodine). Evaporation and crystallization yielded 70 mg. of I-3-C^{14}, m. p. and mixture m. p. 122–125°, count, 8.4×10^7.

Full experimental details will be reported later.

(1) Aided by grants from the National Cancer Institute, U. S. Public Health Service, the Medical Research Division of the National Research Council (Ottawa), and Charles E. Frosst & Co., Montreal.

(2) Riegel and Prout, *J. Org. Chem.*, **13**, 933 (1948); MacPhillamy and Scholz, *J. Biol. Chem.*, **178**, 37 (1949).

(3) Reichstein and Fuchs, *Helv. chim. acta*, **23**, 676 (1940).

(4) Steiger and Reichstein, *ibid.*, **20**, 1164 (1937).

(5) Wilds and Shunk, THIS JOURNAL, **70**, 2427 (1948).

(6) Kindly prepared by Mr. B. Belleau.

(7) Wolfrom and Brown, THIS JOURNAL, **65**, 1516 (1943).

DEPARTMENT OF BIOCHEMISTRY
MCGILL UNIVERSITY R. D. H. HEARD
MONTREAL, CANADA P. ZIEGLER

RECEIVED JULY 17, 1950

THE CHEMICAL NATURE OF A UNIQUE FATTY ACID

Sir:

In connection with studies on the relation between biotin and fatty acids[1] we investigated the chemical nature of the fatty acids of *Lactobacillus arabinosus*. Distillation of the methyl esters, derived from the saponifiable fraction from 1.3 kg. of this organism, yielded, in addition to other materials, a fraction boiling at 187–188° at 3 mm. Saponification of this fraction gave an optically inactive, "branched chain" fatty acid (I), melting at 28–30°, of the composition $C_{19}H_{36}O_2$ (*Anal.* Calcd.: C, 76.96; H, 12.24; neut. eq., 296; C-methyl, 2. Found: C, 76.83; H, 12.54; N.E., 300; C-methyl, 1.3). The fatty acid exhibited an X-ray diffraction pattern indicating a chain length in the range of a C_{18} acid. The pattern was clearly distinguishable from those of known C_{18} fatty acids.[2] The compound failed to react with potassium permanganate in acetone and remained unchanged upon exposure to monoperphthalic acid. However, one mole of hydrogen was absorbed on catalytic hydrogenation

(1) Hofmann and Axelrod, *Arch. Biochem.*, **14**, 482 (1947).

(2) We are indebted to Dr. E. S. Lutton, The Procter & Gamble Company, for the X-ray work.